EXPERIENCE SUMMARY

Dr. Karl Kosciuch is an ecologist and project manager with over 12 years experience in laboratory and field biology. His primary interests are avian ecology, and he has specialized in the study colonially breeding birds and avian demography. Karl has managed projects on endangered bird species, bats, construction monitoring, bird research, and energy facility permitting. He works very effectively in teams and has obtained agency approval on several wildlife monitoring projects. Karl's interest in songbird ecology and the effects of parasitism by brown-headed cowbirds on host productivity make him well suited to address endangered songbird issues and to develop research studies on songbird reproduction. Effective communication is essential when bringing together clients, agencies, and NGOs, and Karl has facilitated positive interactions among stakeholders regarding endangered species by engaging both parties and articulating the results of the study. Karl is knowledgeable about grassland ecosystem function and grassland bird biology, and he has studied prairie songbirds, shorebirds, and grouse, and is knowledgeable about the potential impacts of wind farms to whooping cranes. He understands wind-wildlife interactions, especially in prairie ecosystems and in Texas. He is experienced with demographic, statistical, and meta-analytic models and effectively communicates results from these models to a wide variety of audience members through the use of non-technical language and concepts.

EDUCATION

PhD, Biology, 2006, Kansas State University, Kansas
MS, Wildlife and Fisheries Sciences, 2002, Texas A&M University, Texas
BS, Environmental Studies, 1997, East Stroudsburg University, Pennsylvania

TRAINING

First Aid and CPR, American Red Cross, 2008
Adult AED, American Red Cross, 2008
PM101, 2008
PM201, 2008

CORPORATION PROJECT EXPERIENCE

Ecologist and Project Manager, 2008-Present
Stateline 3 Wind Project Oregon EFSC application, OR
Project manager for Oregon Energy Facility Siting Council site certificate amendment request and Walla Walla County, WA conditional use permit. Prepared several proposals and cost models, managed invoices and worked with client regarding progress of project. The amendment request included 30 exhibits that range from financial assurances to biology to geology. Coordinated design of two project layouts with engineers, worked closely with GIS staff to produce over 20 figures. This project requires coordination with over 12 TtEC staff, two subcontractors, FPL Energy Staff, legal council, the Oregon Department of Energy, Umatilla County, Walla Walla County and other permitting agencies. Lead biologist and peer reviewer for wildlife studies; reviewer for all project documents. Project in progress.

Ecologist and Project Manager, 2008-Present
Silver Star Wind Resource Area, Bat Acoustic Monitoring, TX
Project manager for bat acoustic monitoring in Texas using Sonobat detectors. Prepared proposal and cost model, managed invoices and worked with client regarding progress of project. Lead biologist and peer reviewer for bat studies. Coordinated surveys with field biologists and tracked data analysis and report progress. Project in progress.

Ecologist and Project Manager, 2008-Present
Silver Star II Wind Resource Area, Black-capped Vireo Presence/Absence Surveys, TX
Project manager for the federally endangered black-capped vireo presence/absence surveys in Texas. Prepared proposal and cost model, managed invoices and worked with client regarding progress of project. Lead biologist and peer reviewer for surveys; delineated black-capped vireo habitat and conducted presence/absence surveys. Managed subcontractor and assured subcontractor compliance with permit requirements. Discussed implications of the endangered species act on development activities in vireo habitat with client. Calculated potential habitat removed due to project activities and provided client with scenarios regarding the potential consequences of construction. Submitted permit compliant report to USFWS. Project in progress.

Ecologist and Project Manager, 2008-Present
Searchlight Wind Project, Wildlife Studies, NV
Project manager for a wind project on BLM land in Nevada. Aspects of the project include FAA studies, engineering and design, avian studies, and bat studies. Worked with the BLM and Nevada department of wildlife to implement agency-approved protocols for wildlife studies in support of EIS. Coordinated project calls with at least 9 stake holders. Prepared proposal and cost model, managed invoices and worked with client regarding progress of project. Lead biologist and peer reviewer for wildlife studies, and coordinator for subcontractor bat and bird work. Project in progress.

Ecologist and Project Manager, 2008-Present
Silver Star Wind Resource Area, Black-capped Vireo Construction Monitoring, TX
Project manager for construction monitoring project to prevent impacts to breeding federally endangered black-capped vireos. Prepared proposal and cost model, managed invoices and worked with client regarding progress of project. Designed communications plan and field monitoring protocol; supervised associate biologist during field surveys. Worked with the field biologist, construction crew, permitting specialists, project developers, and senior TtEC staff to ensure that all parties were involved when important decisions regarding construction were required. Provided client with updates of project construction activity. Designed material to effectively communicate the construction restrictions to construction personnel, which resulted in no disturbance to vireo habitat. Lead biologist and peer reviewer for final reports.

Ecologist and Project Manager, 2008-Present
Silver Star Wind Resource Area, Black-capped Vireo Productivity Study, TX
Project manager study in Texas that will evaluate the effects of a wind farm on the distribution and reproductive success of the federally endangered black-capped vireo. Prepared proposal and cost model, managed invoices and worked with client regarding progress of project. Lead biologist and peer reviewer for surveys; supervised field staff. Conducted data analysis and prepared report. Met with US Fish and Wildlife Service to discuss survey results; submitted permit compliant report to USFWS.

Ecologist 2008-Present
Technical Expert and Task Manager, Birds - Wind Power Projects
Serve as task manager for avian studies at 3 wind power projects. Prepared proposals and cost models, coordinated with subcontractors and field staff, provided regular updates to project managers about project progress, and supervised avian reports. Provided technical expertise at least 7 windpower projects including recommendation of survey methods, proposal and budget review, client conference, agency coordination, and report revisions.

Associate Ecologist, 2007
Whooping Crane Migration Study, North Dakota and South Dakota

Assisted with the development of a proposal and prepared a cost model to investigate the likelihood of occurrence of whooping cranes at seven potential wind farm sites in North Dakota and South Dakota. Developed conceptual model and quantitative model to rank sites based on biological and physical factors. Worked with GIS analyst and prepared report.

Associate Ecologist 2007
Avian Report Author and Peer Reviewer, 40 Wind Power Projects
Entered and proofed data, queried database, and prepared avian point count report for clients. Provided suggestions to minimize impacts and recommended additional studies. Peer reviewed avian point count surveys, endangered species surveys, proposals, and biology section of critical issues analysis documents. Assessed the likelihood of species occurrence within a project area and evaluated potential impact of project activities to wildlife and vegetation.

Associate Ecologist 2007
Shooting Star Wind Resource Area, Avian Point Count Survey, KS
Assisted with preparation of proposal for avian point count study and sandhill crane study. Set-up avian point counts and worked with GIS technicians to produce study site maps. Served as supervisor for field biologist and communicated regularly with field biologist regarding weekly progress of surveys. Prepared change of work order to expand study to increased area of WRA.

Associate Ecologist, 2007
Silver Star Wind Resource Area, Black-capped Vireo Management Plan, TX
Coordinated efforts of several Tetra Tech staff to prepare sections of management plan. Developed disruption minimization plan to minimize construction impacts to black-capped vireos. Conducted site visit to review compliance with disruption minimization plan. Coordinated mitigation effort for black-capped vireos with Environmental Defense.

Associate Ecologist, 2007
Silver Star Wind Resource Area, Black-capped Vireo Productivity Study, TX
Prepared a proposal and cost model to investigate the effects of wind turbine operation on black-capped vireo productivity using a before-after-control-impact design. Designed study methods and conducted field work; found several black-capped vireo nests. Served as supervisor for field biologist; discussed daily project progress. Interacted with clients on conference calls and provided daily project support. Conducted data analysis including logistic and linear regressions, and nest survival in Program MARK. Attended ground breaking ceremony and spoke with client executives about the scope of the research study. Prepared final report and will present study results at meetings.

Associate Ecologist, 2007-Present
Rolling Thunder Wind Resource Area, Habitat Mapping and Native Prairie Surveys, SD.
Prepared a proposal and cost model to identify areas of native prairie in the wind resource area through field surveys and GIS mapping. Corresponded with state and federal personnel regarding prairie quality and survey methods. Served as technical lead and corresponded regularly with subcontractors to track progress of fieldwork. Ensured quality of work and presented summary of work for clients on conference calls. Prepared final report and provided recommendations to minimize impacts.

Associate Ecologist, 2007
Shooting Star Wind Resource Area, Threatened and Endangered Species White Paper Report, KS
Investigated the likelihood of occurrence of five federally threatened or endangered species at a wind resource are in Kansas. Conducted extensive literature review and contacted state and federal personnel in regards to species occurrence. Made recommendations regarding additional studies and the siting of project features. Prepared final report and discussed results with client.

PREVIOUS EXPERIENCE

Faculty Research Assistant, 2006-2007
Oregon State University, Corvallis, OR
Assisted director with management of over 65 international aquaculture research projects. Critically reviewed proposals, budgets, and research reports for programmatic compliance. Coordinated NSF-style peer review panels for disbursement of $1.2 million in funding.

Shorebird and Prairie Chicken Research Technician, 2003-2006
Kansas State University, Manhattan, KS
Identified, captured, and handled migrant shorebirds. Observed lekking behavior of greater prairie chickens. Located radio-tagged upland sandpipers and prairie chickens using radio telemetry. Studied ecology of shorebirds and prairie chickens in context of tallgrass prairie.

Field Biologist, 2004-2005
Western EcoSystem Technologies, Laramie, WY
Conducted point counts for raptors and songbirds in tallgrass prairie. Located and monitored greater prairie chicken leks. Maintained data and prepared final report.

Graduate Teaching Assistant, 2002-2006
Kansas State University, Manhattan, KS
Developed curriculum, prepared exams, and assisted with student research for the following labs/classes (number of semesters), ornithology (4), principles of biology (2), organismic biology (1), animal physiology (1). Supervised 3 lab practicum students and one NSF REU (research experience for undergraduates) student. Conducted dissertation research on the effects of brown-headed cowbird removal on songbird productivity with a focus on Bell's vireo. Located, banded, and monitored vireos and other songbirds, in a prairie/shrubland ecosystem. Published research results in peer-reviewed journals and presented at international meetings.

Assistant Biologist, 2002
Florida Fish and Wildlife Conservation Commission, Panama City, FL
Conducted breeding surveys for beach nesting shorebirds and colonial seabirds. Analyzed data from state-wide colonial breeding bird survey. Prepared presentations and reviewed reports.

Assistant Curator of Birds, 2000-2002
Texas Cooperative Wildlife Collection, College Station, TX
Prepared scientific avian specimens for research and teaching collections. Identified specimens and revised catalog according to changes in taxonomy.

Graduate Teaching Assistant, 1999-2002
Texas A&M University, College Station, TX
Developed curriculum, prepare exams, and assisted with student research for ornithology lab (6 semesters). Supervised 2 directed studies students. Conducted thesis research on cave, barn, and cliff swallow breeding biology. Located, banded, and monitored swallows. Published research results in peer-reviewed journals and presented at international meetings.

Research Technician, 1998-1999
University of Georgia, Athens, GA

Located and monitored nests of forest dwelling songbirds. Banded and re-sighted songbirds. Conducted point counts and line transects in forest habitats. Conducted nest vegetation and random point vegetation sampling.

Biological Technician, 1997
National Park Service, Bandelier National Monument, NM
Conducted point counts and line transect surveys for southwestern willow flycatcher and other songbirds. Mapped riparian habitat along Rio Grande using GIS software.

PUBLICATIONS & PRESENTATIONS

Sandercock, B. K., E. L. Hewett, and **K. L. Kosciuch**. In press. Impacts of brood parasitism and predation on productivity of a grassland songbird: a cowbird removal experiment. Auk
Shawkey, M. D., **K. L. Kosciuch**, M. Liu, F. C. Rohwer, E. R. Loos, J. M. Wang, and S. R. Beissinger. Do birds differentially distribute antimicrobial proteins within clutches of eggs? Behavioral Ecology 19:920-927.
Kosciuch, K. L., J. W. Rivers, and B. K. Sandercock. 2008. Stable isotopes identify the natal origins of a brood parasite. Journal of Avian Biology 39:364-367
Kosciuch, K. L. and B. K. Sandercock. 2008. Experimental removal of Brown-headed Cowbirds increases productivity of the parasite and their songbird host. Ecological Applications 18: 537-548.
Kosciuch, K. L., T. H. Parker, and B. K. Sandercock. 2006. Nest desertion by a cowbird host: anti-parasite behavior or a response to egg loss? Behavioral Ecology 17:917-924.
Kosciuch, K. L., C. G. Ormston, and K. A. Arnold. 2006. Breeding range expansion by cave swallows (*Petrochelidon fulva*) in Texas. Southwestern Naturalist 51:203-209.
Kosciuch, K. L. and R. B. Langerhans. 2004. The evolution of coloniality via commodity selection; what about variance? Auk 121:257-262.
Kosciuch, K. L. and K. A. Arnold. 2003. Novel nesting behavior by Cave Swallows. Wilson Bulletin 113:347-348.
Kosciuch, K. L., A. C. Kasner, and K. A. Arnold. 2001. Annual reproductive success of culvert-dwelling Cliff Swallows in East-Central Texas. Condor 103:879-885.

Selected presentations:
Kosciuch, K. L., E. Lubell, A. Oller, and L. Nagy. 2008. Understanding whooping crane risk at potential wind power sites. National Wind Coordinating Committee Wildlife Research Meeting, Madison, WI.
Kosciuch, K. L., L. R. Nagy, and R. J. Young. 2008. Wind power development and black-capped vireos. Project Siting Workshop, American Wind Energy Association, Austin, TX.
Rives, J. W., W. E. Jensen, **K. L. Kosciuch**, and S. I. Rothstein. Community-level patterns of host use by a generalist brood parasite. American Ornithologists' Union 126th Stated Meeting, Laramie, Wyoming.
Shawkey, M. D., J. M. Wang, S. R. Beissinger, and **K. L. Kosciuch**. Differential deposition of anti-microbial proteins in eggs: an unstudied maternal effect? American Ornithologists' Union 126th Stated Meeting, Laramie, Wyoming.
Kosciuch, K. L. J. W. Rivers, and B. K. Sandercock. 2007. Stable isotopes identify the natal origins of a generalist brood parasite. American Ornithologists' Union 126th Stated Meeting, Laramie, Wyoming.

Kosciuch, K. L., R. Fagan, B. K. Sandercock, and D. A. Rintoul. 2005. Habitat use by Brown-headed Cowbirds: insights into egg-laying and foraging areas using stable isotope analysis. American Ornithologists' Union 123rd Stated Meeting, Santa Barbara, California.
Kosciuch, K. L., T. H. Parker, and B. K. Sandercock. 2005. High nest desertion frequencies by Bell's Vireo in Kansas: population-specific adaptation or a generalized response? American Ornithologists' Union 123rd Stated Meeting, Santa Barbara, California.
Kosciuch, K. L. and B. K. Sandercock. 2004. Proximate mechanisms account for nest desertion in response to cowbird parasitism by Bell's Vireo. American Ornithologists' Union 122nd Stated Meeting, Québec City, Canada.
Kosciuch, K. L. 2003. Nesting and reproductive biology of Cave Swallows associating with Barn Swallows. Cooper Ornithological Society 75th annual meeting, Flagstaff, Arizona.
Kosciuch, K. L., K. A. Arnold, T. N. Johnson, and P. J. Sikes. 2002. Influence of age and dispersal on reproductive success in Cliff Swallows. North American Ornithological Congress (3rd meeting), New Orleans, Louisiana.
Kosciuch, K. L., A. C. Kasner, and K. A. Arnold. 2001. Annual reproductive success of culvert-dwelling Cliff Swallows in East-Central Texas. The Wildlife Society, 8th Annual Meeting, Reno, Nevada.

