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Wildlife Monitoring Report
Palmer's Creek Wind Farm

Palmer's Creek Wind Farm, LLC.

Prepared for:

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Granite Falls, MN 56241

PALMER'S CREEK
Wind Farm

WENCK
Responsive partner.
Exceptional outcomes.

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1.0 Introduction

1.1 PROJECT OVERVIEW

Palmer's Creek Wind Farm, LLC (Palmer's Creek) proposes to construct the Palmer's Creek Wind Energy Facility (Project or PCWF), a Large Wind Energy Conversion System (LWECS), with a 44.6-megawatt (MW) nameplate capacity in Chippewa County, Minnesota (**Figure 1**). Wenck Associates, Inc. (Wenck) and New Century Environmental (NCE) were contracted by Palmer's Creek to conduct and analyze a variety of pre-construction wildlife surveys prior to building and operation of the proposed facility.

The data from these studies were used to identify species, species groups or species of concern that are present in the project area and vicinity that may be at a higher risk of mortality and/or displacement. Data is presented in several categories, and highlight federally listed species and state listed species. This is a final report that contains data collected from June 29, 2016 to June 16, 2017.

1.2 DIURNAL FIXED-POINT AND INCIDENTAL AVIAN USE SURVEYS

Spring and fall are migration periods for non-resident avian species. During the spring, birds move north from wintering grounds to summer breeding grounds. In the fall, birds move south to wintering grounds. Spring and fall are prime periods to conduct avian surveys on potential wind farm areas to observe migratory species and resident species.

Avian surveys focus on inventory and monitoring with specific objectives that include: 1) an inventory of bird species in a specific project area; 2) determining the relative abundance of species; and 3) monitoring seasonal changes in species composition and relative abundance (Whitworth et al. 2007). Diurnal fixed-point surveys are one of the most common methods used to determine avian composition and abundance. Point counts not only focus on visual cues but also on auditory cues to give the observer an advantage in rough terrain. For some species, vocal cues may be the only reliable means of detection (Whitworth et al. 2007).

Incidental avian surveys are used to obtain bird distribution and composition information between point count locations. Larger birds, such as game birds, raptors, and waterfowl, large flocks of smaller birds, and birds that are a rarity in the area are typically recorded during incidental surveys.

1.3 EAGLE USE SURVEYS

Following Stage 2 of the Eagle Conservation Plan Guidance (USFWS 2013), eagle point count surveys have been conducted to collect quantitative data on eagle presence that would allow estimation of eagle exposure rate, which forms the basis of a risk assessment model. Eagle use surveys focus exclusively on eagles and occur at the eight (8) point count locations (**Figure 2**) used for point count surveys in 2016-2017. The objective of the eagle use survey is to document eagle movements and behavior within and adjacent to the study area in all four seasons to assess risk to eagles (primarily bald eagles). Eagle surveys were conducted by a qualified biologist and were conducted for one calendar year to capture temporal variation in eagle use of the study area.

1.4 RAPTOR AND EAGLE NEST SURVEYS

Raptors and eagles spend much of their time hunting and soaring within elevation ranges that correspond to the wind turbine rotor-sweep area (RSA), making them susceptible to turbine blades (Erickson et al. 2002). Because raptors and eagles are long-lived species with low reproduction rates, potential impacts from collision-related mortality are of concern (Erickson et al. 2002). Although specific studies are lacking, adults and recently fledged young could be at particular risk of collision with turbines because of their higher use of areas near nest sites. After young raptors and eagles fledge, fledglings often spend significant amounts of time flying and roosting near nest locations until they become capable flyers and hunters. Additionally, construction activities near active nests during the breeding season may potentially result in disturbance or abandonment of nest sites.

In 2007, the bald eagle (State Special Concern) was delisted from its federally threatened status in the lower 48 states, but it is still federally protected under the Bald and Golden Eagle Protection Act ("BGEPA"). It was also delisted in Minnesota in 2013.

Bald eagles associate with distinct geographic areas and landscape features, including nest sites, foraging areas, communal roost sites, migration corridors and migration stopover sites (USFWS 2013). They are typically found near water bodies, natural and manmade, due to the presence of fish. They prefer to nest, perch, and roost in old-growth or mature stands of trees, and they usually select a nesting tree that is the tallest among those in its vicinity to provide visibility. Nesting trees are usually situated near a water body that supports fish, their main preferred prey.

1.5 ACOUSTIC BAT SURVEYS

There are seven bat species known to occur in Minnesota – big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*) and tri-colored bat (eastern pipistrelle, *Perimyotis subflavus*) (MNDNR 2016). The northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), and little brown bat (*Myotis lucifugus*) are all state-listed species of special concern.

NCE initiated acoustic monitoring surveys to capture the diversity/abundance of bat species within the proposed Palmer's Creek Wind Farm (project area) and to meet due diligence with regulatory agencies (NCE 2017).

2.0 Methodology

2.1 DIURNAL FIXED-POINT AND INCIDENTAL AVIAN USE SURVEYS

2.1.1 Fixed-point Surveys

Avian point count (PC) surveys were conducted in summer 2016 through summer 2017 to capture migrating and resident species at the project site (**Table 1**). Survey data was used to evaluate avian use, behavior, and species composition during migration and determine resident avian species. Diurnal fixed-point count surveys were conducted at eight (8) circular plots (**Figure 2**). Point count locations were selected to capture a diverse range of habitats and locations with the best possible view shed.

Table 1: Palmer's Creek Point Count Dates

Summer 2016		Fall 2016		Winter 2016-2017		Spring 2017		Summer 2017	
Survey Number	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*
1	6/29/2016	6	9/8/2016	18	12/15/2016	24	3/1/2017	34	5/18/2017
2	7/13/2016	7	9/23/2016	19	12/28/2016	25	3/8/2017	35	6/1/2017
3	7/28/2016	8	9/29/2016	20	1/10/2017	26	3/17/2017	36	6/16/2017
4	8/8/2016	9	10/7/2016	21	1/26/2017	27	3/22/2017		
5	8/23/2016	10	10/13/2016	22	2/9/2017	28	3/29/2017		
		11	10/18/2016	23	2/24/2017	29	4/4/2017		
		12	10/26/2016			30	4/14/2017		
		13	10/31/2016			31	4/18/2017		
		14	11/9/2016			32	4/25/2017		
		15	11/16/2016			33	5/2/2017		
		16	11/23/2016						
		17	11/30/2016						

All observations within an 800-meter radius at each point count were recorded; any observations outside the 800-meter radius were considered incidental. Each PC survey lasted for 20 minutes; all audio and visual observations were recorded. Surveys were conducted by an experience ornithologist. Surveys were rotated to cover all daylight hours to ensure each PC was surveyed at various times of the day. Data recorded for each observation included species, number of individuals, time, and height above ground, behavior, and flight direction. A range finder and topographic maps were used as references to determine bird distances to the observer and flight heights. Birds not easily identifiable due to low light conditions and distance were identified to the lowest taxonomic level possible.

The data collected from these surveys can be used to estimate the potential effects of wind turbines on avian species in the project area. The survey protocol estimates avian use throughout the day and captures a variety of bird species. Songbirds are most active in the morning during the breeding season and can be difficult to detect during the afternoon, compared to raptors which become more active as the sunlight heats the air and creates thermals, which individuals use for soaring.

Twenty-minute survey periods provide adequate time to detect both raptors and non-raptors. Double counting may occur during the 20-minute survey because individuals may appear and disappear from view. Double-counting of birds is not problematic for this type of survey because the objective is to document use in terms of number of birds noted per 20-minute survey, not number of distinct individual birds.

The ability to detect all species within the 800-meter survey radius varies among species and potentially not all individuals within the survey area are counted. This variation in detectability results in an overestimate of mean use in conspicuous species and an underestimate of mean use in reclusive species (Thompson 2002).

2.1.2 Incidental Observations

Incidental observations included those occurring while traveling between PC locations, pre- and post-PC survey time period, and outside the 800-meter radius circular plot. These observations were recorded but not used in the formal analysis.

2.1.3 Species Groupings

The data is presented in two primary groups of interest: raptors and non-raptors. Raptors were defined as vultures, hawks, eagles, falcons, and owls. Non-raptors were defined as all other avian species.

2.1.4 Mean Avian Use

Mean use was calculated by dividing the total number of birds per species observed by the total number of surveys conducted. Mean use was also calculated for each individual point count location to determine if there were areas with a higher mean use compared to other areas. The number of observations is also presented. This information helps depict whether a high mean use is driven by a single observation.

2.1.5 Flight Behavior

Flight behavior was evaluated by calculating the proportion of flying birds that were observed flying below, within, or above the turbine rotor sweep area (RSA). The Project is comprised of two (2) 2.3-MW and sixteen (16) 2.5-MW horizontal axis wind turbines. Each will have an anticipated hub height between 80 and 90 meters and a rotor diameter of approximately 116 meters. Therefore, an RSA between 22 and 148 meters above the ground was used.

2.1.6 Encounter Rate

The encounter rate is the rate at which a species was observed flying through the RSA during the avian point count surveys in the project area and suggests potential mortality risk from flight behavior.

To estimate the rate at which a species flies through the RSA, the following equation was applied to every species observed in the project area:
Encounter Rate = A*P*f**P*t*

- A is the mean use of birds/20 minutes for a given species

- P*f* is the proportion of all activity observations for a given species that were flying
- P*t* is the proportion of flying observations that were within the turbine RSA

The encounter rate index is relative to the observations of species during the surveys and within the study area and cannot be extrapolated to the species that may use the project area in the future. The encounter rate index from this study does not take into consideration behavior (e.g. foraging, courtship), habitat use, and turbine avoidance differences between species.

2.2 EAGLE USE SURVEYS

Eagle use data was collected in 1-minute intervals so that the data could be translated into eagle exposure minutes. The data recorded for each survey includes the count start and stop times, eagle species observed, numbers and age classes of eagles seen, minutes of eagle flight in two height categories based on the USFWS Eagle Conservation Plan Guidance (< 200 and > 200 meters [m] above ground), notes on flight and other behaviors, and an individual identifier for each flight observation allowing it to be linked to a flight map. Each sampling point consisted of an 800-meter (0.5-mile) radius circle (0.77 square mile) that provides distant, unobstructed views and allows visual observations of eagles and other large birds at a 2 to 3-mile distance. Numerical data was collected within 800-m-radius plots, but flight lines were documented across line-of-sight and were not limited to the 800-m-redius survey plot. Detailed protocol study-specific data sheets and a data management plan were utilized in the field.

Surveys were conducted once per month during the non-migration months (April-August), and conducted at a minimum of twice per month during the migration months (September-March) starting July 2016 and concluding in June 2017 for a total of 20 survey weeks. Individual surveys consisted of a 1-hour observation period at each of the eight point-count locations during each week of the surveys for a total of 160 hours of observations (**Figure 2** and **Table 2**). Surveys occurred in all weather conditions except when visibility was poor. The eagle use surveys were conducted outside of the 20-minute avian point count surveys.

Table 2: Palmer's Creek Eagle Use Survey Dates

Summer 2016		Fall 2016		Winter 2016-2017		Spring 2017		Summer 2017	
Survey Number	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*	*Survey Number*	*Survey Date*
1	7/28/2016	3	9/7/2016	10	12/14/2016	16	3/7/2017	19	5/18/2017
2	8/22/2016	4	9/22/2016	11	12/27/2016	17	3/21/2017	20	6/16/2017
		5	10/6/2016	12	1/9/2017	18	4/13/2017		
		6	10/17/2016	13	1/26/2017				
		7	10/31/2016	14	2/9/2017				
		8	11/15/2016	15	2/24/2017				
		9	11/29/2016						

2.3 GROUND AND AERIAL RAPTOR AND EAGLE NEST SURVEYS

During Spring 2017, a ground raptor nest survey was conducted to locate raptor nests, and determine nest activity status and the species using those nests. The initial surveys were conducted before trees leaf out to locate nests and identify early breeding species. The project area and a 1-mile buffer was surveyed from a vehicle using binoculars and spotting scopes. All raptor nest locations were documented with Global Positioning System (GPS) coordinates. Raptor species, height of nest, nest activity status, nest condition, substrate, and other relevant data were recorded for each nest. An additional visit was conducted if nests were found to document the activity status of nests located during the initial survey and to identify nesting attempts by late nesting raptors such as Swainson's hawks. Raptors may use nests intermittently among years as well as re-nest after a nest failure; therefore, early- and late-season nest surveys allow for a more accurate summary of breeding raptors.

A review of historical eagle nest data (MNDNR 2016) within one mile of the Project was completed at the request of Fagen, Inc. (Fagen). A bald eagle (*Haliaeetus leucocephalus*) nest has been documented in T116N R40W Section 11 just outside of the project area boundary. This nest was active when checked in 2000, 2001, and 2005.

An additional nest was located Spring 2016 by Fagen. This nest was active in 2016 and 2017 and located in T116N R39W Section 20, immediately outside of the project area boundary. Fagen staff monitored this nest in 2016 and 2017 or until all eaglets have fledged (Michael Rutledge, Fagen, Inc., Personal Communication, March 7, 2017).

The objective of the aerial eagle nest surveys is to locate and record nests that may be in the proximity of the project area, identify concentration and density of eagle nests, and identify nests that may be vulnerable to disturbance and/or displacement effects by the Project. The intent of the nest survey is to gather information on species nesting in the area, including nest locations, nesting season (timing), and nest success.

The survey was conducted within a ten-mile buffer from the project area (defined as the analysis area). Eagle Aviation Inc. was contracted to fly an aerial survey of the project area on April 20, 2017. A Cessna Skyhawk with two observers (Ray Jilek, Eagle Aviation Pilot and Justin Askim, Wenck biologist) were used during the survey. Complete coverage of the project area was obtained by systematically flying over the landscape and visually scanning all areas for potential roosting, nesting and foraging eagles. Aerial surveys were conducted using a fixed-wing aircraft, flying over relatively even terrain at approximately 250 – 500 feet above ground level and at speeds of 85 to 125 miles per hour.

2.4 ACOUSTIC BAT SURVEYS

2.4.1 2015 and 2016 Surveys

Fagen deployed five separate Anabat systems (Anabat® SD-2 ultrasonic detectors) to record bat activity throughout the study area. The first deployment was done with two of the Anabat recorders during the fall of 2015 and continued through October 15, 2016. Three additional Anabat recorders were launched on August 3, 2016. Refer to **Figure 3** below.

2.4.2 2017 Surveys

Data was gathered in the field within the study area from four different Anabat acoustic recorders and two SM3 full spectrum monitors. The monitors gathered data from late March 2017 and are currently active gathering data throughout the 2017 field season.

3.0 Results

3.1 DIURNAL FIXED-POINT AND INCIDENTAL AVIAN USE SURVEYS

Of the approximate 6,150 acres that comprise the Palmer's Creek project area, approximately 3,970 acres were surveyed during PC surveys. Eight point-count locations were established and surveyed in the project area (**Figure 2**). A total of 36 surveys were conducted over four seasons, with seasons defined as summer (June 27, 2016–August 31, 2016 and May 14, 2017-June 17, 2017 [8-point count surveys]), fall (September 1, 2016–November 30, 2016 [12-point count surveys]), winter (December 1, 2016–February 25, 2017 [6-point count surveys]), and spring (February 26, 2017–May 15, 2017 [10-point count surveys]), as provided in **Table 1** above.

3.1.1 Species Composition

The summer 2016 and summer 2017 surveys consisted of 875 avian individuals (46 different species) that were recorded during the eight fixed-PC surveys (**Table 3a**). The most frequently observed birds were brown-headed cowbird (*Molothrus bonariensis*), (15.54 percent of all birds observed), red-winged blackbird (*Agelaius phoeniceus*), (14.74 percent) and barn swallow (*Hirundo rustica*), (12.79 percent) (**Table 3a**). The remaining 43 species comprised approximately 57.03 percent of the total birds observed.

The fall 2016 survey consisted of 1,702 avian individuals (39 different species) that were recorded during the eight fixed-PC surveys (**Table 3b**). The most frequently observed birds were American crow (*Corvus brachyrhynchos*), (14.63 percent of all birds observed), red-winged blackbird, (12.04 percent), and brown-headed cowbird, (11.69 percent) (**Table 3b**). The remaining 36 species comprised approximately 61.63 percent of the total birds observed.

The winter 2016-2017 survey consisted of 822 avian individuals (18 different species) that were recorded during the eight fixed-PC surveys (**Table 3c**). The most frequently observed birds were European starling (*Sturnus vulgaris*), (41.24 percent of all birds observed), snow bunting, (*Plectrophenax nivalis*) (13.26 percent), and wild turkey, (*Meleagris gallopavo*) (11.19 percent) (**Table 3c**). The remaining 15 species comprised approximately 34.31 percent of the total birds observed.

The spring 2017 survey consisted of 1,714 avian individuals (42 different species) that were recorded during the eight fixed-PC surveys (**Table 3d**). The most frequently observed birds were European starling, (28.80 percent of all birds observed), red-winged blackbird, (17.98 percent), American crow (11.22 percent), and Canada goose (*Branta canadensis*), (10.56 percent) (**Table 3d**). The remaining 36 species comprised approximately 31.44 percent of the total birds observed.

Cumulatively, surveys identified 5,368 avian individuals (64 different species) that were recorded during the eight fixed-PC surveys (**Table 4**). The most frequently observed birds were European starling, (19.63 percent of all birds observed/1,054 individuals), red-winged blackbird, (12.82 percent/688 individuals), American crow, (10.54 percent/566 individuals), brown-headed cowbird, (6.99 percent/375 individuals), and Canada goose, (6.48

percent/348 individuals) (**Table 4**). The remaining 59 species comprised approximately 43.54 percent of the total birds observed.

3.1.2 Avian Use

Summer 2016 and summer 2017 overall mean bird use was 13.67 birds/20 min (**Table 5**). The overall mean use by non-raptors was 13.53 birds/20 min; the highest mean use was brown-headed cowbird (2.13 birds/20 min), red-winged blackbird (2.02 birds/20 min), and barn swallow (1.73 birds/20 min) (**Table 5**). Raptors are a group of special interest because of their propensity to fly at heights within a turbine RSA. The mean use for raptors/vultures/owls was 0.14 birds/20 min; the highest mean use was turkey vulture (*Cathartes aura*) (0.08 birds/20 min), red-tailed hawk (*Buteo jamaicensis*) (0.05 birds/20 min), and Swainson's hawk (*Buteo swainsoni*) (0.02 birds/20 min) (**Table 5**). For the species groups, overall mean use was highest for songbirds (10.97 birds/20 min) (**Table 5**).

Fall 2016 overall mean bird use was 17.73 birds/20 min (**Table 5**). The overall mean use by non-raptors was 17.27 birds/20 min; the highest mean use was American crow (2.59 birds/20 min), red-winged blackbird (2.14 birds/20 min), and brown-headed cowbird (2.07 birds/20 min) (**Table 5**). The mean use for raptors/vultures/owls was 0.46 birds/20 min; the highest mean use was red-tailed hawk (0.20 birds/20 min), bald eagle (*Haliaeetus leucocephalus*) (0.10 birds/20 min), and turkey vulture (0.07 birds/20 min) (**Table 5**). For the species groups, overall mean use was highest for songbirds (10.73 birds/20 min) (**Table 5**).

Winter 2016-2017 overall mean bird use was 17.13 birds/20 min (**Table 5**). The overall mean use by non-raptors was 16.96 birds/20 min; the highest mean use was European starling (7.06 birds/20 min), snow bunting (2.27 birds/20 min), and wild turkey (1.92 birds/20 min) (**Table 5**). The mean use for raptors/vultures/owls was 0.17 birds/20 min; the highest mean use was red-tailed hawk (0.13 birds/20 min), Swainson's hawk (0.02 birds/20 min), and northern harrier (*Circus hudsonius*) (0.02 birds/20 min) (**Table 5**). For the species groups, overall mean use was highest for songbirds (11.44 birds/20 min) (**Table 5**).

Spring 2017 overall mean bird use was 24.61 birds/20 min (**Table 5**). The overall mean use by non-raptors was 23.96 birds/20 min; the highest mean use was European starling (7.09 birds/20 min), red-winged blackbird (4.43 birds/20 min), American crow (2.76 birds/20 min), and Canada goose (2.60 birds/20 min) (**Table 5**). The mean use for raptors/vultures/owls was 0.65 birds/20 min; the highest mean use was red-tailed hawk (0.21 birds/20 min), bald eagle (0.21 birds/20 min), and turkey vulture (0.20 birds/20 min) (**Table 5**). For the species groups, overall mean use was highest for songbirds (15.95 birds/20 min) (**Table 5**).

Cumulative overall mean bird use for all surveys was 18.64 birds/20 min (**Table 5**). The overall mean use by non-raptors was 18.25 birds/20 min; the highest mean use was European starling (3.66 birds/20 min), red-winged blackbird (2.39 birds/20 min), American crow (1.97 birds/20 min), brown-headed cowbird (1.30 birds/20 min), and Canada goose (1.21 birds/20 min) (**Table 5**). The mean use for raptors/vultures/owls was 0.39 birds/20 min; the highest mean use was red-tailed hawk (0.16 birds/20 min), turkey vulture (0.10 birds/20 min), and bald eagle (0.09 birds/20 min) (**Table 5**). For the species groups, overall mean use was highest for songbirds (12.35 birds/20 min) (**Table 5**).

3.1.3 Frequency of Occurrence

During the summer 2016 and summer 2017 surveys, the most common species present during the surveys was the red-winged blackbird (34.38 percent of all surveys), which was widely distributed throughout the project area (**Tables 6** and **7a**). Other frequently occurring species included barn swallow (32.81 percent of all surveys), American goldfinch (*Spinus tristis*) (29.69 percent of all surveys), and field sparrow (*Spizella pusilla*) (26.56 percent of all surveys) (**Table 6**).

During the fall 2016 surveys, the most common species present during the surveys was the blue jay (*Cyanocitta cristata*) (27.08 percent of all surveys), which was widely distributed throughout the project area (**Tables 6** and **7b**). Other frequently occurring species included American crow (23.96 percent of all surveys), field sparrow (22.92 percent of all surveys), and rock pigeon (*Columba livia*) (17.71 percent of all surveys) (**Table 6**).

During the winter 2016-2017 surveys, the most common species present during the surveys was the American crow (31.25 percent of all surveys), which was widely distributed throughout the project area (**Tables 6** and **7c**). Other frequently occurring species included European starling (20.83 percent of all surveys), rock pigeon (20.83 percent of all surveys), and blue jay (18.75 percent of all surveys) (**Table 6**).

During the spring 2017 surveys, the most common species present during the surveys was the horned lark (*Eremophila alpestris*) (37.50 percent of all surveys), which was widely distributed throughout the project area (**Tables 6** and **7b**). Other frequently occurring species included Canada goose (25.00 percent of all surveys), and American crow (23.75 percent of all surveys (**Table 6**).

Cumulatively, the most common species present during the surveys was the field sparrow (13.54 percent of all surveys (**Tables 6** and **8**). Other frequently occurring species included blue jay (13.19 percent of all surveys), red-winged blackbird (11.81 percent of all surveys), American goldfinch (11.46 percent of all surveys), and American crow (10.07 percent of all surveys (**Table 6**).

3.1.4 Flight Height and Encounter Rate

During the summer 2016 and summer 2017 surveys, 73.14 percent of all individuals observed were flying (**Table 10**). Flight height and flight direction data was recorded for all the flying birds (**Table 11**). Approximately 0.00 percent of flying raptor species flew above the RSA, 44.44 percent flew below the RSA, and 55.56 percent flew within the RSA. For all other species, 0.00 percent flew above the RSA, 98.89 percent flew below the RSA, and 1.11 percent flew within the RSA (**Table 9**). The turkey vulture and American white pelican (*Pelecanus erythrorhynchos*) were the two highest encounter rates of 0.06 respectively (**Table 10**).

During the fall 2016 surveys, 81.43 percent of all individuals observed were flying (**Table 10**). Flight height and flight direction data was recorded for all the flying birds (**Table 11**). Approximately 34.21 percent of flying raptor species flew above the RSA, 39.47 percent flew below the RSA, and 26.32 percent flew within the RSA. For all other species, 4.47 percent flew above the RSA, 85.88 percent flew below the RSA, and 9.65 percent flew

within the RSA (**Table 9**). Species with the highest encounter rate were as follows: unknown blackbird (*Turdus sp.*) (0.42), red-winged blackbird (0.27), American crow (0.23) and ring-billed gull (*Larus delawarensis*) (0.18) (**Table 10**).

During the winter 2016-2017 surveys, 80.78 percent of all individuals observed were flying (**Table 10**). Flight height and flight direction data was recorded for all the flying birds (**Table 11**). Approximately 12.50 percent of flying raptor species flew above the RSA, 62.50 percent flew below the RSA, and 25.00 percent flew within the RSA. For all other species, 1.07 percent flew above the RSA, 91.77 percent flew below the RSA, and 7.16 percent flew within the RSA (**Table 9**). The species with the highest encounter rate was the unknown duck (*Anatidae sp.*) (0.96) (**Table 10**).

During the spring 2017 surveys, 87.05 percent of all individuals observed were flying (**Table 10**). Flight height and flight direction data was recorded for all the flying birds (**Table 11**). Approximately 11.54 percent of flying raptor species flew above the RSA, 23.08 percent flew below the RSA, and 65.38 percent flew within the RSA. For all other species, 1.14 percent flew above the RSA, 85.32 percent flew below the RSA, and 13.54 percent flew within the RSA (**Table 9**). The Canada goose and American crow were the two highest encounter rates of 1.44 and 0.61 respectively (**Table 10**).

Cumulatively, 82.04 percent of all individuals observed were flying (**Table 10**). Flight height and flight direction data was recorded for all the flying birds (**Table 11**). Approximately 18.52 percent of flying raptor species flew above the RSA, 33.33 percent flew below the RSA, and 48.15 percent flew within the RSA. For all other species, 3.21 percent flew above the RSA, 87.73 percent flew below the RSA, and 9.05 percent flew within the RSA (**Table 9**). Species with the highest encounter rate were as follows: Canada goose (0.40), American crow (0.25), unknown duck (0.18) and unknown blackbird (0.14) (**Table 10**).

3.1.5 Sensitive Species Observations

Two state special concern species {bald eagle (21 observations, 27 individuals) and American white pelican (3 observations, 16 individuals)} were observed during the avian surveys (**Table 4**). Neither of these species are protected by the federal Endangered Species Act.

3.1.6 Flight Direction

The summer 2016 and summer 2017 surveys indicated that birds were generally flying in variable directions (60.94 percent). Specific directions of flight and respective percentages are as follows: northwest (8.13 percent), west (7.97 percent), north (5.16 percent), south (4.84 percent), southeast (4.22 percent), east (3.44 percent), northeast (3.28 percent), and southwest (2.03 percent) (**Table 11**).

The fall 2016 surveys indicated that birds were generally flying in variable directions (31.17 percent). Specific directions of flight and respective percentages are as follows: south (20.20 percent), southeast (14.29 percent), southwest (10.25 percent), north (7.50 percent), west (6.13 percent), east (5.84 percent), northwest (3.03 percent), and northeast (1.59 percent) (**Table 11**).

The winter 2016-2017 surveys indicated that birds were generally flying in variable directions (65.96 percent). Specific directions of flight and respective percentages are as

follows: north (10.39 percent), southeast (8.28 percent), south (5.12 percent), west (4.37 percent), northeast (2.56 percent), northwest (1.81 percent), southwest (0.90 percent), and east (0.60 percent) (**Table 11**).

The spring 2017 surveys indicated that birds were generally flying in variable directions (51.55 percent). Specific directions of flight and respective percentages are as follows: west (14.36 percent), northwest (9.40 percent), north (8.17 percent), south (5.90 percent), southeast (3.39 percent), east (3.09 percent), northeast (2.36 percent), and southwest (1.52 percent) (**Table 11**).

Cumulatively, the surveys indicated that birds were generally flying in variable directions (48.67 percent). Specific directions of flight and respective percentages are as follows: south (10.13 percent), west (9.33 percent), north (7.86 percent), southeast (7.68 percent), northwest (6.06 percent), southwest (4.25 percent), east (3.63 percent), and northeast (2.38 percent) (**Table 11**).

3.1.7 Incidental Surveys

Staff documented seven species and a total of 45 individual incidental observations. One species, a single northern pintail (*Anas acuta*), was detected during incidental surveys, but not during the point count surveys. See **Table 12** below.

Table 12. Cumulative Palmer's Creek Incidental Point Count Data

Species	Summer 2016 & 2017		Fall 2016		Winter 2016-2017		Spring 2017		Cumulative	
	Observations	Individuals	Observations	Individuals	Observations	Individuals	Observations	Individuals	Observations	Individuals
Red-tailed Hawk	4	4	8	8	0	0	9	9	21	21
American Kestrel	0	0	1	1	0	0	2	3	3	4
Bald Eagle	1	1	1	1	1	1	4	5	7	8
Northern Harrier	1	1	1	1	0	0	4	4	6	6
Northern Pintail	0	0	1	1	0	0	0	0	1	1
American White Pelican	0	0	0	0	0	0	1	6	1	6
Turkey Vulture	3	5	1	1	0	0	2	2	6	8
Totals	**9**	**11**	**13**	**13**	**1**	**1**	**22**	**29**	**45**	**54**

3.2 EAGLE USE SURVEYS

Eagle use surveys documented 19 bald eagles with 87 flight minutes, and 78.9 percent of the individuals were flying within the RSA. Most of these eagles have been observed within one mile of the Minnesota River along point count locations 1, 2, 3 and 4 (**Figure 2** and **Table 13**).

Table 13. Eagle Point Count Results

	Points								Totals
	1	2	3	4	5	6	7	8	
Individuals	1	1	10	7	0	0	0	0	19
Individuals Flying	1	1	10	7	0	0	0	0	19
Above RSA	0	0	0	0	0	0	0	0	0
Within RSA	0	1	9	5	0	0	0	0	15
Below RSA	1	0	1	2	0	0	0	0	4
Flight Minutes	2	3	65	17	0	0	0	0	87

Eagles were observed less than 1 percent of the survey time period (87 minutes observed/9,600 survey minutes). Of the 87 minutes in which eagles were observed, 78 minutes of observations were made with eagles flying within the RSA. The eagle point count surveys are reflective of the eagle data collected during the avian point count surveys, both with a relatively low encounter rate of 0.09 and 0.03 respectively.

3.3 GROUND AND AERIAL RAPTOR AND EAGLE NEST SURVEYS

An aerial (fixed-wing) raptor/eagle nest survey was conducted on April 20, 2017 that encompassed a 10-mile buffer of the project area. Three active nests, three inactive nests and ten individuals (three on nest and seven in flight or perched) were observed during the April 20, 2017 aerial survey (**Figure 4** and **Table 14**). Except for Nest 3, all nests are approximately five miles or greater from the project area.

Table 14: Eagle Nests Within Palmer's Creek Analysis Area

Nest Number	Status	Distance from Project Area	Latitude	Longitude
1	Active	4.9 miles	44.90855599	-95.70717782
2	Inactive	8.5 miles	44.73293894	-95.42223611
3	Active	0.3 miles	44.83149047	-95.56799484
4	Active	7.0 miles	44.72996346	-95.48105437
5	Inactive	10.0 miles	44.67489358	-95.53845803
6	Inactive	9.0 miles	44.68952578	-95.53443812

Eagle nest density within the analysis area is approximately one active nest per 102,000 acres.

See **Appendix C** for the *Aerial Eagle/Raptor Nest Survey Report.*

Two active red-tailed hawk nests were located within the project area during the ground surveys (**Figure 4**).

3.4 ACOUSTIC BAT SURVEYS

3.4.1 2015 and 2016 Surveys

The data collected from Fagen was sent to NCE, who processed the data in zero-crossing through Kaleidoscope (Ver. 3.1.8) to confirm presence diversity and abundance of bat species. The software uses a presence/absent indicator by giving each species of bat a p-value. The lower the p-value, the more likely the species of bat is present. Bat presence, in the form of vocalization, was detected, identified by species, and catalogued, thereby allowing estimates of species occurrences, distribution and relative abundance.

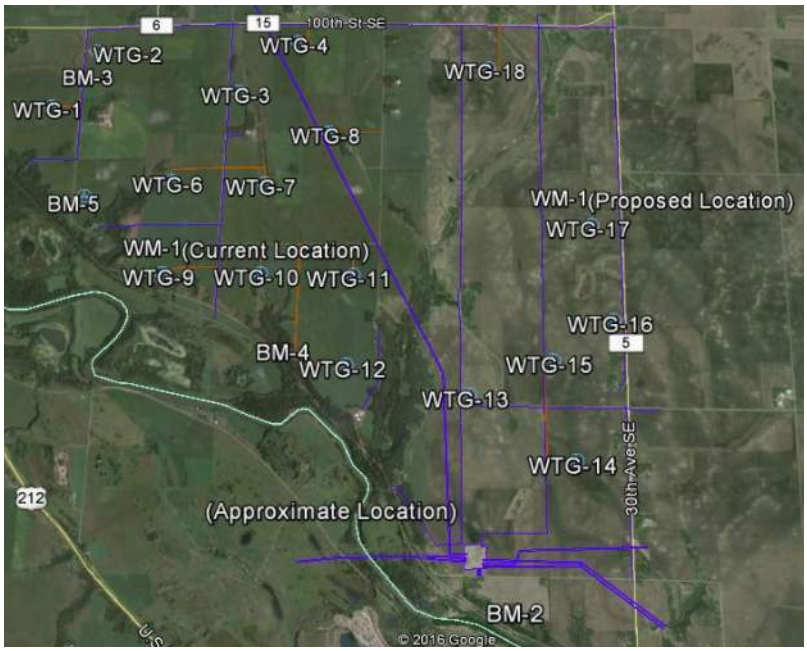

Figure 3. Bat Monitor (BM) Locations. BM-1 is not shown on the map but lies next to BM-2.

Bat Monitors (BM) 1 & 2 gathered data throughout the fall of 2015 and were deployed again in May 2016. Monitors 3-5 were added in September 2016.

Monitors 1 & 2 were deployed on September 13, 2015 and removed on October 11, 2015. They were deployed again on April 12, 2016, then removed on October 15. Monitor 3, Monitor 4 and Monitor 5 were deployed on August 3, 2016 then removed on October 15, 2016. The monitors were deployed for 287 trap nights.

From the five (5) Anabat recording systems, 232,116 sound files were recorded. Visual examination and filtering of files to eliminate extraneous noise (e.g., wind, insects, etc.) resulted in a total of 14,442 bat detections.

There was a total of six bat species documented throughout the course of the study (September-October 2015 and 2016). The tricolored bat, also known as the eastern pipistrelle (*Pipistrellus sublavus*) was documented at this site and is listed as a species of concern in the state of Minnesota. It was detected in small numbers but was found at every monitor except for Monitor 1. The northern long-eared myotis (*Myotis septentrionalis*) is a federally threatened species whose home range lies within the study area. However, no confirmed documentation was recorded here. Even though a total of five clicks of which Kaleidoscope classified as MYSE (northern long-eared myotis) the P-value was given a 1 for every monitor indicating the likelihood of presence is near non-existent. All other species documented are of least concern. Of the six-species documented, the silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*) and big brown bat (*Eptesicus fuscus*) were among the most common followed by the little brown bat (*Myotis lucifugus*) and eastern red bat (*Lasiurus borealis*). See **Appendix D** for the entire *Interim Acoustic Bat Summary Report.*

3.4.2 2017 Surveys

At this point in time the four Anabat and two SM3 full spectrum recording system visual examination and filtering of files to eliminate extraneous noise (e.g., wind, insects, etc.) resulted in a total of 15,511 sound files classified as bat detection passes as of data collected through Jun 29, 2017.

Monitor 1 is located on the lower end of a met tower surrounded by agriculture with some roosting trees nearby. The monitor recorded 1,933 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 57% of total detections. The big brown bat was the second most common being 24% of total detections. The federally threatened northern long-eared myotis was detected 1 time (0.05%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.8%) detections.

Monitor 2 is located on the upper end of the same met tower as monitor 1, total elevation of 55 m. The monitor recorded only 116 files that Kaleidoscope Pro was able to classify as bat passes. The monitor only recorded a total of two species. The Hoary bat was the dominant species at this with 90 (78%) total bat passes. The second species was the big-brown bat with 26 (22%) total bat passes.

Monitor 3 is one of two SM3 ultrasonic detector which is located along a creek bank just off of the road surrounded by a combination of agriculture and roosting tree habitat. The monitor recorded 3,231 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 35% of total detections. The big brown bat was the second most common being 26% of total detections. The federally threatened northern long-eared myotis was detected 1 time (0.0003%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.5%) detections.

Monitor 4 is located in a corn field and is surrounded by agriculture, with a creek with roosting habitat located near the site, the monitor recorded 1,127 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the hoary bat being 49% of total detections. The second most common was the silver-haired bat being 40% of total detections. The northern long-eared myotis was not recorded at this site. The eastern pipistrelle had a total of 10 (0.9%) detections.

Monitor 5 is located along the roadside in agriculturally dominated landscape, the monitor recorded 763 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver haired bat being 67% of total detections. The second most common was the hoary bat with being 24% of total detections. The northern long-eared myotis was not detected at this site. The eastern pipistrelle had a total of 8 (1%) detections.

Monitor 6 is located in a tree line near a farm house, this is the second of the SM3 full spectrum devices. The monitor recorded a total of 8,341 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver haired bat being 42% of total detections. The second most common was the big brown bat with being 35% of total detections. The northern long-eared myotis was detected 1 time (0.01%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.2%) detections.
Bat acoustic surveys will continue through the 2017 season.

4.0 Discussion and Impact Assessment

4.1 DISCUSSION

Based on the point count surveys, the avian community currently using the project area is characterized by species associated with typical midwestern agricultural lands, mixed-grass prairie vegetation and riparian areas. Most of the project area and its vicinity have been developed for agricultural use, specifically row crops such as corn, sunflower and soybeans. Within disturbed habitats such as these, the greatest potential impact of wind facilities to avian species is risk of collisions with turbines. The close proximity of the Minnesota River may serve as an attractant to migratory bird species, especially waterfowl, which pass through the area during the spring and fall migration. Mean avian fatality rates estimated from wind facilities in the Midwest (NE, WI, MN, and IA) range from 0.44 to 11.83 birds/turbine/year (0.49 – 7.17 birds/MW/year; Tetra Tech 2012). Palmer's Creek bird fatalities are estimated to fall within this range.

4.2 RAPTOR USE AND ENCOUNTER RATE

Survey data gathered totaled 113 individual raptors observed for an annual mean use of 0.39 raptors/20 minute (**Table 5**). This rate was compared to a study of 37 other wind facilities that implemented similar protocols. The raptor annual mean use at these wind facilities ranged from 0.09 to 2.34 raptors/20 min survey. Based on the results from these wind facilities, as summarized by Derby et al. 2010, a ranking of seasonal raptor mean use was developed: low (0-0.5 raptors/20 min. survey); low to moderate (0.5-1.0 raptors/20 min); moderate (1.0-2.0 raptors/20 min); high (2.0-3.0 raptors/20 min); and very high (> 3.0 raptors/20 min). Under this ranking, the current mean raptor use in the project area is considered low.

Encounter rate analysis may also suggest which species may be at risk to become turbine casualties. The encounter rate is an index and only considers probability of exposure based on abundance, number of individuals flying, and flight height of each species within the RSA for turbines at the wind facility.

Based on 52 of 108 individuals observed flying within the RSA/20 minutes during the surveys (**Table 9**), raptor encounter rates in the project area are considered moderate. Approximately 48.15 percent of all raptor observations were within the RSA. The highest raptor encounter rate was red-tailed hawk and turkey vulture with each having 0.07 individuals flying within the RSA/20 minutes and bald eagle at 0.03 individuals flying within the RSA/20 minutes (**Table 10**).

High numbers of raptor fatalities have been documented at wind facilities (e.g. Altamont Pass); however other studies at wind facilities in the United States found that 3.2 percent of the total casualties were raptors (Erickson et al. 2001). Results from Altamont Pass in California suggest that species mortality is not all related to abundance (Orloff and Flanery 1992). Based on survey results for species occurrence/abundance and encounter rates within the Palmer's Creek project area, red-tailed hawks, turkey vultures and bald eagles may be at highest collision risk with the Project.

High raptor use (greater than 2.0 birds/20 min) has been associated with high raptor fatality at wind facilities (Strickland et al. 2011). Conversely, raptor fatality appears to be low when raptor use is low (less than 1.0 birds/20 min; Strickland et al. 2011), which is the case for raptor use in the project area. Currently the project area has a raptor use of 0.39 birds/20 minutes (**Table 5**).

Turkey vultures and red-tailed hawks were the raptor species with the highest mean use and were also among the most frequently detected raptor species in the project area. Both species are commonly associated with agricultural and grassland habitats which provide opportunities for foraging and activity associated with susceptibility to turbine-collisions (Thelander et al. 2003). In a recent study of raptor response to wind facilities, red-tailed hawks were observed engaging in high-risk behaviors at operational wind facilities (Garvin et al. 2011). Results from post-construction fatality monitoring studies indicate that red-tailed hawks are frequently found as turbine-related fatalities (228 records of red-tailed hawk from 27 studies – Tetra Tech 2012; Jain 2005, Grodsky and Drake 2011, Johnson and Erickson 2011). However, Garvin et al. (2011) documented that red-tailed hawks, despite high-risk behavior, also demonstrated collision avoidance behavior (Garvin et al. 2011). Thus, risk of turbine-related fatalities in the project area exists for red-tailed hawks, but turbine-related fatalities would be expected to be low given the moderate level of use. Project-related fatalities of red-tailed hawks, should they occur, are unlikely to population-level impacts because red-tailed hawks are common nationwide (Sauer et al. 2011). Turkey vultures are also very common nationwide and Project-related fatalities, should they occur, would not have population-level impacts.

4.3 NON-RAPTOR USE AND ENCOUNTER RATE

Migratory bird species in the United States are protected by the Migratory Bird Treaty Act (MBTA). Passerine species have been the most abundant bird fatality at wind facilities outside California (Erickson et al. 2001 and Erickson et al. 2002), often comprising more than 80 percent of the bird fatalities. Both migrant and resident passerine fatalities have been observed (Erickson et al. 2001 and Erickson et al. 2002). Passerines make up a large proportion of the birds observed during the avian surveys in the project area and would be expected to make up the largest proportion of fatalities. Encounter rates indicate that the Canada goose, American crow, unknown duck, unknown blackbird and red-winged blackbird are likely to be exposed to collisions from wind turbines in the project area (**Table 4** and **10**). The red-winged blackbird is commonly found as a turbine-related fatality (more than 20 records of post-construction fatality from 27 studies; Tetra Tech 2012, Johnson et al. 2000, Howe et al. 2002, TRC Environmental 2008, Gruver et al 2009, BHE Environmental 2010, Jain et al. 2011, Grodsky and Drake 2011). Thus, risk of turbine-related fatalities of red-winged blackbird, and perhaps other at risk non-raptors in the project area, should they occur, are unlikely to have population-level impacts because collision fatalities appears to have little effect on North American land bird populations (Arnold and Zink 2011).

There were other species that flew through the RSA during the PC surveys, but their frequency of occurrence and overall numbers were not high enough to warrant significant collision exposure (**Table 10**).

4.4 LISTED AND SENSITIVE SPECIES RISK

The sensitive species observed in the project area are summarized in Section 3.6. No federally listed threatened, endangered or candidate species were observed during the

surveys to date. Based on survey data, two state special concern species (bald eagle and American white pelican (*Pelecanus erythrorhynchos*)) were observed during the avian surveys. None of these species are protected by the federal Endangered Species Act.

Eagle use surveys documented 19 bald eagles with 87 flight minutes, and 78.9 percent of the individuals were flying within the RSA. Most of these eagles have been observed within one mile of the Minnesota River along point count locations 1, 2, 3 and 4 (**Figure 2** and **Table 13**).

4.5 GROUND AND AERIAL RAPTOR AND EAGLE NEST SURVEYS

An aerial (fixed-wing) raptor/eagle nest survey identified three active nests and three inactive nests (**Figure 4** and **Table 14**). Except for Nest 3, which is in close proximity to the project area, all nests are approximately five miles or greater from the project area.

Ground surveys identified two active red-tailed hawk nests were located within the project area during the ground surveys (**Figure 4**).

4.6 ACOUSTIC BAT SURVEYS

4.6.1 2015 and 2016 Surveys

There was a total of six bat species documented throughout the course of the surveys (Fall 2015 and Fall 2016). Three species of concern in the state of Minnesota were observed during the acoustic bat monitoring (tricolored bat, big brown bat, and little brown bat). The northern long-eared bat is a federally threatened species with a species range that includes the majority of the eastern United States, extending west through Minnesota to the western borders of the Dakotas. No confirmed documentation of the northern long-eared bat in the project area was recorded during the Fall 2015 to Fall 2016 acoustic bat monitoring (see **Appendix D**).

Bats typically utilize farm buildings and dead and dying trees with cavities and loose bark as roosting and maternity habitat. Bats typically use forests, riparian corridors and wetlands as feeding habitats due to higher nocturnal insect densities in these areas. There is minimal native vegetation that serves as wildlife habitat within the project area near direct areas of Project impact. There are bats in the project area and some wind turbine collision bat mortality is likely to occur because of the Project. Compared to birds, less is known about bat populations and habitat preferences on a local, regional or national level. Bat mortality is likely to be greatest for migratory tree bat species, including hoary, eastern red and silver-haired bats during the fall migration period (Johnson 2005, Arnett et al. 2008).

4.6.2 2017 Surveys

There were a total of six bat species documented at this point in time during the course of the study (late March, 2017-late June, 2017). The eastern pipistrelle (*Pipistrellus sublavus)* was documented at this site and is listed as a species of concern in the state of Minnesota. It was detected in small numbers but was found at every monitor except for monitor 2. The northern long-eared myotis (*Myotis septentrionalis*) is a federally threatened species whose home range lies within the study site. However no confirmed documentation was recorded here. Even though a total of three passes of which Kaleidoscope classified as MYSE (northern long-eared myotis) the P-value was given a 1 for every monitor indicating the likelihood of presence is near non-existent. All other species documented are of least

concern. Of the six species documented the silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*) and big brown bat (*Eptesicus fuscus*) were among the most common followed by the little brown bat (*Myotis lucifugus*) and eastern red bat (*Lasiurus borealis*). Bat acoustic surveys will continue through the 2017 season.

5.0 Conclusions

It appeared that birds were using specific areas near the project area, especially along the Minnesota River. Strong associations with topographic features along the Minnesota River were noted for raptors and other large avian species. The Minnesota River appears to be a flyway or concentration area for migrating avian species.

Data collected suggest an overall low impact in the project area on the local avian community as compared to other upper Midwest wind facilities. The low mean-use rate in the project area is primarily due to few common residents and migratory species. Raptor use was low for each raptor species detected. Although there is potential for turbine-related fatalities of Canada goose, American crow, unknown duck, unknown blackbird and red-winged blackbird, fatalities are not expected to have population-level impacts. If avian fatality rates are similar to other wind facilities within the region, it is estimated the Project would result in fatality rates between 0.44 – 11.83 birds/turbine/year (0.49 – 7.17birds/MW/year) which is comparable to other Midwest wind facilities.

Assuming the general relationship between bat activity and bat mortality observed at other sites is broadly applicable to locations with similar characteristics, levels of turbine-related bat mortality at the Palmer's Creek Wind Farm is estimated to be on the lower end of the spectrum, and similar with mortality rates at other wind facilities in the region.

No federally-listed endangered, threatened, or candidate species were observed within the project area. However, two state special concern species (bald eagle and American white pelican) were observed during the avian surveys. No historical bald eagle nests are within the project area, and raptor use, including bald eagles, is considered relatively low within the project area. All migratory avian species are protected by the Migratory Bird Treaty Act of 1918, which requires a project proposer to work with the U.S. Fish and Wildlife Service to identify and implement measures to avoid and minimize impacts to migratory bird species.

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Appendix A

Table 3a. Palmer's Creek Point Count Data by Season (Summer 2016 & 2017)																					
Species	Group	Obs	Ind	Fly	Mean Use per 20 min	Percent Composition	No. Surveys Species Observed	Frequency (% Surveys)	Proportion Ind. Flying	Proportion Ind. Flying Below RSA	Proportion Ind. Flying Within RSA	Proportion Ind. Flying Above RSA	Encounter Rate	N	NE	E	SE	S	SW	W	NW	Var
Brown-headed Cowbird	SB	13	136	122	2.13	15.54%	13	20.31%	89.71%	100.00%	0.00%	0.00%	0.00	2.46%	0.00%	5.74%	2.46%	0.00%	0.00%	27.87%	11.48%	50.00%
Red-winged Blackbird	SB	22	129	117	2.02	14.74%	22	34.38%	90.70%	100.00%	0.00%	0.00%	0.00	0.85%	3.42%	0.00%	4.27%	0.85%	0.00%	0.85%	2.56%	87.18%
Barn Swallow	SB	21	111	111	1.73	12.69%	21	32.81%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	1.80%	0.00%	0.00%	0.00%	0.00%	0.00%	98.20%
American Goldfinch	SB	20	44	44	0.69	5.03%	19	29.69%	100.00%	100.00%	0.00%	0.00%	0.00	25.00%	4.55%	9.09%	18.18%	18.18%	6.82%	6.82%	2.27%	9.09%
European Starling	SB	3	44	44	0.69	5.03%	3	4.69%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.64%	86.36%
American Crow	C	8	39	32	0.61	4.46%	8	12.50%	82.05%	100.00%	0.00%	0.00%	0.00	12.50%	3.13%	0.00%	0.00%	0.00%	15.63%	15.63%	53.13%	0.00%
Field Sparrow	SB	17	35	12	0.55	4.00%	17	26.56%	34.29%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Blue Jay	C	12	28	8	0.44	3.20%	12	18.75%	28.57%	100.00%	0.00%	0.00%	0.00	37.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	62.50%
Horned Lark	SB	13	26	21	0.41	2.97%	13	20.31%	80.77%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	4.76%	0.00%	4.76%	9.52%	0.00%	80.95%
Tree Swallow	SB	9	23	23	0.36	2.63%	9	14.06%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.04%	86.96%
Rock Pigeon	PD	9	22	16	0.34	2.51%	9	14.06%	72.73%	93.75%	6.25%	0.00%	0.02	6.25%	62.50%	12.50%	0.00%	6.25%	0.00%	12.50%	0.00%	0.00%
Common Yellowthroat	SB	10	20	0	0.31	2.29%	10	15.63%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow Warbler	SB	4	20	13	0.31	2.29%	3	4.69%	65.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Clay-colored Sparrow	SB	12	16	0	0.25	1.83%	12	18.75%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mourning Dove	PD	9	14	11	0.22	1.60%	9	14.06%	78.57%	90.91%	9.09%	0.00%	0.02	54.55%	0.00%	18.18%	9.09%	0.00%	0.00%	18.18%	0.00%	0.00%
American Robin	SB	8	14	6	0.22	1.60%	8	12.50%	42.86%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	16.67%	50.00%	0.00%	33.33%	0.00%	0.00%	0.00%
Killdeer	SH	9	12	5	0.19	1.37%	9	14.06%	41.67%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	60.00%
Ring-necked Pheasant	GB	8	12	0	0.19	1.37%	8	12.50%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bank Swallow	SB	1	12	12	0.19	1.37%	1	1.56%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Common Grackle	SB	4	11	11	0.17	1.26%	4	6.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	36.36%	9.09%	36.36%	18.18%	0.00%	0.00%	0.00%	0.00%
Unknown Duck	WF	2	11	0	0.17	1.26%	2	3.13%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Vesper Sparrow	SB	6	10	0	0.16	1.14%	6	9.38%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chipping Sparrow	SB	8	9	5	0.14	1.03%	8	12.50%	55.56%	100.00%	0.00%	0.00%	0.00	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.00%
Mallard	WF	4	9	0	0.14	1.03%	4	6.25%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Song Sparrow	SB	5	7	0	0.11	0.80%	5	7.81%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cedar Waxwing	SB	3	6	4	0.09	0.69%	3	4.69%	66.67%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Sedge Wren	SB	5	5	0	0.08	0.57%	5	7.81%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Turkey Vulture	RVO	4	5	5	0.08	0.57%	4	6.25%	100.00%	20.00%	80.00%	0.00%	0.06	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	40.00%	0.00%	40.00%
Eastern Kingbird	SB	3	4	2	0.06	0.46%	3	4.69%	50.00%	100.00%	0.00%	0.00%	0.00	50.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Least Flycatcher	SB	3	4	0	0.06	0.46%	3	4.69%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ring-billed Gull	GT	2	4	4	0.06	0.46%	2	3.13%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%	75.00%	0.00%
Black-capped Chickadee	SB	2	4	0	0.06	0.46%	2	3.13%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American White Pelican	WB	1	4	4	0.06	0.46%	1	1.56%	100.00%	0.00%	100.00%	0.00%	0.06	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Red-tailed Hawk	RVO	3	3	3	0.05	0.34%	3	4.69%	100.00%	66.67%	33.33%	0.00%	0.02	33.33%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%
Eastern Wood-Pewee	SB	3	3	0	0.05	0.34%	3	4.69%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Downy Woodpecker	WP	3	3	0	0.05	0.34%	3	4.69%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Canada Goose	WF	2	3	0	0.05	0.34%	2	3.13%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Belted Kingfisher	SB	2	2	1	0.03	0.23%	2	3.13%	50.00%	100.00%	0.00%	0.00%	0.00	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Great Blue Heron	WA	2	2	2	0.03	0.23%	2	3.13%	100.00%	50.00%	50.00%	0.00%	0.02	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	50.00%	0.00%
Grasshopper Sparrow	SB	2	2	0	0.03	0.23%	2	3.13%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow-headed Blackbird	SB	2	2	1	0.03	0.23%	2	3.13%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Swainson's Hawk	RVO	1	1	1	0.02	0.11%	1	1.56%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
Bobolink	SB	1	1	0	0.02	0.11%	1	1.56%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Willow Flycatcher	SB	1	1	0	0.02	0.11%	1	1.56%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Marsh Wren	SB	1	1	0	0.02	0.11%	1	1.56%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wild Turkey	GB	1	1	0	0.02	0.11%	1	1.56%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		284	**875**	**640**	**13.67**	**100.00%**			**73.14%**				**0.19**	**5.16%**	**3.28%**	**3.44%**	**4.22%**	**4.84%**	**2.03%**	**7.97%**	**8.13%**	**60.94%**