PROFESSIONAL ACCOMPLISHMENTS

Spot Bonus, Tetra Tech EC, 2007
First Place Student Presentation, Graduate Research Forum, Kansas State University, 2005
Haymaker Award for Excellence in Graduate Student Research, Kansas State University, 2005
Best Student Paper, Kansas Ornithological Society fall meeting, 2004
Ackert Award for Outstanding Graduate Research, Kansas State University, 2004
Michael Scott Watkins Award for Teaching Excellence, Division of Biology, Kansas State University, 2004
Second Place Student Presentation, Graduate Research Forum, Kansas State University, 2003
Outstanding Master's Student, Department of Wildlife and Fisheries Sciences, Texas A&M University (one award per year), 2002
Best Graduate Student Paper, Texas Academy of Science, 2002
W. B. 'Doc' Davis Endowed Scholarship, Texas A&M University, 2001
Outstanding Teaching Assistant (awarded three times), Department of Wildlife and Fisheries Sciences, Texas A&M University, 1999-2001

PROFESSIONAL AFFILIATIONS

American Ornithologists' Union
Ecological Society of America
The Wildlife Society

DISCIPLINE CODES

07 Biologist
19 Ecologist

SKILL SET

BIOLOGICAL SCIENCES

Animal Behavior Studies
Avian Ecology
Biological Field Studies
Biological Modeling
Environmental Monitoring
Field Biology
Field Sampling
Landscape Ecology
Ornithology
Quantitative Analysis
Statistics
Terrestrial Ecology
TES Evaluations
Threatened and Endangered Species Assessments
Threatened and Endangered Species Surveys
Vegetation Assessments
Wildlife
Wildlife and Aquatic Surveys
Wildlife and Habitat Inventory
Wildlife Biology

TECHNICAL EXPERTISE

Oregon Energy Facility Siting Council applications
Endangered species surveys
Knowledgeable about the implications of the endangered species act and bald and golden protection act for wind energy projects
Black-capped vireo habitat delineation and presence/absence surveys.
Skilled with mark-recapture analysis in Program MARK (v. 5.1)
Program DISTANCE for density estimates
Skilled with statistical analysis software SAS (v. 9); SPSS
Skilled with graphics presentation software (Sigma Plot v. 8, Excel)
Stable isotope analysis of animal tissue using mass spectrometry

PROFESSIONAL REFERENCES

Laura Nagy, PhD
Senior Ecologist
Tetra Tech EC
1750 SW Harbor Way, Suite 400
Portland, OR 97201
503-721-7214
laura.nagy@tteci.com

Brett Sandercock, PhD
Division of Biology
Kansas State University
Manhattan, KS 66501
785-532-0120
bsanderc@ksu.edu

RELATED COMPANY INFORMATION

Payroll Number:
Employment Status: Full
Preferred First Name: Karl
Office Location: Portland
Hire Date: 3/31/07
Years with Other Firms: 11
Years with Current Firm: >1
Total Years Experience: 11
Supervisor: Laura Nagy, Senior Ecologist
Office Phone: 503-222-4537
Cell Phone: 503-432-7093
Fax: 503-227-1287

E-mail Address: karl.kosciuch@tteci.com
Other E-mail Address (if any):
Resume Last Revised: October, 2008

Spring Avian Survey 2008

Lee-DeKalb Wind Resource Area

"Business Confidential"

Lee and DeKalb Counties, Illinois

Final Draft
Prepared for

FPL Energy, LLC

September 2008

TETRA TECH EC, INC.

EXECUTIVE SUMMARY

Tetra Tech, EC, Inc. (TtEC) was contracted by FPL Energy, LLC. (FPLE) to undertake spring avian use surveys for the proposed Lee-DeKalb Wind Resource Area (WRA) in Lee and DeKalb Counties, Illinois. The studies were conducted to identify potential avian impacts associated with building and operating the wind conversion facility. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the construction and presence of the associated structures. Weekly spring surveys were performed at the Lee-DeKalb WRA from 28 March to 28 June 2008. Fixed point count surveys (800-meter radius) were conducted at 24 points distributed throughout the Lee-DeKalb WRA. The results of these surveys are relevant to the spring season only.

A total of 59 identified species and 9 unidentified species groups, consisting of 13,564 birds were observed within the Lee-DeKalb WRA. Overall mean bird use within the Lee-DeKalb WRA was 40.37 birds/20 min, ranging from 3 to 1,682 birds per 20-minute point count.

Songbirds had the highest mean use out of all species groups observed (32.18 birds/20 min). The most commonly observed species, the red-winged blackbird (7.10 birds/20 min), common grackle (5.19 birds/20 min), and brown-headed cowbird (3.38 birds/ 20 min) are all associated with agriculture, are widespread species and have relatively stable populations (PIF 2007). Thus, any local mortality is not expected to have population-level consequences for the most commonly observed species.

Red-tailed hawks were the most commonly observed raptor in the Lee-DeKalb WRA (0.13 birds/20 min); however, this species was only observed in 12.2 percent of surveys, and the encounter rate was low (0.03 birds flying within the rotor swept area [RSA]/20 min). Red-tailed hawks have a propensity to fly within the RSA and, as a result, are at risk of being struck by turbines. However, red-tailed hawks are widespread throughout North America, populations appear to be relatively stable, and any mortality is not anticipated to have population-level impacts.

No federal-listed species were observed in the Lee-DeKalb WRA during Spring 2008. The Illinois state-endangered northern harrier was recorded 7 times during point counts and an additional 5 times as an incidental. The northern harrier is a migratory species that is common across much of North America. This species tends to fly below the RSA; thus, the mortality risk posed by wind turbines to northern harriers is considered to be low.

The state-threatened sandhill crane was observed both during point counts and as an incidental. None of the flying birds recorded during point counts were within the RSA; thus, the risk at the Lee-DeKalb WRA is considered low for this species in the spring.

The avian community at the Lee-DeKalb WRA is characterized by species that are associated with corn agriculture, especially blackbirds. Thus, the surveys conducted in the fall and spring characterizes the avian community and we do not recommend additional surveys.

TABLE OF CONTENTS

EXECUTIVE SUMMARY iii

1.0 INTRODUCTION 1

2.0 METHODS 1

2.1 DIURNAL FIXED-POINT AND INCIDENTAL AVIAN USE SURVEYS 2
2.2 ANALYSIS 3
2.3 RAPTOR NEST SURVEYS 5

3.0 RESULTS 5

3.1 LEE-DEKALB WRA 5
3.2 SPECIES COMPOSITION 5
3.3 AVIAN USE 5
3.4 FREQUENCY OF OCCURRENCE 7
3.5 FLIGHT HEIGHT AND ENCOUNTER RATE 7
3.6 INCIDENTAL OBSERVATIONS 8
3.7 RAPTOR NEST SURVEYS 8

4.0 DISCUSSION AND RECOMMENDATIONS 8

4.1 NON-RAPTOR USE AND ENCOUNTER RATE 8
4.2 RAPTOR USE AND ENCOUNTER RATE 9
4.3 COMPARISON TO FALL 2007 RESULTS 9
4.4 LISTED AND SENSITIVE SPECIES 10
4.5 LEE-DEKALB PROJECT AREA CONCLUSIONS AND RECOMMENDATIONS 11

5.0 REFERENCES 11

List of Figures

Figure 1. Lee-DeKalb Wind Resource Area Location Map

Figure 2. Lee-DeKalb Point Count Location Map

Figure 3. Mean Non-Raptor Use by Survey Date for Spring 2008 surveys at the Lee-DeKalb WRA

Figure 4. Lee-DeKalb Mean Non-Raptor Use by Point Count Location (spring 2008)

Figure 5. Mean Raptor Use by Survey Date for Spring 2008 surveys at the Lee-DeKalb WRA

Figure 6. Lee-DeKalb Mean Raptor Use by Point Count Location (spring 2008)

Figure 7. Lee-DeKalb Raptor Nest Locations (spring 2008)

List of Tables

Table 1. Lee-DeKalb Wind Resource Area, Spring 2008 point count survey dates

Table 2. Avian species observed during Spring point count surveys at the Lee-DeKalb Wind Resource Area, 2008

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-DeKalb Wind Resource Area, 2008

Table 4. Avian species observed by point during Spring point count surveys at the Lee-DeKalb Wind Resource Area, 2008

Table 5. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA) during Spring point count surveys at the Lee-DeKalb Wind Resource Area, 2008

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Lee-DeKalb Wind Resource Area, during Spring 2008

Table 7. Incidental observations of birds during Spring point counts at the Lee-DeKalb Wind Resource Area, 2008

Table 8. Comparison of raptor and other bird use per 20-minute survey with other studies of wind projects using the similar survey methodology

Appendix 1. Flight directions of birds observed during spring point count surveys at the Lee-DeKalb Wind Resource Area, 2008.

1.0 INTRODUCTION

FPL Energy, LLC (FPLE) is planning to develop a wind energy conversion facility in northern Illinois in Lee and DeKalb Counties, about 75 miles west of Chicago (Figure 1). The Lee-DeKalb Wind Resource Area (WRA) is located on private land. FPLE is committed to environmental due diligence and has contracted Tetra Tech EC, Inc. (TtEC) to conduct a spring avian migration survey at the Lee-DeKalb WRA to quantify local avian use in the area and to identify potential avian impacts associated with building and/or operating the proposed facility.

The Lee-DeKalb WRA will occupy approximately 59,150 acres and measures approximately 10 miles north-south by 6 miles east-west. The WRA is on predominantly flat land in a semi-rural area with scattered residences surrounding Lee, IL. Land use within the Lee-Dekalb WRA is agriculture consisting of corn and soybeans. There are a few scattered areas of wetlands and their associated vegetation.

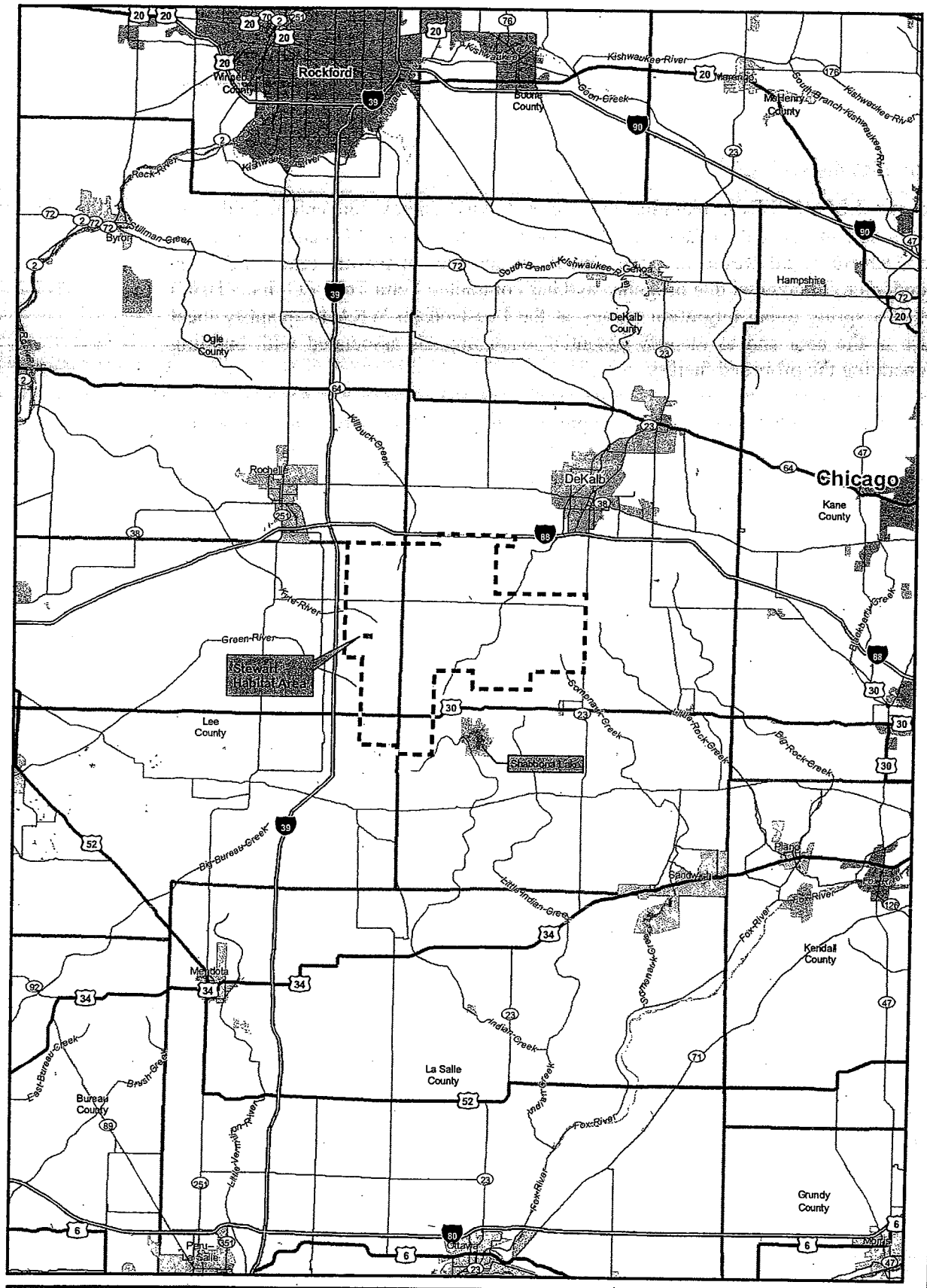
Wind energy provides a clean, renewable energy source that is in high demand. As wind power has become more common, the need to address potential environmental impacts has increased. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures (Erickson et al. 2005, Drewitt and Langston 2006, Arnett et al. 2007). Specifically, raptors and migrant passerines (e.g., songbirds) were found more often in post-construction mortality monitoring compared to other groups of birds (Erickson et al. 2001, 2005; Drewitt and Langston 2006; Johnson et al. 2007a; Strickland and Morrison 2008).

Illinois has 436 documented bird species and is situated within the Mississippi Flyway, one of the main bird migratory routes of North America (IOS 2006, USFWS 2008). In the U.S., the Mississippi Flyway runs through the states of Alabama, Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin, and, subsequently, the Lee-DeKalb WRA. This route stretches from the Arctic to Patagonia in Argentina and Chile and is well-forested, well-watered, and uninterrupted by mountains (Birdnature 2001).

As the Lee-Dekalb WRA is mostly flat and agricultural, the most common birds will likely be blackbirds (family *Icteridae*), which congregate in large numbers in this habitat type. There are some streams that flow through the WRA and Shabbona Lake is located just south-east of the WRA, which could attract migratory birds (Figure 1). Migratory birds are often more susceptible than resident birds to wind farm-related mortality (Kunz et al. 2007).

2.0 METHODS

To evaluate avian risk at wind energy facilities, standardized protocols for pre-construction point counts have been established and were used here. Data collected from these counts can then be used to identify species or species groups of concern and may



P:\GIS_2006_PROJECTS\FPL_Lee&Dekalb\maps\AvianReport_2008\FPL_LeeDekalb_Figure1_WRA_Location_Map_071608.mxd - Last Accessed: 9/24/2008 - Map Scale is correct when printed at: Portrait ANSI B (11 x 17 inches)

provide additional information for micro-siting to minimize impacts to birds. To facilitate identifying species at risk, results in this report are presented in terms of species groupings, and highlight federally listed species, state-listed species, and species of concern.

2.1 Diurnal Fixed-point and Incidental Avian Use Surveys

Fixed-point Surveys

Experienced field biologists conducted 20-minute point count surveys at 24 locations within the Lee-DeKalb WRA to evaluate avian use, behavior, and species composition during spring migration (Figure 2). TtEC selected survey dates to encompass the spring migration period; biologists conducted weekly surveys from March 28 to June 28 (Table 1). The early start date may include resident winter birds and the late end date may include the summer breeding birds. TtEC distributed the survey locations throughout the WRA and chose locations that maximized the 360-degree sight distance for the observer and covered a diversity of habitats.

Experienced field ornithologists collected data on all birds observed within an 800-meter radius circle centered on the point count location. The biologists also recorded incidental observations, such as birds detected outside the 800-m radius or while moving between point count locations. Surveys at each point lasted for 20 minutes, during which time biologists continuously scanned for birds and recorded any visual or auditory observations. Biologists scheduled point counts to cover all daylight hours and to ensure that each point was visited during different times of day to ensure species coverage. Biologists collected the following data: species, number of individuals, time, height above ground, behavior, and flight direction. The biologists also estimated flight heights and distances using existing meterological towers, local transmission lines, and topographic maps for reference. Flight direction data are included in Appendix 1.

The survey protocol used in this study is designed to collect data on all bird species and to provide results that are comparable with other studies of avian use at wind farms rather than to target specific taxa. The benefit of using this method is that it estimates avian use throughout the day and captures activity by a variety of bird species. During the breeding season, songbirds are most active in the morning and can be difficult to detect during the afternoon. In contrast, raptors become active as the sunlight heats the air and creates thermals, which individuals use for soaring (Ballam 1984). Thus, raptors are more readily detected several hours after sunrise. Therefore, the survey method used in this study is appropriate for the bird community using the WRA.