Table 3b. Palmer's Creek Point Count Data by Season (Fall 2016)																					
Species	Group	Obs	Ind	Fly	Mean Use per 20 min	Percent Composition	No. Surveys Species Observed	Frequency (% Surveys)	Proportion Ind. Flying	Proportion Ind. Flying Below RSA	Proportion Ind. Flying Within RSA	Proportion Ind. Flying Above RSA	Encounter Rate	N	NE	E	SE	S	SW	W	NW	Var
American Crow	C	27	249	70	2.59	14.63%	23	23.96%	28.11%	68.57%	31.43%	0.00%	0.23	14.29%	2.86%	4.29%	10.00%	12.86%	0.00%	0.00%	10.00%	45.71%
Red-winged Blackbird	SB	12	205	205	2.14	12.04%	12	12.50%	100.00%	87.32%	12.68%	0.00%	0.27	0.00%	0.00%	0.00%	26.34%	23.90%	18.54%	0.00%	0.00%	31.22%
Brown-headed Cowbird	SB	15	199	164	2.07	11.69%	14	14.58%	82.41%	100.00%	0.00%	0.00%	0.00	7.32%	0.00%	0.61%	9.15%	23.78%	32.32%	8.54%	0.00%	18.29%
Canada Goose	WF	10	130	124	1.35	7.64%	10	10.42%	95.38%	24.19%	0.00%	75.81%	0.00	0.81%	0.00%	0.00%	41.94%	42.74%	14.52%	0.00%	0.00%	0.00%
European Starling	SB	6	104	75	1.08	6.11%	6	6.25%	72.12%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	58.67%	0.00%	0.00%	0.00%	41.33%
American Goldfinch	SB	15	90	90	0.94	5.29%	14	14.58%	100.00%	97.78%	2.22%	0.00%	0.02	2.22%	2.22%	46.67%	7.78%	18.89%	5.56%	0.00%	0.00%	16.67%
Blue Jay	C	26	80	55	0.83	4.70%	26	27.08%	68.75%	100.00%	0.00%	0.00%	0.00	10.91%	18.18%	18.18%	7.27%	16.36%	12.73%	14.55%	0.00%	1.82%
Rock Pigeon	PD	17	79	79	0.82	4.64%	17	17.71%	100.00%	97.47%	2.53%	0.00%	0.02	26.58%	0.00%	10.13%	0.00%	2.53%	0.00%	6.33%	13.92%	40.51%
Barn Swallow	SB	5	77	77	0.80	4.52%	5	5.21%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Field Sparrow	SB	22	61	48	0.64	3.58%	22	22.92%	78.69%	100.00%	0.00%	0.00%	0.00	8.33%	0.00%	4.17%	0.00%	4.17%	4.17%	2.08%	0.00%	77.08%
Dark-eyed Junco	SB	6	54	54	0.56	3.17%	6	6.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.63%	0.00%	70.37%
Horned Lark	SB	5	47	43	0.49	2.76%	5	5.21%	91.49%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	34.88%	0.00%	53.49%	0.00%	11.63%
Unknown Blackbird	SB	1	40	40	0.42	2.35%	1	1.04%	100.00%	0.00%	100.00%	0.00%	0.42	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American Tree Sparrow	SB	5	38	37	0.40	2.23%	5	5.21%	97.37%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	35.14%	64.86%
Black-capped Chickadee	SB	7	36	36	0.38	2.12%	7	7.29%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	5.56%	0.00%	0.00%	22.22%	13.89%	0.00%	58.33%
Common Grackle	SB	4	25	25	0.26	1.47%	4	4.17%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	8.00%	68.00%	20.00%	0.00%	4.00%	0.00%
Ring-billed Gull	GT	4	21	21	0.22	1.23%	4	4.17%	100.00%	19.05%	80.95%	0.00%	0.18	0.00%	0.00%	0.00%	0.00%	9.52%	0.00%	9.52%	0.00%	80.95%
Snow Goose	WF	2	20	20	0.21	1.18%	2	2.08%	100.00%	10.00%	0.00%	90.00%	0.00	0.00%	0.00%	0.00%	90.00%	10.00%	0.00%	0.00%	0.00%	0.00%
Red-tailed Hawk	RVO	16	19	17	0.20	1.12%	15	15.63%	89.47%	52.94%	23.53%	23.53%	0.04	5.88%	0.00%	0.00%	29.41%	29.41%	5.88%	11.76%	5.88%	11.76%
American Robin	SB	8	15	11	0.16	0.88%	8	8.33%	73.33%	100.00%	0.00%	0.00%	0.00	18.18%	0.00%	0.00%	9.09%	18.18%	0.00%	0.00%	27.27%	27.27%
Northern Flicker	WP	6	15	15	0.16	0.88%	6	6.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	26.67%	0.00%	20.00%	33.33%	20.00%	0.00%	0.00%	0.00%
Cedar Waxwing	SB	3	15	15	0.16	0.88%	3	3.13%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	53.33%	46.67%	0.00%	0.00%	0.00%	0.00%	0.00%
Western Meadowlark	SB	3	14	14	0.15	0.82%	3	3.13%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	50.00%	35.71%	0.00%	14.29%	0.00%	0.00%
Mourning Dove	PD	8	13	10	0.14	0.76%	8	8.33%	76.92%	100.00%	0.00%	0.00%	0.00	30.00%	0.00%	10.00%	0.00%	10.00%	10.00%	40.00%	0.00%	0.00%
Bald Eagle	RVO	8	10	9	0.10	0.59%	6	6.25%	90.00%	11.11%	33.33%	55.56%	0.03	0.00%	33.33%	0.00%	44.44%	11.11%	0.00%	0.00%	0.00%	11.11%
Downy Woodpecker	WP	7	7	7	0.07	0.41%	7	7.29%	100.00%	100.00%	0.00%	0.00%	0.00	14.29%	0.00%	14.29%	28.57%	0.00%	14.29%	28.57%	0.00%	0.00%
Turkey Vulture	RVO	5	7	7	0.07	0.41%	5	5.21%	100.00%	42.86%	28.57%	28.57%	0.02	0.00%	0.00%	42.86%	57.14%	0.00%	0.00%	0.00%	0.00%	0.00%
Unknown Duck	WF	3	7	1	0.07	0.41%	3	3.13%	14.29%	0.00%	100.00%	0.00%	0.01	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastern Bluebird	SB	2	6	6	0.06	0.35%	2	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	83.33%	0.00%
Rough-legged Hawk	RVO	3	4	4	0.04	0.24%	2	2.08%	100.00%	25.00%	25.00%	50.00%	0.01	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Killdeer	SH	2	3	2	0.03	0.18%	2	2.08%	66.67%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Swainson's Hawk	RVO	2	3	1	0.03	0.18%	2	2.08%	33.33%	0.00%	100.00%	0.00%	0.01	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Common Yellowthroat	SB	2	2	0	0.02	0.12%	2	2.08%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ring-necked Pheasant	GB	2	2	1	0.02	0.12%	2	2.08%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%
American Kestrel	RVO	1	1	1	0.01	0.06%	1	1.04%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Belted Kingfisher	SB	1	1	1	0.01	0.06%	1	1.04%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Least Flycatcher	SB	1	1	1	0.01	0.06%	1	1.04%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wild Turkey	GB	1	1	0	0.01	0.06%	1	1.04%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wilson's Snipe	SH	1	1	0	0.01	0.06%	1	1.04%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		274	**1,702**	**1,386**	**17.73**	**100.00%**			**81.43%**				**1.26**	**7.50%**	**1.59%**	**5.84%**	**14.29%**	**20.20%**	**10.25%**	**6.13%**	**3.03%**	**31.17%**

Table 3c. Palmer's Creek Point Count Data by Season (Winter 2016-2017)																					
Species	**Group**	**Obs**	**Ind**	**Fly**	**Mean Use per 20 min**	**Percent Composition**	**No. Surveys Species Observed**	**Frequency (% Surveys)**	**Proportion Ind. Flying**	**Proportion Ind. Flying Below RSA**	**Proportion Ind. Flying Within RSA**	**Proportion Ind. Flying Above RSA**	**Encounter Rate**	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**	**Var**
European Starling	SB	10	339	309	7.06	41.24%	10	20.83%	91.15%	100.00%	0.00%	0.00%	0.00	10.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	89.97%
Snow Bunting	SB	6	109	109	2.27	13.26%	6	12.50%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	15.60%	0.00%	0.00%	15.60%	0.00%	18.35%	0.00%	50.46%
Wild Turkey	GB	4	92	0	1.92	11.19%	4	8.33%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American Crow	C	15	57	44	1.19	6.93%	15	31.25%	77.19%	97.73%	2.27%	0.00%	0.02	43.18%	0.00%	0.00%	29.55%	13.64%	11.36%	2.27%	0.00%	0.00%
Unknown Duck	WF	2	46	46	0.96	5.60%	2	4.17%	100.00%	0.00%	100.00%	0.00%	0.96	30.43%	0.00%	0.00%	69.57%	0.00%	0.00%	0.00%	0.00%	0.00%
Unidentified Sparrow	SB	4	35	34	0.73	4.26%	4	8.33%	97.14%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	97.06%
Rock Pigeon	PD	10	31	31	0.65	3.77%	10	20.83%	100.00%	100.00%	0.00%	0.00%	0.00	6.45%	0.00%	6.45%	0.00%	0.00%	0.00%	16.13%	9.68%	61.29%
Black-capped Chickadee	SB	5	28	28	0.58	3.41%	5	10.42%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Dark-eyed Junco	SB	4	28	28	0.58	3.41%	4	8.33%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	17.86%	82.14%
Blue Jay	C	9	18	11	0.38	2.19%	9	18.75%	61.11%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	9.09%	27.27%	9.09%	0.00%	18.18%	36.36%	0.00%
Ring-necked Pheasant	GB	4	12	6	0.25	1.46%	4	8.33%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Savannah Sparrow	SB	1	8	0	0.17	0.97%	1	2.08%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Canada Goose	WF	1	7	7	0.15	0.85%	1	2.08%	100.00%	0.00%	0.00%	100.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Red-tailed Hawk	RVO	6	6	6	0.13	0.73%	5	10.42%	100.00%	50.00%	33.33%	16.67%	0.04	50.00%	0.00%	0.00%	16.67%	16.67%	16.67%	0.00%	0.00%	0.00%
Downy Woodpecker	WP	2	2	1	0.04	0.24%	2	4.17%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Horned Lark	SB	1	2	2	0.04	0.24%	1	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Northern Harrier	RVO	1	1	1	0.02	0.12%	1	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Swainson's Hawk	RVO	1	1	1	0.02	0.12%	1	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
		86	**822**	**664**	**17.13**	**100.00%**			**80.78%**				**0.00**	**10.39%**	**2.56%**	**0.60%**	**8.28%**	**5.12%**	**0.90%**	**4.37%**	**1.81%**	**65.96%**

Table 3d. Palmer's Creek Point Count Data by Season (Spring 2017)																					
Species	Group	Obs	Ind	Fly	Mean Use per 20 min	Percent Composition	No. Surveys Species Observed	Frequency (% Surveys)	Proportion Ind. Flying	Proportion Ind. Flying Below RSA	Proportion Ind. Flying Within RSA	Proportion Ind. Flying Above RSA	Encounter Rate	N	NE	E	SE	S	SW	W	NW	Var
European Starling	SB	15	567	562	7.09	28.80%	15	18.75%	99.12%	97.69%	2.31%	0.00%	0.16	0.00%	0.00%	0.00%	0.00%	2.31%	0.00%	0.00%	0.00%	97.69%
Red-winged Blackbird	SB	18	354	354	4.43	17.98%	15	18.75%	100.00%	98.31%	1.69%	0.00%	0.08	0.00%	0.00%	0.00%	1.13%	0.56%	3.95%	44.35%	0.28%	49.72%
American Crow	C	23	221	214	2.76	11.22%	19	23.75%	96.83%	77.10%	22.90%	0.00%	0.61	23.36%	9.35%	15.89%	0.00%	27.10%	3.27%	20.09%	0.93%	0.00%
Canada Goose	WF	21	208	119	2.60	10.56%	20	25.00%	57.21%	0.00%	96.64%	3.36%	1.44	14.29%	0.00%	5.04%	8.40%	0.00%	0.00%	0.00%	72.27%	0.00%
Horned Lark	SB	34	124	105	1.55	6.30%	30	37.50%	84.68%	100.00%	0.00%	0.00%	0.00	4.76%	1.90%	2.86%	0.95%	3.81%	0.00%	2.86%	5.71%	77.14%
Common Grackle	SB	6	53	53	0.66	2.69%	6	7.50%	100.00%	73.58%	26.42%	0.00%	0.18	3.77%	0.00%	0.00%	32.08%	0.00%	0.00%	9.43%	54.72%	0.00%
Mallard	WF	13	51	31	0.64	2.59%	11	13.75%	60.78%	45.16%	6.45%	48.39%	0.03	58.06%	19.35%	0.00%	3.23%	6.45%	0.00%	0.00%	9.68%	0.00%
Wild Turkey	GB	4	45	0	0.56	2.29%	4	5.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Rock Pigeon	PD	13	40	40	0.50	2.03%	12	15.00%	100.00%	77.50%	22.50%	0.00%	0.11	40.00%	0.00%	0.00%	32.50%	10.00%	2.50%	0.00%	0.00%	15.00%
Brown-headed Cowbird	SB	5	40	39	0.50	2.03%	5	6.25%	97.50%	100.00%	0.00%	0.00%	0.00	0.00%	15.38%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	76.92%
Unidentified Sparrow	SB	1	25	25	0.31	1.27%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%
American Robin	SB	10	24	13	0.30	1.22%	10	12.50%	54.17%	100.00%	0.00%	0.00%	0.00	15.38%	0.00%	46.15%	0.00%	30.77%	0.00%	7.69%	0.00%	0.00%
Blue Jay	C	11	22	7	0.28	1.12%	11	13.75%	31.82%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	14.29%	42.86%	28.57%
Dark-eyed Junco	SB	3	18	18	0.23	0.91%	3	3.75%	100.00%	100.00%	0.00%	0.00%	0.00	38.89%	0.00%	0.00%	0.00%	0.00%	0.00%	22.22%	0.00%	38.89%
Red-tailed Hawk	RVO	16	17	17	0.21	0.86%	15	18.75%	100.00%	17.65%	76.47%	5.88%	0.16	11.76%	23.53%	5.88%	23.53%	5.88%	0.00%	11.76%	17.65%	0.00%
Bald Eagle	RVO	13	17	17	0.21	0.86%	8	10.00%	100.00%	47.06%	29.41%	23.53%	0.06	29.41%	0.00%	0.00%	5.88%	29.41%	5.88%	0.00%	23.53%	5.88%
Turkey Vulture	RVO	6	16	16	0.20	0.81%	5	6.25%	100.00%	0.00%	93.75%	6.25%	0.19	0.00%	0.00%	18.75%	0.00%	0.00%	0.00%	0.00%	81.25%	0.00%
American Goldfinch	SB	3	12	12	0.15	0.61%	3	3.75%	100.00%	100.00%	0.00%	0.00%	0.00	66.67%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Black-capped Chickadee	SB	2	12	12	0.15	0.61%	2	2.50%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
American White Pelican	WB	2	12	12	0.15	0.61%	2	2.50%	100.00%	0.00%	100.00%	0.00%	0.15	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	75.00%	0.00%
Ring-necked Pheasant	GB	9	11	1	0.14	0.56%	9	11.25%	9.09%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
Field Sparrow	SB	5	11	2	0.14	0.56%	5	6.25%	18.18%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Unknown Duck	WF	5	10	5	0.13	0.51%	5	6.25%	50.00%	0.00%	100.00%	0.00%	0.06	0.00%	0.00%	0.00%	80.00%	0.00%	20.00%	0.00%	0.00%	0.00%
Killdeer	SH	5	8	4	0.10	0.41%	5	6.25%	50.00%	100.00%	0.00%	0.00%	0.00	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mourning Dove	PD	6	7	3	0.09	0.36%	6	7.50%	42.86%	100.00%	0.00%	0.00%	0.00	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%
Tree Swallow	SB	4	7	7	0.09	0.36%	4	5.00%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	85.71%
Savannah Sparrow	SB	1	7	7	0.09	0.36%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Cedar Waxwing	SB	2	6	3	0.08	0.30%	2	2.50%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Yellow-headed Blackbird	SB	2	6	6	0.08	0.30%	2	2.50%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Chipping Sparrow	SB	2	2	1	0.03	0.10%	2	2.50%	50.00%	100.00%	0.00%	0.00%	0.00	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Song Sparrow	SB	2	2	0	0.03	0.10%	2	2.50%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Northern Flicker	WP	2	2	2	0.03	0.10%	2	2.50%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%
Downy Woodpecker	WP	2	2	1	0.03	0.10%	2	2.50%	50.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastern Bluebird	SB	1	2	2	0.03	0.10%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Western Meadowlark	SB	1	1	0	0.01	0.05%	1	1.25%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Northern Harrier	RVO	1	1	1	0.01	0.05%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Cooper's Hawk	RVO	1	1	1	0.01	0.05%	1	1.25%	100.00%	0.00%	100.00%	0.00%	0.01	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Belted Kingfisher	SB	1	1	1	0.01	0.05%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Upland Sandpiper	SH	1	1	0	0.01	0.05%	1	1.25%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Blue-winged teal	WF	1	1	0	0.01	0.05%	1	1.25%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Clay-colored Sparrow	SB	1	1	0	0.01	0.05%	1	1.25%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow Warbler	SB	1	1	1	0.01	0.05%	1	1.25%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
		275	**1,969**	**1,714**	**24.61**	**100.00%**			**87.05%**				**0.00**	**8.17%**	**2.63%**	**3.09%**	**3.39%**	**5.90%**	**1.52%**	**14.36%**	**9.40%**	**51.55%**

Table 4. Cumulative Palmer's Creek Point Count Data (Summer 2016-Summer 2017)																					
Species	Group	Obs	Ind	Fly	Mean Use per 20 min	Percent Composition	No. Surveys Species Observed	Frequency (% Surveys)	Proportion Ind. Flying	Proportion Ind. Flying Below RSA	Proportion Ind. Flying Within RSA	Proportion Ind. Flying Above RSA	Encounter Rate	N	NE	E	SE	S	SW	W	NW	Var
European Starling	SB	34	1054	990	3.66	19.63%	8	2.78%	93.93%	98.69%	1.31%	0.00%	0.05	3.13%	0.00%	0.00%	0.00%	5.76%	0.00%	0.00%	0.61%	90.51%
Red-winged Blackbird	SB	52	688	676	2.39	12.82%	34	11.81%	98.26%	95.27%	4.73%	0.00%	0.11	0.15%	0.59%	0.00%	9.32%	7.69%	7.69%	23.37%	0.59%	50.59%
American Crow	C	73	566	360	1.97	10.54%	29	10.07%	63.60%	80.00%	20.00%	0.00%	0.25	23.06%	6.39%	10.28%	5.56%	20.28%	4.72%	13.61%	7.22%	8.89%
Brown-headed Cowbird	SB	33	375	325	1.30	6.99%	27	9.38%	86.67%	100.00%	0.00%	0.00%	0.00	4.62%	1.85%	2.46%	5.54%	12.92%	16.31%	14.77%	4.31%	37.23%
Canada Goose	WF	34	348	250	1.21	6.48%	12	4.17%	71.84%	12.00%	46.00%	42.00%	0.40	7.20%	0.00%	2.40%	24.80%	24.00%	7.20%	0.00%	34.40%	0.00%
Horned Lark	SB	53	199	171	0.69	3.71%	18	6.25%	85.93%	100.00%	0.00%	0.00%	0.00	2.92%	1.17%	1.75%	1.17%	11.11%	0.58%	16.37%	3.51%	61.40%
Barn Swallow	SB	26	188	188	0.65	3.50%	26	9.03%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	1.06%	0.00%	0.00%	0.00%	0.00%	0.00%	98.94%
Rock Pigeon	PD	49	172	166	0.60	3.20%	26	9.03%	96.51%	92.77%	7.23%	0.00%	0.04	24.10%	6.02%	7.23%	7.83%	4.22%	0.60%	7.23%	8.43%	34.34%
Blue Jay	C	58	148	81	0.51	2.76%	38	13.19%	54.73%	100.00%	0.00%	0.00%	0.00	11.11%	12.35%	13.58%	8.64%	13.58%	8.64%	13.58%	8.64%	9.88%
American Goldfinch	SB	38	146	146	0.51	2.72%	33	11.46%	100.00%	98.63%	1.37%	0.00%	0.01	14.38%	5.48%	31.51%	10.27%	17.12%	5.48%	2.05%	0.68%	13.01%
Wild Turkey	GB	10	139	0	0.48	2.59%	2	0.69%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Snow Bunting	SB	6	109	109	0.38	2.03%	0	0.00%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	15.60%	0.00%	0.00%	15.60%	0.00%	18.35%	0.00%	50.46%
Field Sparrow	SB	44	107	62	0.37	1.99%	39	13.54%	57.94%	100.00%	0.00%	0.00%	0.00	6.45%	0.00%	3.23%	3.23%	3.23%	3.23%	1.61%	0.00%	79.03%
Dark-eyed Junco	SB	13	100	100	0.35	1.86%	6	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	7.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	5.00%	68.00%
Common Grackle	SB	14	89	89	0.31	1.66%	8	2.78%	100.00%	84.27%	15.73%	0.00%	0.05	2.25%	4.49%	1.12%	25.84%	21.35%	5.62%	5.62%	33.71%	0.00%
Black-capped Chickadee	SB	16	80	76	0.28	1.49%	9	3.13%	95.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	2.63%	0.00%	0.00%	10.53%	6.58%	0.00%	80.26%
Unknown Duck	WF	12	74	52	0.26	1.38%	5	1.74%	70.27%	0.00%	100.00%	0.00%	0.18	26.92%	0.00%	0.00%	71.15%	0.00%	1.92%	0.00%	0.00%	0.00%
Mallard	WF	17	60	31	0.21	1.12%	4	1.39%	51.67%	45.16%	6.45%	48.39%	0.01	58.06%	19.35%	0.00%	3.23%	6.45%	0.00%	0.00%	9.68%	0.00%
Unidentified Sparrow	SB	5	60	59	0.21	1.12%	0	0.00%	98.33%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.07%	0.00%	55.93%
American Robin	SB	26	53	30	0.18	0.99%	16	5.56%	56.60%	100.00%	0.00%	0.00%	0.00	13.33%	0.00%	23.33%	13.33%	20.00%	6.67%	3.33%	10.00%	10.00%
Red-tailed Hawk	RVO	41	45	43	0.16	0.84%	18	6.25%	95.56%	39.53%	46.51%	13.95%	0.07	16.28%	9.30%	4.65%	23.26%	16.28%	6.98%	9.30%	9.30%	4.65%
Unknown Blackbird	SB	1	40	40	0.14	0.75%	1	0.35%	100.00%	0.00%	100.00%	0.00%	0.14	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American Tree Sparrow	SB	5	38	37	0.13	0.71%	5	1.74%	97.37%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	35.14%	64.86%
Ring-necked Pheasant	GB	23	37	8	0.13	0.69%	10	3.47%	21.62%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	75.00%	0.00%	12.50%	12.50%	0.00%	0.00%
Mourning Dove	PD	23	34	24	0.12	0.63%	17	5.90%	70.59%	95.83%	4.17%	0.00%	0.00	45.83%	0.00%	12.50%	4.17%	4.17%	8.33%	25.00%	0.00%	0.00%
Tree Swallow	SB	13	30	30	0.10	0.56%	9	3.13%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.33%	10.00%	86.67%
Turkey Vulture	RVO	15	28	28	0.10	0.52%	9	3.13%	100.00%	14.29%	75.00%	10.71%	0.07	0.00%	0.00%	21.43%	14.29%	3.57%	0.00%	7.14%	46.43%	7.14%
Bald Eagle	RVO	21	27	26	0.09	0.50%	6	2.08%	96.30%	34.62%	30.77%	34.62%	0.03	19.23%	11.54%	0.00%	19.23%	23.08%	3.85%	0.00%	15.38%	7.69%
Cedar Waxwing	SB	8	27	22	0.09	0.50%	6	2.08%	81.48%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	36.36%	31.82%	31.82%	0.00%	0.00%	0.00%	0.00%
Ring-billed Gull	GT	6	25	25	0.09	0.47%	6	2.08%	100.00%	32.00%	68.00%	0.00%	0.06	0.00%	0.00%	0.00%	4.00%	8.00%	0.00%	8.00%	12.00%	68.00%
Killdeer	SH	16	23	11	0.08	0.43%	11	3.82%	47.83%	100.00%	0.00%	0.00%	0.00	36.36%	0.00%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	45.45%
Common Yellowthroat	SB	12	22	0	0.08	0.41%	12	4.17%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow Warbler	SB	5	21	14	0.07	0.39%	3	1.04%	66.67%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	92.86%	0.00%	0.00%	7.14%	0.00%
Snow Goose	WF	2	20	20	0.07	0.37%	2	0.69%	100.00%	10.00%	0.00%	90.00%	0.00	0.00%	0.00%	0.00%	90.00%	10.00%	0.00%	0.00%	0.00%	0.00%
Clay-colored Sparrow	SB	13	17	0	0.06	0.32%	12	4.17%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Northern Flicker	WP	8	17	17	0.06	0.32%	6	2.08%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	29.41%	0.00%	17.65%	29.41%	17.65%	5.88%	0.00%	0.00%
American White Pelican	WB	3	16	16	0.06	0.30%	1	0.35%	100.00%	0.00%	100.00%	0.00%	0.06	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.75%	81.25%	0.00%
Western Meadowlark	SB	4	15	14	0.05	0.28%	3	1.04%	93.33%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	50.00%	35.71%	0.00%	14.29%	0.00%	0.00%
Savannah Sparrow	SB	2	15	7	0.05	0.28%	0	0.00%	46.67%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Downy Woodpecker	WP	14	14	9	0.05	0.26%	10	3.47%	64.29%	100.00%	0.00%	0.00%	0.00	11.11%	0.00%	11.11%	33.33%	11.11%	11.11%	22.22%	0.00%	0.00%
Bank Swallow	SB	1	12	12	0.04	0.22%	1	0.35%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Chipping Sparrow	SB	10	11	6	0.04	0.20%	8	2.78%	54.55%	100.00%	0.00%	0.00%	0.00	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.67%
Vesper Sparrow	SB	6	10	0	0.03	0.19%	6	2.08%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Song Sparrow	SB	7	9	0	0.03	0.17%	5	1.74%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow-headed Blackbird	SB	4	8	7	0.03	0.15%	2	0.69%	87.50%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Eastern Bluebird	SB	3	8	8	0.03	0.15%	2	0.69%	100.00%	100.00%	0.00%	0.00%	0.00	12.50%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	62.50%	0.00%
Sedge Wren	SB	5	5	0	0.02	0.09%	5	1.74%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Least Flycatcher	SB	4	5	1	0.02	0.09%	4	1.39%	20.00%	100.00%	0.00%	0.00%	0.00	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Swainson's Hawk	RVO	4	5	3	0.02	0.09%	3	1.04%	60.00%	66.67%	33.33%	0.00%	0.00	0.00%	0.00%	0.00%	33.33%	33.33%	33.33%	0.00%	0.00%	0.00%
Belted Kingfisher	SB	4	4	3	0.01	0.07%	3	1.04%	75.00%	100.00%	0.00%	0.00%	0.00	66.67%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%
Eastern Kingbird	SB	3	4	2	0.01	0.07%	3	1.04%	50.00%	100.00%	0.00%	0.00%	0.00	50.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Rough-legged Hawk	RVO	3	4	4	0.01	0.07%	2	0.69%	100.00%	25.00%	25.00%	50.00%	0.00	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastern Wood-Pewee	SB	3	3	0	0.01	0.06%	3	1.04%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Grasshopper Sparrow	SB	2	2	0	0.01	0.04%	2	0.69%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Great Blue Heron	WA	2	2	2	0.01	0.04%	2	0.69%	100.00%	50.00%	50.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	50.00%	0.00%
Northern Harrier	RVO	2	2	2	0.01	0.04%	0	0.00%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	50.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%
American Kestrel	RVO	1	1	1	0.00	0.02%	1	0.35%	100.00%	100.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Blue-winged teal	WF	1	1	0	0.00	0.02%	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bobolink	SB	1	1	0	0.00	0.02%	1	0.35%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cooper's Hawk	RVO	1	1	1	0.00	0.02%	0	0.00%	100.00%	0.00%	100.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Marsh Wren	SB	1	1	0	0.00	0.02%	1	0.35%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Upland Sandpiper	SH	1	1	0	0.00	0.02%	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Willow Flycatcher	SB	1	1	0	0.00	0.02%	1	0.35%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wilson's Snipe	SH	1	1	0	0.00	0.02%	1	0.35%	0.00%	0.00%	0.00%	0.00%	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		919	**5,368**	**4,404**	**18.64**	**100.00%**			**82.04%**				**1.53**	**7.86%**	**2.38%**	**3.63%**	**7.68%**	**10.13%**	**4.25%**	**9.33%**	**6.06%**	**48.67%**

Table 5. Cumulative Palmer's Creek Point Count Avian Species by Group															
Species	Summer 2016 & 2017			Fall 2016			Winter 2016-2017			Spring 2017			Cumulative		
	Ind	Obs	Mean Use per 20 min	Ind	Obs	Mean Use per 20 min	Ind	Obs	Mean Use per 20 min	Ind	Obs	Mean Use per 20 min	Ind	Obs	Mean Use per 20 min
Songbirds															
European Starling	44	3	0.69	104	6	1.08	339	10	7.06	567	15	7.09	1,054	34	3.66
Red-winged Blackbird	129	22	2.02	205	12	2.14	0	0	0.00	354	18	4.43	688	52	2.39
Brown-headed Cowbird	136	13	2.13	199	15	2.07	0	0	0.00	40	5	0.50	375	33	1.30
Horned Lark	26	13	0.41	47	5	0.49	2	1	0.04	124	34	1.55	199	53	0.69
Barn Swallow	111	21	1.73	77	5	0.80	0	0	0.00	0	0	0.00	188	26	0.65
American Goldfinch	44	20	0.69	90	15	0.94	0	0	0.00	12	3	0.15	146	38	0.51
Snow Bunting	0	0	0.00	0	0	0.00	109	6	2.27	0	0	0.00	109	6	0.38
Field Sparrow	35	17	0.55	61	22	0.64	0	0	0.00	11	5	0.14	107	44	0.37
Dark-eyed Junco	0	0	0.00	54	6	0.56	28	4	0.58	18	3	0.23	100	13	0.35
Common Grackle	11	4	0.17	25	4	0.26	0	0	0.00	53	6	0.66	89	14	0.31
Black-capped Chickadee	4	2	0.06	36	7	0.38	28	5	0.58	12	2	0.15	80	16	0.28
Unidentified Sparrow	0	0	0.00	0	0	0.00	35	4	0.73	25	1	0.31	60	5	0.21
American Robin	14	8	0.22	15	8	0.16	0	0	0.00	24	10	0.30	53	26	0.18
Unknown Blackbird	0	0	0.00	40	1	0.42	0	0	0.00	0	0	0.00	40	1	0.14
American Tree Sparrow	0	0	0.00	38	5	0.40	0	0	0.00	0	0	0.00	38	5	0.13
Tree Swallow	23	9	0.36	0	0	0.00	0	0	0.00	7	4	0.09	30	13	0.10
Cedar Waxwing	6	3	0.09	15	3	0.16	0	0	0.00	6	2	0.08	27	8	0.09
Common Yellowthroat	20	10	0.31	2	2	0.02	0	0	0.00	0	0	0.00	22	12	0.08
Yellow Warbler	20	4	0.31	0	0	0.00	0	0	0.00	1	1	0.01	21	5	0.07
Clay-colored Sparrow	16	12	0.25	0	0	0.00	0	0	0.00	1	1	0.01	17	13	0.06
Western Meadowlark	0	0	0.00	14	3	0.15	0	0	0.00	1	1	0.01	15	4	0.05
Savannah Sparrow	0	0	0.00	0	0	0.00	8	1	0.17	7	1	0.09	15	2	0.05
Bank Swallow	12	1	0.19	0	0	0.00	0	0	0.00	0	0	0.00	12	1	0.04
Chipping Sparrow	9	8	0.14	0	0	0.00	0	0	0.00	2	2	0.03	11	10	0.04
Vesper Sparrow	10	6	0.16	0	0	0.00	0	0	0.00	0	0	0.00	10	6	0.03
Song Sparrow	7	5	0.11	0	0	0.00	0	0	0.00	2	2	0.03	9	7	0.03
Yellow-headed Blackbird	2	2	0.03	0	0	0.00	0	0	0.00	6	2	0.08	8	4	0.03
Eastern Bluebird	0	0	0.00	6	2	0.06	0	0	0.00	2	1	0.03	8	3	0.03
Sedge Wren	5	5	0.08	0	0	0.00	0	0	0.00	0	0	0.00	5	5	0.02
Least Flycatcher	4	3	0.06	1	1	0.01	0	0	0.00	0	0	0.00	5	4	0.02
Belted Kingfisher	2	2	0.03	1	1	0.01	0	0	0.00	1	1	0.01	4	4	0.01
Eastern Kingbird	4	3	0.06	0	0	0.00	0	0	0.00	0	0	0.00	4	3	0.01
Eastern Wood-Pewee	3	3	0.05	0	0	0.00	0	0	0.00	0	0	0.00	3	3	0.01
Grasshopper Sparrow	2	2	0.03	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
Bobolink	1	1	0.02	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.00
Marsh Wren	1	1	0.02	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.00
Willow Flycatcher	1	1	0.02	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.00
Totals	**702**	**204**	**10.97**	**1,030**	**123**	**10.73**	**549**	**31**	**11.44**	**1,276**	**120**	**15.95**	**3,557**	**478**	**12.35**
Raptors/Vultures/Owls															
Red-tailed Hawk	3	3	0.05	19	16	0.20	6	6	0.13	17	16	0.21	45	41	0.16
Turkey Vulture	5	4	0.08	7	5	0.07	0	0	0.00	16	6	0.20	28	15	0.10
Bald Eagle	0	0	0.00	10	8	0.10	0	0	0.00	17	13	0.21	27	21	0.09
Swainson's Hawk	1	1	0.02	3	2	0.03	1	1	0.02	0	0	0.00	5	4	0.02
Rough-legged Hawk	0	0	0.00	4	3	0.04	0	0	0.00	0	0	0.00	4	3	0.01
Northern Harrier	0	0	0.00	0	0	0.00	1	1	0.02	1	1	0.01	2	2	0.01
American Kestrel	0	0	0.00	1	1	0.01	0	0	0.00	0	0	0.00	1	1	0.00
Cooper's Hawk	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
Totals	**9**	**8**	**0.14**	**44**	**35**	**0.46**	**8**	**8**	**0.17**	**52**	**37**	**0.65**	**113**	**88**	**0.39**
Waterfowl															
Canada Goose	3	2	0.05	130	10	1.35	7	1	0.15	208	21	2.60	348	34	1.21
Unknown Duck	11	2	0.17	7	3	0.07	46	2	0.96	10	5	0.13	74	12	0.26
Mallard	9	4	0.14	0	0	0.00	0	0	0.00	51	13	0.64	60	17	0.21
Snow Goose	0	0	0.00	20	2	0.21	0	0	0.00	0	0	0.00	20	2	0.07
Blue-winged teal	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
Totals	**23**	**8**	**0.36**	**157**	**15**	**1.64**	**53**	**3**	**1.10**	**270**	**40**	**3.38**	**503**	**66**	**1.75**
Shorebirds															
Killdeer	12	9	0.19	3	2	0.03	0	0	0.00	8	5	0.10	23	16	0.08
Upland Sandpiper	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
Wilson's Snipe	0	0	0.00	1	1	0.01	0	0	0.00	0	0	0.00	1	1	0.00
Totals	**12**	**9**	**0.19**	**4**	**3**	**0.04**	**0**	**0**	**0.00**	**9**	**6**	**0.11**	**25**	**18**	**0.09**
Gamebirds															
Wild Turkey	1	1	0.02	1	1	0.01	92	4	1.92	45	4	0.56	139	10	0.48
Ring-necked Pheasant	12	8	0.19	2	2	0.02	12	4	0.25	11	9	0.14	37	23	0.13
Totals	**13**	**9**	**0.20**	**3**	**3**	**0.03**	**104**	**8**	**2.17**	**56**	**13**	**0.70**	**176**	**33**	**0.61**
Woodpecker															
Northern Flicker	0	0	0.00	15	6	0.16	0	0	0.00	2	2	0.03	17	8	0.06
Downy Woodpecker	3	3	0.05	7	7	0.07	2	2	0.04	2	2	0.03	14	14	0.05
Totals	**3**	**3**	**0.05**	**22**	**13**	**0.23**	**2**	**2**	**0.04**	**4**	**4**	**0.05**	**31**	**22**	**0.11**
Crows and Allies															
American Crow	39	8	0.61	249	27	2.59	57	15	1.19	221	23	2.76	566	73	1.97
Blue Jay	28	12	0.44	80	26	0.83	18	9	0.38	22	11	0.28	148	58	0.51
Totals	**67**	**20**	**1.05**	**329**	**53**	**3.43**	**75**	**24**	**1.56**	**243**	**34**	**3.04**	**714**	**131**	**2.48**
Pigeons & Doves															
Rock Pigeon	22	9	0.34	79	17	0.82	31	10	0.65	40	13	0.50	172	49	0.60
Mourning Dove	14	9	0.22	13	8	0.14	0	0	0.00	7	6	0.09	34	23	0.12
Totals	**36**	**18**	**0.56**	**92**	**25**	**0.96**	**31**	**10**	**0.65**	**47**	**19**	**0.59**	**206**	**72**	**0.72**
Wadingbirds															
Great Blue Heron	2	2	0.03	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
Totals	**2**	**2**	**0.03**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**2**	**2**	**0.01**
Waterbirds															
American White Pelican	4	1	0.06	0	0	0.00	0	0	0.00	12	2	0.15	16	3	0.06
Totals	**4**	**1**	**0.06**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**12**	**2**	**0.15**	**16**	**3**	**0.06**
Gulls/Terns															
Ring-billed Gull	4	2	0.06	21	4	0.22	0	0	0.00	0	0	0.00	25	6	0.09
Totals	**4**	**2**	**0.06**	**21**	**4**	**0.22**	**0**	**0**	**0.00**	**0**	**0**	**0.00**	**25**	**6**	**0.09**
Grand Totals	**875**	**284**	**13.67**	**1,702**	**274**	**17.73**	**822**	**86**	**17.13**	**1,969**	**275**	**24.61**	**5,368**	**919**	**18.64**

Table 6. Cumulative Palmer's Creek Point Count Percent Composition and Frequency by Species Group										
Species	Summer 2016 & 2017		Fall 2016		Winter 2016-2017		Spring 2017		Cumulative	
	Percent (%) Composition	Percent (%) Frequency	Percent (%) Composition	Percent (%) Frequency	Percent (%) Composition	Percent (%) Frequency	Percent (%) Composition	Percent (%) Frequency	Percent (%) Composition	Percent (%) Frequency
Songbirds										
European Starling	5.03%	4.69%	6.11%	6.25%	41.24%	20.83%	28.80%	18.75%	19.63%	2.78%
Red-winged Blackbird	14.74%	34.38%	12.04%	12.50%	0.00%	0.00%	17.98%	18.75%	12.82%	11.81%
Brown-headed Cowbird	15.54%	20.31%	11.69%	14.58%	0.00%	0.00%	2.03%	6.25%	6.99%	9.38%
Horned Lark	2.97%	20.31%	2.76%	5.21%	0.24%	2.08%	6.30%	37.50%	3.71%	6.25%
Barn Swallow	12.69%	32.81%	4.52%	5.21%	0.00%	0.00%	0.00%	0.00%	3.50%	9.03%
American Goldfinch	5.03%	29.69%	5.29%	14.58%	0.00%	0.00%	0.61%	3.75%	2.72%	11.46%
Snow Bunting	0.00%	0.00%	0.00%	0.00%	13.26%	12.50%	0.00%	0.00%	2.03%	0.00%
Field Sparrow	4.00%	26.56%	3.58%	22.92%	0.00%	0.00%	0.56%	6.25%	1.99%	13.54%
Dark-eyed Junco	0.00%	0.00%	3.17%	6.25%	3.41%	8.33%	0.91%	3.75%	1.86%	2.08%
Common Grackle	1.26%	6.25%	1.47%	4.17%	0.00%	0.00%	2.69%	7.50%	1.66%	2.78%
Black-capped Chickadee	0.46%	3.13%	2.12%	7.29%	3.41%	10.42%	0.61%	2.50%	1.49%	3.13%
Unidentified Sparrow	0.00%	0.00%	0.00%	0.00%	4.26%	8.33%	1.27%	1.25%	1.12%	0.00%
American Robin	1.60%	12.50%	0.88%	8.33%	0.00%	0.00%	1.22%	12.50%	0.99%	5.56%
Unknown Blackbird	0.00%	0.00%	2.35%	1.04%	0.00%	0.00%	0.00%	0.00%	0.75%	0.35%
American Tree Sparrow	0.00%	0.00%	2.23%	5.21%	0.00%	0.00%	0.00%	0.00%	0.71%	1.74%
Tree Swallow	2.63%	14.06%	0.00%	0.00%	0.00%	0.00%	0.36%	5.00%	0.56%	3.13%
Cedar Waxwing	0.69%	4.69%	0.88%	3.13%	0.00%	0.00%	0.30%	2.50%	0.50%	2.08%
Common Yellowthroat	2.29%	15.63%	0.12%	2.08%	0.00%	0.00%	0.00%	0.00%	0.41%	4.17%
Yellow Warbler	2.29%	4.69%	0.00%	0.00%	0.00%	0.00%	0.05%	1.25%	0.39%	1.04%
Clay-colored Sparrow	1.83%	18.75%	0.00%	0.00%	0.00%	0.00%	0.05%	1.25%	0.32%	4.17%
Western Meadowlark	0.00%	0.00%	0.82%	3.13%	0.00%	0.00%	0.05%	1.25%	0.28%	1.04%
Savannah Sparrow	0.00%	0.00%	0.00%	0.00%	0.97%	2.08%	0.36%	1.25%	0.28%	0.00%
Bank Swallow	1.37%	1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.35%
Chipping Sparrow	1.03%	12.50%	0.00%	0.00%	0.00%	0.00%	0.10%	2.50%	0.20%	2.78%
Vesper Sparrow	1.14%	9.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	2.08%
Song Sparrow	0.80%	7.81%	0.00%	0.00%	0.00%	0.00%	0.10%	2.50%	0.17%	1.74%
Yellow-headed Blackbird	0.23%	3.13%	0.00%	0.00%	0.00%	0.00%	0.30%	2.50%	0.15%	0.69%
Eastern Bluebird	0.00%	0.00%	0.35%	2.08%	0.00%	0.00%	0.10%	1.25%	0.15%	0.69%
Sedge Wren	0.57%	7.81%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	1.74%
Least Flycatcher	0.46%	4.69%	0.06%	1.04%	0.00%	0.00%	0.00%	0.00%	0.09%	1.39%
Belted Kingfisher	0.23%	3.13%	0.06%	1.04%	0.00%	0.00%	0.05%	1.25%	0.07%	1.04%
Eastern Kingbird	0.46%	4.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	1.04%
Eastern Wood-Pewee	0.34%	4.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	1.04%
Grasshopper Sparrow	0.23%	3.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.69%
Bobolink	0.11%	1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.35%
Marsh Wren	0.11%	1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.35%
Willow Flycatcher	0.11%	1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.35%
Totals	**80.23%**		**60.52%**		**66.79%**		**64.80%**		**66.26%**	
Raptors/Vultures/Owls										
Red-tailed Hawk	0.34%	4.69%	1.12%	15.63%	0.73%	10.42%	0.86%	18.75%	0.84%	6.25%
Turkey Vulture	0.57%	6.25%	0.41%	5.21%	0.00%	0.00%	0.81%	6.25%	0.52%	3.13%
Bald Eagle	0.00%	0.00%	0.59%	6.25%	0.00%	0.00%	0.86%	10.00%	0.50%	2.08%
Swainson's Hawk	0.11%	1.56%	0.18%	2.08%	0.12%	2.08%	0.00%	0.00%	0.09%	1.04%
Rough-legged Hawk	0.00%	0.00%	0.24%	2.08%	0.00%	0.00%	0.00%	0.00%	0.07%	0.69%
Northern Harrier	0.00%	0.00%	0.00%	0.00%	0.12%	2.08%	0.05%	1.25%	0.04%	0.00%
American Kestrel	0.00%	0.00%	0.06%	1.04%	0.00%	0.00%	0.00%	0.00%	0.02%	0.35%
Cooper's Hawk	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	1.25%	0.02%	0.00%
Totals	**1.03%**		**2.59%**		**0.97%**		**2.64%**		**2.11%**	
Waterfowl										
Canada Goose	0.00%	0.00%	7.64%	10.42%	0.85%	2.08%	10.56%	25.00%	6.48%	4.17%
Unknown Duck	1.26%	3.13%	0.41%	3.13%	5.60%	4.17%	0.51%	6.25%	1.38%	1.74%
Mallard	1.03%	6.25%	0.00%	0.00%	0.00%	0.00%	2.59%	13.75%	1.12%	1.39%
Snow Goose	0.34%	3.13%	1.18%	2.08%	0.00%	0.00%	0.00%	0.00%	0.37%	0.69%
Blue-winged teal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	1.25%	0.02%	0.00%
Totals	**2.63%**		**9.22%**		**6.45%**		**13.71%**		**9.37%**	
Shorebirds										
Killdeer	1.37%	14.06%	0.18%	2.08%	0.00%	0.00%	0.41%	6.25%	0.43%	3.82%
Upland Sandpiper	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	1.25%	0.02%	0.00%
Wilson's Snipe	0.00%	0.00%	0.06%	1.04%	0.00%	0.00%	0.00%	0.00%	0.02%	0.35%
Totals	**1.37%**		**0.24%**		**0.00%**		**0.46%**		**0.47%**	
Gamebirds										
Wild Turkey	0.11%	1.56%	0.06%	1.04%	11.19%	8.33%	2.29%	5.00%	2.59%	0.69%
Ring-necked Pheasant	1.37%	12.50%	0.12%	2.08%	1.46%	8.33%	0.56%	11.25%	0.69%	3.47%
Totals	**1.49%**		**0.18%**		**12.65%**		**2.84%**		**3.28%**	
Woodpecker										
Northern Flicker	0.00%	0.00%	0.88%	6.25%	0.00%	0.00%	0.10%	2.50%	0.32%	2.08%
Downy Woodpecker	0.34%	4.69%	0.41%	7.29%	0.24%	4.17%	0.10%	2.50%	0.26%	3.47%
Totals	**0.34%**		**1.29%**		**0.24%**		**0.20%**		**0.58%**	
Crows and Allies										
American Crow	4.46%	12.50%	14.63%	23.96%	6.93%	31.25%	11.22%	23.75%	10.54%	10.07%
Blue Jay	3.20%	18.75%	4.70%	27.08%	2.19%	18.75%	1.12%	13.75%	2.76%	13.19%
Totals	**7.66%**		**19.33%**		**9.12%**		**12.34%**		**13.30%**	
Pigeons & Doves										
Rock Pigeon	2.51%	14.06%	4.64%	17.71%	3.77%	20.83%	2.03%	15.00%	3.20%	9.03%
Mourning Dove	1.60%	14.06%	0.76%	8.33%	0.00%	0.00%	0.36%	7.50%	0.63%	5.90%
Totals	**4.11%**		**5.41%**		**3.77%**		**2.39%**		**3.84%**	
Wadingbirds										
Great Blue Heron	0.23%	3.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.69%
Totals	**0.23%**		**0.00%**		**0.00%**		**0.00%**		**0.04%**	
Waterbirds										
American White Pelican	0.46%	1.56%	0.00%	0.00%	0.00%	0.00%	0.61%	2.50%	0.30%	0.35%
Totals	**0.46%**		**0.00%**		**0.00%**		**0.61%**		**0.30%**	
Gulls/Terns										
Ring-billed Gull	0.46%	3.13%	1.23%	4.17%	0.00%	0.00%	0.00%	0.00%	0.47%	2.08%
Totals	**0.46%**		**1.23%**		**0.00%**		**0.00%**		**0.47%**	
Grand Totals	**100.00%**		**100.00%**		**100.00%**		**100.00%**		**100.00%**	

Table 7a. Avian Species Observed by Point Count at Palmer's Creek (Summer 2016 & Summer 2017)										
Species	Number of Observations	Number of Individuals	Points							
			1	2	3	4	5	6	7	8
Songbirds										
European Starling	3	44	0	0	0	0	0	0	6	38
Red-winged Blackbird	22	129	0	3	90	3	5	7	14	7
Brown-headed Cowbird	13	136	12	2	3	1	0	7	3	108
Horned Lark	13	26	3	2	0	11	5	3	0	2
Barn Swallow	21	111	7	24	3	14	3	38	1	21
American Goldfinch	20	44	5	7	9	8	2	6	5	2
Field Sparrow	17	35	4	3	7	7	6	2	5	1
Common Grackle	4	11	0	0	0	2	0	4	5	0
Black-capped Chickadee	2	4	1	0	3	0	0	0	0	0
American Robin	8	14	3	0	1	4	0	2	0	4
Tree Swallow	9	23	0	5	2	2	1	0	5	8
Cedar Waxwing	3	6	0	2	1	3	0	0	0	0
Common Yellowthroat	10	20	0	5	6	0	2	1	3	3
Yellow Warbler	4	20	0	0	18	0	0	0	0	2
Clay-colored Sparrow	12	16	1	5	4	1	1	1	2	1
Bank Swallow	1	12	0	0	0	0	0	0	0	12
Chipping Sparrow	8	9	1	1	4	0	0	0	1	2
Vesper Sparrow	6	10	6	1	0	0	2	1	0	0
Song Sparrow	5	7	0	1	4	0	1	0	0	1
Yellow-headed Blackbird	2	2	0	0	2	0	0	0	0	0
Sedge Wren	5	5	0	0	3	0	2	0	0	0
Least Flycatcher	3	4	0	0	1	2	1	0	0	0
Belted Kingfisher	2	2	0	0	1	0	0	0	0	1
Eastern Kingbird	3	4	0	1	0	0	2	0	1	0
Eastern Wood-Pewee	3	3	2	0	0	1	0	0	0	0
Grasshopper Sparrow	2	2	1	1	0	0	0	0	0	0
Bobolink	1	1	0	0	0	0	0	0	0	1
Marsh Wren	1	1	0	0	1	0	0	0	0	0
Willow Flycatcher	1	1	0	0	0	1	0	0	0	0
Raptors/Vultures/Owls										
Red-tailed Hawk	3	3	0	1	0	1	0	0	0	1
Turkey Vulture	4	5	0	3	0	1	0	1	0	0
Swainson's Hawk	1	1	0	0	1	0	0	0	0	0
Waterfowl										
Canada Goose	2	3	0	0	3	0	0	0	0	0
Unknown Duck	2	11	0	0	11	0	0	0	0	0
Mallard	4	9	0	0	6	0	0	0	0	3
Shorebirds										
Killdeer	9	12	2	1	0	1	2	0	1	5
Gamebirds										
Wild Turkey	1	1	1	0	0	0	0	0	0	0
Ring-necked Pheasant	8	12	4	1	0	0	2	3	2	0
Woodpecker										
Downy Woodpecker	3	3	0	0	0	0	1	1	0	1
Crows and Allies										
American Crow	8	39	11	21	5	2	0	0	0	0
Blue Jay	12	28	9	1	0	9	0	1	3	5
Pigeons & Doves										
Rock Pigeon	9	22	1	0	0	11	0	3	2	5
Mourning Dove	9	14	0	3	0	4	0	7	0	0
Wadingbirds										
Great Blue Heron	2	2	0	0	1	1	0	0	0	0
Waterbirds										
American White Pelican	1	4	4	0	0	0	0	0	0	0
Gulls/Terns										
Ring-billed Gull	2	4	0	0	1	0	0	3	0	0
Totals	**284**	**875**	**78**	**94**	**191**	**90**	**38**	**91**	**59**	**234**
Mean Use		**13.67**	**9.75**	**11.75**	**23.88**	**11.25**	**4.75**	**11.38**	**7.38**	**29.25**

Table 7b. Avian Species Observed by Point Count at Palmer's Creek (Fall 2016)										
Species	Number of Observations	Number of Individuals	Points							
			1	2	3	4	5	6	7	8
Songbirds										
European Starling	6	104	75	0	0	0	0	0	0	29
Red-winged Blackbird	12	205	0	0	81	7	11	74	32	0
Brown-headed Cowbird	15	199	13	32	0	14	8	18	15	99
Horned Lark	5	47	0	23	15	0	0	3	1	5
Barn Swallow	5	77	0	1	38	0	0	0	0	38
American Goldfinch	15	90	37	9	18	0	5	1	9	11
Field Sparrow	22	61	19	2	23	3	5	3	5	1
Dark-eyed Junco	6	54	0	0	36	0	14	0	0	4
Common Grackle	4	25	2	0	6	0	0	17	0	0
Black-capped Chickadee	7	36	0	0	8	0	26	0	0	2
American Robin	8	15	2	5	0	0	0	3	1	4
Unknown Blackbird	1	40	0	0	0	0	0	40	0	0
American Tree Sparrow	5	38	0	4	10	18	6	0	0	0
Cedar Waxwing	3	15	3	0	0	0	0	5	7	0
Common Yellowthroat	2	2	1	0	0	0	1	0	0	0
Western Meadowlark	3	14	0	0	5	0	0	0	2	7
Eastern Bluebird	2	6	0	5	1	0	0	0	0	0
Least Flycatcher	1	1	0	0	0	1	0	0	0	0
Belted Kingfisher	1	1	0	0	1	0	0	0	0	0
Raptors/Vultures/Owls										
Red-tailed Hawk	16	19	1	3	5	4	1	1	2	2
Turkey Vulture	5	7	0	2	2	0	2	1	0	0
Bald Eagle	8	10	5	1	0	2	0	1	1	0
Swainson's Hawk	2	3	0	0	2	1	0	0	0	0
Rough-legged Hawk	3	4	0	0	1	0	0	0	3	0
American Kestrel	1	1	0	1	0	0	0	0	0	0
Waterfowl										
Canada Goose	10	130	27	3	64	21	0	3	12	0
Unknown Duck	3	7	0	0	6	0	0	1	0	0
Snow Goose	2	20	2	0	18	0	0	0	0	0
Shorebirds										
Killdeer	2	3	2	0	0	0	0	0	0	1
Wilson's Snipe	1	1	1	0	0	0	0	0	0	0
Gamebirds										
Wild Turkey	1	1	1	0	0	0	0	0	0	0
Ring-necked Pheasant	2	2	0	1	0	0	1	0	0	0
Woodpecker										
Northern Flicker	6	15	0	4	0	3	4	0	4	0
Downy Woodpecker	7	7	1	1	0	1	0	3	1	0
Crows and Allies										
American Crow	27	249	180	24	0	8	5	8	2	22
Blue Jay	26	80	16	17	10	5	12	8	3	9
Pigeons & Doves										
Rock Pigeon	17	79	22	10	7	3	3	6	12	16
Mourning Dove	8	13	0	1	0	5	3	3	1	0
Gulls/Terns										
Ring-billed Gull	4	21	0	0	0	16	1	0	2	2
Totals	**274**	**1,702**	**410**	**149**	**357**	**112**	**108**	**199**	**115**	**252**
Mean Use		**17.73**	**34.17**	**12.42**	**29.75**	**9.33**	**9.00**	**16.58**	**9.58**	**21.00**

Table 7c. Avian Species Observed by Point Count at Palmer's Creek (Winter 2016-2017)										
Species	Number of Observations	Number of Individuals	Points							
			1	2	3	4	5	6	7	8
Songbirds										
European Starling	10	339	51	0	0	0	0	31	0	257
Horned Lark	1	2	0	0	2	0	0	0	0	0
Snow Bunting	6	109	0	48	0	0	20	0	0	41
Dark-eyed Junco	4	28	0	0	10	0	18	0	0	0
Black-capped Chickadee	5	28	0	0	9	0	19	0	0	0
Unidentified Sparrow	4	35	0	0	1	16	0	0	18	0
Savannah Sparrow	1	8	0	0	0	8	0	0	0	0
Raptors/Vultures/Owls										
Red-tailed Hawk	6	6	0	2	1	0	0	1	1	1
Swainson's Hawk	1	1	0	0	1	0	0	0	0	0
Northern Harrier	1	1	1	0	0	0	0	0	0	0
Waterfowl										
Canada Goose	1	7	0	7	0	0	0	0	0	0
Unknown Duck	2	46	0	14	32	0	0	0	0	0
Gamebirds										
Wild Turkey	4	92	89	3	0	0	0	0	0	0
Ring-necked Pheasant	4	12	0	0	6	5	1	0	0	0
Woodpecker										
Downy Woodpecker	2	2	0	0	0	0	0	1	1	0
Crows and Allies										
American Crow	15	57	17	12	10	1	1	0	15	1
Blue Jay	9	18	4	11	0	2	1	0	0	0
Pigeons & Doves										
Rock Pigeon	10	31	0	12	0	3	0	6	6	4
Totals	**86**	**822**	**162**	**109**	**72**	**35**	**60**	**39**	**41**	**304**
Mean Use		**17.13**	**27.00**	**18.17**	**12.00**	**5.83**	**10.00**	**6.50**	**6.83**	**50.67**

Table 7d. Avian Species Observed by Point Count at Palmer's Creek (Spring 2017)										
Species	Number of Observations	Number of Individuals	Points							
			1	2	3	4	5	6	7	8
Songbirds										
European Starling	15	567	104	0	0	0	8	5	0	450
Red-winged Blackbird	18	354	0	0	324	5	10	8	4	3
Brown-headed Cowbird	5	40	0	0	1	3	0	6	0	30
Horned Lark	34	124	10	20	14	32	8	22	14	4
American Goldfinch	3	12	0	8	0	0	0	0	0	4
Field Sparrow	5	11	0	4	2	5	0	0	0	0
Dark-eyed Junco	3	18	0	7	4	0	7	0	0	0
Common Grackle	6	53	6	14	14	0	0	17	2	0
Black-capped Chickadee	2	12	0	0	0	0	12	0	0	0
Unidentified Sparrow	1	25	0	0	0	25	0	0	0	0
American Robin	10	24	3	8	3	0	4	2	2	2
Tree Swallow	4	7	4	2	0	0	0	1	0	0
Cedar Waxwing	2	6	0	6	0	0	0	0	0	0
Yellow Warbler	1	1	0	0	1	0	0	0	0	0
Clay-colored Sparrow	1	1	0	1	0	0	0	0	0	0
Western Meadowlark	1	1	0	1	0	0	0	0	0	0
Savannah Sparrow	1	7	0	0	0	7	0	0	0	0
Chipping Sparrow	2	2	0	1	1	0	0	0	0	0
Song Sparrow	2	2	0	0	0	1	1	0	0	0
Yellow-headed Blackbird	2	6	0	0	6	0	0	0	0	0
Eastern Bluebird	1	2	0	0	0	0	0	0	2	0
Belted Kingfisher	1	1	0	0	0	0	0	0	0	1
Raptors/Vultures/Owls										
Red-tailed Hawk	16	17	2	1	6	4	1	0	2	1
Turkey Vulture	6	16	0	0	2	11	2	0	0	1
Bald Eagle	13	17	3	0	5	8	0	0	1	0
Northern Harrier	1	1	0	1	0	0	0	0	0	0
Cooper's Hawk	1	1	0	0	0	0	1	0	0	0
Waterfowl										
Canada Goose	21	208	21	10	98	0	6	62	11	0
Unknown Duck	5	10	0	0	9	0	1	0	0	0
Mallard	13	51	0	0	25	6	6	0	12	2
Blue-winged teal	1	1	0	0	1	0	0	0	0	0
Shorebirds										
Killdeer	5	8	0	0	0	1	0	0	0	7
Upland Sandpiper	1	1	0	0	0	0	0	0	0	1
Gamebirds										
Wild Turkey	4	45	45	0	0	0	0	0	0	0
Ring-necked Pheasant	9	11	0	3	1	0	6	0	1	0
Woodpecker										
Northern Flicker	2	2	1	0	0	1	0	0	0	0
Downy Woodpecker	2	2	0	0	1	0	0	0	0	1
Crows and Allies										
American Crow	23	221	30	24	72	49	12	22	0	12
Blue Jay	11	22	5	2	2	7	0	5	0	1
Pigeons & Doves										
Rock Pigeon	13	40	0	0	0	3	1	16	9	11
Mourning Dove	6	7	2	0	0	2	1	1	0	1
Waterbirds										
American White Pelican	2	12	0	0	3	9	0	0	0	0
Totals	**275**	**1,969**	**236**	**113**	**595**	**179**	**87**	**167**	**60**	**532**
Mean Use		**24.61**	**23.60**	**11.30**	**59.50**	**17.90**	**8.70**	**16.70**	**6.00**	**53.20**