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

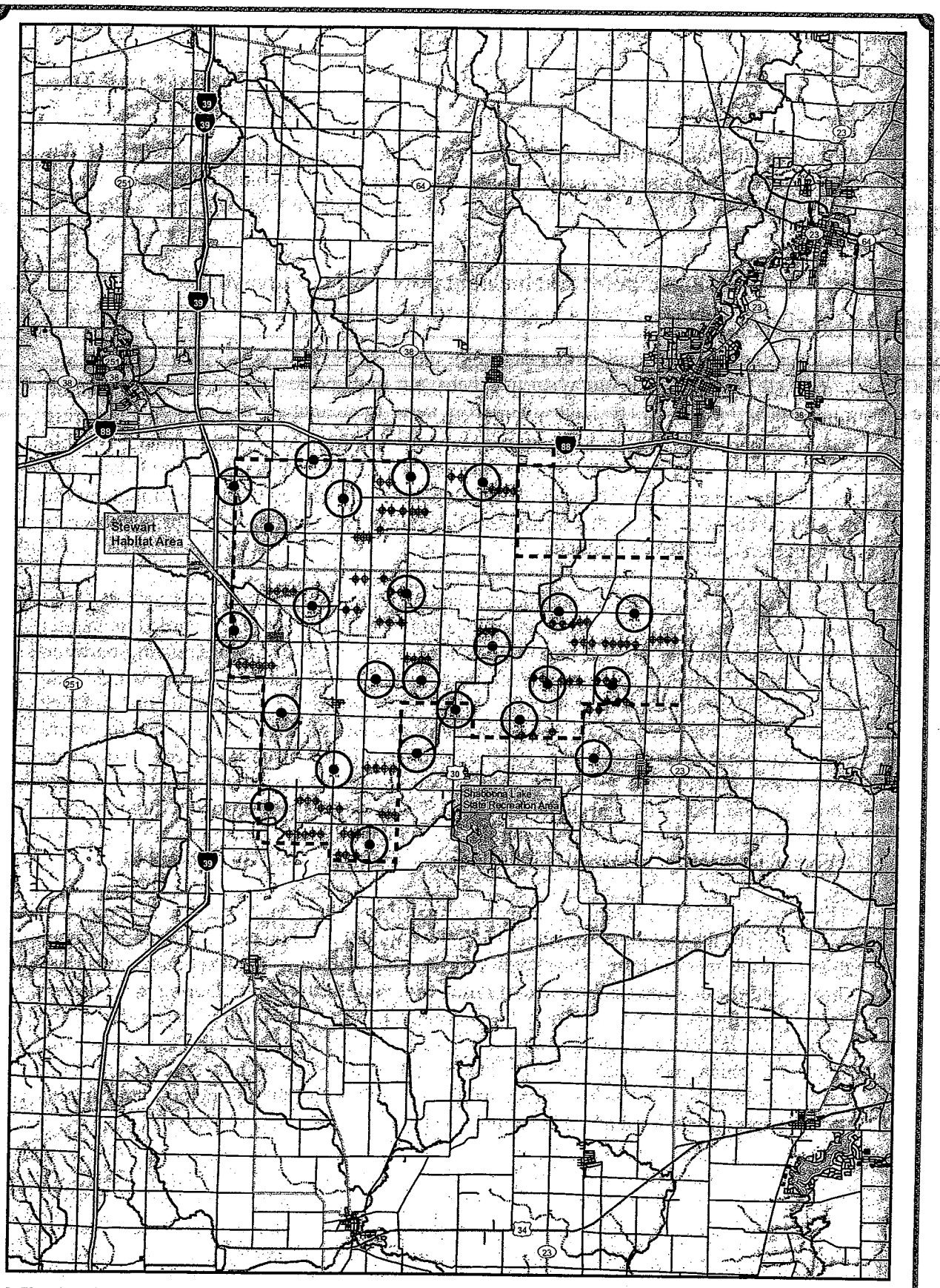


Figure 2. Lee-DeKalb Point Count Location Map

Lee and DeKalb Counties, Illinois
July 18, 2008

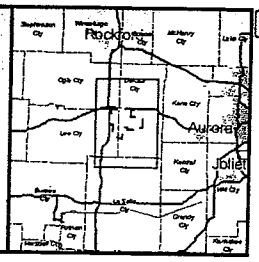
1:155,601
NAD 1983 UTM 16N

Miles
0 0.5 1 2

Proposed Turbine
Avian Survey Point
Survey Point - 800m buffer
Project Area
Water Body
State or Local Park

Perennial Stream
Intermittent Stream

Transportation
Limited Access
Highway
Major Road
Other Road



TETRA TECH EC, INC

P:\GIS_2006_PROJECTS\FPL_Lee&Dekalb\maps\AvianReport_2008\FPL_LeeDekalb_Figure2_Point_Count_Location_Map_071608.mxd - Last Accessed: 9/24/2008 - Map Scale is correct when printed at: Portrait ANSI B (11 x 17 inches)

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.

Detectability varies among species and potentially not all individuals within the 800-meter survey were 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). Birds not easily identifiable, such as those seen under low light conditions or small birds seen at a distance, were identified to the lowest taxonomic level possible. Hence, unidentified birds are presented in the results.

Incidental Observations

Incidental observations included observations that occurred 1) during travel between points, 2) before or after the official 20-minute survey period, and 3) outside the 800-meter radius circular plot. Biologists recorded these observations on separate data sheets and these data were not used in the formal analysis; however, a summary of incidental birds is presented to provide additional information about species found in the local area.

Data Quality Assurance/Quality Control

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

2.2 Analysis

Species Groupings

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

Avian Use

TtEC derived avian use (mean use) of the Lee-DeKalb WRA by calculating the average number of birds observed per 20-minute survey at each point. To evaluate the diversity and composition of avian species using the Lee-DeKalb WRA, TtEC first summarized the number of individuals (birds/20 min) and species. TtEC also calculated a measure of variability (90% confidence intervals) for all mean use values. In addition, the number of observations (obs/20 min) is also presented, where an observation can be either an individual bird or a discrete flock of birds. This information helps evaluate whether high mean use is driven by a single event (e.g., flock of birds moving through the rotor swept area). Because individual birds are not uniquely marked and identified, actual population size or abundance cannot be determined. One individual may be counted multiple times

during a survey period or across survey periods. Therefore, avian use does not equate to abundance.

Flight Behavior

TtEC evaluated flight behavior by calculating the proportion of flying birds observed below, within, or above the turbine rotor swept area (RSA). Turbines proposed for this site are GE 1.5 XLEs. Therefore, TtEC used an RSA between 38.75 and 121.25 meters above ground. TtEC considered a bird to have flown within the RSA if any of its recorded heights overlapped the RSA.

Encounter Rate

To estimate the rate at which a species flew through the anticipated RSA, TtEC applied the following equation to every species observed in the WRA:

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

where A is the mean number of birds/20 min for a given species, P_f is the proportion of all activity observations for a given species that were flying; and P_t is the proportion flying observations that were within the turbine RSA for a given species. The encounter rate provides information on the rate at which a species moves through the RSA. This information is an important component in evaluating risk; however, this number alone does not indicate risk to a species.

Encounter rate is an index of birds flying within the RSA and may not equate to actual post-construction mortality. Species with a high encounter rate are at a higher risk of collision than species with a low risk, but it does not mean that mortality is certain. Other factors such as a species ability to detect turbine blades, flight maneuverability to avoid blades, and habitat selection also influence mortality; therefore, actual mortality may be higher or lower than indicated by the encounter rate (Orloff anf Flannery 1992). Encounter rate is based on day-time observations of bird mean use and flight height. Values are sensitive to large flocks of birds flying within the RSA. Encounter rate also does not account for migrating behavior of nocturnal migrants.

Mortality estimates

TtEC has not included mortality estimates as part of this report. The statistical relationship between pre-construction avian use and post-construction mortality remains poorly defined, thereby limiting our power to predict mortality based on use. Previous studies (e.g., Johnson 2007) have documented a significant positive relationship between use and mortality for raptors; however, these studies have been based on data sets from throughout the United States, contain several statistical inconsistencies, and likely have limited applicability on a regional scale. This limited applicability is due, in large part, to the highly regional nature of avian mean use across North America (Arnett et al. 2007). Unfortunately, data on avian mortality at wind farms are lacking at regional scales in many parts of North America. Rather than attempt to draw conclusions from limited data sets, TtEC takes a conservative approach and limiting our discussion to patterns of avian use and mortality risk factors.

2.3 Raptor Nest Surveys

The purpose of raptor nest surveys is to estimate the number of active and inactive raptor nests in the project area. Biologists conducted the raptor nest survey across the project area before trees began to leaf out (26–27 December 2007) to increase visibility of raptor nests. Where possible, biologists also surveyed over an approximately 1-mile around the project area. Raptor nest surveys provide an estimate of the number and species of raptors that use stick nests in the area. Ground nesting raptor species, such as northern harriers, were not surveyed.

3.0 RESULTS

3.1 Lee-DeKalb WRA

Biologists surveyed 9,744 acres of the Lee-DeKalb WRA during point count surveys, or approximately 17 percent of the WRA. The 24 point count locations were surveyed 14 times, resulting in 336 total 20-minute surveys.

3.2 Species Composition

Biologists recorded a total of 13,564 birds of 59 identified species and 9 unidentified species groups during the 336 fixed-point count surveys (Table 2). The most frequently observed identified species were red-winged blackbird (17.6 percent of all birds observed), common grackle (12.9 percent), brown-headed cowbird (8.4 percent), American robin (5.8 percent), and horned lark (5.2 percent). Unidentified blackbirds comprised 15.1 percent of birds seen. Each remaining species and unidentified species group comprised less than 5 percent the total number of birds observed (Table 2).

3.3 Avian Use

Overall mean bird use within the Lee-DeKalb WRA during Spring 2008 was 40.37 birds/20 min, and ranged from 3 to 1,682 birds/20 min. Overall mean use by non-raptors was 40.06 birds/20 min. The non-raptors with the highest mean use were red-winged blackbird (7.10 birds/20 min), common grackle (5.19 birds/20 min), and brown-headed cowbird (3.38 birds/20 min; Table 2). These birds are all blackbirds, which tend to gather in agricultural areas in flocks; the average group size per observation for these 3 species was 4 individuals. Overall mean raptor use was 0.31 birds/20 min. The raptor with the highest mean use was the red-tailed hawk (0.13 birds/20 min).

Among species groups, mean use was highest for songbirds (32.18 birds/20 min), with the most commonly-observed songbird species being the red-winged blackbird, which accounted for 22.1 percent of observed individuals in this species group. The second most frequently-observed songbird was the common grackle (16.1 percent of songbird observations; Table 3). Every other species group had mean use of less than 1.0 bird/20 min (Table 3).

Non-raptor use of the WRA peaked early in the spring (mean use 140.75 birds/20 min on 4 April) and tapered off as summer began (15.67 birds/20 min on 28 June; Figure 3).

Non-raptor use was highest at point 10 (158.86 birds/20 min), much higher than at the second-highest point for non-raptor use (Point 12; 65.36 birds/20 min; Figure 4).

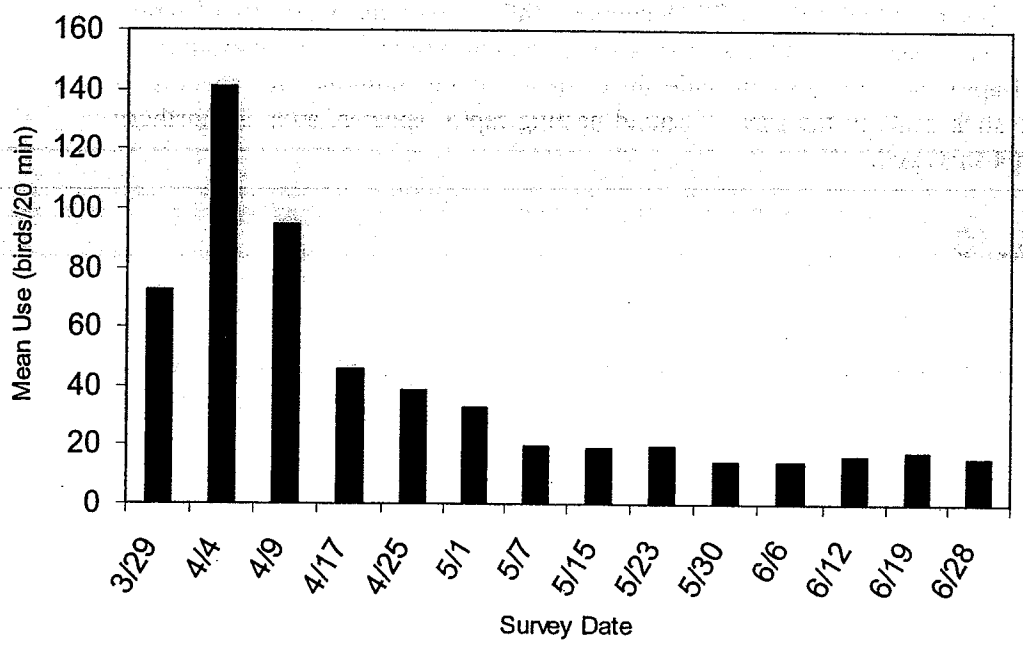


Figure 3. Mean Non-Raptor Use by Survey Date for Spring 2008 surveys at the Lee-DeKalb WRA.

Raptors are a group of special interest because of their propensity to fly at heights corresponding to a typical turbine RSA. Overall mean use for raptors was 0.31 birds/20 min. The raptor with the highest use was the red-tailed hawk (0.13 birds/20 min), followed by turkey vulture (0.07 birds/20 min). Mean use was 0.02 birds/20 min or fewer for each remaining raptor species observed: northern harrier, American kestrel, broad-winged hawk, and sharp-shinned hawk (Table 3).

No distinct temporal or spatial trends were found for raptors. The highest raptor mean use was recorded during the first survey on 29 March (0.83 birds/20 min). Although mean use on this date was almost 3 times the season-wide mean of 0.31 birds/20 min, the rest of the surveys during Spring 2008 showed no noticeable increasing or decreasing trend, as with non-raptors (Figure 5). Raptor mean use also varied spatially over the WRA ranging from 0.00–0.79 birds/20 min across point count locations (Figure 6).

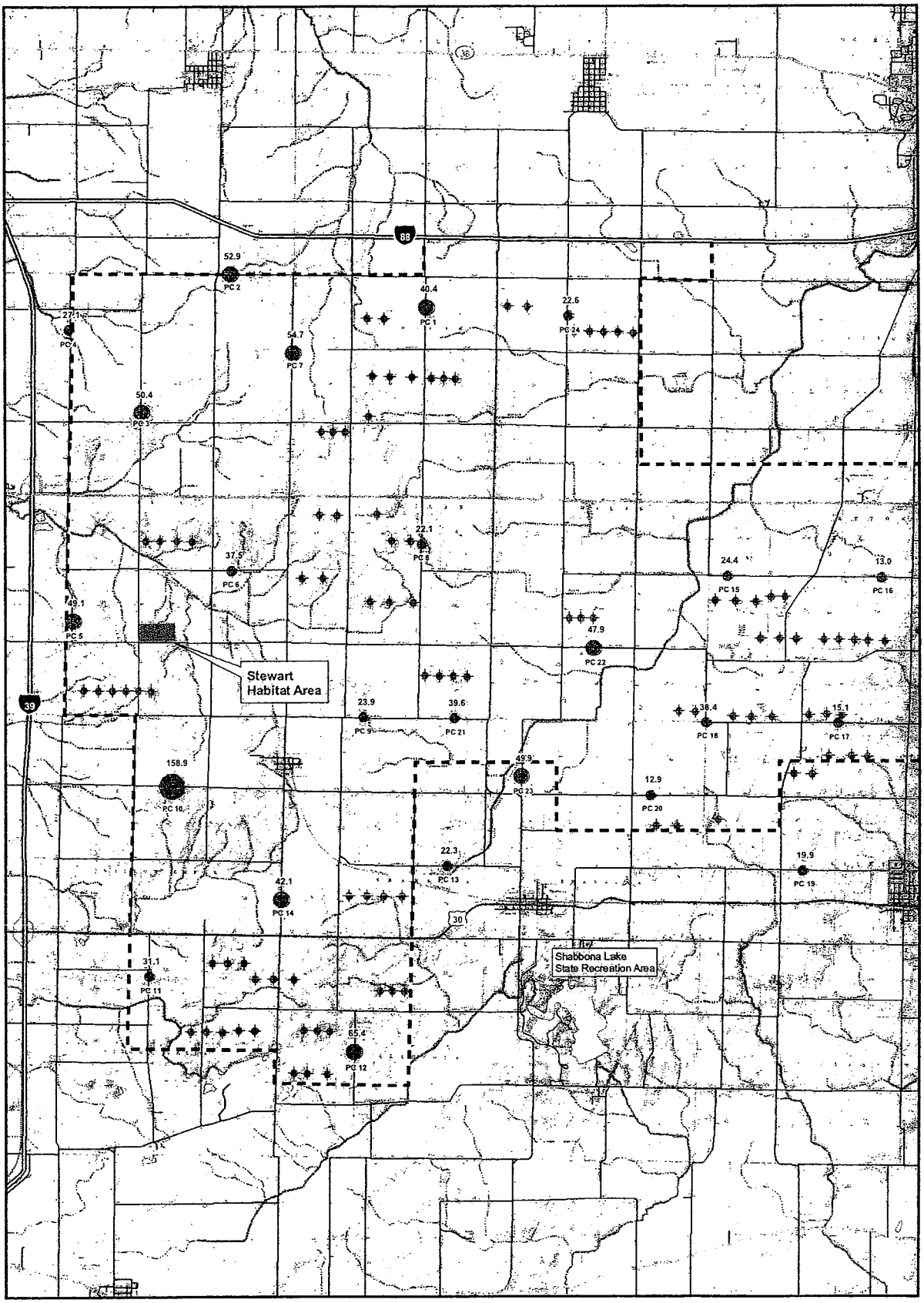


Figure 4. Lee-DeKalb Mean Non-Raptor Use by Point Count Location (spring 2008)

Lee and DeKalb Counties, Illinois

July 18, 2008

1:80,000
NAD 1983 UTM 16N

Miles
0 0.35 0.7 1.4

Non-Raptors per 20 Minutes

- 0 - 40
- 40.1 - 80
- 80.1 - 120
- 120.1 - 160

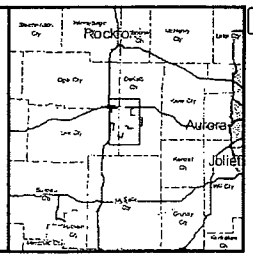
\# Mean Use Value

PC# Point Count Number

- Proposed Turbine
- Project Area
- Water Body
- Perennial Stream
- Intermittent Stream

Transportation

- Limited Access
- Highway
- Major Road
- Other Road



TETRA TECH EC, INC.

P:\GIS_2006 PROJECTS\FPL Lee&Dekalb maps\AvianReport 2008\FPL LeeDekalb Figure4 Mean NonRaptorUse by PointCount Location 071808.mxd - Last Accessed 9/22/2006 - Map Scale is correct when printed at Portrait ANSI B (11 x 17 inches)

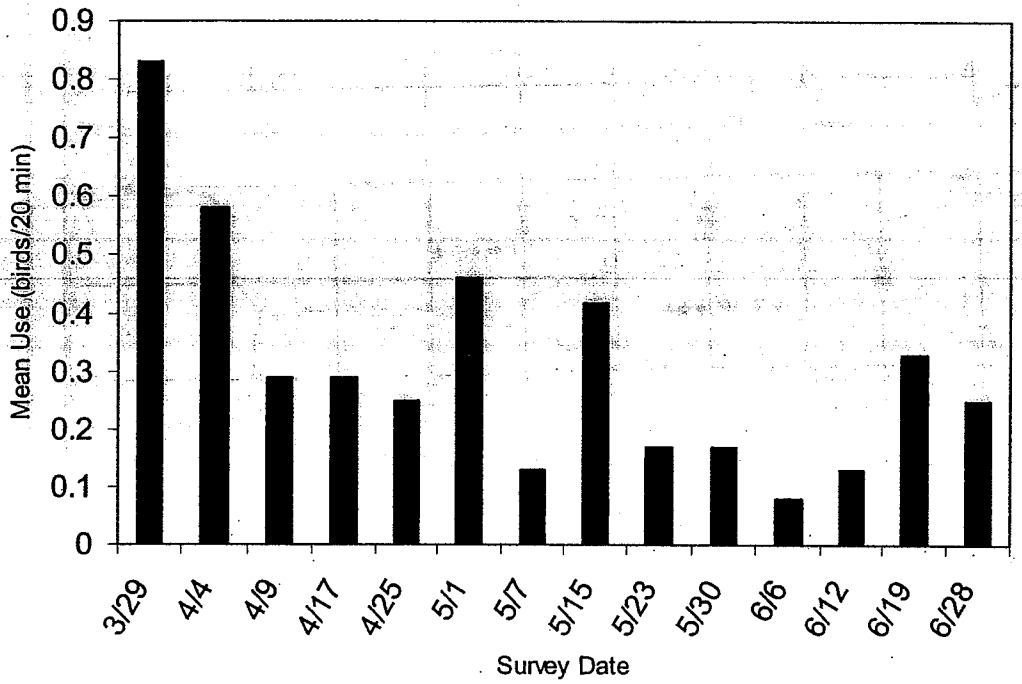


Figure 5. Mean Raptor Use by Survey Date for Spring 2008 surveys at the Lee-DeKalb WRA.

3.4 Frequency of Occurrence

Songbirds were present in the majority of surveys and were widely distributed throughout the Lee-DeKalb WRA (Table 4); the red-winged blackbird (78.3 percent of all surveys), horned lark (71.7 percent), common grackle (67.3 percent), and American robin (61.9 percent) occurred the most often (Table 3).

Raptors were not regularly observed during the spring surveys (Table 3). Among raptors, the red-tailed hawk was detected most frequently (12.2 percent of all surveys), and were also widespread throughout the Lee-DeKalb WRA, being observed at 75 percent of point count locations (Table 4). Turkey vulture was the second-most commonly observed raptor (5.1 percent of all surveys), and was present at about half of point count locations (Table 3). Other raptors observed during point counts were northern harrier, American kestrel, broad-winged hawk, and sharp-shinned hawk, all of which were detected during less than 5 percent of surveys (Table 3).

3.5 Flight Height and Encounter Rate

During spring avian use surveys, biologists collected behavioral data for 89.9 percent of all birds observed during point count surveys. Biologists observed that 62.2 percent of bird seen were flying, and they collected flight height data for 100.0 percent and flight direction 99.9 percent of observations of flying birds. For flying non-raptor species, 20.5 percent of individuals occurred within the anticipated RSA, 77.1 percent flew below the anticipated RSA, and 2.4 percent flew above the anticipated RSA. For flying raptor

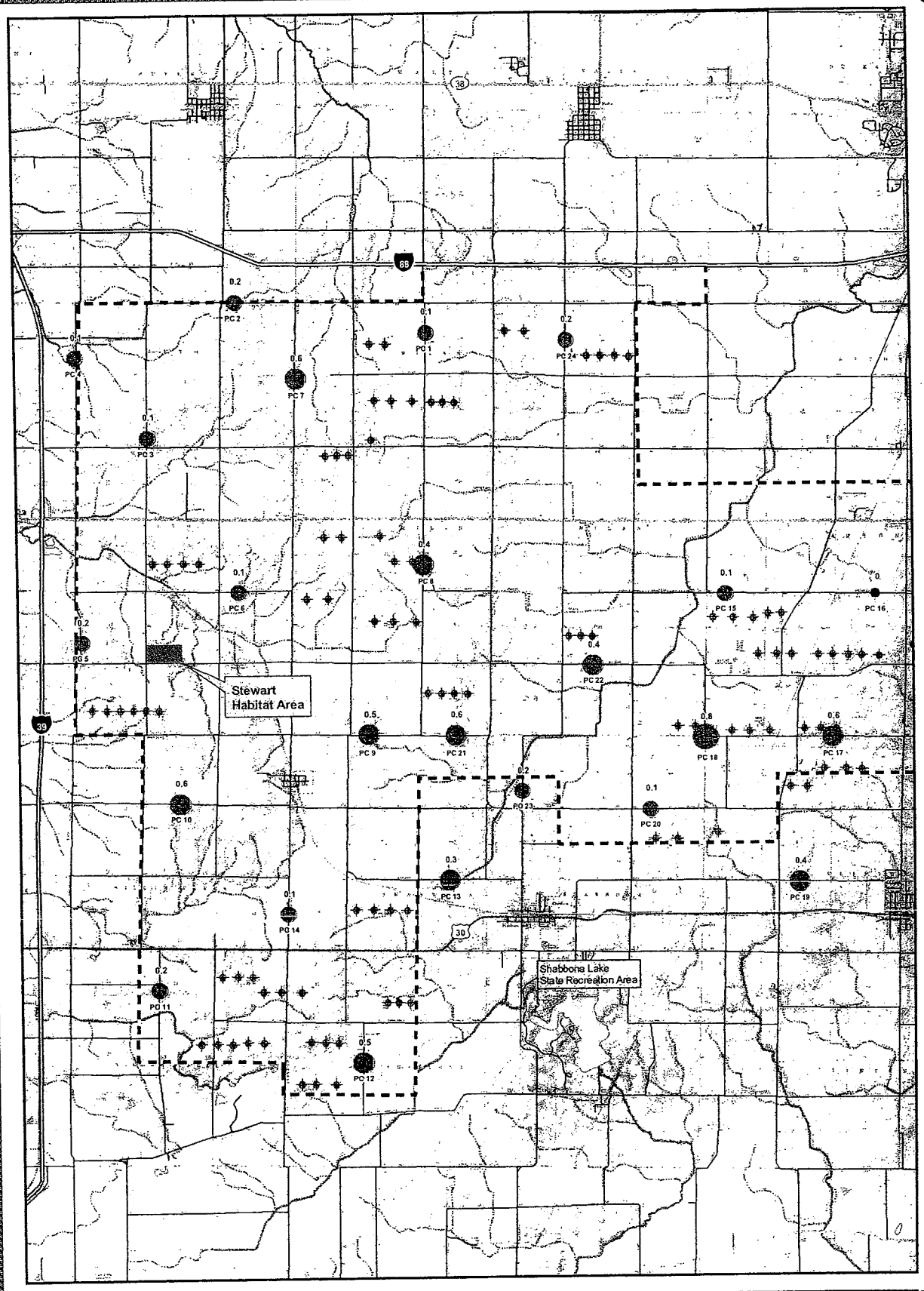


Figure 6. Lee-DeKalb Mean Raptor Use by Point Count Location (spring 2008)
Lee and DeKalb Counties, Illinois
July 18, 2008

1:80,000
NAD 1983 UTM 16N

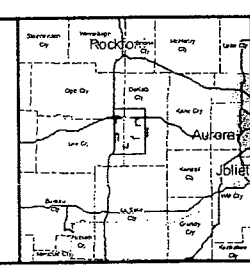
Miles
0 0.3 0.6 1.2

Raptors per 20 Minutes
- Zero
- 0.01 - .2
- .21 - .4
- .41 - .6
- .61 - .8
- Proposed Turbine

\# Mean Use Value
PC# Point Count Number

Project Area
Water Body
Perennial Stream
Intermittent Stream

Transportation
Limited Access
Highway
Major Road
Other Road



TETRA TECH EC, INC

P:\GIS_2006_PROJECTS_FPL_Lee&DeKalb.mxp\AvianReport_2008_FPL_LeeDeKalb_Figure6_Mean_RaptorUse_by_PointCount_Location_07168.mxd - Last Accessed: 9/24/2008 - Map Scale is correct when printed at: Portrait ANSI B (11 x 17 inches)

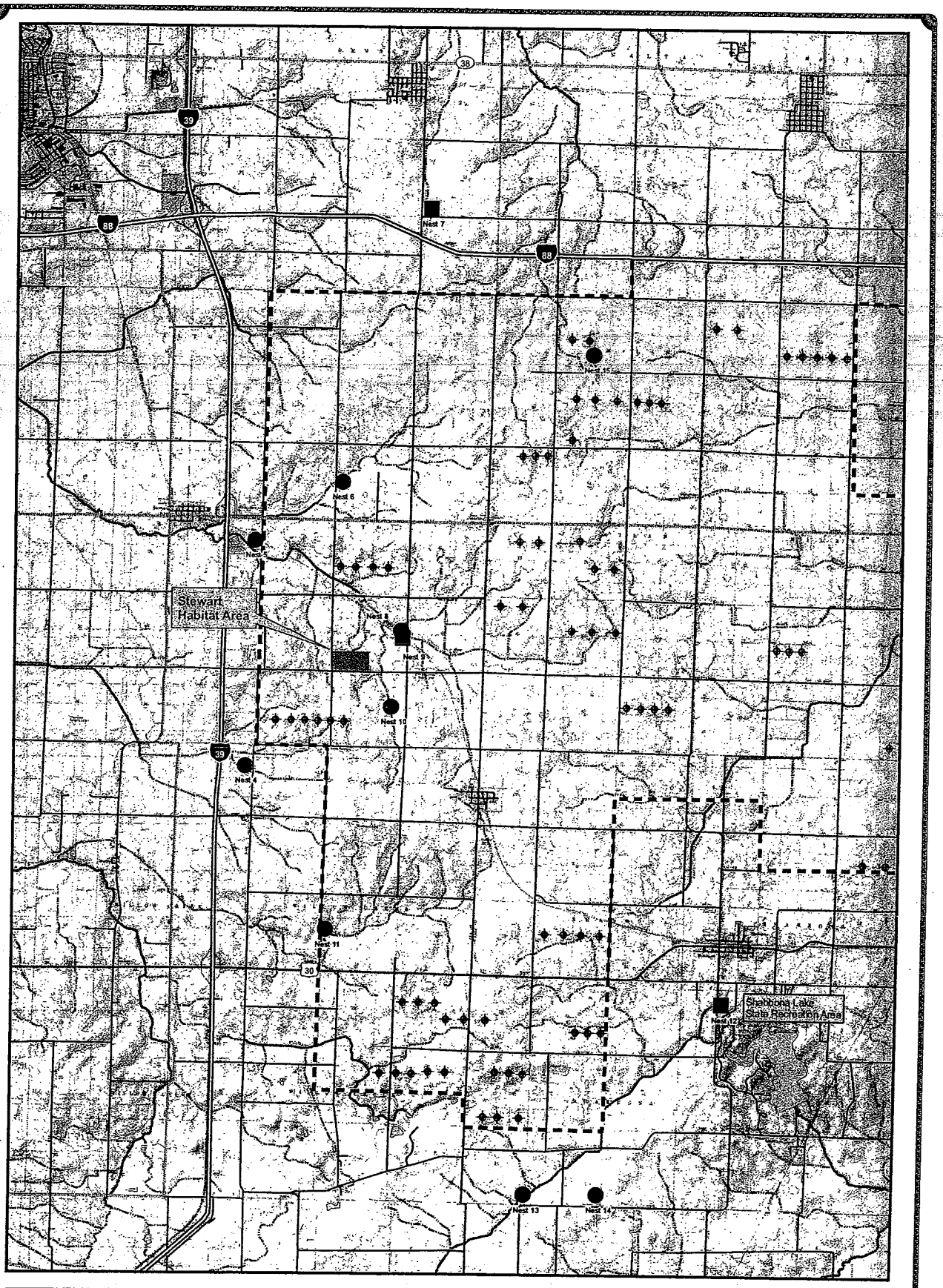


Figure 7. Lee-DeKalb Raptor Nest Locations (spring 2008)

Lee and DeKalb Counties, Illinois
July 18, 2008

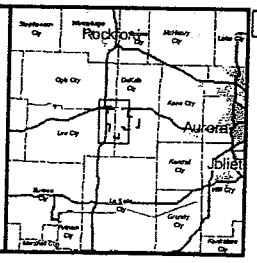
1:75,000
NAD 1983 UTM 16N

Miles
0 0.5 1 2

Raptor Nest
- Red-tailed Hawk
- Unknown
- Proposed Turbine
- Project Area
- Water Body

- Perennial Stream
- Intermittent Stream

Transportation
- Limited Access
- Highway
- Major Road
- Other Road



TETRA TECH EC, INC

GIS_2006_PROJECTS\FPL_Lee&DeKalb\maps\AvianReport_2008\FPL_LeeDeKalb_Figure7_RaptorNest_and_PrairieGrouseLec_Locations_071608.mxd - Last Accessed: 9/24/2008 - Map Scale is correct when printed at: Portrait ANSI B (11 x 17 inches)

species, 37.7 percent flew within the RSA, 46.8 percent flew below it, and 15.6 percent flew above (Table 5). Species-specific flight direction data are located in Appendix 1.