Table 8. Cumulative Avian Species Observed by Point Count at Palmer's Creek										
Species	Number of Observations	Number of Individuals	Points							
			1	2	3	4	5	6	7	8
Songbirds										
European Starling	34	1,054	230	0	0	0	8	36	6	774
Red-winged Blackbird	52	688	0	3	495	15	26	89	50	10
Brown-headed Cowbird	33	375	25	34	4	18	8	31	18	237
Horned Lark	53	199	13	45	31	43	13	28	15	11
Barn Swallow	26	188	7	25	41	14	3	38	1	59
American Goldfinch	38	146	42	24	27	8	7	7	14	17
Snow Bunting	6	109	0	48	0	0	20	0	0	41
Field Sparrow	44	107	23	9	32	15	11	5	10	2
Dark-eyed Junco	13	100	0	7	50	0	39	0	0	4
Common Grackle	14	89	8	14	20	2	0	38	7	0
Black-capped Chickadee	16	80	1	0	20	0	57	0	0	2
Unidentified Sparrow	5	60	0	0	1	41	0	0	18	0
American Robin	26	53	8	13	4	4	4	7	3	10
Unknown Blackbird	1	40	0	0	0	0	0	40	0	0
American Tree Sparrow	5	38	0	4	10	18	6	0	0	0
Tree Swallow	13	30	4	7	2	2	1	1	5	8
Cedar Waxwing	8	27	3	8	1	3	0	5	7	0
Common Yellowthroat	12	22	1	5	6	0	3	1	3	3
Yellow Warbler	5	21	0	0	19	0	0	0	0	2
Clay-colored Sparrow	13	17	1	6	4	1	1	1	2	1
Western Meadowlark	4	15	0	1	5	0	0	0	2	7
Savannah Sparrow	2	15	0	0	0	15	0	0	0	0
Bank Swallow	1	12	0	0	0	0	0	0	0	12
Chipping Sparrow	10	11	1	2	5	0	0	0	1	2
Vesper Sparrow	6	10	6	1	0	0	2	1	0	0
Song Sparrow	7	9	0	1	4	1	2	0	0	1
Yellow-headed Blackbird	4	8	0	0	8	0	0	0	0	0
Eastern Bluebird	3	8	0	5	1	0	0	0	2	0
Sedge Wren	5	5	0	0	3	0	2	0	0	0
Least Flycatcher	4	5	0	0	1	3	1	0	0	0
Belted Kingfisher	4	4	0	0	2	0	0	0	0	2
Eastern Kingbird	3	4	0	1	0	0	2	0	1	0
Eastern Wood-Pewee	3	3	2	0	0	1	0	0	0	0
Grasshopper Sparrow	2	2	1	1	0	0	0	0	0	0
Bobolink	1	1	0	0	0	0	0	0	0	1
Marsh Wren	1	1	0	0	1	0	0	0	0	0
Willow Flycatcher	1	1	0	0	0	1	0	0	0	0
Raptors/Vultures/Owls										
Red-tailed Hawk	41	45	3	7	12	9	2	2	5	5
Turkey Vulture	15	28	0	5	4	12	4	2	0	1
Bald Eagle	21	27	8	1	5	10	0	1	2	0
Swainson's Hawk	4	5	0	0	4	1	0	0	0	0
Rough-legged Hawk	3	4	0	0	1	0	0	0	3	0
Northern Harrier	2	2	1	1	0	0	0	0	0	0
American Kestrel	1	1	0	1	0	0	0	0	0	0
Cooper's Hawk	1	1	0	0	0	0	1	0	0	0
Waterfowl										
Canada Goose	34	348	48	20	165	21	6	65	23	0
Unknown Duck	12	74	0	14	58	0	1	1	0	0
Mallard	17	60	0	0	31	6	6	0	12	5
Snow Goose	2	20	2	0	18	0	0	0	0	0
Blue-winged teal	1	1	0	0	1	0	0	0	0	0
Shorebirds										
Killdeer	16	23	4	1	0	2	2	0	1	13
Upland Sandpiper	1	1	0	0	0	0	0	0	0	1
Wilson's Snipe	1	1	1	0	0	0	0	0	0	0
Gamebirds										
Wild Turkey	10	139	136	3	0	0	0	0	0	0
Ring-necked Pheasant	23	37	4	5	7	5	10	3	3	0
Woodpecker										
Northern Flicker	8	17	1	4	0	4	4	0	4	0
Downy Woodpecker	14	14	1	1	1	1	1	5	2	2
Crows and Allies										
American Crow	73	566	238	81	87	60	18	30	17	35
Blue Jay	58	148	34	31	12	23	13	14	6	15
Pigeons & Doves										
Rock Pigeon	49	172	23	22	7	20	4	31	29	36
Mourning Dove	23	34	2	4	0	11	4	11	1	1
Wadingbirds										
Great Blue Heron	2	2	0	0	1	1	0	0	0	0
Waterbirds										
American White Pelican	3	16	4	0	3	9	0	0	0	0
Gulls/Terns										
Ring-billed Gull	6	25	0	0	1	16	1	3	2	2
Totals	**919**	**5,368**	**886**	**465**	**1,215**	**416**	**293**	**496**	**275**	**1,322**
Mean Use		**18.64**	**24.61**	**12.92**	**33.75**	**11.56**	**8.14**	**13.78**	**7.64**	**36.72**

Table 9. Avian Flight Heights at Palmer's Creek																				
Species	Summer 2016 & 2017				Fall 2016				Winter 2016-2017				Spring 2017				Cumulative			
	Observation		Individuals		Observation		Individuals		Observation		Individuals		Observation		Individuals		Observation		Individuals	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Non-Raptors																				
Above RSA (>148m)	0	0.00%	0	0.00%	5	3.05%	51	4.47%	1	1.79%	7	1.07%	5	3.01%	19	1.14%	13	2.38%	138	3.21%
Below RSA (<22m)	138	97.18%	624	98.89%	145	88.41%	979	85.88%	52	92.86%	602	91.77%	129	77.71%	1418	85.32%	480	87.91%	3769	87.73%
Within RSA (≥22m and ≤148m)	4	2.82%	7	1.11%	14	8.54%	110	9.65%	3	5.36%	47	7.16%	32	19.28%	225	13.54%	53	9.71%	389	9.05%
Raptors/Vultures/Owls																				
Above RSA (>148m)	0	0.00%	0	0.00%	8	26.67%	13	34.21%	1	12.50%	1	12.50%	4	10.81%	6	11.54%	13	15.48%	20	18.52%
Below RSA (<22m)	4	50.00%	4	44.44%	13	43.33%	15	39.47%	5	62.50%	5	62.50%	10	27.03%	12	23.08%	32	38.10%	36	33.33%
Within RSA (≥22m and ≤148m)	4	50.00%	5	55.56%	9	30.00%	10	26.32%	2	25.00%	2	25.00%	23	62.16%	34	65.38%	39	46.43%	52	48.15%

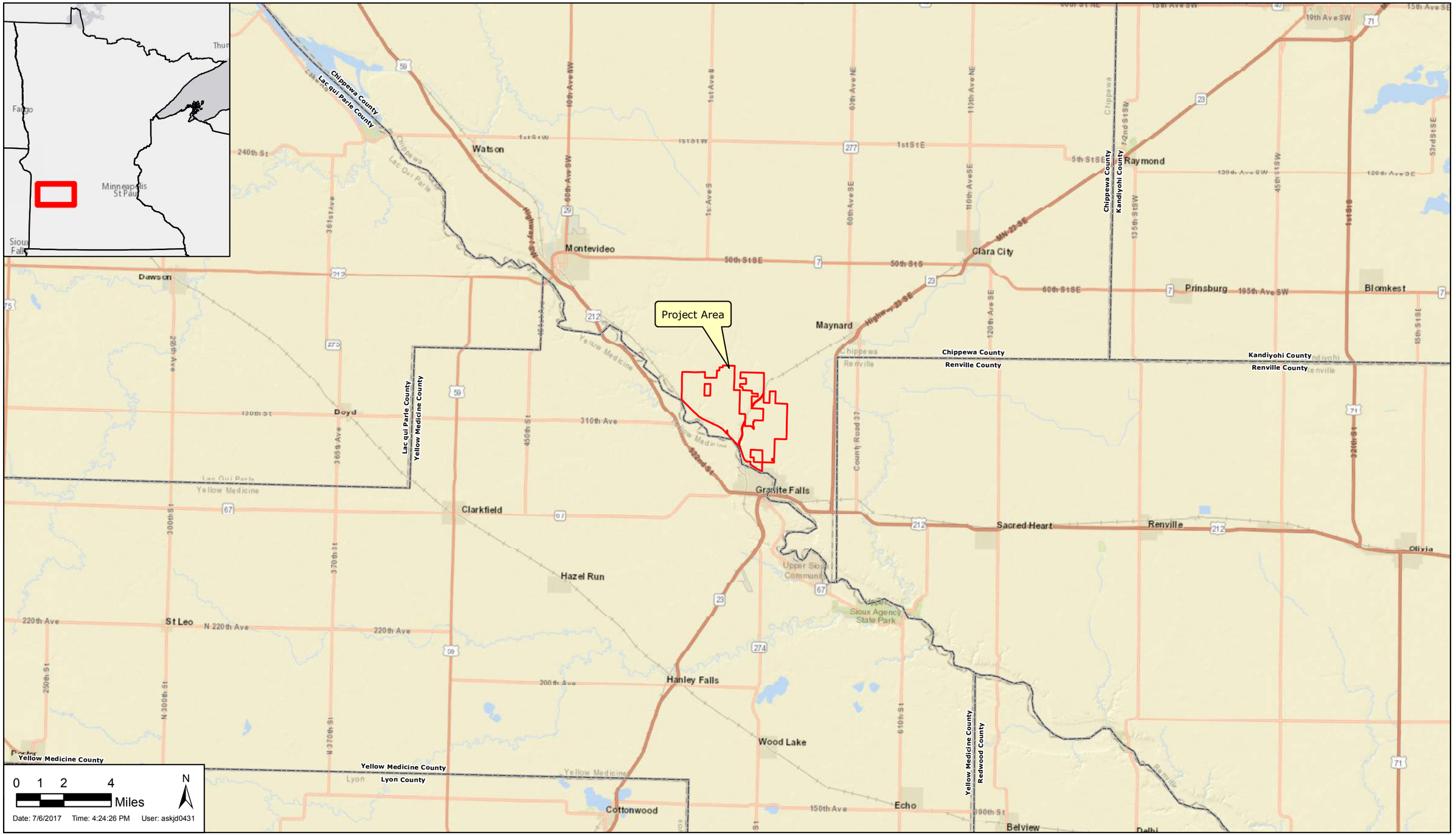
Table 10. Point Count Individuals and RSA at Palmer's Creek

Species	Summer 2016 & 2017						Fall 2016						Winter 2016-2017						Spring 2017						Cumulative					
	Encounter Rate	Mean Use (# birds/20 min)	Flying (%)	Percent (%) Flying Below RSA	Percent (%) Flying Within RSA	Percent (%) Flying Above RSA	Encounter Rate	Mean Use (# birds/20 min)	Flying (%)	Percent (%) Flying Below RSA	Percent (%) Flying Within RSA	Percent (%) Flying Above RSA	Encounter Rate	Mean Use (# birds/20 min)	Flying (%)	Percent (%) Flying Below RSA	Percent (%) Flying Within RSA	Percent (%) Flying Above RSA	Encounter Rate	Mean Use (# birds/20 min)	Flying (%)	Percent (%) Flying Below RSA	Percent (%) Flying Within RSA	Percent (%) Flying Above RSA	Encounter Rate	Mean Use (# birds/20 min)	Flying (%)	Percent (%) Flying Below RSA	Percent (%) Flying Within RSA	Percent (%) Flying Above RSA
Songbirds																														
European Starling	0.00	0.69	100.00%	100.00%	0.00%	0.00%	0.00	1.08	72.12%	100.00%	0.00%	0.00%	0.00	7.06	91.15%	100.00%	0.00%	0.00%	0.16	7.09	99.12%	97.69%	2.31%	0.00%	0.05	3.66	93.93%	98.69%	1.31%	0.00%
Red-winged Blackbird	0.00	2.02	90.70%	100.00%	0.00%	0.00%	0.27	2.14	100.00%	87.32%	12.68%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.08	4.43	100.00%	98.31%	1.69%	0.00%	0.11	2.39	98.26%	95.27%	4.73%	0.00%
Brown-headed Cowbird	0.00	2.13	89.71%	100.00%	0.00%	0.00%	0.00	2.07	82.41%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.50	97.50%	100.00%	0.00%	0.00%	0.00	1.30	86.67%	100.00%	0.00%	0.00%
Horned Lark	0.00	0.41	80.77%	100.00%	0.00%	0.00%	0.00	0.49	91.49%	100.00%	0.00%	0.00%	0.00	0.04	100.00%	100.00%	0.00%	0.00%	0.00	1.55	84.68%	100.00%	0.00%	0.00%	0.00	0.69	85.93%	100.00%	0.00%	0.00%
Barn Swallow	0.00	1.73	100.00%	100.00%	0.00%	0.00%	0.00	0.80	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.65	100.00%	100.00%	0.00%	0.00%
American Goldfinch	0.00	0.69	100.00%	100.00%	0.00%	0.00%	0.02	0.94	100.00%	97.78%	2.22%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.15	100.00%	100.00%	0.00%	0.00%	0.01	0.51	100.00%	98.63%	1.37%	0.00%
Snow Bunting	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	2.27	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.38	100.00%	100.00%	0.00%	0.00%
Field Sparrow	0.00	0.55	34.29%	100.00%	0.00%	0.00%	0.00	0.64	78.69%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.14	18.18%	100.00%	0.00%	0.00%	0.00	0.37	57.94%	100.00%	0.00%	0.00%
Dark-eyed Junco	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.56	100.00%	100.00%	0.00%	0.00%	0.00	0.58	100.00%	100.00%	0.00%	0.00%	0.00	0.23	100.00%	100.00%	0.00%	0.00%	0.00	0.35	100.00%	100.00%	0.00%	0.00%
Common Grackle	0.00	0.17	100.00%	100.00%	0.00%	0.00%	0.00	0.26	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.18	0.66	100.00%	73.58%	26.42%	0.00%	0.05	0.31	100.00%	84.27%	15.73%	0.00%
Black-capped Chickadee	0.00	0.06	0.00%	0.00%	0.00%	0.00%	0.00	0.38	100.00%	100.00%	0.00%	0.00%	0.00	0.58	100.00%	100.00%	0.00%	0.00%	0.00	0.15	100.00%	100.00%	0.00%	0.00%	0.00	0.28	95.00%	100.00%	0.00%	0.00%
Unidentified Sparrow	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.73	97.14%	100.00%	0.00%	0.00%	0.00	0.31	100.00%	100.00%	0.00%	0.00%	0.00	0.21	98.33%	100.00%	0.00%	0.00%
American Robin	0.00	0.22	42.86%	100.00%	0.00%	0.00%	0.00	0.16	73.33%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.30	54.17%	100.00%	0.00%	0.00%	0.00	0.18	56.60%	100.00%	0.00%	0.00%
Unknown Blackbird	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.42	0.42	100.00%	0.00%	100.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.14	0.14	100.00%	0.00%	100.00%	0.00%
American Tree Sparrow	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.40	97.37%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.13	97.37%	100.00%	0.00%	0.00%
Tree Swallow	0.00	0.36	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.09	100.00%	100.00%	0.00%	0.00%	0.00	0.10	100.00%	100.00%	0.00%	0.00%
Cedar Waxwing	0.00	0.09	66.67%	100.00%	0.00%	0.00%	0.00	0.16	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.08	50.00%	100.00%	0.00%	0.00%	0.00	0.09	81.48%	100.00%	0.00%	0.00%
Common Yellowthroat	0.00	0.31	0.00%	0.00%	0.00%	0.00%	0.00	0.02	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.08	0.00%	0.00%	0.00%	0.00%
Yellow Warbler	0.00	0.31	65.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.07	66.67%	100.00%	0.00%	0.00%
Clay-colored Sparrow	0.00	0.25	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	0.06	0.00%	0.00%	0.00%	0.00%
Western Meadowlark	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.15	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	0.05	93.33%	100.00%	0.00%	0.00%
Savannah Sparrow	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.17	0.00%	0.00%	0.00%	0.00%	0.00	0.09	100.00%	100.00%	0.00%	0.00%	0.00	0.05	46.67%	100.00%	0.00%	0.00%
Bank Swallow	0.00	0.19	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.04	100.00%	100.00%	0.00%	0.00%
Chipping Sparrow	0.00	0.14	55.56%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.03	50.00%	100.00%	0.00%	0.00%	0.00	0.04	54.55%	100.00%	0.00%	0.00%
Vesper Sparrow	0.00	0.16	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.03	0.00%	0.00%	0.00%	0.00%
Song Sparrow	0.00	0.11	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.03	0.00%	0.00%	0.00%	0.00%	0.00	0.03	0.00%	0.00%	0.00%	0.00%
Yellow-headed Blackbird	0.00	0.03	50.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.08	100.00%	100.00%	0.00%	0.00%	0.00	0.03	87.50%	100.00%	0.00%	0.00%
Eastern Bluebird	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.06	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.03	100.00%	100.00%	0.00%	0.00%	0.00	0.03	100.00%	100.00%	0.00%	0.00%
Sedge Wren	0.00	0.08	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.02	0.00%	0.00%	0.00%	0.00%
Least Flycatcher	0.00	0.06	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.02	20.00%	100.00%	0.00%	0.00%
Belted Kingfisher	0.00	0.03	50.00%	100.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.01	75.00%	100.00%	0.00%	0.00%
Eastern Kingbird	0.00	0.06	50.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	50.00%	100.00%	0.00%	0.00%
Eastern Wood-Pewee	0.00	0.05	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%
Grasshopper Sparrow	0.00	0.03	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%
Bobolink	0.00	0.02	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Marsh Wren	0.00	0.02	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Willow Flycatcher	0.00	0.02	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Raptors/Vultures/Owls																														
Red-tailed Hawk	0.02	0.05	100.00%	66.67%	33.33%	0.00%	0.04	0.20	89.47%	52.94%	23.53%	23.53%	0.04	0.13	100.00%	50.00%	33.33%	16.67%	0.16	0.21	100.00%	17.65%	76.47%	5.88%	0.07	0.16	95.56%	39.53%	46.51%	13.95%
Turkey Vulture	0.06	0.08	100.00%	20.00%	80.00%	0.00%	0.02	0.07	100.00%	42.86%	28.57%	28.57%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.19	0.20	100.00%	0.00%	93.75%	6.25%	0.07	0.10	100.00%	14.29%	75.00%	10.71%
Bald Eagle	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.03	0.10	90.00%	11.11%	33.33%	55.56%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.06	0.21	100.00%	47.06%	29.41%	23.53%	0.03	0.09	96.30%	34.62%	30.77%	34.62%
Swainson's Hawk	0.00	0.02	100.00%	100.00%	0.00%	0.00%	0.01	0.03	33.33%	0.00%	100.00%	0.00%	0.00	0.02	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.02	60.00%	66.67%	33.33%	0.00%
Rough-legged Hawk	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.01	0.04	100.00%	25.00%	25.00%	50.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	25.00%	25.00%	50.00%
Northern Harrier	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.02	100.00%	100.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%
American Kestrel	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	100.00%	100.00%	0.00%	0.00%
Cooper's Hawk	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.01	0.01	100.00%	0.00%	100.00%	0.00%	0.00	0.00	100.00%	0.00%	100.00%	0.00%
Waterfowl																														
Canada Goose	0.00	0.05	0.00%	0.00%	0.00%	0.00%	0.00	1.35	95.38%	24.19%	0.00%	75.81%	0.00	0.15	100.00%	0.00%	0.00%	100.00%	1.44	2.60	57.21%	0.00%	96.64%	3.36%	0.40	1.21	71.84%	12.00%	46.00%	42.00%
Unknown Duck	0.00	0.17	0.00%	0.00%	0.00%	0.00%	0.01	0.07	14.29%	0.00%	100.00%	0.00%	0.96	0.96	100.00%	0.00%	100.00%	0.00%	0.06	0.13	50.00%	0.00%	100.00%	0.00%	0.18	0.26	70.27%	0.00%	100.00%	0.00%
Mallard	0.00	0.14	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.03	0.64	60.78%	45.16%	6.45%	48.39%	0.01	0.21	51.67%	45.16%	6.45%	48.39%
Snow Goose	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.21	100.00%	10.00%	0.00%	90.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.07	100.00%	10.00%	0.00%	90.00%
Blue-winged teal	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Shorebirds																														
Killdeer	0.00	0.19	41.67%	100.00%	0.00%	0.00%	0.00	0.03	66.67%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.10	50.00%	100.00%	0.00%	0.00%	0.00	0.08	47.83%	100.00%	0.00%	0.00%
Upland Sandpiper	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Wilson's Snipe	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Gamebirds																														
Wild Turkey	0.00	0.02	0.00%	0.00%	0.00%	0.00%	0.00	0.01	0.00%	0.00%	0.00%	0.00%	0.00	1.92	0.00%	0.00%	0.00%	0.00%	0.00	0.56	0.00%	0.00%	0.00%	0.00%	0.00	0.48	0.00%	0.00%	0.00%	0.00%
Ring-necked Pheasant	0.00	0.19	0.00%	0.00%	0.00%	0.00%	0.00	0.02	50.00%	100.00%	0.00%	0.00%	0.00	0.25	50.00%	100.00%	0.00%	0.00%	0.00	0.14	9.09%	100.00%	0.00%	0.00%	0.00	0.13	21.62%	100.00%	0.00%	0.00%
Woodpecker																														
Northern Flicker	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.16	100.00%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.03	100.00%	100.00%	0.00%	0.00%	0.00	0.06	100.00%	100.00%	0.00%	0.00%
Downy Woodpecker	0.00	0.05	0.00%	0.00%	0.00%	0.00%	0.00	0.07	100.00%	100.00%	0.00%	0.00%	0.00	0.04	50.00%	100.00%	0.00%	0.00%	0.00	0.03	50.00%	100.00%	0.00%	0.00%	0.00	0.05	64.29%	100.00%	0.00%	0.00%
Crows and Allies																														
American Crow	0.00	0.61	82.05%	100.00%	0.00%	0.00%	0.23	2.59	28.11%	68.57%	31.43%	0.00%	0.02	1.19	77.19%	97.73%	2.27%	0.00%	0.61	2.76	96.83%	77.10%	22.90%	0.00%	0.25	1.97	63.60%	80.00%	20.00%	0.00%
Blue Jay	0.00	0.44	28.57%	100.00%	0.00%	0.00%	0.00	0.83	68.75%	100.00%	0.00%	0.00%	0.00	0.38	61.11%	100.00%	0.00%	0.00%	0.00	0.28	31.82%	100.00%	0.00%	0.00%	0.00	0.51	54.73%	100.00%	0.00%	0.00%
Pigeons & Doves																														
Rock Pigeon	0.02	0.34	72.73%	93.75%	6.25%	0.00%	0.02	0.82	100.00%	97.47%	2.53%	0.00%	0.00	0.65	100.00%	100.00%	0.00%	0.00%	0.11	0.50	100.00%	77.50%	22.50%	0.00%	0.04	0.60	96.51%	92.77%	7.23%	0.00%
Mourning Dove	0.02	0.22	78.57%	90.91%	9.09%	0.00%	0.00	0.14	76.92%	100.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.09	42.86%	100.00%	0.00%	0.00%	0.00	0.12	70.59%	95.83%	4.17%	0.00%
Wadingbirds																														
Great Blue Heron	0.02	0.03	100.00%	50.00%	50.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.01	100.00%	50.00%	50.00%	0.00%
Waterbirds																														
American White Pelican	0.06	0.06	100.00%	0.00%	100.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.15	0.15	100.00%	0.00%	100.00%	0.00%	0.06	0.06	100.00%	0.00%	100.00%	0.00%
Gulls/Terns																														
Ring-billed Gull	0.00	0.06	100.00%	100.00%	0.00%	0.00%	0.18	0.22	100.00%	19.05%	80.95%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.06	0.09	100.00%	32.00%	68.00%	0.00%
Totals	**0.19**	**13.67**	**73.14%**				**1.26**	**17.73**	**81.43%**				**1.02**	**17.13**	**80.78%**				**3.24**	**24.61**	**87.05%**				**1.53**	**18.64**	**82.04%**			