Of identifiable species, Red-winged blackbirds had the highest encounter rate (1.35 birds flying within the RSA/20 min). Common grackles had the second-highest encounter rate (0.23 birds flying within the RSA/20 min) and the Lapland longspur had the third highest encounter rate (0.11 birds flying within the RSA/20 min); all other species had encounter rates of <0.10 (Table 6).

3.6 Incidental Observations

During incidental spring surveys, biologists documented 22 species for a total of 660 birds (Table 7). Lapland longspur was the species most commonly recorded as an incidental observation within the Lee-DeKalb WRA (400 birds). Biologists documented 4 incidental species – lesser scaup, lesser yellowlegs, great egret, and belted kingfisher (in order of most to least observed) – that were not detected during spring point count surveys. Biologists observed several raptor species as incidentals that were also recorded during point counts: red-tailed hawk, American kestrel, turkey vulture, northern harrier, and sharp-shinned hawk.

3.7 Raptor Nest Surveys

During winter while trees were still without leaves, biologists identified 15 stick nests that were used by either raptors or American crows (Figure 7). Activity could not be determined because the survey was conducted during the non-breeding season. Red-tailed hawks were presumed to have constructed 9 of the nests. Nests were most commonly located in agricultural hedgerows or riparian areas.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Non-Raptor Use and Encounter Rate

Overall use by non-raptors at the Lee-DeKalb WRA was high in the spring 2008 surveys (40.06 birds/20 min). The Lee-DeKalb WRA ranked first out of 25 studies for non-raptor use rates in spring reported for existing wind energy facilities throughout the country (Table 8). Because studies of avian use do not share identical methodologies (e.g., length of survey period) and there is variance associated with the mean values, comparisons of avian use represent generalizations only. The high incidence of non-raptors at the Lee-DeKalb WRA is largely due to large flocks of red-winged blackbirds, common grackles, and brown-headed cowbirds which often congregate in large numbers in agricultural areas, such as the Lee-DeKalb WRA. Large flocks of birds moved through the Lee-DeKalb WRA in early April and although non-raptor mean use was highest at point 10, this area did not appear to have distinct features that would make it more attractive to birds.

Red-winged blackbirds had the highest encounter rate of all species observed, and they were also the most frequently observed species. Red-winged blackbirds can occur on the Lee-DeKalb WRA year-round, and were detected at all survey point locations. Red-

winged blackbird fatalities have been recorded at wind energy facilities; however, mortality rates were lower than expected based on pre-construction avian use (Kerlinger et al. 2005). Common grackles were the second-most observed species, and they had the second-highest encounter rate. They also occupy Illinois year-round and were recorded at every survey point. There are estimated to be over 9 million red-winged blackbirds and over 6 million common grackles in Illinois (PIF 2007), both species are listed as species of least concern on the IUCN Red List (NatureServe 2008), and neither of these species is expected to draw much concern by regulatory agencies. Neither is considered threatened or endangered either federally or at the state level. In addition, red-winged blackbirds and common grackles are often regarded as agricultural pests and are subject to population control in some areas (Linz et al. 1996).

4.2 Raptor Use and Encounter Rate

Overall raptor use at the Lee-DeKalb WRA was moderate (0.31 birds/20 min) compared to other species groups in the spring 2008 surveys; they were fifth after songbirds, shorebirds, pigeons and doves, and waterfowl. The Lee-DeKalb WRA ranked thirtieth out of 36 studies that reported spring raptor use at existing wind energy facilities throughout the country (Table 8).

Red-tailed hawks were the major contributor to overall raptor use. They are year-round residents in Illinois (Preston and Beane 1993), and were observed frequently. Although red-tailed hawks had the highest encounter rate of all raptors (0.03 birds flying within the RSA/20 min), this encounter rate is still relatively low for the WRA. Mortality of red-tailed hawks due to collisions with wind turbines has been documented at multiple sites (Johnson et al. 2002, Erickson et al. 2004, Erickson 2007), and may be higher than expected from pre-construction avian use surveys (Orloff and Flannery 1992); therefore, red-tailed hawk mortality events may occur at the Lee-DeKalb WRA. However, the overall low mean use of red-tailed hawks within the WRA coupled with a large population in Illinois (approximately 25,000 birds; PIF 2007) makes it unlikely that mortality of red-tailed hawks will have population-level impacts.

Turkey vultures, northern harriers, American kestrels, broad-winged hawks, and sharp-shinned hawks (in order of decreasing abundance) were also observed at the Lee-DeKalb WRA, all with low encounter rates of <0.30 birds flying within the RSA/20 min (Table 6). No raptors observed during the spring 2008 surveys are federal-listed, although the northern harrier is state-listed in Illinois as endangered.

4.3 Comparison to Fall 2007 Results

In Fall 2007, surveys were performed at 14 locations weekly (spring = 24 locations weekly) from 30 August to 16 November, for a total of 168 surveys. Fewer species were observed in Fall 2007 (47 identified species) than in Spring 2008 (59 species), although mean use was higher in Fall (56.08 birds/20 min) than in Spring (40.37 birds/20 min). Many species were unique to the season; fifteen species were seen in Fall 2007 that were not recorded during point counts in Spring 2008, and there were 27 seen in Spring 2008

that were not seen in Fall 2007. Overall mean non-raptor use was higher in Fall 2007 (55.5 birds/20 min) than in Spring 2008 (40.08 birds/20 min), as was overall mean raptor use (fall = 0.54 birds/20 min; spring = 0.31 birds/20 min).

Songbirds were the most commonly detected species group in both seasons, and the most commonly-observed species were similar, with blackbirds being the most numerous. The most commonly-observed species in Fall 2007 were brown-headed cowbird (26.8 percent of individuals observed), European starling (23.7 percent), red-winged blackbird (6.0 percent), and Canada goose (4.6 percent). Though the most commonly-observed species are not exactly the same as in Spring 2008, in both seasons, agricultural species such as blackbirds make up the majority of observations.

A slightly higher percentage of raptors flying within the RSA was seen in Spring 2008 (37.7 percent) compared to Fall 2007 (30.8 percent). However, more than three times the percentage of non-raptors were flying within the RSA in Spring 2008 (20.5 percent) than in Fall 2007 (4.5 percent).

In summary, avian use at the Lee-DeKalb WRA is high in fall and spring and is characterized by large numbers of birds associated with agriculture, especially blackbirds, which are numerous and widely distributed in Illinois. Raptor use overall is moderate and the red-tailed hawk, a common and widespread species, accounts for most individuals. Further, the apparent differences between the Spring 2008 and Fall 2007 survey results imply that the risk of turbine-related mortality for birds using the Lee-DeKalb WRA will be seasonal.

4.4 Listed and Sensitive Species

No federal or state threatened or endangered avian species were recorded during surveys. The northern harrier, which is state-listed as endangered, was recorded 7 times during point counts and an additional 5 times as an incidental. Endangered is defined as "any species which is in danger of extinction as a breeding species in Illinois" (IESPB 2006). The northern harrier is a migratory species that is common across much of North America, with a habitat preference for open fields and wetlands. This species is often observed flying low over open fields in search of prey. During spring 2008 surveys, all individuals observed were flying below the RSA. Due to flight behavior, the mortality risk posed by turbines to this species is low, an opinion supported by data from previous studies (e.g., Orloff and Flannery 1992). The observation dates of northern harriers in spring 2008 suggests that the birds were migrants and not local breeders because they were not detected after April 29, 2009 and the breeding season extends into July.

The sandhill crane is state-listed as threatened, which is defined as "likely to become a state endangered species within the foreseeable future in Illinois" (IESPB 2006). This species was observed both during point counts (26 individuals) and as an incidental (25 individuals). Sandhill cranes breed in Canada, Alaska, and around the Great Lakes, and winter in Texas, northern Mexico, and Florida. Cranes are large birds that are less maneuverable than many other species, and collisions of whooping cranes, a similar

species to sandhill cranes, with power lines contribute substantially to mortality during migration (CWS & USFWS 2005, Manville 2005). During the Spring 2008 surveys, none of the sandhill cranes observed were flying in the RSA., and no new power lines will be developed within the Lee-Dekalb WRA. Illinois state threatened and endangered species are protected by the Illinois Endangered Species Protection Act, which prohibits take or possession of any listed species (ILCS 2000).

4.5 Lee-DeKalb Project Area Conclusions and Recommendations

Non-raptor mean use at the Lee-DeKalb WRA ranked first of 25 studies, which is attributed to large congregations of blackbirds commonly associated with agricultural fields (i.e., red-winged blackbirds, common grackles, and brown-headed cowbirds). Although mortality events will likely occur at the Lee-DeKalb WRA, the most commonly observed species are all abundant, widespread species with stable populations (PIF 2007); therefore, individual mortalities are unlikely to have population-level consequences or receive a high level of scrutiny from state of federal wildlife agencies. Nocturnal migrants may pass through the Lee-DeKalb WRA and would not be detected by the survey methods used in this study if the birds did not stop-over within the WRA. However, mortality of nocturnal migrants at the Lee-DeKalb WRA is not expected to have population-level implications because less than 0.01 percent of nocturnal migrants that fly through wind farms are killed (Erickson 2007).

- Raptor use at the Lee-DeKalb WRA was low when compared to other wind generation facilities (Table 8). Low raptor use at the Lee-DeKalb WRA suggests that raptor mortality may be low; however, mortality rates are variable among species, and pre-construction mean use surveys may not equate to or correspond with post-construction mortality. Red-tailed hawks were the most common raptor observed at the Lee-DeKalb WRA, although their numbers were still relatively low. Red-tailed hawk mortalities have occurred at wind farms (Kerns and Kerlinger 2004, Anderson et al. 2005, Kerlinger et al. 2005); however, the low mean use and stable populations make it unlikely that mortalities will have a population-level effect.

5.0 REFERENCES

Anderson, R., J. Tom, N. Neumann, W. P. Erickson, M. D. Strickland, M. Bourasse, K. J. Bay, and K. J. Sernka. 2005. Avian monitoring and risk assessment at the San Gorgonio Wind Resource Area. Technical report prepared by State Energy Resources Conservation and Development Commission and Western EcoSystems Technology, Inc. for National Renewable Energy Laboratory. Golden, CO.

Arnett, E. B., D. B. Inkley, D. H. Johnson, R.P. Larkin, S. Manes, A. M. Manville, J. R. Mason, M. L. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, MA, USA.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested practices for avian protection on power lines: The state of the art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington,, DC, and Sacramento, CA.

APLIC (Avian Power Line Interaction Committee) and USFWS (U.S. Fish and Wildlife Service). 2005. Avian protection plan guidelines. Edison Electric Institute, APLIC, and the U.S. Fish and Wildlife Service.

Ballam, J. M. 1984. The use of soaring by the red-tailed hawk (*Buteo jamaicensis*). Auk 3:519-524.

Birdnature. 2001. North American Migration Flyways. http://www.birdnature.com/flyways.html. Accessed 7.14.08.

CWS (Canadian Wildlife Service) and USFWS (United States Fish and Wildlife Service). 2005. International recovery plan for the whooping crane. Recovery of Nationally Endangered Wildlife, Ottawa, Canada, and U.S. Fish and Wildlife Service, Albuquerque, New Mexico, USA. 162 pp.

Drewitt, A. L. and R. H. W. Langston. 2006. Assessing the impacts of wind farms on birds. Ibis 148:29-42.

Erickson, W. P. 2007. Summary of methods and results for prediction and estimation of impacts and risk. Presented at NWCC Probability of Impact Workshop, 13 November 2007, Golden, CO.

Erickson, W. P., G. D. Johnson, and D. P. Young, Jr. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Final Report, July 2001 – December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W. P., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003a. Wildlife Baseline Study for the Wild Horse Wind Project, Summary of Results from 2002-2003 Wildlife Surveys. Prepared for Zilkha Renewable Energy, Portland, OR.

Erickson, W., J. Jeffery, D. Young, K. Bay, R. Good, and K. Sernka. 2003b. Wildlife Baseline Study for the Kittitas Valley Wind Project. Prepared for Zilkha Renewable Energy. January 2003.

Erickson, W. P., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind

developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, OR.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young Jr., K. J. Sernka, and R. E. Good. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee, Washington, DC.

Evans, W. R., Y. Akashi, N. S. Altman, and A. M. Manville II. 2007. Response of night-migrating birds in cloud to colored and flashing light: a report to the Communications Tower Working Group. January.

ICLS (Illinois Compiled Statutes). 2000. Illinois Endangered Species Protection Act. Illinois Compiled Statutes, Chapter 520 Wildlife, ILCS 10 Illinois Endangered Species Protection Act. http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1730&ChapAct=520%26nbsp%3BILCS%26nbsp%3B10%2F&ChapterID=43&ChapterName=WILDLIFE&ActName=Illinois+Endangered+Species+Protection+Act%2E. Accessed 7.23.08.

IESPB (Illinois Endangered Species Protection Board). 2006. 2006 Endangered and threatened species list. dnr.state.il.us/espb/datelist.htm. Accessed 7.18.08.

IOS (Illinois Ornithological Society). 2006. Birds of Illinois. http://www.illinoisbirds.org/birds_of_illinois1.html. Accessed 7.14.08.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual report for the Maple Ridge wind power project postconstruction bird and bat fatality study – 2006. Prepared by Curry and Kerlinger, LLC for PPM Energy, Horizon Energy, and Technical Advisory Committee for the Maple Ridge project.

Jefferey, J. D., Poulton, V. K., Bay, K. J., Flaig, K. F., Roderick, C. C., Erickson, W. P., and J. E. Baker. 2007. Wildlife and Habitat Baseline Study for the Proposed Vantage Wind Power Project, Kittitas County Washington. Prepared for Invenergy. August 2007.

Johnson, G. D. 2007. Cumulative impacts analysis for birds and bats from existing and permitted wind energy projects in Klickitat County, Washington. Technical report submitted to Windy Point Partners.

Johnson, G. D., and W. P. Erickson. 2004. Analysis of Potential Wildlife/Wind Plant interactions Bighorn Site Klickitat County Washington. Prepared for CH2M Hill. August 2004.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2007a. Collision mortality of local and migrant birds at a large-scale wind-power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30(3): 879-887.

Johnson, G. D., J. Jeffery, J. Baker, and K. Bay. 2007b. Baseline Avian Studies for the Windy Flats Wind Energy Project, Klickitat County Washington. Prepared for Windy Point Partners. May 2007.

Johnson, G. D., V. Poulton, and K. Bay. 2007c. Baseline Ecological Studies for the Sand Ridge Wind Energy Project Klickitat County Washington. Prepared for Northwest Wind Partners. April 2007.

Johnson, G. D., J. Baker, and K. Bay. 2007d. Baseline Ecological Studies for the Lower Linden Ranch Wind Energy Project Klickitat County Washington. Prepared for Northwest Partners. July 2007.

Johnson, G. D., W. P Erickson, and J. D. Jeffrey. 2006a. Analysis of Potential Wildlife Impacts from the Windy Point Wind Energy Project, Klickitat County, Washington. Technical Report prepared by Western EcoSystems Technology, Inc., for Ecology and Environment, Portland, Oregon.

Johnson, G. D., Jeffery, J., Poulton, V., and K. Baker. 2006b. Baseline Ecological Studies for the Hoctor Ridge Wind Energy Project Klickitat County Washington. Prepared for Windtricity Ventures. August 2006.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30: 879-887.

Johnson, G. D., D. P. Young Jr., W. P. Erickson, C. E. Derby, M. D. Strickland, and R. E. Good. 2000. Wildlife Monitoring Studies, SeaWest Windpower Project, Carbon County, Wyoming 1995–1999. Technical Report prepared by Western EcoSystems Technology, Inc., for SeaWest Energy Corporation and Bureau of Land Management.

Kerlinger, P., L. Culp, and R. Curry. 2005. Post construction avian monitoring study for the High Winds wind power project. Solano County, California. Prepared for High Winds, LLC. FPL Energy.

Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: annual report for 2003. Technical report prepared by Curry and Kerlinger, LLC. For FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Kronner, K., Gritski, B., Baker, J., Marr, V., Johnson, G., and B. Kimberly. 2005a. Wildlife Baseline Study for the Learning Juniper Wind Power Project Gilliam County Oregon. Prepared for PPM Energy and CH2M Hill. November 2005.

Kronner, K., Gritski, B., Baker, J., Marr, V., Johnson, G., Kimberl, B., Good, R., and E. Lack. 2005b. Ecological Baseline Stidies and Wildlife Impact Accessment for

the White Creek Wind Power Project. Prepared for Last Mile Electric Cooperative. February 2005.

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

Leddy, K. L., K. F. Higgins, and D. E. Naugle. 1999. Effects of wind turbines on upland nesting birds in CRP grasslands. Wilson Bulletin 111:100-104.

Linz, G. M., R. A. Dolbeer, J. J. Hanzel, and L. E. Huffman. 1996. Controlling blackbird damage to sunflower and grain crops in the northern Great Plains. United States Department of Agriculture, Animal and Plant Health Inspection Service, Agriculture Information Bulletin No. 679. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/blkbird/index.htm (Version 16JUL97).

Mabee, T.J., B.A. Cooper, and C. Grinnell. 2005. Baseline Avian Use at the Klondike III Wind Project, Oregon, Spring 2004/2005. Prepared by ABR, Inc.—Environmental Research and Services for David Evans & Associates, Inc. 22 p.

Macwhirter, R. B., and K. L. Bildstein. 1996. Northern harrier (*Circus cyaneus*), the birds of North America online. Cornell Lab of Ornithology, Ithaca, NY. http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/210.

Manville, A. M. 2005. Bird strikes and electrocutions at power lines, communication towers, and wind turbines: state of the art and state of the science – next steps toward mitigation. USDA Forest Service General Technical Report PSW-GTR-101: 1051–1064.

NatureServe. 2008. NatureServe explorer: an online encyclopedia of life. http://www.natureserve.org/explorer/. Accessed 7.15.08

Orloff, S., and A. Flannery. 1992. Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final report prepared by Biosystems Analysis, Inc. for Alameda, Contra Costa, and Solano Counties and the California Energy Commission.

PIF (Partners in Flight). 2007. Landbird population estimates database. http://www.rmbo.org/pif_db/laped/default.aspx. Accessed 7.15.08.

Pickwell, B. 1931. The prairie horned lark. St. Louis Academy of Sciences Transactions 27: 1-153.

Pitman, J. C., C. A. Hagen, R. J. Robel, T. M. Loughin, and R. D. Applegate. 2005. Location and success of lesser prairie-chicken nests in relation to vegetation and human disturbance. Journal of Wildlife Management 69:1259–1269.

Pollock, J. 2008. Bird species of state conservation concern. Illinois Steward 17.

Preston, C. R., and R. D. Beane. 1993. Red-tailed hawk (*Buteo jamaicensis*). The birds of North America online. Cornell Lab of Ornithology, Ithaca, NY. http://bna.birds.cornell.edu/bna/species/052. Accessed 7.21.08.

Strickland, D., and M. L. Morrison. 2008. A summary of avian/wind facility interactions in the U.S. Federal Guidelines Committee for Wind Siting Guidelines, February 26, 2008, Washington, DC.

Thompson, W. L. 2002. Towards reliable bird surveys: accounting for individuals present but not detected. Auk 119:18-25.

TtEC (Tetra Tech EC). 2008. Fall avian survey – DeKalb and Lee Wind Resource Area, DeKalb and Lee Counties, Illinois. January.

URS Corporation and WEST, Inc. 2001. Avian Baseline Study for the Stateline Project. Prepared for ESI Vansycle Partners, L.P.

URS Corporation, WEST, Inc., and Northwest Wildlife Consultants. 2001. Final Report – Ecological Baseline Study for the Condon Wind Project. Prepared for Bonneville Power Administration and SeaWest Windpower, Inc.

USCI & BLM (U.S. Department of the Interior, Bureau of Land Management, Twin Falls District, Burley Field Office). 2005. Draft Environmental Impact Statement for the Proposed Cotterel Wind Power Project and Draft Resource Management Plan Amendment, Burley, Cassia County, Idaho.

USFWS (United States Fish and Wildlife Service). 2008. Flyways. http://flyways.us/flyways/mississippi. Accessed 7.14.08.

Welch, R., and L. Schleder. 2006. Wildlife Assessment for the Shepherds Flat Wind Farm. Prepared for Lifeline Renewable Energy. November 2006.

WEST (Western EcoSystems Technology Inc.). 2005a. Wildlife and Habitat Baseline Study for the proposed Biglow Canyon wind power project, Sherman County, Oregon. Prepared for Orion Energy LLC. 66 p.

WEST (Western EcoSystems Technology Inc.). 2005b. Ecological Baseline Study at the Elkhorn Wind Power Project. Prepared fro Zikha Renewable Energy. June 2005.

WEST (Western EcoSystems Technology Inc.) and NWC (Northwest Wildlife Consultants). 2004. Stateline wildlife monitoring final report. July 2001-December 2003. Prepared for FPLE, Stateline Technical Advisory Committee, and Oregon Department of Energy.

Young, D. P., Victoria, K. P., and K. Bay. 2007a. Ecological Baseline Studies Report Proposed Bry Lake Wind Project Navajo County Arizona. Prepared for PPM Energy. June 20.

Young, D. P., Johnson, G. D., Poulton, V. K., and K. Bay. 2007b. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project Shasta County California. Prepared fro Hatchet Ridge Wind. August 2007.

Young, D. P. Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and G. D. Johnson. 2003. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Wind Power Project, Carbon County, Wyoming: November 1998 - June 2002. Technical Report prepared by WEST, Inc. for Pacificorp, Inc., SeaWest Windpower, Inc. and Bureau of Land Management. 35 pp.

Young, D., W. Erickson, K. Bay, R. Good, and K Kronner. 2002a. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report prepared for Bonneville Power Administration.

Young, D., W. Erickson, J. D. Jeffery, K. Bay, and M. Bourassa. 2002b. Avian and Sensitive Species Baseline Study Plan and Interim Report TPC Combine Hills Turbine Ranch Umatilli County Oregon. Prepared for Tomen Power Corporation USA. August 2002.

Jessica Piasecke	7-21-08
Report Author	Date
Karl L, Kosciuch, Ph.D.	7/22/08
Peer Review #1	Date
Jason Jones, Ph.D.	7/23/08
Peer Review #2	Date

Table 1. Lee-Dekalb Wind Resource Area, Spring 2008 point count survey dates.

Survey number	Date
1	March 28
1	March 29
2	April 2
2	April 4
3	April 4
3	April 8
3	April 9
4	April 14
4	April 17
5	April 24
5	April 25
6	April 29
6	May 1
7	May 6
7	May 7
8	May 15
8	May 16
9	May 22
9	May 23
10	May 19
10	May 29
10	May 30
11	June 4
11	June 6
12	June 10
12	June 12
13	June 18
13	June 19
14	June 26
14	June 28

Species	Number of Birds	Number of Obs	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
red-winged blackbird	2386	556	7.10 (3.69 - 10.51)	78.3	17.6%
unidentified blackbird	2054	112	6.11 (3.80 - 8.42)	27.1	15.1%
unidentified bird	1931	23	5.75 (2.84 - 8.66)	6.3	14.2%
common grackle	1744	410	5.19 (2.64 - 7.74)	67.3	12.9%
brown-headed cowbird	1137	260	3.38 (0.69 - 6.07)	54.2	8.4%
American robin	789	319	2.35 (2.02 - 2.68)	61.9	5.8%
horned lark	708	352	2.11 (1.77 - 2.45)	71.7	5.2%
European starling	642	164	1.91 (1.26 - 2.56)	37.5	4.7%
vesper sparrow	249	167	0.74 (0.65 - 0.83)	45.8	1.8%
barn swallow	190	99	0.57 (0.47 - 0.67)	27.4	1.4%
killdeer	189	164	0.56 (0.49 - 0.63)	41.1	1.4%
Lapland longspur	151	9	0.45 (-0.07 - 0.97)	2.1	1.1%
eastern meadowlark	125	115	0.37 (0.31 - 0.43)	31.0	0.9%
mourning dove	114	66	0.34 (0.27 - 0.41)	17.9	0.8%
song sparrow	112	102	0.33 (0.28 - 0.38)	28.3	0.8%
house sparrow	109	51	0.32 (0.22 - 0.42)	14.3	0.8%
American goldfinch	80	64	0.24 (0.18 - 0.30)	16.4	0.6%
tree swallow	74	38	0.22 (0.16 - 0.28)	11.3	0.5%
rock pigeon	71	32	0.21 (0.14 - 0.28)	9.5	0.5%
northern cardinal	66	65	0.20 (0.16 - 0.24)	19.3	0.5%
unidentified duck	55	12	0.16 (0.02 - 0.30)	3.3	0.4%
red-tailed hawk	45	43	0.13 (0.10 - 0.16)	12.2	0.3%
northern flicker	44	43	0.13 (0.10 - 0.16)	12.2	0.3%
mallard	44	23	0.13 (0.08 - 0.18)	6.3	0.3%
American crow	40	31	0.12 (0.08 - 0.16)	8.9	0.3%
Canada goose	32	12	0.10 (0.04 - 0.16)	3.6	0.2%
savannah sparrow	31	26	0.09 (0.06 - 0.12)	7.7	0.2%

Table 2. Avian species observed during Spring point count surveys at the Lee-DekalbWind Resource Area, 2008.

Species	Number of Birds	Number of Obs.	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
chipping sparrow	30	29	0.09 (0.06 - 0.12)	8.6	0.2%
sandhill crane	26	4	0.08 (-0.02 - 0.18)	1.2	0.2%
house finch	26	19	0.08 (0.05 - 0.11)	5.7	0.2%
unidentified shorebird	25	1	0.07 (-0.05 - 0.19)	0.3	0.2%
brown thrasher	24	24	0.07 (0.05 - 0.09)	6.8	0.2%
turkey vulture	23	18	0.07 (0.04 - 0.10)	5.1	0.2%
chimney swift	21	15	0.06 (0.03 - 0.09)	4.5	0.2%
unidentified buteo	17	16	0.05 (0.03 - 0.07)	4.2	0.1%
eastern kingbird	17	14	0.05 (0.02 - 0.08)	3.9	0.1%
blue jay	14	13	0.04 (0.02 - 0.06)	3.9	0.1%
bobolink	13	11	0.04 (0.02 - 0.06)	3.0	0.1%
northern shoveler	10	4	0.03 (0.00 - 0.06)	1.2	0.1%
common yellowthroat	9	6	0.03 (0.01 - 0.05)	1.8	0.1%
house wren	8	8	0.02 (0.01 - 0.03)	2.4	0.1%
great blue heron	8	7	0.02 (0.00 - 0.04)	2.1	0.1%
dickcissel	8	8	0.02 (0.01 - 0.03)	2.4	0.1%
bank swallow	8	3	0.02 (0.00 - 0.04)	0.9	0.1%
northern harrier	7	7	0.02 (0.01 - 0.03)	1.8	0.1%
ring-necked pheasant	6	6	0.02 (0.01 - 0.03)	1.8	0.0%
American kestrel	6	6	0.02 (0.01 - 0.03)	1.8	0.0%
unidentified sparrow	5	4	0.01 (0.00 - 0.02)	1.2	0.0%
red-bellied woodpecker	5	5	0.01 (0.00 - 0.02)	1.5	0.0%
palm warbler	3	3	0.01 (0.00 - 0.02)	0.9	0.0%
common snipe	3	1	0.01 (0.00 - 0.02)	0.3	0.0%
cedar waxwing	3	2	0.01 (0.00 - 0.02)	0.6	0.0%
blue-winged teal	3	1	0.01 (0.00 - 0.02)	0.3	0.0%
broad-winged hawk	3	2	0.01 (0.00 - 0.02)	0.6	0.0%

Species	Number of Birds	Number of Obs	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
unidentified hawk	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
unidentified gull	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
sharp-shinned hawk	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
snow bunting	2	1	0.01 (0.00 - 0.02)	0.3	0.0%
purple martin	2	1	0.01 (0.00 - 0.02)	0.3	0.0%
grasshopper sparrow	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
gray catbird	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
yellow warbler	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
unidentified swallow	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
spotted sandpiper	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
indigo bunting	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
eastern bluebird	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Baltimore oriole	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
American coot	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Grand Total	**13564**	**3614**	**40.37** (30.88-49.86)		

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
Songbirds					
red-winged blackbird	2386	556	7.10 (3.69 - 10.51)	78.3	17.6%
unidentified blackbird	2054	112	6.11 (3.80 - 8.42)	27.1	15.1%
common grackle	1744	410	5.19 (2.64 - 7.74)	67.3	12.9%
brown-headed cowbird	1137	260	3.38 (0.69 - 6.07)	54.2	8.4%
American robin	789	319	2.35 (2.02 - 2.68)	61.9	5.8%
horned lark	708	352	2.11 (1.77 - 2.45)	71.7	5.2%
European starling	642	164	1.91 (1.26 - 2.56)	37.5	4.7%
vesper sparrow	249	167	0.74 (0.65 - 0.83)	45.8	1.8%
barn swallow	190	99	0.57 (0.47 - 0.67)	27.4	1.4%
Lapland longspur	151	9	0.45 (-0.07 - 0.97)	2.1	1.1%
eastern meadowlark	125	115	0.37 (0.31 - 0.43)	31.0	0.9%
song sparrow	112	102	0.33 (0.28 - 0.38)	28.3	0.8%
house sparrow	109	51	0.32 (0.22 - 0.42)	14.3	0.8%
American goldfinch	80	64	0.24 (0.18 - 0.30)	16.4	0.6%
tree swallow	74	38	0.22 (0.16 - 0.28)	11.3	0.5%
northern cardinal	66	65	0.20 (0.16 - 0.24)	19.3	0.5%
savannah sparrow	31	26	0.09 (0.06 - 0.12)	7.7	0.2%
chipping sparrow	30	29	0.09 (0.06 - 0.12)	8.6	0.2%
house finch	26	19	0.08 (0.05 - 0.11)	5.7	0.2%
brown thrasher	24	24	0.07 (0.05 - 0.09)	6.8	0.2%
eastern kingbird	17	14	0.05 (0.02 - 0.08)	3.9	0.1%
bobolink	13	11	0.04 (0.02 - 0.06)	3.0	0.1%
common yellowthroat	9	6	0.03 (0.01 - 0.05)	1.8	0.1%

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
house wren	8	8	0.02 (0.01 - 0.03)	2.4	0.1%
dickcissel	8	8	0.02 (0.01 - 0.03)	2.4	0.1%
bank swallow	8	3	0.02 (0.00 - 0.04)	0.9	0.1%
unidentified sparrow	5	4	0.01 (0.00 - 0.02)	1.2	0.0%
palm warbler	3	3	0.01 (0.00 - 0.02)	0.9	0.0%
cedar waxwing	3	2	0.01 (0.00 - 0.02)	0.6	0.0%
snow bunting	2	1	0.01 (0.00 - 0.02)	0.3	0.0%
purple martin	2	1	0.01 (0.00 - 0.02)	0.3	0.0%
grasshopper sparrow	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
gray catbird	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
yellow warbler	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
unidentified swallow	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
indigo bunting	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
eastern bluebird	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Baltimore oriole	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Group Total	**10814**	**3051**	**32.18 (23.34-41.02)**		**79.7%**
Raptors/Vultures/Owls					
red-tailed hawk	45	43	0.13 (0.10 - 0.16)	12.2	0.3%
turkey vulture	23	18	0.07 (0.04 - 0.10)	5.1	0.2%
unidentified buteo	17	16	0.05 (0.03 - 0.07)	4.2	0.1%
northern harrier	7	7	0.02 (0.01 - 0.03)	1.8	0.1%
American kestrel	6	6	0.02 (0.01 - 0.03)	1.8	0.0%
broad-winged hawk	3	2	0.01 (0.00 - 0.02)	0.6	0.0%
unidentified hawk	2	2	0.01 (0.00 - 0.02)	0.6	0.0%