Table 11. Cumulative Point Count Individuals and RSA at Palmer's Creek

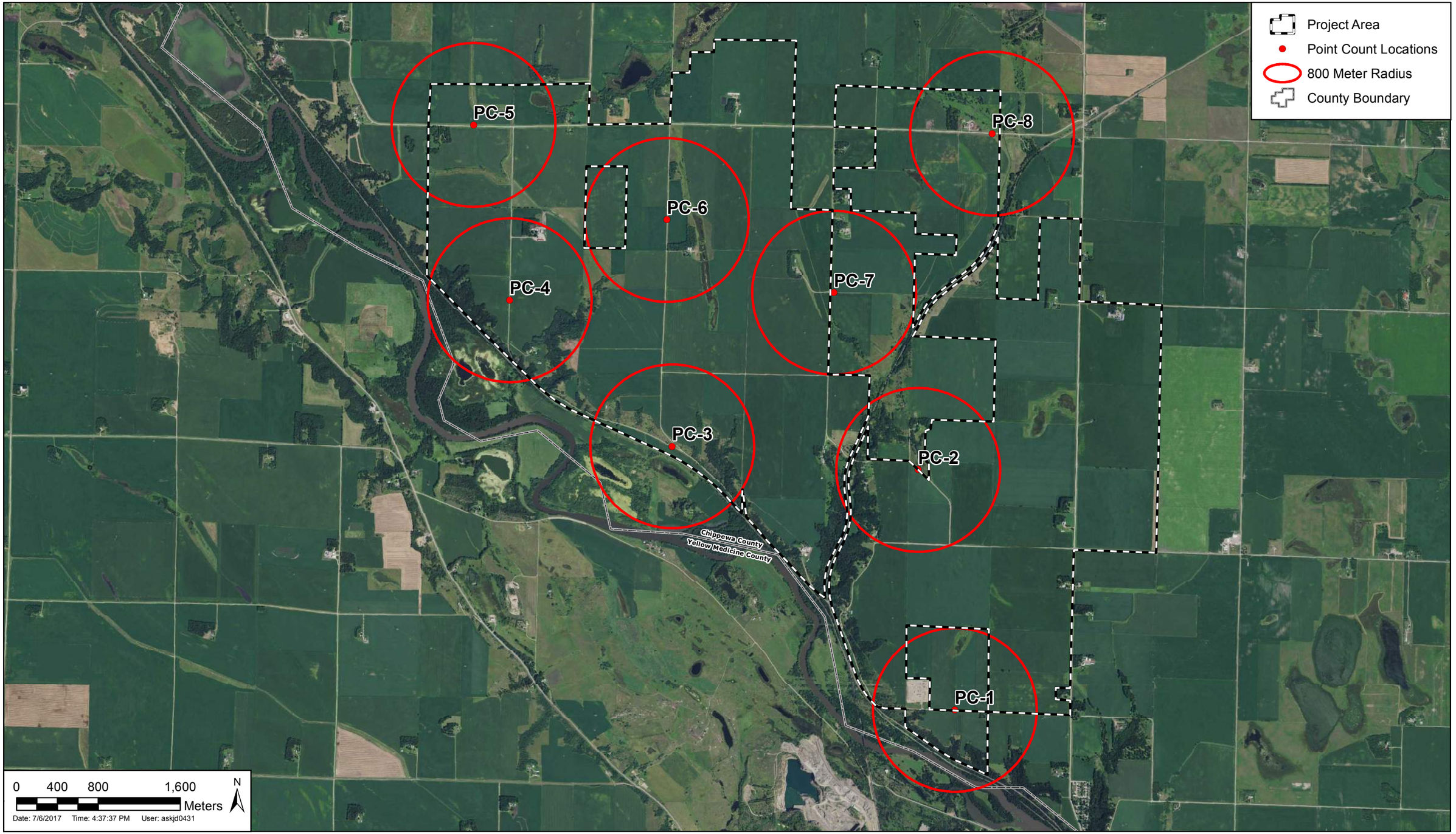
Species	Number Flying	Number of Observations	Summer 2016 & 2017									Fall 2016									Winter 2016-2017									Spring 2017									Cumulative								
			N	NE	E	SE	S	SW	W	NW	Var	N	NE	E	SE	S	SW	W	NW	Var	N	NE	E	SE	S	SW	W	NW	Var	N	NE	E	SE	S	SW	W	NW	Var	N	NE	E	SE	S	SW	W	NW	Var
Songbirds																																															
European Starling	990	34	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.64%	86.36%	0.00%	0.00%	0.00%	0.00%	58.67%	0.00%	0.00%	0.00%	41.33%	10.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	89.97%	0.00%	0.00%	0.00%	0.00%	2.31%	0.00%	0.00%	0.00%	97.69%	3.13%	0.00%	0.00%	0.00%	5.76%	0.00%	0.00%	0.61%	90.51%
Red-winged Blackbird	676	52	0.85%	3.42%	0.00%	4.27%	0.85%	0.00%	0.85%	2.56%	87.18%	0.00%	0.00%	0.00%	26.34%	23.90%	18.54%	0.00%	0.00%	31.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.13%	0.56%	3.95%	44.35%	0.28%	49.72%	0.15%	0.59%	0.00%	9.32%	7.69%	7.69%	23.37%	0.59%	50.59%
Brown-headed Cowbird	325	33	2.46%	0.00%	5.74%	2.46%	0.00%	0.00%	27.87%	11.48%	50.00%	7.32%	0.00%	0.61%	9.15%	23.78%	32.32%	8.54%	0.00%	18.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.38%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	76.92%	4.62%	1.85%	2.46%	5.54%	12.92%	16.31%	14.77%	4.31%	37.23%
Horned Lark	171	53	0.00%	0.00%	0.00%	4.76%	0.00%	4.76%	9.52%	0.00%	80.95%	0.00%	0.00%	0.00%	0.00%	34.88%	0.00%	53.49%	0.00%	11.63%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	4.76%	1.90%	2.86%	0.95%	3.81%	0.00%	2.86%	5.71%	77.14%	2.92%	1.17%	1.75%	1.17%	11.11%	0.58%	16.37%	3.51%	61.40%
Barn Swallow	188	26	0.00%	0.00%	1.80%	0.00%	0.00%	0.00%	0.00%	0.00%	98.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.06%	0.00%	0.00%	0.00%	0.00%	0.00%	98.94%
American Goldfinch	146	38	25.00%	4.55%	9.09%	18.18%	18.18%	6.82%	6.82%	2.27%	9.09%	2.22%	2.22%	46.67%	7.78%	18.89%	5.56%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.67%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.38%	5.48%	31.51%	10.27%	17.12%	5.48%	2.05%	0.68%	13.01%
Snow Bunting	109	6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.60%	0.00%	0.00%	15.60%	0.00%	18.35%	0.00%	50.46%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.60%	0.00%	0.00%	15.60%	0.00%	18.35%	0.00%	50.46%
Field Sparrow	62	44	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	8.33%	0.00%	4.17%	0.00%	4.17%	4.17%	2.08%	0.00%	77.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.45%	0.00%	3.23%	3.23%	3.23%	3.23%	1.61%	0.00%	79.03%
Dark-eyed Junco	100	13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.63%	0.00%	70.37%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	17.86%	82.14%	38.89%	0.00%	0.00%	0.00%	0.00%	0.00%	22.22%	0.00%	38.89%	7.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	5.00%	68.00%
Common Grackle	89	14	0.00%	36.36%	9.09%	36.36%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.00%	68.00%	20.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.77%	0.00%	0.00%	32.08%	0.00%	0.00%	9.43%	54.72%	0.00%	2.25%	4.49%	1.12%	25.84%	21.35%	5.62%	5.62%	33.71%	0.00%
Black-capped Chickadee	76	16	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	22.22%	13.89%	0.00%	58.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	2.63%	0.00%	0.00%	10.53%	6.58%	0.00%	80.26%
Unidentified Sparrow	59	5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	97.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.07%	0.00%	55.93%
American Robin	30	26	0.00%	0.00%	16.67%	50.00%	0.00%	33.33%	0.00%	0.00%	0.00%	18.18%	0.00%	0.00%	9.09%	18.18%	0.00%	0.00%	27.27%	27.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.38%	0.00%	46.15%	0.00%	30.77%	0.00%	7.69%	0.00%	0.00%	13.33%	0.00%	23.33%	13.33%	20.00%	6.67%	3.33%	10.00%	10.00%
Unknown Blackbird	40	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
American Tree Sparrow	37	5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	35.14%	64.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	35.14%	64.86%
Tree Swallow	30	13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.04%	86.96%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	85.71%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.33%	10.00%	86.67%
Cedar Waxwing	22	8	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	53.33%	46.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	36.36%	31.82%	31.82%	0.00%	0.00%	0.00%	0.00%
Common Yellowthroat	0	12	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow Warbler	14	5	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.86%	0.00%	0.00%	7.14%	0.00%
Clay-colored Sparrow	0	13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Western Meadowlark	14	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	35.71%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	35.71%	0.00%	14.29%	0.00%	0.00%
Savannah Sparrow	7	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Bank Swallow	12	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Chipping Sparrow	6	10	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.67%
Vesper Sparrow	0	6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Song Sparrow	0	7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Yellow-headed Blackbird	7	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Eastern Bluebird	8	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	83.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	62.50%	0.00%
Sedge Wren	0	5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Least Flycatcher	1	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Belted Kingfisher	3	4	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.67%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%
Eastern Kingbird	2	3	50.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastern Wood-Pewee	0	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Grasshopper Sparrow	0	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bobolink	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Marsh Wren	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Willow Flycatcher	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Raptors/Vultures/Owls																																															
Red-tailed Hawk	43	41	33.33%	0.00%	33.33%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	29.41%	29.41%	5.88%	11.76%	5.88%	11.76%	50.00%	0.00%	0.00%	16.67%	16.67%	16.67%	0.00%	0.00%	0.00%	11.76%	23.53%	5.88%	23.53%	5.88%	0.00%	11.76%	17.65%	0.00%	16.28%	9.30%	4.65%	23.26%	16.28%	6.98%	9.30%	9.30%	4.65%
Turkey Vulture	28	15	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	40.00%	0.00%	40.00%	0.00%	0.00%	42.86%	57.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.75%	0.00%	0.00%	0.00%	0.00%	81.25%	0.00%	0.00%	0.00%	21.43%	14.29%	3.57%	0.00%	7.14%	46.43%	7.14%
Bald Eagle	26	21	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	44.44%	11.11%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.41%	0.00%	0.00%	5.88%	29.41%	5.88%	0.00%	23.53%	5.88%	19.23%	11.54%	0.00%	19.23%	23.08%	3.85%	0.00%	15.38%	7.69%
Swainson's Hawk	3	4	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	33.33%	33.33%	0.00%	0.00%	0.00%
Rough-legged Hawk	4	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Northern Harrier	2	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%
American Kestrel	1	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Cooper's Hawk	1	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
Waterfowl																																															
Canada Goose	250	34	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.81%	0.00%	0.00%	41.94%	42.74%	14.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	5.04%	8.40%	0.00%	0.00%	0.00%	72.27%	0.00%	7.20%	0.00%	2.40%	24.80%	24.00%	7.20%	0.00%	34.40%	0.00%
Unknown Duck	52	12	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	30.43%	0.00%	0.00%	69.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.00%	0.00%	20.00%	0.00%	0.00%	0.00%	26.92%	0.00%	0.00%	71.15%	0.00%	1.92%	0.00%	0.00%	0.00%
Mallard	31	17	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	58.06%	19.35%	0.00%	3.23%	6.45%	0.00%	0.00%	9.68%	0.00%	58.06%	19.35%	0.00%	3.23%	6.45%	0.00%	0.00%	9.68%	0.00%
Snow Goose	20	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	90.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	90.00%	10.00%	0.00%	0.00%	0.00%	0.00%
Blue-winged teal	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Shorebirds																																															
Killdeer	11	16	0.00%	0.00%	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	36.36%	0.00%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	45.45%
Upland Sandpiper	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wilson's Snipe	0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Gamebirds																																															
Wild Turkey	0	10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ring-necked Pheasant	8	23	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	75.00%	0.00%	12.50%	12.50%	0.00%	0.00%
Woodpecker																																															
Northern Flicker	17	8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	26.67%	0.00%	20.00%	33.33%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	29.41%	0.00%	17.65%	29.41%	17.65%	5.88%	0.00%	0.00%
Downy Woodpecker	9	14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	14.29%	28.57%	0.00%	14.29%	28.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	11.11%	33.33%	11.11%	11.11%	22.22%	0.00%	0.00%
Crows and Allies																																															
American Crow	360	73	12.50%	3.13%	0.00%	0.00%	0.00%	15.63%	15.63%	53.13%	0.00%	14.29%	2.86%	4.29%	10.00%	12.86%	0.00%	0.00%	10.00%	45.71%	43.18%	0.00%	0.00%	29.55%	13.64%	11.36%	2.27%	0.00%	0.00%	23.36%	9.35%	15.89%	0.00%	27.10%	3.27%	20.09%	0.93%	0.00%	23.06%	6.39%	10.28%	5.56%	20.28%	4.72%	13.61%	7.22%	8.89%
Blue Jay	81	58	37.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	62.50%	10.91%	18.18%	18.18%	7.27%	16.36%	12.73%	14.55%	0.00%	1.82%	0.00%	0.00%	9.09%	27.27%	9.09%	0.00%	18.18%	36.36%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	14.29%	42.86%	28.57%	11.11%	12.35%	13.58%	8.64%	13.58%	8.64%	13.58%	8.64%	9.88%
Pigeons & Doves																																															
Rock Pigeon	166	49	6.25%	62.50%	12.50%	0.00%	6.25%	0.00%	12.50%	0.00%	0.00%	26.58%	0.00%	10.13%	0.00%	2.53%	0.00%	6.33%	13.92%	40.51%	6.45%	0.00%	6.45%	0.00%	0.00%	0.00%	16.13%	9.68%	61.29%	40.00%	0.00%	0.00%	32.50%	10.00%	2.50%	0.00%	0.00%	15.00%	24.10%	6.02%	7.23%	7.83%	4.22%	0.60%	7.23%	8.43%	34.34%
Mourning Dove	24	23	54.55%	0.00%	18.18%	9.09%	0.00%	0.00%	18.18%	0.00%	0.00%	30.00%	0.00%	10.00%	0.00%	10.00%	10.00%	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	45.83%	0.00%	12.50%	4.17%	4.17%	8.33%	25.00%	0.00%	0.00%
Wadingbirds																																															
Great Blue Heron	2	2	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	50.00%	0.00%
Waterbirds																																															
American White Pelican	16	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	75.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.75%	81.25%	0.00%
Gulls/Terns																																															
Ring-billed Gull	25	6	0.00%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%	75.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.52%	0.00%	9.52%	0.00%	80.95%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.00%	8.00%	0.00%	8.00%	12.00%	68.00%
Totals			**5.16%**	**3.28%**	**3.44%**	**4.22%**	**4.84%**	**2.03%**	**7.97%**	**8.13%**	**60.94%**	**7.50%**	**1.59%**	**5.84%**	**14.29%**	**20.20%**	**10.25%**	**6.13%**	**3.03%**	**31.17%**	**10.39%**	**2.56%**	**0.60%**	**8.28%**	**5.12%**	**0.90%**	**4.37%**	**1.81%**	**65.96%**	**8.17%**	**2.63%**	**3.09%**	**3.39%**	**5.90%**	**1.52%**	**14.36%**	**9.40%**	**51.55%**	**7.86%**	**2.38%**	**3.63%**	**7.68%**	**10.13%**	**4.25%**	**9.33%**	**6.06%**	**48.67%**

Appendix B



Path: J:\GIS\2759\05 Palmers Creek Wind Farm\01 Avian PC Surveys\MXD\Site Location.mxd

FAGEN ENGINEERING	WENCK ASSOCIATES Responsive partner. Exceptional outcomes.	JUL 2017
Site Location Map		Figure 1



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FAGEN ENGINEERING

Point Count Locations

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

JUL 2017

Figure 2

Project Area

Analysis Area

Red-tailed Hawk Nest-Active

Bald Eagle Nest-Active

Bald Eagle Nest-Inactive

2015 Aerial Image (Source: NAIP)

0 2 4 Miles

N

Date: 7/6/2017 Time: 4:59:43 PM User: askjd0431

Esri, HERE, DeLorme, TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

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PALMER'S CREEK WIND FARM, LLC

Nest Locations and Survey Area

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

JUL 2017

Figure 4

Appendix C

Aerial Eagle/Raptor Nest Survey Report; Palmer's Creek Wind Farm

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

April 27, 2017

Michael Rutledge
Palmer's Creek Wind Farm, LLC
501 West Highway 212
Granite Falls, MN 56241

Aerial Eagle/Raptor Nest Survey Report
Palmer's Creek Wind Farm
Chippewa County, Minnesota
Wenck File No. B2759-0005-11

Introduction

Palmer's Creek Wind Farm, LLC contracted Wenck Associates, Inc. to complete an aerial bald eagle (*Haliaeetus leucocephalus*) nest survey on state and private lands surrounding the proposed Palmer's Creek Wind Farm project area (**Figure 1**). The survey was recommended to potentially identify active/inactive nests within a ten-mile buffer of the project area (USFWS 2016). In 2007, the bald eagle (State Special Concern Species) was delisted from its federally threatened status in the lower 48 states, but it is still federally protected under the Bald and Golden Eagle Protection Act ("BGEPA"). It was also delisted in Minnesota in 2013.

Methods

The objective of the aerial eagle nest surveys is to locate and record nests that may be in the proximity of the project area, to identify concentration and density of eagle nests, and to identify nests that may be vulnerable to disturbance and/or displacement effects by the proposed project. The intent of the nest survey is to gather information on species nesting in the area, including nest locations, nesting season (timing), and nest success.

The survey was conducted within a ten-mile buffer from the project area (defined as the analysis area). Eagle Aviation Inc. was contracted to fly an aerial survey of the project area on April 20, 2017. A Cessna Skyhawk with two observers were used during the survey, Ray Jilek (Eagle Aviation, Pilot) and Justin Askim (Wenck, Natural Resources Services Leader) (**Photo 1**). Complete coverage of the project area was obtained by systematically flying over the landscape and visually scanning all areas for potential roosting, nesting and foraging eagles. Aerial surveys were conducted using a fixed-wing aircraft, flying over relatively even terrain at approximately 250 – 500 feet above ground level and at speeds of 85 to 125 miles per hour.

Photo 1: Note low flight ceiling height and minor precipitation prior to the aerial survey.

A total of approximately 415 miles were flown in the analysis area to investigate woody draws, riparian areas, farm yards and other appropriate habitats for eagle nests and eagle activity (**Figure 2**).

Existing data on bald eagle nest locations was received from the Minnesota Department of Natural Resources (MNDNR) on July 5, 2016. Based on historical records, one nest is located in Section 11, T116N R40W (MNDNR 2016), is nest was not observed during the aerial surveys. However, two eagles were observed perched in the areas. During the 2016 field surveys, another eagle nest (**Figure 3**, Nest 3) was located in the Minnesota River Valley, approximately one mile southeast of the nearest WTG (WTG 12) and 0.3 miles outside of the project area. This nest was not recorded in the MNDNR Natural Heritage Information System (NHIS) database. Both nests are located outside of the project area. These nests were further examined during the aerial survey, as summarized in **Table 1** below.

Results and Conclusion

Three active nests, three inactive nests and ten individuals (three on nest and seven in flight or perched) were observed during the April 20, 2017 aerial survey (**Figure 2**, **Figure 3** and **Table 1**). With the exception of Nest 3, all nests are approximately five miles or greater from the project area.

Table 1: Eagle Nests Within Palmer's Creek Wind Farm Analysis Area

Nest Number	Status	Distance from Project Area	Latitude	Longitude
1	Active	4.9 miles	44.90855599	-95.70717782
2	Inactive	8.5 miles	44.73293894	-95.42223611
3	Active	0.3 miles	44.83149047	-95.56799484
4	Active	7.0 miles	44.72996346	-95.48105437
5	Inactive	10.0 miles	44.67489358	-95.53845803
6	Inactive	9.0 miles	44.68952578	-95.53443812

Eagle nest density within the analysis area is approximately one active nest per 102,000 acres.

Please contact Justin Askim at 701-751-6125, **jaskim@wenck.com** if you have comments or require additional information.

Sincerely,

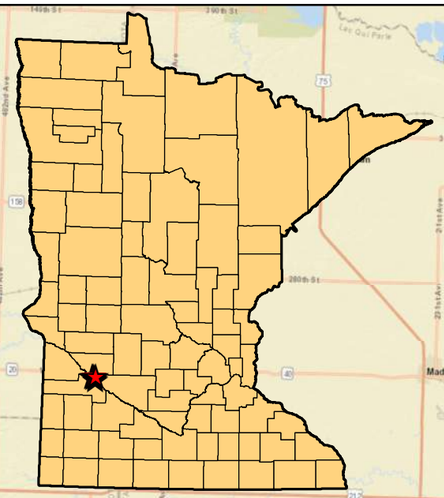
WENCK ASSOCIATES, INC.

Justin Askim
Principal/Natural Resources Services Leader

References

MNDNR. 2016. Natural Heritage Information System Correspondence #ERDB 20160322-0002, July 5, 2016.

USFWS 2016. Palmer's Creek Wind Farm Eagle Use Surveys. Email from Margaret Rheude. August 22, 2016.



ESRI Street Map (Source: ESRI)

0 5 10 Miles

N

Date: 4/26/2017 Time: 1:14:10 PM User: askjd0431

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Path: J:\GIS\2759\05 Palmers Creek Wind Farm\11 Aerial Eagle Surveys\mxd\F1-Flight Area.mxd

PALMER'S CREEK WIND FARM, LLC	APR 2017
Project Location and Analysis Area	Figure 1

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Project Area
Flight Area
Flight Path
Nest-Active
Nest-Inactive
Observation

2015 Aerial Image (Source: NAIP)

0 2 4 Miles

N

Date: 4/26/2017 Time: 1:16:49 PM User: askjd0431

Path: J:\GIS\2759\05 Palmers Creek Wind Farm\11 Aerial Eagle Surveys\mxd\F2-Flight Path and Results.mxd

PALMER'S CREEK WIND FARM, LLC

Flight Path and Results

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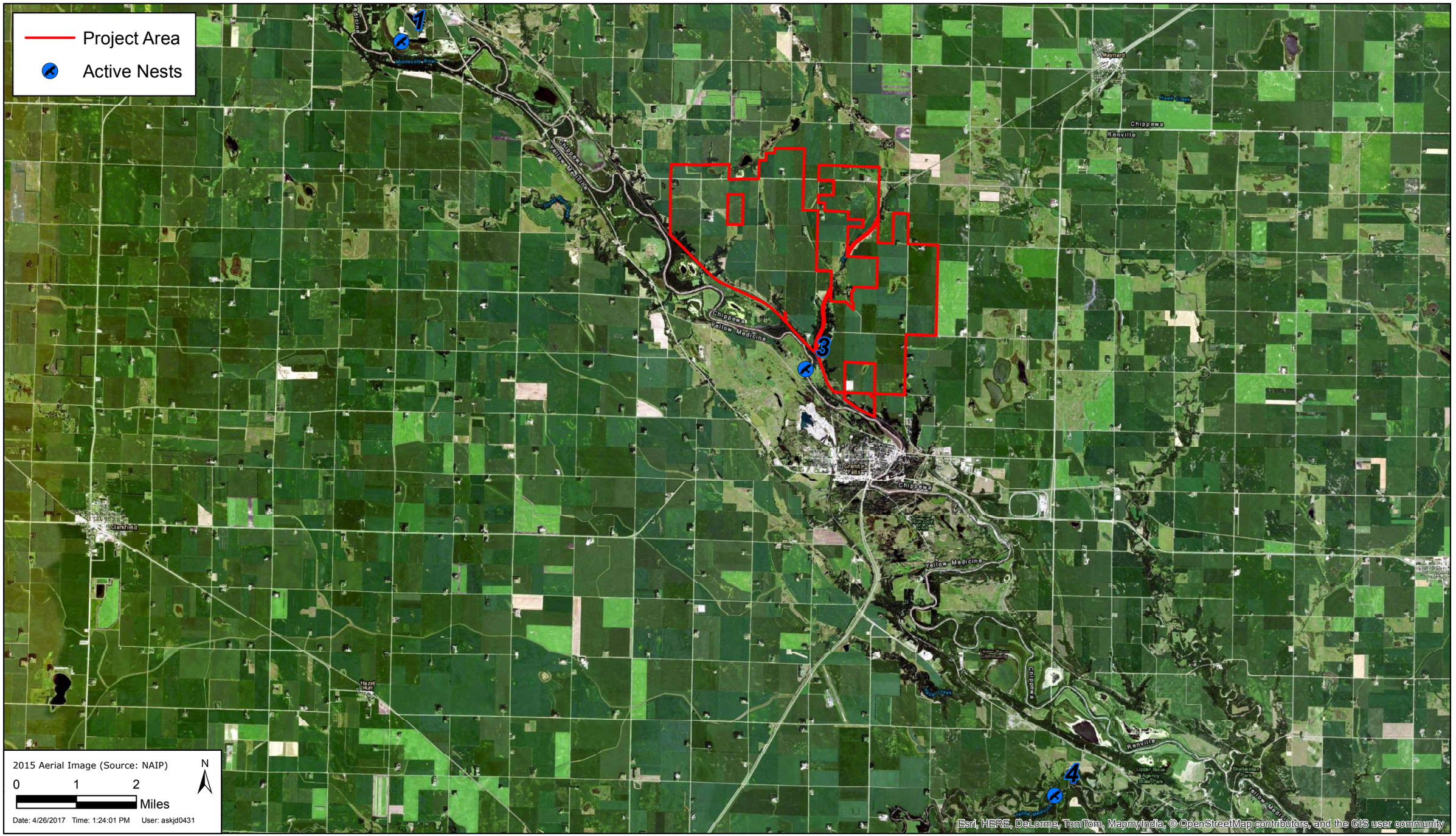
APR 2017

Figure 2



PALMER'S CREEK WIND FARM, LLC

Active Nest Locations

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APR 2017

Figure 3

Path: J:\GIS\2759\05 Palmers Creek Wind Farm\11 Aerial Eagle Surveys\mxd\F3-Active Nest Locations.mxd

Appendix D

Interim Acoustic Bat Summary Report (2015-2016); Palmer's Creek Wind Farm

Interim Acoustic Bat Summary Report (Spring 2017); Palmer's Creek Wind Farm

FAGEN, INC.

GRANITE FALLS, MINNESOTA

Palmer's Creek Wind Farm

Acoustic Bat Summary Report

2017

NEW CENTURY ENVIRONMENTAL LLC

Environmental Compliance and Stewardship made Cost Effective

NEW CENTURY ENVIRONMENTAL LLC, COLUMBUS, NE

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Palmer's Creek WRA Acoustic Bat Monitoring Study
Fagen, Inc.
Granite Falls, Minnesota

Prepared By
New Century Environmental, LLC.
Columbus, Nebraska

Executive Summary

In early summer of 2016, Mike Rutledge of Fagen Engineering contacted Mike Gutzmer of New Century Environmental, LLC (NCE) to aid in the effort of completing a bat report that would capture the diversity/abundance of bat species within the study area of Palmer's Creek to meet due diligence with regulatory agencies, which was done through acoustic monitoring. The client proposed to develop a wind farm within the study area of Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). The study area lies within the Des Moines Lobe Western Corn Belt Plains (47b) ecoregion of Minnesota. Staff of Fagen Engineering deployed five separate ANABAT systems to record bat activity throughout the study area, the first deployment was done with two of the ANABAT recorders during the fall of 2015 and continued through 15 October 2016. Three more ANABAT recorders were launched on 03 August, 2016. The data collected from Fagen Engineering was sent to NCE via Procore Portal. NCE then took the data and processed in zero-crossing through Kaleidoscope version 3.1.8 to confirm presence diversity and abundance of bat species. The software uses a presence/absent indicator by giving each species of bat a p-value. The lower the p-value, the more likely the species of bat is present. Bat presence, in the form of vocalization, was detected, identified by species, and catalogued, thereby allowing us to estimate species occurrences, distribution and relative abundance.

Introduction

In early summer of 2016, Mike Rutledge of Fagen Engineering, LLC contacted Mike Gutzmer of New Century Environmental, LLC (NCE) to aid in the effort of completing a bat report that would capture the diversity/abundance of bat species within the study area of Palmer's Creek to meet due diligence with regulatory agencies. The client proposed to develop a wind farm in Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). Bat fatalities result from wind turbine strikes as they feed on insects at night. The heat from the wind turbines attract insects and therefore bring the bats close to the wind turbine. With decreasing bat populations, the gathering of necessary bat data is crucial for this proposed site. Threatened and Endangered bat species become at risk in wind farm areas. Populations of bat species are experiencing 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. All studies of bat impacts have demonstrated that fatalities peak in late summer and early fall, coinciding with the migration of many species (Johnson 2005; Kunz et al. 2007a; Arnett et al. 2008). A smaller spike in bat fatalities occurs during spring migration for some species at some facilities (Arnett et al. 2008). However, the seasonal fatality peaks noted above may change as more facilities are developed and studied.

Study Area

The study area is located within Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). The study area lies within the Des Moines Lobe Western Corn Belt Plains (47b) ecoregion of Minnesota. This ecoregion consists of fast fertile plain of deep soils dominated by row crops. The boundaries of the Minnesota River Prairie Subsection coincide with large till plains flanking the Minnesota River. The unit is bounded to the southwest by the Prairie Coteau. A series of moraines define the eastern boundary, the Alexandria Moraine to the northeast and the Bemis moraine to the southeast (Minnesota 2016).

The Minnesota River Prairie is a large subsection that includes part of northwestern Iowa and spreads across southwestern Minnesota into eastern South Dakota. The Minnesota River forms a broad valley, dividing the area in half. This valley once had a continuous band of floodplain forest that extended upstream as far as Lac Qui Parle, with highly unique bedrock exposures. There are 150 lakes larger than 160 acres in the subsection, most of which are shallow. Before settlement by people of European descent, the predominant vegetation was tallgrass prairie and wetlands. Fire was once a common natural disturbance and critical to maintaining native prairie communities (Minnesota, 2016).

Today, row-crop agriculture is the predominant land use, and prairie remnants and floodplain forests are rare. A major concern is impacts on water quality from intensive agricultural activities, including use of fertilizers and pesticides, expanding use of pattern tiling, and ditching and draining of small wetlands. Continued loss of the small amount of native upland habitat and over-intensive grazing remain a concern (Minnesota, 2016).