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
sharp-shinned hawk	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
Group Total	**105**	**96**	**0.31** (0.25-0.37)		**0.8%**
Waterfowl					
unidentified duck	55	12	0.16 (0.02 - 0.30)	3.3	0.4%
mallard	44	23	0.13 (0.08 - 0.18)	6.3	0.3%
Canada goose	32	12	0.10 (0.04 - 0.16)	3.6	0.2%
northern shoveler	10	4	0.03 (0.00 - 0.06)	1.2	0.1%
blue-winged teal	3	1	0.01 (0.00 - 0.02)	0.3	0.0%
Group Total	**144**	**52**	**0.43** (0.26-0.60)		**1.1%**
Woodpeckers					
northern flicker	44	43	0.13 (0.10 - 0.16)	12.2	0.3%
red-bellied woodpecker	5	5	0.01 (0.00 - 0.02)	1.5	0.0%
Group Total	**49**	**48**	**0.15** (0.12-0.18)		**0.4%**
Crows and Allies					
American crow	40	31	0.12 (0.08 - 0.16)	8.9	0.3%
blue jay	14	13	0.04 (0.02 - 0.06)	3.9	0.1%
Group Total	**54**	**44**	**0.16** (0.12-0.20)		**0.4%**
Cranes/Rails					
sandhill crane	26	4	0.08 (-0.02 - 0.18)	1.2	0.2%
Group Total	**26**	**4**	**0.08** (-0.02-0.18)		**0.2%**
Gamebirds					
ring-necked pheasant	6	6	0.02 (0.01 - 0.03)	1.8	0.0%
Group Total	**6**	**6**	**0.02** (0.01-0.03)		**0.0%**

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
Gulls/Terns					
unidentified gull	2	2	0.01 (0.00 - 0.02)	0.6	0.0%
Group Total	**2**	**2**	**0.01 (0.00-0.02)**		**0.0%**
Waterbirds					
American coot	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Group Total	**1**	**1**	**0.00 (0.00-0.00)**		**0.0%**
Pigeons/Doves					
mourning dove	114	66	0.34 (0.27 - 0.41)	17.9	0.8%
rock pigeon	71	32	0.21 (0.14 - 0.28)	9.5	0.5%
Group Total	**185**	**98**	**0.55 (0.45-0.65)**		**1.4%**
Shorebirds					
killdeer	189	164	0.56 (0.49 - 0.63)	41.1	1.4%
unidentified shorebird	25	1	0.07 (-0.05 - 0.19)	0.3	0.2%
common snipe	3	1	0.01 (0.00 - 0.02)	0.3	0.0%
spotted sandpiper	1	1	0.00 (0.00 - 0.00)	0.3	0.0%
Group Total	**218**	**167**	**0.65 (0.51-0.79)**		**1.6%**
Swifts/Hummingbirds					
chimney swift	21	15	0.06 (0.03 - 0.09)	4.5	0.2%
Group Total	**21**	**15**	**0.06 (0.03-0.09)**		**0.2%**
Wadingbirds					
great blue heron	8	7	0.02 (0.00 - 0.04)	2.1	0.1%
Group Total	**8**	**7**	**0.02 (0.00-0.04)**		**0.1%**

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
Other					
unidentified bird	1931	23	5.75 (2.84 - 8.66)	6.3	14.2%
Group Total	**1931**	**23**	**5.75** (2.84-8.66)		**14.2%**
Grand Total	**13564**	**3614**	**40.37** (30.88-49.86)		

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs.	Points											
			1	2	3	4	5	6	7	8	9	10	11	12
red-winged blackbird	2386	556	76	133	114	95	31	28	392	36	41	715	42	201
unidentified blackbird	2054	112	37	265	113	11	372	87	22	40	76	3	24	236
unidentified bird	1931	23	50	0	200	0	20	215	101	4	0	100	4	0
common grackle	1744	410	114	109	67	24	72	36	55	44	16	629	103	71
brown-headed cowbird	1137	260	17	34	33	21	21	15	24	24	45	591	16	10
American robin	789	319	21	51	42	86	54	32	16	22	25	22	56	35
horned lark	708	352	17	18	23	11	28	18	77	45	30	7	21	46
European starling	642	164	109	20	21	38	9	11	8	9	22	39	73	126
vesper sparrow	249	167	14	13	11	4	9	10	3	18	10	2	6	14
barn swallow	190	99	9	7	16	7	8	10	4	0	6	4	26	8
killdeer	189	164	12	7	11	14	12	11	15	4	8	4	5	9
Lapland longspur	151	9	0	35	0	0	0	1	0	0	0	0	0	103
eastern meadowlark	125	115	1	3	9	1	5	9	13	3	14	0	5	9
mourning dove	114	66	2	5	16	2	10	5	3	2	2	3	7	3
song sparrow	112	102	8	3	3	15	1	2	1	2	1	14	3	4
house sparrow	109	51	4	2	2	12	2	3	0	0	0	20	24	0
American goldfinch	80	64	2	5	2	2	2	8	0	2	3	1	3	3
tree swallow	74	38	5	0	0	2	6	0	4	3	1	9	1	17
rock pigeon	71	32	15	16	6	0	2	0	0	3	2	0	0	0
northern cardinal	66	65	5	1	3	9	1	4	0	1	0	6	1	0
unidentified duck	55	12	15	0	0	0	0	7	0	26	2	2	0	0
red-tailed hawk	45	43	1	0	1	2	2	0	5	2	6	3	1	3
northern flicker	44	43	1	1	1	2	5	1	0	3	1	3	2	4
mallard	44	23	10	0	0	4	0	0	9	0	2	0	0	4
American crow	40	31	2	0	3	2	1	0	0	9	0	1	0	5

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs.	Points											
			1	2	3	4	5	6	7	8	9	10	11	12
Canada goose	32	12	0	0	0	3	2	7	5	0	0	0	0	0
savannah sparrow	31	26	0	7	1	0	1	0	0	5	0	2	0	0
chipping sparrow	30	29	4	1	0	1	2	1	0	0	0	4	0	0
sandhill crane	26	4	0	0	0	0	0	0	0	0	0	21	0	0
house finch	26	19	0	0	1	1	2	1	0	2	0	1	3	0
unidentified shorebird	25	1	0	0	0	0	0	0	0	0	25	0	0	0
brown thrasher	24	24	2	1	1	1	0	0	0	0	0	6	1	0
turkey vulture	23	18	0	0	0	0	0	0	0	0	0	3	2	3
chimney swift	21	15	0	1	1	0	3	0	0	0	3	0	0	0
unidentified buteo	17	16	0	0	0	0	0	1	1	0	1	0	0	0
eastern kingbird	17	14	0	2	1	1	3	0	0	0	0	3	0	0
blue jay	14	13	1	0	0	0	1	0	0	0	0	6	0	0
bobolink	13	11	0	0	1	0	0	0	1	0	0	0	0	4
northern shoveler	10	4	6	0	0	0	0	0	4	0	0	0	0	0
common yellowthroat	9	6	0	0	0	8	0	0	0	0	0	0	0	0
house wren	8	8	1	0	1	1	0	0	0	0	0	1	0	0
great blue heron	8	7	0	0	0	0	0	3	0	0	0	1	0	0
dickcissel	8	8	0	0	1	0	1	0	1	0	0	0	1	3
bank swallow	8	3	0	0	0	0	0	0	0	0	0	0	8	0
northern harrier	7	7	0	2	0	0	0	0	2	0	0	1	0	0
ring-necked pheasant	6	6	0	0	0	0	0	0	0	0	0	2	0	0
American kestrel	6	6	0	1	0	0	1	0	1	0	0	2	0	0
unidentified sparrow	5	4	0	0	0	0	0	0	1	0	0	0	0	0
red-bellied woodpecker	5	5	0	0	1	1	1	0	0	0	0	0	0	0
palm warbler	3	3	1	0	0	0	0	0	0	0	0	1	0	0

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs	Points											
			1	2	3	4	5	6	7	8	9	10	11	12
common snipe	3	1	3	0	0	0	0	0	0	0	0	0	0	0
cedar waxwing	3	2	0	0	0	0	0	0	0	0	0	0	0	0
blue-winged teal	3	1	0	0	0	0	0	0	3	0	0	0	0	0
broad-winged hawk	3	2	0	0	0	0	0	0	0	3	0	0	0	0
unidentified hawk	2	2	0	0	0	0	0	0	0	0	0	0	0	1
unidentified gull	2	2	0	0	0	0	0	0	0	0	0	0	0	0
sharp-shinned hawk	2	2	0	0	1	0	0	0	0	0	0	0	0	0
snow bunting	2	1	0	0	0	0	0	0	2	0	0	0	0	0
purple martin	2	1	0	0	0	0	0	0	0	2	0	0	0	0
grasshopper sparrow	2	2	0	0	1	0	0	0	0	0	0	0	0	0
gray catbird	2	2	1	0	0	0	0	0	0	0	0	0	0	0
yellow warbler	1	1	0	0	0	0	0	0	1	0	0	0	0	0
unidentified swallow	1	1	0	0	0	0	0	0	0	0	0	0	0	0
spotted sandpiper	1	1	0	0	0	0	0	0	0	0	0	0	0	0
indigo bunting	1	1	0	0	0	0	0	0	0	0	0	0	0	0
eastern bluebird	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Baltimore oriole	1	1	0	0	0	0	0	0	0	0	0	1	0	0
American coot	1	1	0	0	0	0	0	0	1	0	0	0	0	0
Grand Total	**13564**	**3614**	**566**	**743**	**708**	**381**	**690**	**526**	**775**	**314**	**342**	**2233**	**438**	**922**

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs.	Points											
			13	14	15	16	17	18	19	20	21	22	23	24
red-winged blackbird	2386	556	56	48	43	18	31	25	11	19	28	42	111	50
unidentified blackbird	2054	112	33	280	46	3	14	48	0	1	203	100	40	0
unidentified bird	1931	23	100	100	30	1	0	300	0	6	100	300	300	0
common grackle	1744	410	14	25	44	21	14	25	72	18	25	51	47	48
brown-headed cowbird	1137	260	11	14	18	33	29	14	35	39	26	11	19	37
American robin	789	319	8	28	31	19	14	15	28	4	53	36	61	30
horned lark	708	352	31	20	43	33	35	31	23	51	28	34	14	24
European starling	642	164	5	19	12	10	4	6	18	2	10	31	14	26
vesper sparrow	249	167	4	2	14	15	14	26	10	11	15	8	5	11
barn swallow	190	99	8	7	2	6	2	4	21	1	6	8	4	16
killdeer	189	164	7	5	4	6	4	6	9	4	8	5	8	11
Lapland longspur	151	9	0	3	0	1	0	0	0	8	0	0	0	0
eastern meadowlark	125	115	4	4	13	3	1	3	1	3	9	5	5	2
mourning dove	114	66	2	4	6	1	2	9	6	3	2	2	12	5
song sparrow	112	102	3	4	1	0	7	2	11	0	4	1	4	18
house sparrow	109	51	0	0	4	1	4	2	2	0	16	4	5	2
American goldfinch	80	64	4	3	6	0	3	2	3	7	2	6	8	3
tree swallow	74	38	0	3	4	1	3	0	4	1	2	0	6	2
rock pigeon	71	32	0	10	6	2	0	3	1	0	0	1	2	2
northern cardinal	66	65	1	2	3	1	4	3	2	0	3	6	5	5
unidentified duck	55	12	2	0	0	0	0	0	0	0	1	0	0	0
red-tailed hawk	45	43	1	1	0	0	2	5	3	1	4	2	0	0
northern flicker	44	43	0	2	2	0	2	1	2	1	4	2	1	3
mallard	44	23	5	0	0	0	0	0	0	0	0	4	6	0
American crow	40	31	2	1	2	0	1	0	3	1	1	1	0	5

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs	Points											
			13	14	15	16	17	18	19	20	21	22	23	24
Canada goose	32	12	1	0	0	0	11	0	0	0	0	0	3	0
savannah sparrow	31	26	2	1	0	0	2	5	0	0	2	0	1	2
chipping sparrow	30	29	0	0	0	0	1	1	5	0	1	4	4	1
sandhill crane	26	4	0	0	0	1	3	0	0	0	0	0	0	1
house finch	26	19	0	0	1	0	3	0	4	0	1	1	4	1
unidentified shorebird	25	1	0	0	0	0	0	0	0	0	0	0	0	0
brown thrasher	24	24	0	1	0	0	0	2	2	0	0	0	2	5
turkey vulture	23	18	1	1	1	0	2	1	2	1	0	2	2	2
chimney swift	21	15	0	0	2	0	1	1	3	1	0	3	1	1
unidentified buteo	17	16	0	0	0	0	4	5	0	0	3	1	0	1
eastern kingbird	17	14	1	0	0	2	0	2	0	0	1	0	0	1
blue jay	14	13	0	0	1	0	1	1	1	0	2	0	0	0
bobolink	13	11	6	0	0	1	0	0	0	0	0	0	0	0
northern shoveler	10	4	0	0	0	0	0	0	0	0	0	0	0	0
common yellowthroat	9	6	1	0	0	0	0	0	0	0	0	0	0	0
house wren	8	8	0	0	0	0	0	0	0	0	1	2	1	0
great blue heron	8	7	0	1	0	0	0	0	0	0	0	1	1	1
dickcissel	8	8	0	0	0	0	0	0	0	0	0	0	1	0
bank swallow	8	3	0	0	0	0	0	0	0	0	0	0	0	0
northern harrier	7	7	1	0	0	0	0	0	0	0	1	0	0	0
ring-necked pheasant	6	6	0	0	1	0	1	0	0	0	0	0	0	2
American kestrel	6	6	1	0	0	0	0	0	0	0	0	0	0	0
unidentified sparrow	5	4	0	2	0	1	0	0	1	0	0	0	0	0
red-bellied woodpecker	5	5	0	1	0	0	1	0	0	0	0	0	0	0
palm warbler	3	3	0	0	0	0	0	0	0	0	0	0	1	0

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of Birds	Number of Obs.	Points											
			13	14	15	16	17	18	19	20	21	22	23	24
common snipe	3	1	0	0	0	0	0	0	0	0	0	0	0	0
cedar waxwing	3	2	0	0	1	2	0	0	0	0	0	0	0	0
blue-winged teal	3	1	0	0	0	0	0	0	0	0	0	0	0	0
broad-winged hawk	3	2	0	0	0	0	0	0	0	0	0	0	0	0
unidentified hawk	2	2	0	0	0	0	0	0	0	0	0	0	1	0
unidentified gull	2	2	0	0	0	0	0	0	0	0	0	1	1	0
sharp-shinned hawk	2	2	0	0	0	0	0	0	0	0	0	1	0	0
snow bunting	2	1	0	0	0	0	0	0	0	0	0	0	0	0
purple martin	2	1	0	0	0	0	0	0	0	0	0	0	0	0
grasshopper sparrow	2	2	0	0	0	0	0	0	0	0	1	0	0	0
gray catbird	2	2	0	0	0	0	0	0	0	0	0	0	0	1
yellow warbler	1	1	0	0	0	0	0	0	0	0	0	0	0	0
unidentified swallow	1	1	0	0	0	0	0	0	0	0	0	0	1	0
spotted sandpiper	1	1	0	0	1	0	0	0	0	0	0	0	0	0
indigo bunting	1	1	1	0	0	0	0	0	0	0	0	0	0	0
eastern bluebird	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Baltimore oriole	1	1	0	0	0	0	0	0	0	0	0	0	0	0
American coot	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	**13564**	**3614**	**316**	**592**	**342**	**182**	**220**	**548**	**283**	**183**	**563**	**676**	**702**	**319**

Table 5. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA)[1] during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

	Observations		Individuals	
	Number	Percentage	Number	Percentage
Non-raptors				
Above RSA (>121.25m)	6	0.4%	201	2.4%
Below RSA (<38.75m)	1458	92.9%	6444	77.1%
Within RSA (38.75m–121.25m)	106	6.8%	1714	20.5%
Raptors/Vultures/Owls				
Above RSA (>121.25m)	10	14.5%	12	15.6%
Below RSA (<38.75m)	34	49.3%	36	46.8%
Within RSA (38.75m–121.25m)	25	36.2%	29	37.7%

[1]These values assume a rotor diameter of 82.5 (m) and a hub height of 80 (m)

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Spring 2008.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
unidentified bird	2.41	5.75 (2.84 - 8.66)	99.9	52.8	42.0	5.2
red-winged blackbird	1.35	7.10 (3.69 - 10.51)	71.5	70.5	26.6	2.9
unidentified blackbird	0.60	6.11 (3.80 - 8.42)	37.6	73.7	26.3	0.0
common grackle	0.23	5.19 (2.64 - 7.74)	72.8	94.0	6.0	0.0
Lapland longspur	0.11	0.45 (-0.07 - 0.97)	98.7	75.8	24.2	0.0
American robin	0.09	2.35 (2.02 - 2.68)	19.3	80.9	19.1	0.0
brown-headed cowbird	0.06	3.38 (0.69 - 6.07)	81.1	97.9	2.1	0.0
horned lark	0.05	2.11 (1.77 - 2.45)	19.2	88.2	11.8	0.0
Canada goose	0.04	0.10 (0.04 - 0.16)	59.4	26.3	73.7	0.0
red-tailed hawk	0.03	0.13 (0.10 - 0.16)	66.7	36.7	40.0	23.3
turkey vulture	0.03	0.07 (0.04 - 0.10)	95.7	36.4	45.5	18.2
mallard	0.03	0.13 (0.08 - 0.18)	70.5	67.7	32.3	0.0
barn swallow	0.02	0.57 (0.47 - 0.67)	96.8	95.7	4.3	0.0
European starling	0.02	1.91 (1.26 - 2.56)	68.4	98.2	1.8	0.0
chimney swift	0.02	0.06 (0.03 - 0.09)	100.0	71.4	28.6	0.0
killdeer	0.01	0.56 (0.49 - 0.63)	47.6	94.4	5.6	0.0
unidentified duck	0.01	0.16 (0.02 - 0.30)	83.6	32.6	10.9	56.5
American goldfinch	0.01	0.24 (0.18 - 0.30)	80.0	93.8	6.3	0.0
broad-winged hawk	0.01	0.01 (0.00 - 0.02)	100.0	0.0	100.0	0.0
house finch	0.01	0.08 (0.05 - 0.11)	30.8	62.5	37.5	0.0
tree swallow	0.01	0.22 (0.16 - 0.28)	100.0	95.9	4.1	0.0
unidentified buteo	0.01	0.05 (0.03 - 0.07)	29.4	60.0	40.0	0.0
unidentified hawk	0.01	0.01 (0.00 - 0.02)	100.0	0.0	50.0	50.0
great blue heron	0.01	0.02 (0.00 - 0.04)	100.0	75.0	25.0	0.0
American kestrel	0.00	0.02 (0.01 - 0.03)	100.0	83.3	16.7	0.0
northern cardinal	0.00	0.20 (0.16 - 0.24)	1.5	0.0	100.0	0.0

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Spring 2008.