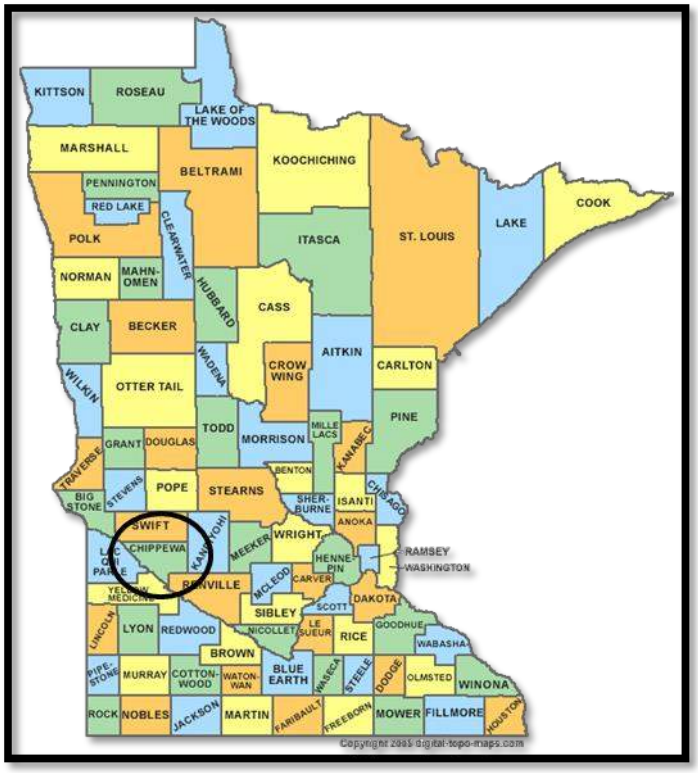

Figure 1: Vicinity map of study area. Chippewa county is located in southwestern Minnesota.

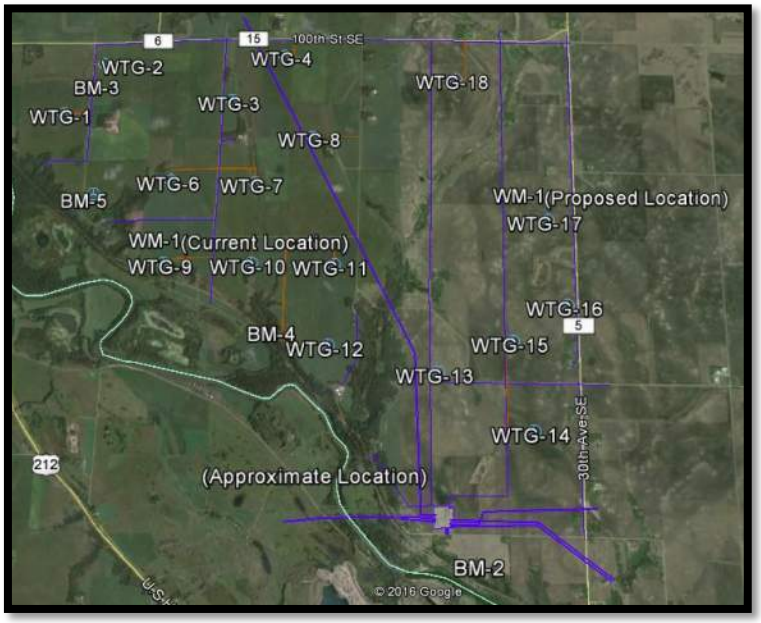

Figure 2: Project location along with bat monitor (BM) locations. BM-1 is not shown on the map but lies next to BM-2.

Methods

Data was gathered in the field by Fagen Engineering, LLC within the study area from five different Anabat acoustic recorders (map in Study Area section shows locations of monitors). Monitors 1 & 2 gathered data throughout the fall of 2015 and were deployed again in May of 2016. Monitors 3-5 were added in September of 2016.

Monitors 1 & 2 were deployed on September 13, 2015 and removed on October 11, 2015. They were deployed again on April 12, 2016 then removed on October 15. Monitor 3, monitor 4 and monitor 5 were deployed on August 3rd, 2016 then removed on October 15th, 2016. The monitors were deployed for 287 trap nights

The data was uploaded through the Procore portal where New Century Environmental staff could access the data to download and process through a program called Kaleidoscope Pro version 3.1.8. The Kaleidoscope classifier uses a source library of user submitted reference calls to compare to recordings. It accepts and displays full-spectrum signals, to match with the calls known bat species. The software uses a presence/absence indicator by giving each species of bat a p-Value of 0 to 1. The lower the P-Value, the more likely the species is present. Variability in the quality of recordings and variations in calls among individual bats creates challenges to acoustic bat classification.

Kaleidoscope Pro has been approved by the U.S. Fish & Wildlife Service for use for presence/absence analysis for Indiana bats (*Myotis sodalis*). Similarly, the approved programs may also be used for presence/absence analysis for northern long-eared bats (*Myotis septentrionalis*). The U.S Geological Survey also tested acoustic matching programs and Kaleidoscope Pro passed their standard validation process (USFWS 2016).

Results

From the five Anabat recording systems, 232,116 sound files were recorded. Visual examination and filtering of files to eliminate extraneous noise (e.g., wind, insects, etc.) resulted in a total of 14,442 bat detections.

Monitor 1 recorded 3,181 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 62% of total detections. The big brown bat was the second most common being 13% of total detections. The federally threatened northern long-eared myotis was detected 4 times (0.001%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 55 (2%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	1971
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	427
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	347
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	158
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	219
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	4
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	55

Figure 3: Summary of species diversity and abundance for monitor 1.

Monitor 2 recorded 3,004 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 57% of total detections. The second most common was the hoary bat at 30% of detections. The federally threatened northern long eared myotis only had a total of 2 (0.0007%) detections but had a P-value of 1. The eastern pipistrelle had a total of 14 (0.005%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	1717
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	167
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	887
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	165
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0.14	52
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	2
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0.01	14

Figure 4: Summary of species abundance and diversity for monitor 2

Monitor 3 recorded 4,870 files that Kaleidoscope Pro was able to classify as bat passes. The hoary bat was the most common species at this site being 75% of total detections. The second most common was the silver haired bat being 8% of total detections. The northern long eared bat had only 1 (0.0002%) detections with a p-value of 1. The eastern pipistrelle had a total of 64 (1%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0.34	401
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	263
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	3672
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	306
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	163
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	1
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	64

Figure 5: Summary of species diversity and abundance for monitor 3

Monitor 4 recorded 1,512 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver-haired bat being 46% of total detections. The second most common was the hoary bat being 26% of total detections. The northern long-eared myotis was not recorded at this site. The eastern pipistrelle had a total of 59 (4%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	688
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	143
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	390
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	129
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	103
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	0
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	59

Figure 6: Summary of species diversity and abundance for monitor 4

Monitor 5 recorded 1,875 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver haired bat being 46% of total detections. The second most common was the hoary bat with being 21%) of total detections. The northern long-eared myotis had a total of 2 (0.001%) detections. The eastern pipistrelle had a total of 70 (4%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	871
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	316
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	403
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	138
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	75
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	2
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	70

Figure 7: Summary of species diversity and abundance for monitor 5.

Discussion

There are seven species of bats that occur regularly in Minnesota; our most common species, the little brown myotis, occurs over most of North America. Along with the Northern myotis and big brown bat, it hibernates in Minnesota caves and mines. In summer, they roost in caves, mines, hollow trees, and buildings. Large groups of these bats hang upside-down in caves. The eastern pipistrelle is the smallest species, weighing only two-tenths of an ounce. It is found in the same Minnesota caves and mines, though it is less common and in fewer numbers.

The silver-haired bat and Eastern red bad are forest dwellers that usually live near water and feed among the trees. Usually a red bat pair will repeatedly fly the same route in search of food. Another woodland species is the hoary bat. It is the largest Minnesota bat, weighing an ounce or more. All three species are somewhat solitary, roost in trees, and migrate south for the winter (Minnesota, 2016).

In early July 2016, a species previously not known to be native to Minnesota, the evening bat, was discovered. Researchers from the DNR Nongame Wildlife Program and Central Lakes College were conducting a survey as part of a project to study summer breeding habits of the state's forest bats. The bat was captured at the Minnesota Army National Guard's Training Site in Arden Hills.

All seven bat species that occur in Minnesota may be found throughout the state.

Common name	Scientific Name	State Status	Federal Status
Northern long-eared myotis	*Myotis septentrionalis*	Threatened	Threatened
Eastern Pipistrelle	*Pipistrellus subflavus*	MN species concern	Not listed
Little brown bat	*Myotis lucifugus*	Not listed	Not listed
Big brown bat	*Eptesicus fuscus*	Not listed	Not listed
Silver-haired bat	*Lasionycteris noctivagans*	Not listed	Not listed
Eastern red bat	*Lasiurus borealis*	Not listed	Not listed
Hoary bat	*Lasiurus cinereus*	Not listed	Not listed
Evening bat	*Nycticeius humeralis*	Newly discovered	Not listed

Figure 8: Bat species found in Minnesota with federal and state conservation status.

There were a total of six bat species documented throughout the course of the study (September-October 2015 and 2016). The eastern pipistrelle (*Pipistrellus sublavus)* was documented at this site and is listed as a species of concern in the state of Minnesota. It was detected in small numbers but was found at every monitor except for monitor 1. The northern long-eared myotis (*Myotis septentrionalis*) is a federally threatened species whose home range lies within the study site. However no confirmed documentation was recorded here. Even though a total of five clicks of which Kaleidoscope classified as MYSE (northern long-eared myotis) the P-value was given a 1 for every monitor indicating the likelihood of presence is near non-existent. All other species documented are of least concern. Of the six species documented the silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*) and big brown bat (*Eptesicus fuscus*) were among the most common followed by the little brown bat (*Myotis lucifugus*) and eastern red bat (*Lasiurus borealis*).

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Appendix

Summary Graphs

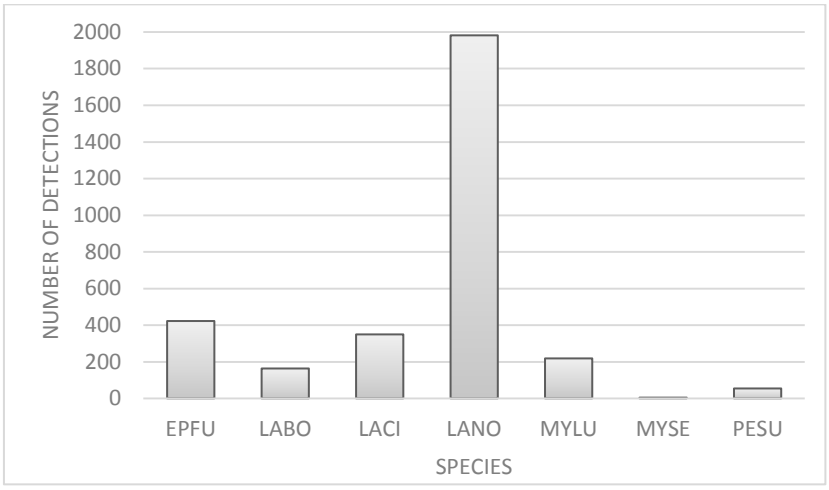

Figure 9.1: Total number of bat detections by species for monitor 1

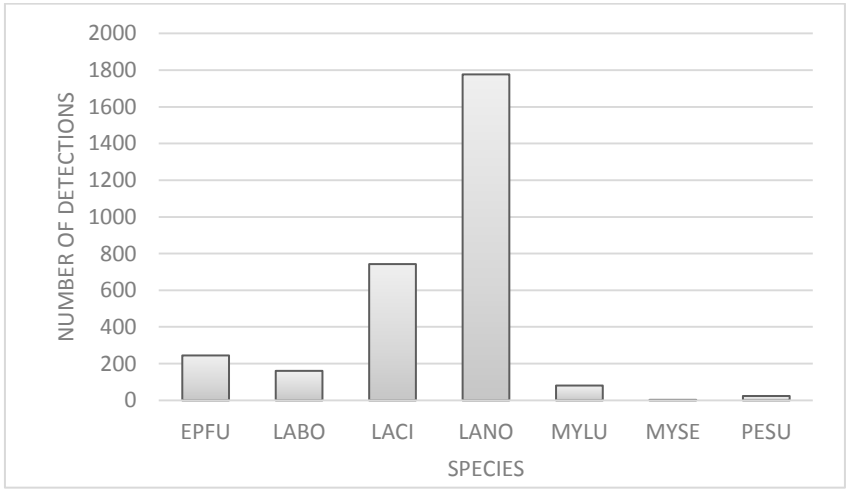

Figure 9.2: Total number of bat detections by species for monitor 2

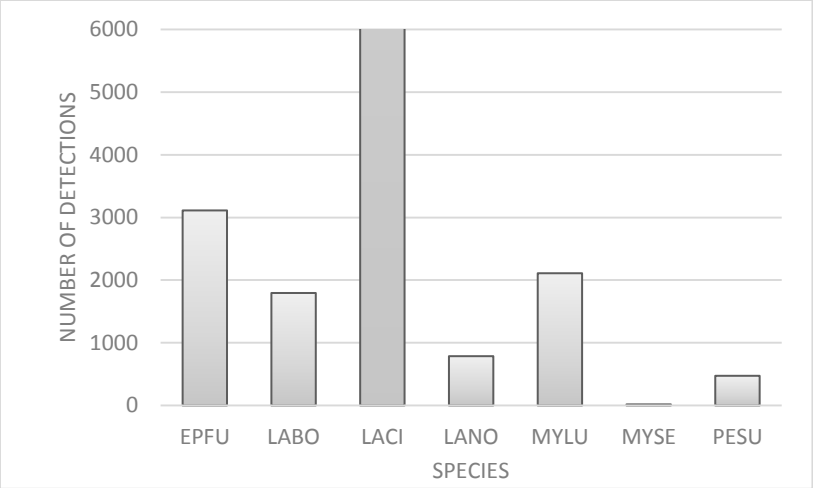

Figure 9.3: Total number of bat detections by species for monitor 3

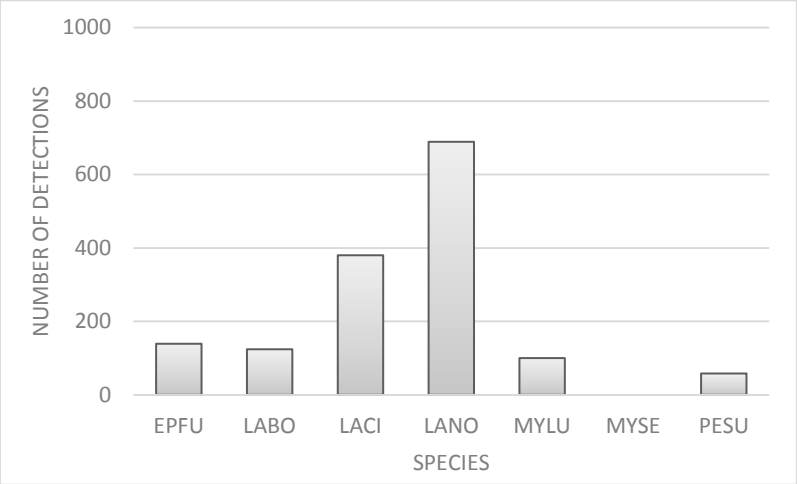

Figure 9.4: Total number of bat detections by species for monitor 4

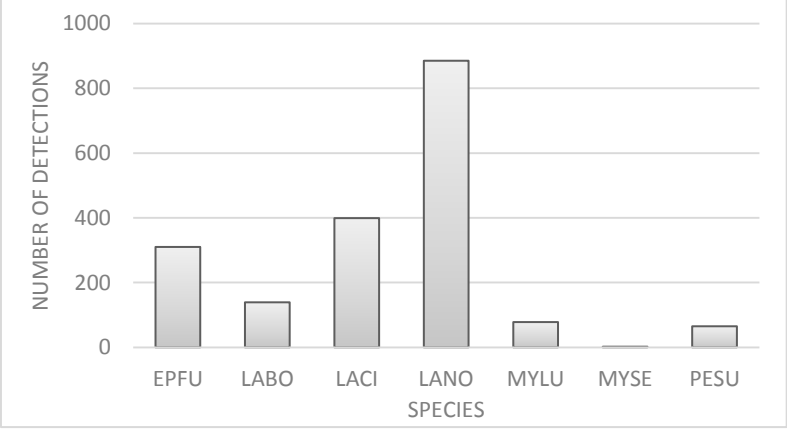

Figure 9.5: Total number of bat detections by species for monitor 5

Kaleidoscope Data

KALEIDOSCOPE 3.1.8

Bats of North America 3.1.0 S/A:+1

Monitor 1			
	Species	Detections	Presence p-value
Fall 2015	EPFU	123	0.95
	LABO	41	0
	LACI	144	0
	LANO	725	0
	MYLU	45	0
	MYSE	0	1
	PESU	10	0
5/28/2016	EPFU	118	0.77
	LABO	34	0
	LACI	104	0
	LANO	670	0
	MYLU	39	0
	MYSE	0	1
	PESU	8	0
9/2/2016	EPFU	91	0
	LABO	46	0
	LACI	53	0
	LANO	194	0
	MYLU	96	0
	MYSE	2	1
	PESU	23	0
10/7/2016	EPFU	92	0
	LABO	34	0
	LACI	38	0
	LANO	377	0
	MYLU	39	0
	MYSE	0	1
	PESU	14	0
10/15/2016	EPFU	3	0.33
	LABO	3	0
	LACI	8	0
	LANO	5	0.46
	MYLU	0	1
	MYSE	0	1
	PESU	0	1

Monitor 2			
	Species	Detections	Presence p-value
Fall 2015	EPFU	33	0.22
	LABO	31	0
	LACI	38	0
	LANO	148	0
	MYLU	15	0
	MYSE	1	1
	PESU	0	1
5/28/2016	EPFU	9	1
	LABO	8	0
	LACI	29	0
	LANO	167	0
	MYLU	9	0
	MYSE	0	1
	PESU	2	0.08
9/2/2016	EPFU	108	1
	LABO	84	0
	LACI	631	0
	LANO	1085	0
	MYLU	20	0
	MYSE	1	1
	PESU	9	0.01
10/7/2016	EPFU	17	1
	LABO	41	0
	LACI	189	0
	LANO	313	0
	MYLU	8	0.14
	MYSE	0	1
	PESU	3	0.33
10/15/2016	EPFU	0	1
	LABO	1	0.10
	LACI	0	1
	LANO	4	0
	MYLU	0	1
	MYSE	0	1
	PESU	0	1

KALEIDOSCOPE 3.1.8
Bats of North America 3.1.0 S/A:+1

Monitor 3			
	Species	Detections	Presence p-value
9/2/2016	EPFU	2	1
	LABO	0	1
	LACI	208	0
	LANO	0	1
	MYLU	0	1
	MYSE	0	1
	PESU	0	0
10/7/2016	EPFU	260	0
	LABO	303	0
	LACI	3463	0
	LANO	399	1
	MYLU	163	0
	MYSE	1	1
	PESU	69	0
10/15/2016	EPFU	1	0.77
	LABO	3	0
	LACI	1	0.09
	LANO	2	0.34
	MYLU	0	1
	MYSE	0	1
	PESU	0	1

Monitor 4			
	Species	Detections	Presence p-value
9/2/2016	EPFU	96	0
	LABO	82	0
	LACI	309	0
	LANO	289	0
	MYLU	85	0
	MYSE	0	1
	PESU	34	0
10/7/2016	EPFU	46	1
	LABO	47	0
	LACI	84	0
	LANO	397	0
	MYLU	18	0
	MYSE	0	1
	PESU	25	0
10/15/2016	EPFU	1	0.69
	LABO	0	1
	LACI	0	1
	LANO	2	0.16
	MYLU	0	1
	MYSE	0	1
	PESU	0	1

KALEIDOSCOPE 3.1.8
Bats of North America 3.1.0 S/A:+1

Monitor 5			
	Species	Detections	Presence p-value
9/2/2016	EPFU	130	0
	LABO	79	0
	LACI	162	0
	LANO	427	0
	MYLU	58	0
	MYSE	2	1
	PESU	40	0
10/7/2016	EPFU	186	0
	LABO	58	0
	LACI	239	0
	LANO	444	0
	MYLU	17	0
	MYSE	0	1
	PESU	27	0
10/15/2016	EPFU	1	1
	LABO	0	0.61
	LACI	2	0
	LANO	0	1
	MYLU	0	1
	MYSE	0	1
	PESU	3	0

Species Descriptions

Silver Haired Bat

The silver-haired bat (*Lasionycteris noctivagans*) is a solitary migratory species and the only member of the genus *Lasionycteris*. They are found in Bermuda, Canada, Mexico and the United States. They often roost in tree cavities or in bark crevices on tree trunks, especially during migration. This medium-sized bat is mostly black (including the wings, ears, interfemoral membrane, and fur) with white-tipped hairs. The basal upper half of its tail membrane is densely furred. This gives the bat a frosted appearance for which it is named. This species has a flattened skull with a broad rostrum. This species weighs around 8–12 g, has a total length of ~100 mm, a tail length of 40 mm, and a forearm length of 37–44 mm. Silver-haired bats consume primarily soft-bodied insects, such as moths, but will also take spiders and harvestmen. This species will forage low, over both still and running water, and also in forest openings. Silver-haired bats are slow but maneuverable flyers that typically detect prey only a short distance away. In addition to the hoary bat (*Lasiurus cinereus*) and eastern red bat (*Lasiurus borealis*), the silver-haired bat is one of the three tree bat species most commonly killed at wind energy facilities (over 75% of the mortalities).

Big Brown Bat

The big brown bat (*Eptesicus fuscus*) is native to North America, Central America, the Caribbean, and extreme northern South America. This medium-sized bat ranges from 10–13 cm in body length, with a wingspan 28-33, and weighs between 14-16 g. The fur is moderately long and shiny brown. The wing membranes, ears, feet, and face are dark brown to blackish in color. Big brown bats roost during the day in hollow trees, beneath loose tree bark, in the crevices of rocks, or in man-made structures such as attics, barns, old buildings, eaves and window shutters. Big brown bats are insectivorous, eating many kinds of night-flying insects including moths, beetles, and wasps.

Hoary Bat

The hoary bat (*Lasiurus cinereus*) is a species of bat in the vesper bat family, Vespertilionidae. It occurs throughout most of North America and much of South America. The hoary bat averages 13-14.5 cm long with a 40 cm wingspan and a weight of 26 g. Its coat is dark brown and the hairs on the back are frosted with silver. The body is covered in fur except for the undersides of the wings. This species normally roosts alone on trees, hidden in the foliage, but on occasion has been seen in caves with other bats. It prefers woodland, mainly coniferous forests, but hunts over open areas or lakes. It hunts alone and its main food source is moths. The bat is migratory and may travel from Canada as far south as the southern United States or Bermuda.

Eastern Red Bat

The eastern red bat (*Lasiurus borealis*) is widespread across eastern North America, with additional records in Bermuda. This is a medium-sized bat, averaging weights of 9.5-14 g and measurements of 112.3 mm in total length. Adults are usually dimorphic: males have red hair while females are chestnut-colored with whitish frosting on the tips of the fur. Moths form the majority of the diet, but red bats also prey on beetles, flies, and other insects.

Eastern Pipistrelle

The Eastern Pipistrelle (*Perimyotis subflavus*) is found commonly in the eastern portion of the United States, but extends into southeastern Nebraska. This reddish, yellowish and brownish bat is one of the smallest bats in the eastern part of the US. The forearms are orange to red while the wing membrane is black. Adults weigh between 4-10g and reach a forearm length of 30-35mm. These bats feed on small insects on the edges of forested areas, rivers, streams or open water.

Little Brown Bat

The Little Brown Bat (Myotis lucifigus) is found throughout much of North America. It is most common in the northern half of the continental United States and Southern Canada. The bat's fur is dark brown and glossy on the back with slightly paler, greyish fur underneath. Wing membranes are dark brown on a typical wingspan of 22–27 cm. Ears are small and black with a short, rounded tragus. Adult bats are typically 6–10 cm long and weigh 5–14g. Since many of their preferred meals are insects with an aquatic life stage, such as mosquitoes, they prefer to roost and forage near water.

Fagen, Inc.

Palmer's Creek Wind Farm 2017 Field Season-Interim Acoustic Bat Report

Granit Falls, MN

New Century Environmental
7-11-2017

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Palmer's Creek WRA Acoustic Bat Monitoring Interim Report 2017
Fagen, Inc.
Granite Falls, Minnesota

Prepared By
New Century Environmental, LLC.
Columbus, Nebraska
July 11,2017

Executive Summary

In early summer of 2016, Mike Rutledge of Fagen Engineering contacted Mike Gutzmer of New Century Environmental, LLC (NCE) to aid in the effort of completing a bat report that would capture the diversity/abundance of bat species within the study area of Palmer's Creek to meet due diligence with regulatory agencies, which was done through acoustic monitoring. The client proposed to develop a wind farm within the study area of Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). The study area lies within the Des Moines Lobe Western Corn Belt Plains (47b) ecoregion of Minnesota. Staff of Fagen Engineering deployed four separate ANABAT systems and two SM3 full spectrum systems to record bat activity throughout the study area, the first deployment of the six monitors was done late March, 2017. This report captures data gathered from late March, 2017 through late June, 2017. The data collected from Fagen Engineering was sent to NCE via certified mail. NCE then took the data and processed in zero-crossing through Kaleidoscope version 3.1.8 to confirm presence diversity and abundance of bat species. The software uses a presence/absent indicator by giving each species of bat a p-value. The lower the p-value, the more likely the species of bat is present. Bat presence, in the form of vocalization, was detected, identified by species, and catalogued, thereby allowing us to estimate species occurrences, distribution and relative abundance.

Introduction

In early summer of 2016, Mike Rutledge of Fagen Engineering, LLC contacted Mike Gutzmer of New Century Environmental, LLC (NCE) to aid in the effort of completing a bat report that would capture the diversity/abundance of bat species within the study area of Palmer's Creek to meet due diligence with regulatory agencies. The client proposed to develop a wind farm in Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). This interim report captures the results from the acoustic monitors from late March, 2017 up to late June, 2017. The full report will be drafted upon completion of the data gathering season.

Study Area

The study area is located within Chippewa County, Minnesota (just north across the Minnesota River from Granite Falls). The study area lies within the Des Moines Lobe Western Corn Belt Plains (47b) ecoregion of Minnesota. This ecoregion consists of fast fertile plain of deep soils dominated by row crops. The boundaries of the Minnesota River Prairie Subsection coincide with large till plains flanking the Minnesota River. The unit is bounded to the southwest by the Prairie Coteau. A series of moraines define the eastern boundary, the Alexandria Moraine to the northeast and the Bemis moraine to the southeast (Minnesota 2016).

The Minnesota River Prairie is a large subsection that includes part of northwestern Iowa and spreads across southwestern Minnesota into eastern South Dakota. The Minnesota River forms a broad valley, dividing the area in half. This valley once had a continuous band of floodplain forest that extended upstream as far as Lac Qui Parle, with highly unique bedrock exposures. There are 150 lakes larger than 160 acres in the subsection, most of which are shallow. Before settlement by people of European descent, the predominant vegetation was tallgrass prairie and wetlands. Fire was once a common natural disturbance and critical to maintaining native prairie communities (Minnesota, 2016).

Today, row-crop agriculture is the predominant land use, and prairie remnants and floodplain forests are rare. A major concern is impacts on water quality from intensive agricultural activities, including use of fertilizers and pesticides, expanding use of pattern tiling, and ditching and draining of small wetlands. Continued loss of the small amount of native upland habitat and over-intensive grazing remain a concern (Minnesota, 2016).

Figure 1: Vicinity map of study area. Chippewa county is located in southwestern Minnesota.

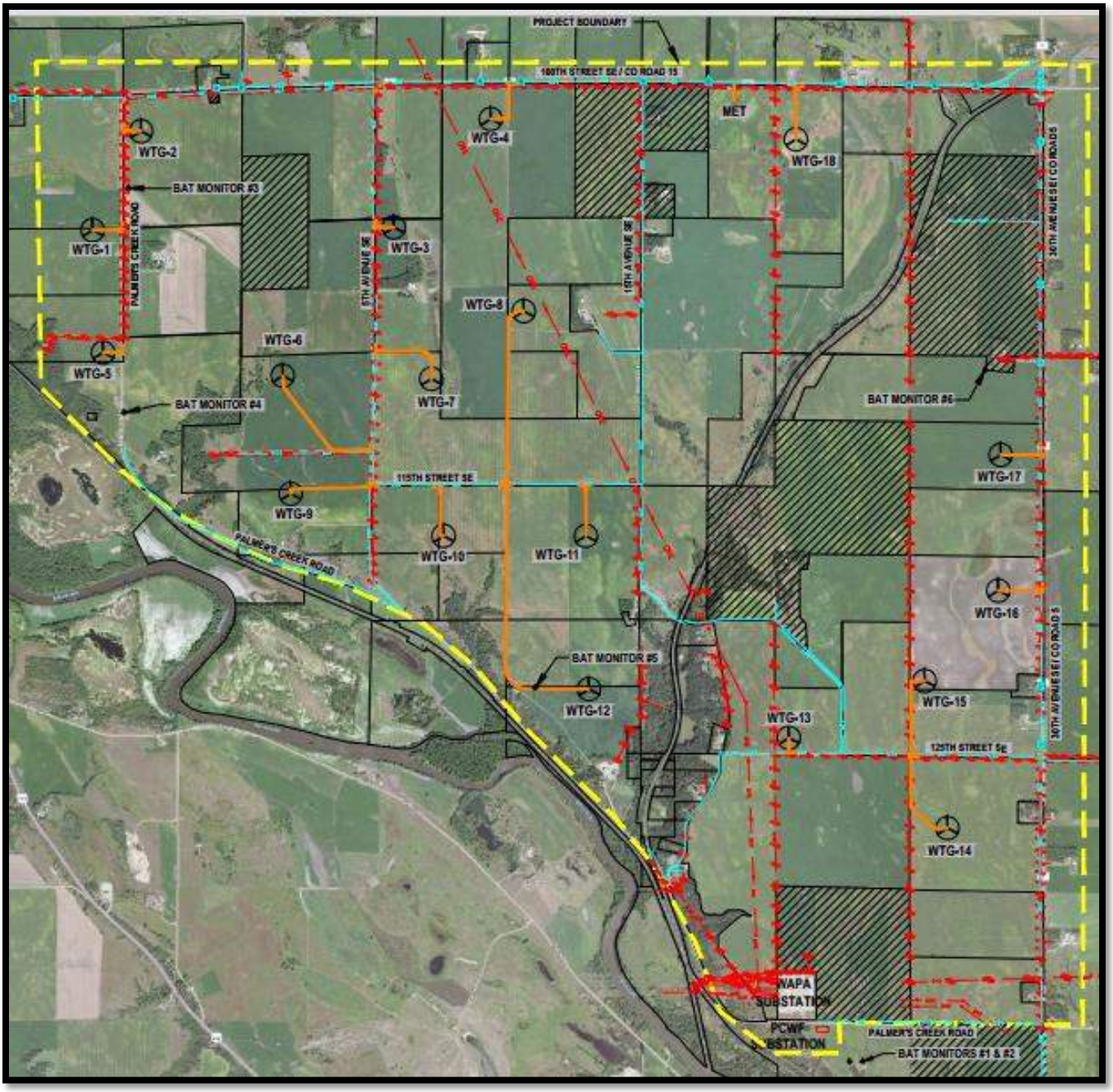

Figure 2. Map of study area showing bat monitor locations.

Methods

Data was gathered in the field by Fagen Engineering, LLC within the study area from four different Anabat acoustic recorders and two SM3 full spectrum monitors (map in Study Area section shows locations of monitors). The monitors gathered data from late March, 2017 and are currently active gathering data.

The memory cards were sent to New Century Environmental staff via certified mail, the data was then downloaded and processed through a program called Kaleidoscope Pro version 3.1.8. The Kaleidoscope classifier uses a source library of user submitted reference calls to compare to recordings. It accepts and displays full-spectrum signals, to match with the calls known bat species. The software uses a presence/absence indicator by giving each species of bat a p-Value of 0 to 1. The lower the P-Value, the more likely the species is present. Variability in the quality of recordings and variations in calls among individual bats creates challenges to acoustic bat classification.

Kaleidoscope Pro has been approved by the U.S. Fish & Wildlife Service for use for presence/absence analysis for Indiana bats (*Myotis sodalis*). Similarly, the approved programs may also be used for presence/absence analysis for northern long-eared bats (*Myotis septentrionalis*). The U.S Geological Survey also tested acoustic matching programs and Kaleidoscope Pro passed their standard validation process (USFWS 2016).

Results

At this point in time the four Anabat and two SM3 full spectrum recording system visual examination and filtering of files to eliminate extraneous noise (e.g., wind, insects, etc.) resulted in a total of 15,511 sound files classified as bat detection passes.

Monitor 1 is located on the lower end of a met tower surrounded by agriculture with some roosting trees nearby. The monitor recorded 1,933 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 57% of total detections. The big brown bat was the second most common being 24% of total detections. The federally threatened northern long-eared myotis was detected 1 time (0.05%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.8%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	1093
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	464
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	287
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	35
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	37
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	1
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	16

Table 1. Results from monitor 1.

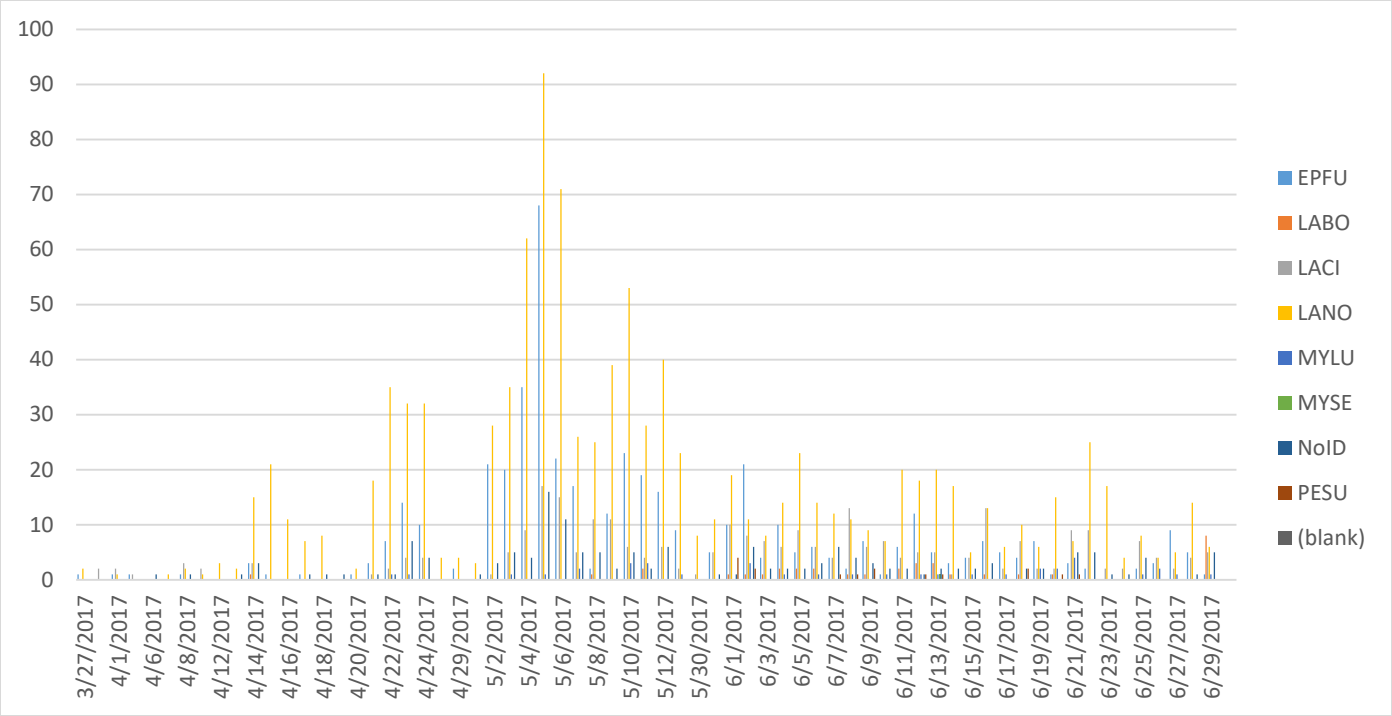

Figure 3. Bar graph of monitor 1 results by date.

Monitor 2 is located on the upper end of the same met tower as monitor 1, total elevation of 55 m. The monitor recorded only 116 files that Kaleidoscope Pro was able to classify as bat passes. The monitor only recorded a total of two species. The Hoary bat was the dominant species at this with 90 (78%) total bat passes. The second species was the big-brown bat with 26 (22%) total bat passes.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	26
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	90

Table 2. Results from monitor 2.

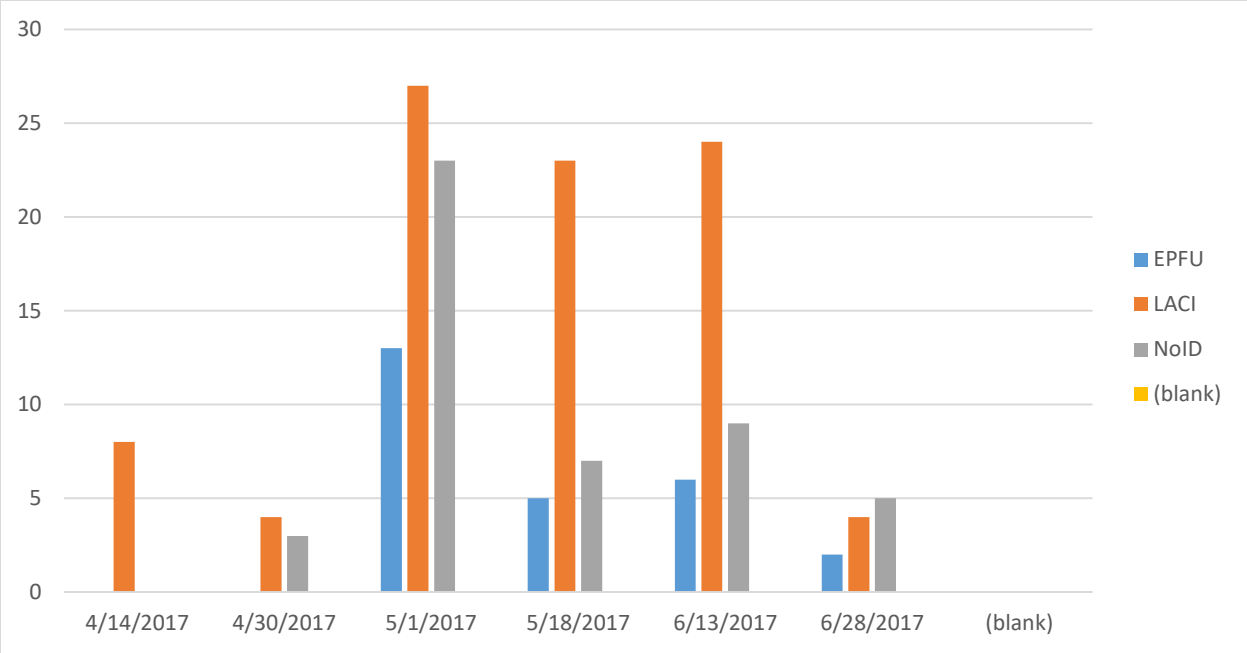

Figure 4. Bar graph of results from monitor 2 by date.

Monitor 3 is one of two SM3 ultrasonic detector which is located along a creek bank just off of the road surrounded by a combination of agriculture and roosting tree habitat. The monitor recorded 3,231 files that Kaleidoscope Pro was able to classify as bat passes. The silver haired bat was the most common species at this site being 35% of total detections. The big brown bat was the second most common being 26% of total detections. The federally threatened northern long-eared myotis was detected 1 time (0.0003%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.5%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	1144
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	850
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	703
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	137
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	380
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	1
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0.000111	16

Table 3. Results from monitor 3.

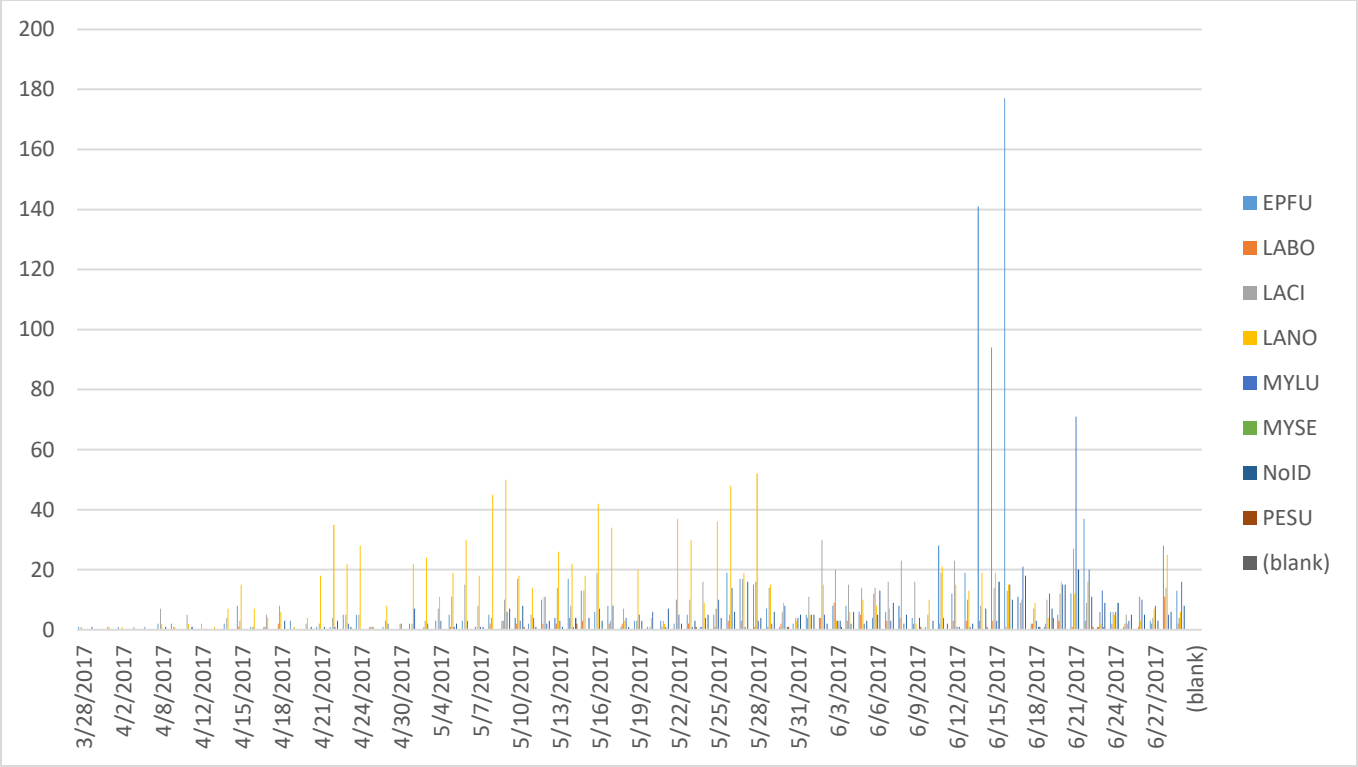

Figure 5. Bar graph of results for monitor 3 by date.

Monitor 4 is located in a corn field and is surrounded by agriculture, with a creek with roosting habitat located near the site, the monitor recorded 1,127 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the hoary bat being 49% of total detections. The second most common was the silver-haired bat being 40% of total detections. The northern long-eared myotis was not recorded at this site. The eastern pipistrelle had a total of 10 (0.9%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	455
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	54
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	553
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	24
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	31
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	0
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0	10

Table 4. Results from monitor 4.

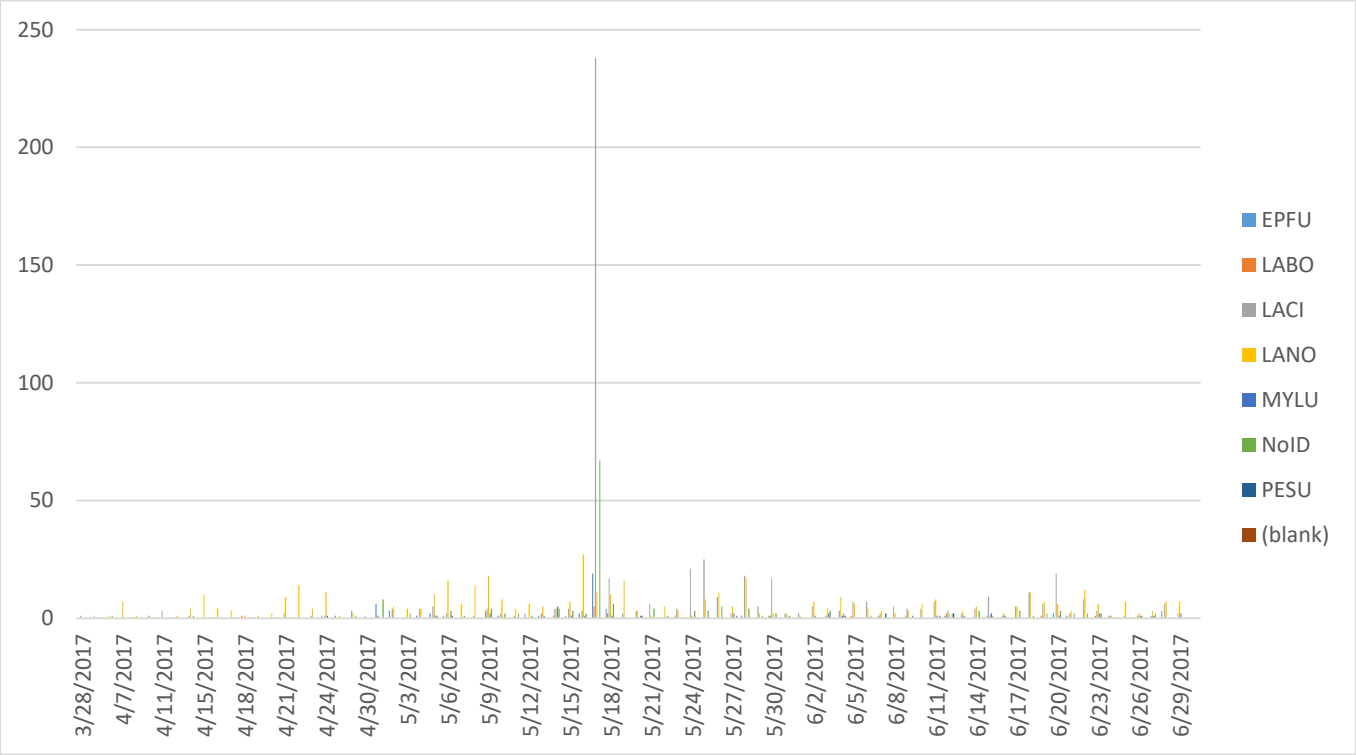

Figure 6. Bar graph of results for monitor 4 by date.

Monitor 5 is located along the roadside in agriculturally dominated landscape, the monitor recorded 763 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver haired bat being 67% of total detections. The second most common was the hoary bat with being 24% of total detections. The northern long-eared myotis was not detected at this site. The eastern pipistrelle had a total of 8 (1%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	514
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	1	16
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	185
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	27
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0.0000607	13
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	0
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0.0000124	8

Table 4. Results from monitor 5.

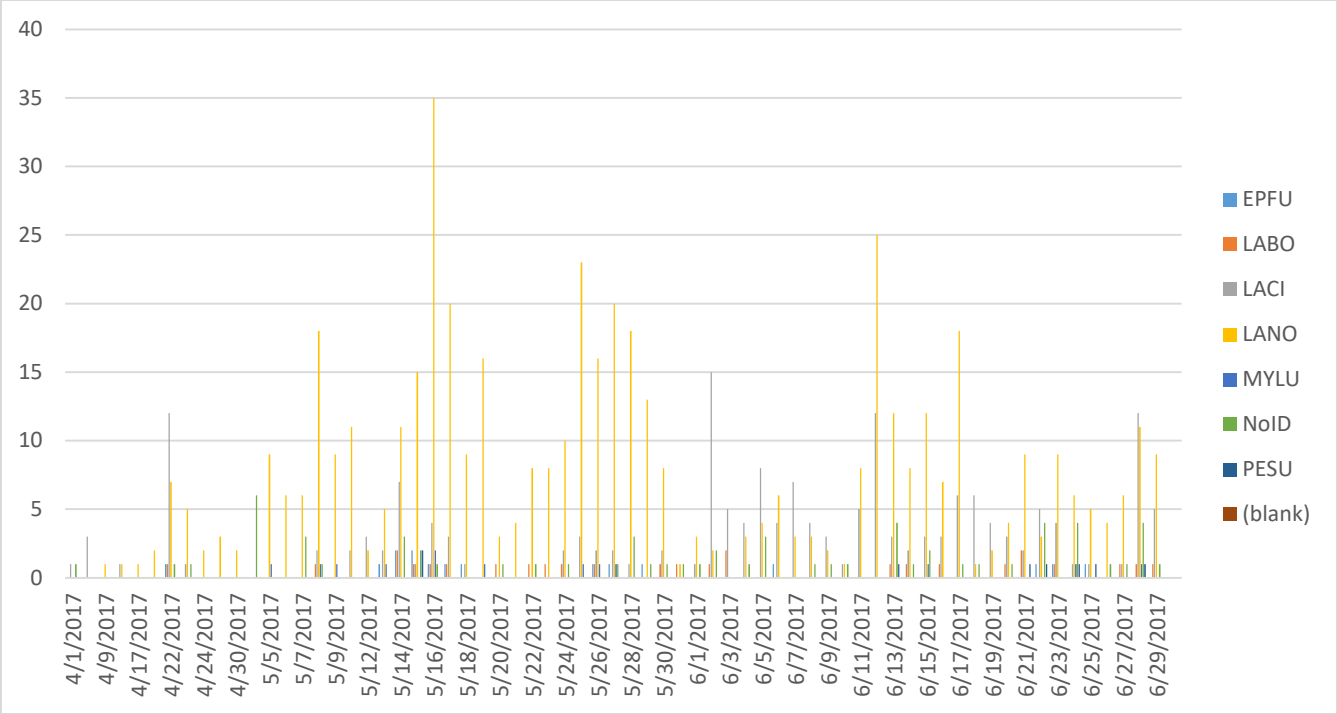

Figure 7. Bar graph of results for monitor 5 by date.

Monitor 6 is located in a tree line near a farm house, this is the second of the SM3 full spectrum devices. The monitor recorded a total of 8,341 files Kaleidoscope Pro classified as bat passes. The most common species at this site was the silver haired bat being 42% of total detections. The second most common was the big brown bat with being 35% of total detections. The northern long-eared myotis was detected 1 time (0.01%), but had a P-value of 1 which almost certainly means it was nonexistent at this site. The eastern pipistrelle had a total of 16 (0.2%) detections.

Code	Common name	Scientific Name	Conservation status	P-Value	# of passes
LANO	Silver-Haired Bat	*Lasionycteris noctivagans*	Least concern	0	3470
EPFU	Big-Brown Bat	*Eptesicus fuscus*	Least concern	0	2934
LACI	Hoary Bat	*Lasiurus cinereus*	Least concern	0	1612
LABO	Eastern Red Bat	*Lasiurus borealis*	Least concern	0	204
MYLU	Little Brown Bat	*Myotis lucificus*	Least concern	0	104
MYSE	Northern long-eared myotis	*Myotis septentrionalis*	Federally threatened	1	1
PESU	Eastern pipistrelle	*Perimyotis subflavus*	MN species of concern	0.707657	16

Table 5. Results from monitor 6.

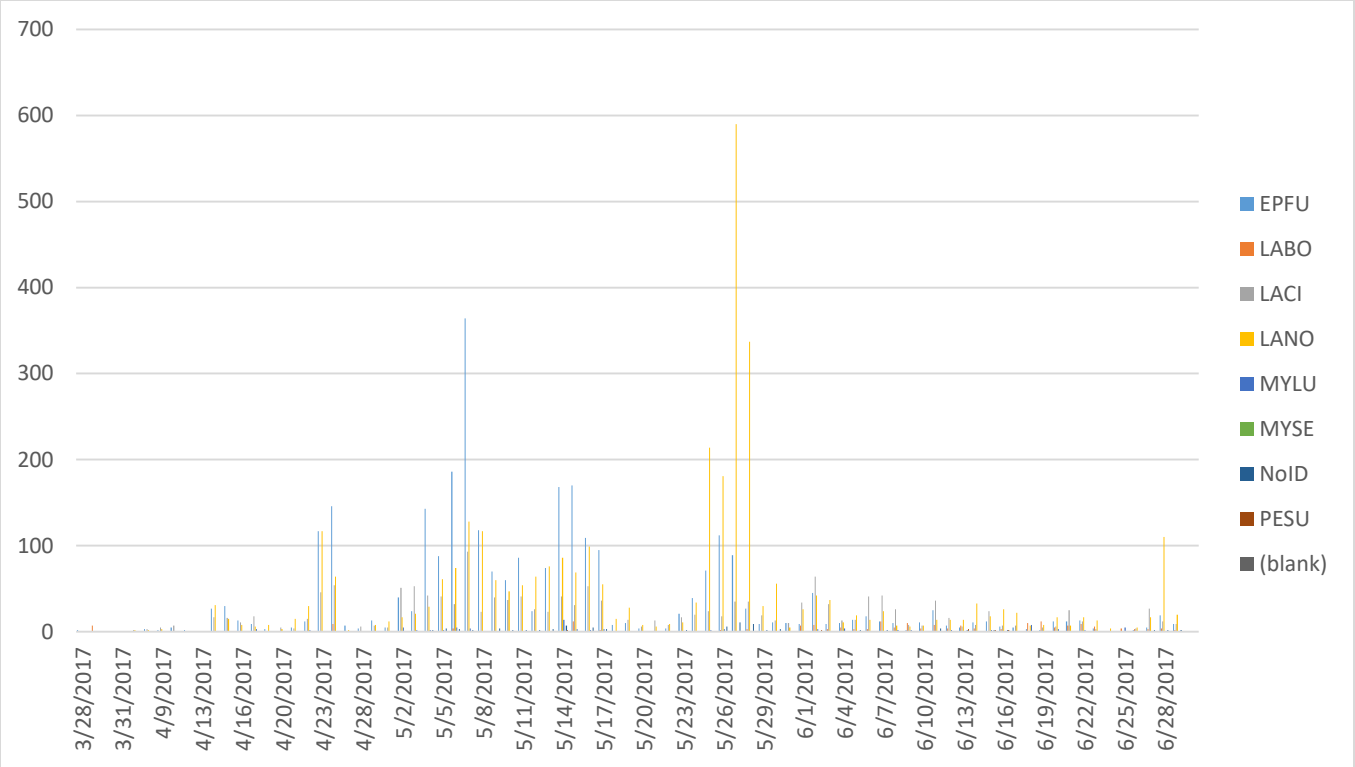

Figure 8. Bar graph of results for monitor 6 by date.

Discussion

There are seven species of bats that occur regularly in Minnesota; our most common species, the little brown myotis, occurs over most of North America. Along with the Northern myotis and big brown bat, it hibernates in Minnesota caves and mines. In summer, they roost in caves, mines, hollow trees, and buildings. Large groups of these bats hang upside-down in caves. The eastern pipistrelle is the smallest species, weighing only two-tenths of an ounce. It is found in the same Minnesota caves and mines, though it is less common and in fewer numbers.

The silver-haired bat and Eastern red bad are forest dwellers that usually live near water and feed among the trees. Usually a red bat pair will repeatedly fly the same route in search of food. Another woodland species is the hoary bat. It is the largest Minnesota bat, weighing an ounce or more. All three species are somewhat solitary, roost in trees, and migrate south for the winter (Minnesota, 2016).

All seven bat species that occur in Minnesota may be found throughout the state.

Common name	Scientific Name	State Status	Federal Status
Northern long-eared myotis	*Myotis septentrionalis*	Threatened	Threatened
Eastern Pipistrelle	*Pipistrellus subflavus*	MN species concern	Not listed
Little brown bat	*Myotis lucifugus*	Not listed	Not listed
Big brown bat	*Eptesicus fuscus*	Not listed	Not listed
Silver-haired bat	*Lasionycteris noctivagans*	Not listed	Not listed
Eastern red bat	*Lasiurus borealis*	Not listed	Not listed
Hoary bat	*Lasiurus cinereus*	Not listed	Not listed
Evening bat	*Nycticeius humeralis*	Newly discovered	Not listed

Figure 9. Bat species found in Minnesota with federal and state conservation status.

There were a total of six bat species documented at this point in time during the course of the study (late March, 2017-late June, 2017). The eastern pipistrelle (*Pipistrellus sublavus)* was documented at this site and is listed as a species of concern in the state of Minnesota. It was detected in small numbers but was found at every monitor except for monitor 2. The northern long-eared myotis (*Myotis septentrionalis*) is a federally threatened species whose home range lies within the study site. However no confirmed documentation was recorded here. Even though a total of three passes of which Kaleidoscope classified as MYSE (northern long-eared myotis) the P-value was given a 1 for every monitor indicating the likelihood of presence is near non-existent. All other species documented are of least concern. Of the six species documented the silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*) and big brown bat (*Eptesicus fuscus*) were among the most common followed by the little brown bat (*Myotis lucifugus*) and eastern red bat (*Lasiurus borealis*).

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US Fish and Wildlife Service. 2016. Endangered Species Midwest Region. Accessed on 10 July 2017 at <https://www.fws.gov/midwest/Endangered/mammals/inba/surveys/inbaAcousticSoftware.html>.

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