Species	Encounter Rate	Mean Use #birds/20 min (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
American crow	0.00	0.12 (0.08 - 0.16)	65.0	96.2	3.8	0.0
northern flicker	0.00	0.13 (0.10 - 0.16)	20.5	88.9	11.1	0.0
yellow warbler	0.00	0.00 (0.00 - 0.00)	0.0	0.0	0.0	0.0
vesper sparrow	0.00	0.74 (0.65 - 0.83)	5.2	100.0	0.0	0.0
unidentified swallow	0.00	0.00 (0.00 - 0.00)	100.0	100.0	0.0	0.0
unidentified sparrow	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
unidentified shorebird	0.00	0.07 (-0.05 - 0.19)	100.0	100.0	0.0	0.0
unidentified gull	0.00	0.01 (0.00 - 0.02)	100.0	50.0	0.0	50.0
sharp-shinned hawk	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
spotted sandpiper	0.00	0.00 (0.00 - 0.00)	100.0	100.0	0.0	0.0
song sparrow	0.00	0.33 (0.28 - 0.38)	0.9	100.0	0.0	0.0
snow bunting	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
savannah sparrow	0.00	0.09 (0.06 - 0.12)	0.0	0.0	0.0	0.0
sandhill crane	0.00	0.08 (-0.02 - 0.18)	92.3	0.0	0.0	100.0
rock pigeon	0.00	0.21 (0.14 - 0.28)	94.4	100.0	0.0	0.0
ring-necked pheasant	0.00	0.02 (0.01 - 0.03)	0.0	0.0	0.0	0.0
red-bellied woodpecker	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
purple martin	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
palm warbler	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
northern shoveler	0.00	0.03 (0.00 - 0.06)	0.0	0.0	0.0	0.0
northern harrier	0.00	0.02 (0.01 - 0.03)	100.0	100.0	0.0	0.0
mourning dove	0.00	0.34 (0.27 - 0.41)	91.2	100.0	0.0	0.0
indigo bunting	0.00	0.00 (0.00 - 0.00)	100.0	100.0	0.0	0.0
house wren	0.00	0.02 (0.01 - 0.03)	0.0	0.0	0.0	0.0
house sparrow	0.00	0.32 (0.22 - 0.42)	11.0	100.0	0.0	0.0
grasshopper sparrow	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Spring 2008.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
gray catbird	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
eastern meadowlark	0.00	0.37 (0.31 - 0.43)	10.4	100.0	0.0	0.0
eastern kingbird	0.00	0.05 (0.02 - 0.08)	29.4	100.0	0.0	0.0
eastern bluebird	0.00	0.00 (0.00 - 0.00)	0.0	0.0	0.0	0.0
dickcissel	0.00	0.02 (0.01 - 0.03)	0.0	0.0	0.0	0.0
common yellowthroat	0.00	0.03 (0.01 - 0.05)	0.0	0.0	0.0	0.0
common snipe	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
chipping sparrow	0.00	0.09 (0.06 - 0.12)	10.0	100.0	0.0	0.0
cedar waxwing	0.00	0.01 (0.00 - 0.02)	66.7	100.0	0.0	0.0
blue-winged teal	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
brown thrasher	0.00	0.07 (0.05 - 0.09)	8.3	100.0	0.0	0.0
bobolink	0.00	0.04 (0.02 - 0.06)	53.8	100.0	0.0	0.0
blue jay	0.00	0.04 (0.02 - 0.06)	14.3	100.0	0.0	0.0
Baltimore oriole	0.00	0.00 (0.00 - 0.00)	0.0	0.0	0.0	0.0
bank swallow	0.00	0.02 (0.00 - 0.04)	100.0	100.0	0.0	0.0
American coot	0.00	0.00 (0.00 - 0.00)	100.0	0.0	100.0	0.0

[1]These values assume a rotor diameter of 82.5 (m) and a hub height of 80 (m)

Table 7. Incidental observations of birds during Spring point counts at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number of individuals
Lapland longspur	400
mallard	39
sandhill crane	25
lesser scaup	25
blue-winged teal	24
Canada goose	23
red-tailed hawk	20
American coot	20
American kestrel	18
northern shoveler	15
turkey vulture	12
great blue heron	9
lesser yellowlegs	8
unidentified buteo	5
northern harrier	5
American crow	5
great egret	2
sharp-shinned hawk	1
snow bunting	1
ring-necked pheasant	1
brown thrasher	1
belted kingfisher	1
Grand Total	**660**

Table 8. Comparison of raptor and other bird use per 20-minute survey with other studies of wind projects using the similar survey methodology.

Project Site	Mean Use by Raptors					Mean Use by Other Birds					Duration of Survey (minutes)	Plot Radius	Reference	Correction factor [b]
	Spr	Sum	Fall	Win	Ann	Spr	Sum	Fall	Win	Ann				
Altamont Pass, CA	3.80	3.00	4.60	3.00							10	800m	Orloff and Flannery (1992)	x 2
Cotterel Mountain, ID	1.69	1.89	1.49	0.18		14.26	11.22	7.65	8.86		20	800m	USDI, BLM (2005)	
Hoctor Ridge, WA	1.42	1.33				10.00	17.92				20	800m	Johnson et al. (2006b)	
Lower Linden Ranch, WA	1.37					11.63					20	800m	Johnson et al. (2007d)	
Kittitas Valley, WA	1.01	1.03	0.73			14.13	8.13	11.47			20	800m	Erickson et al. (2003b)	
Klickitat County PEIS study area, WA	0.96	1.12	N/A	N/A		14.39	12.36				20	800m	Johnson et al. (2006)	
Columbia Hills, WA	0.94	1.34	0.78	0.26							20	800m	Erickson et al. (2002)	
Combine study of: Kittitas Valley; Desert Claim; Wild Horse, WA	0.89	0.85	0.76	0.51	0.75	11.72	8.18	7.99	15.64	10.88	20	800m	Young et al. (2003)	0
Buffalo Ridge Phase II, MN	0.84	0.69	0.83	0.10							20	800m	Erickson et al. (2002)	
Elkhorn, OR	0.81	1.56	0.79			29.43	12.15	20.36			20	800m	WEST (2005b)	
Combine Hills, OR	0.80	0.56	0.44	0.64		5.96	2.63	1.34	2.68		30	800m	Young et al. (2002b)	x 0.67
Windy Point, WA	0.79	N/A	N/A	0.77		16.41			13.55		20	800m	Johnson et al. (2006a)	

Project Site	Mean Use by Raptors					Mean Use by Other Birds					Duration of Survey (minutes)	Plot Radius	Reference	Correction factor
	Spr	Sum	Fall	Win	Anu	Spr	Sum	Fall	Win	Anu				
Windy Flats, WA	0.77	0.88	0.82	0.86		21.51	13.96	16.03	24.56		20	800m	Johnson et al. (2007b)	
Hatchet Ridge, CA	0.70	1.03	0.91	0.12	0.69	5.24	6.94	6.32	4.03	5.65	30	800m	Young et al. (2007b)	x0.67
Buffalo Ridge, MN	0.68	0.52	0.69	0.44							20	800m	Erickson et al. (2002)	
Buffalo Ridge Phase I, MN	0.65	0.43	0.76	0.13							20	800m	Erickson et al. (2002)	
Buffalo Ridge Phase III, MN	0.64	0.54	0.85	0.18							20	800m	Erickson et al. (2002)	
Stateline Wind EIS, OR/WA	0.59	0.40	0.25	0.42		7.09	5.47	29.34	9.04		20	800m	URS and West (2001)	
Foote Creek WEC, WY	0.49	0.76	0.97	0.21							40	800m	Johnson et al. (2000)	x 0.5
Klondike Phase I, OR	0.47	0.39	0.38	0.56							20	800m	Erickson et al. (2002)	
White Creek, WA	0.46	0.87	0.56	0.38		9.91	9.10	15.24	11.01		20	800m	Kronner et al. (2005b)	
Wild Horse, WA	0.46	0.46	0.31	0.14		5.78	5.78	4.02	3.59		30	800m	Erickson et al. (2003a)	x 0.67
Shepherds Flat, OR	0.44	0.49	0.55	0.32		8.98	14.71	5.22	3.97		20	800m	Welch and Schleder (2006)	
Bighorn Site, WA	0.40	0.44				9.72	10.04				20	800m	Johnson and Erickson (2004)	
Leaning Juniper, OR	0.39	1.07	0.53	0.24		11.36	5.68	19.09	47.00		20	800m	Kronner et al. (2005a)	

Project Site	Mean Use by Raptors					Mean Use by Other Birds					Duration of Survey (minutes)	Plot Radius	Reference	Correction factor [b]
	Spr	Sum	Fall	Win	Ann	Spr	Sum	Fall	Win	Ann				
Biglow Canyon WRA, OR	0.37	0.34	0.11	0.25		6.76	5.09	6.71	17.07		30	800m	WEST (2005a)	x 0.67
Nine Canyon, WA	0.35	0.20	0.16	0.31							20	800m	Erickson et al. (2002)	
Sand Ridge, WA	0.34	0.46				6.19	5.21				20	800m	Johnson et al. (2007c)	
Lee-DeKalb, IL*	**0.31**		**0.54**			**40.06**		**55.50**			**20**	**800m**	**TtEC 2008, This report**	
Biglow Canyon project area, OR	0.31	0.39	0.19	0.32		10.17	3.34	7.18	11.66		30	800m	WEST (2005a)	x 0.67
Maiden, WA	0.30	0.35	0.62	0.15		4.58	4.71	11.93	8.58		30	800m	Young et al. (2002a)	x 0.67
Vantage, WA	0.29	0.40	0.14	0.15		10.57	8.83	3.70	4.90		20	800m	Jefferey et al. (2007)	
Stateline Wind, OR/WA	0.28	0.26	0.16	0.02	0.22					23.08	10	800m	Erickson et al. (2004)	x 2
Zintel Canyon, WA	0.19	0.30	0.70	0.51							20	800m	Erickson et al. (2002)	
Dry Lake, AZ	0.08	0.14	0.21	0.14	0.15	8.10	11.02	16.10	18.00	13.52	30	800m	Young et al. (2007a)	x0.67
High Winds, CA					6.72					474[a]	20	800m	Kerlinger et al. (2005)	
Klondike Phase III, OR				0.13					34.90		20	800m	Mabee et al. (2005)	

[a] Mostly unidentified blackbirds.

[b] Multiplication factor to standardize mean use to birds/20 min.

* Only the data from Spring 2008 is presented because Spring 2007 was not a full sampling period.

Appendix 1. Flight directions of birds observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
unidentified bird	1930	22	8.0	16.6	15.5	0.1	5.2	5.4	18.2	15.5	15.5
red-winged blackbird	1705	311	46.8	22.9	5.6	1.5	6.0	1.5	5.2	2.0	8.6
common grackle	1269	310	52.4	5.4	9.4	2.7	6.4	2.1	10.5	3.2	8.0
brown-headed cowbird	922	156	64.4	1.3	3.4	1.8	5.5	1.7	2.9	1.1	17.8
unidentified blackbird	773	38	30.7	1.2	1.9	0.4	8.3	0.0	2.2	0.0	55.4
European starling	439	105	15.9	3.0	5.0	1.6	11.4	1.1	7.1	5.0	49.9
barn swallow	184	96	5.4	0.5	1.6	0.5	1.6	0.5	0.5	1.6	87.5
American robin	152	85	15.8	5.3	9.9	3.9	19.7	15.8	19.7	5.9	3.9
Lapland longspur	149	8	7.4	0.7	0.0	0.0	0.0	0.0	0.7	0.0	91.3
horned lark	136	45	8.8	50.7	2.9	2.2	8.8	0.7	5.9	8.8	11.0
mourning dove	104	59	19.2	6.7	10.6	0.0	21.2	1.9	22.1	6.7	11.5
killdeer	90	72	20.0	1.1	11.1	5.6	8.9	6.7	13.3	4.4	28.9
tree swallow	74	38	5.4	4.1	1.4	0.0	9.5	0.0	1.4	2.7	75.7
rock pigeon	67	30	7.5	0.0	3.0	3.0	0.0	0.0	1.5	0.0	85.1
American goldfinch	64	48	20.3	9.4	23.4	6.3	4.7	4.7	25.0	6.3	0.0
unidentified duck	46	9	15.2	8.7	4.3	0.0	10.9	0.0	4.3	56.5	0.0
mallard	31	16	6.5	16.1	6.5	3.2	25.8	9.7	22.6	3.2	6.5
American crow	26	19	11.5	7.7	7.7	15.4	26.9	7.7	15.4	3.8	3.8
unidentified shorebird	25	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
sandhill crane	24	2	12.5	0.0	0.0	0.0	0.0	0.0	0.0	87.5	0.0
red-tailed hawk	23	23	4.3	13.0	8.7	4.3	21.7	8.7	8.7	0.0	30.4
turkey vulture	21	16	4.8	9.5	14.3	0.0	0.0	23.8	4.8	4.8	38.1

Appendix 1. Flight directions of birds observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
chimney swift	21	15	4.8	0.0	23.8	0.0	0.0	0.0	0.0	0.0	71.4
Canada goose	19	5	15.8	68.4	5.3	0.0	10.5	0.0	0.0	0.0	0.0
vesper sparrow	13	9	0.0	0.0	23.1	7.7	15.4	0.0	7.7	0.0	46.2
eastern meadowlark	13	11	23.1	0.0	0.0	0.0	15.4	0.0	38.5	0.0	23.1
house sparrow	12	7	0.0	0.0	25.0	0.0	16.7	0.0	16.7	0.0	41.7
northern flicker	9	8	33.3	0.0	0.0	11.1	0.0	11.1	44.4	0.0	0.0
house finch	8	5	12.5	12.5	37.5	0.0	0.0	0.0	25.0	12.5	0.0
great blue heron	8	7	12.5	25.0	12.5	0.0	12.5	37.5	0.0	0.0	0.0
bank swallow	8	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
northern harrier	7	7	14.3	0.0	0.0	0.0	0.0	0.0	0.0	14.3	71.4
bobolink	7	5	0.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	71.4
American kestrel	6	6	16.7	16.7	0.0	0.0	0.0	33.3	0.0	16.7	16.7
unidentified sparrow	5	4	60.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0
unidentified buteo	5	5	0.0	0.0	0.0	20.0	20.0	0.0	0.0	0.0	60.0
eastern kingbird	5	4	0.0	40.0	0.0	0.0	20.0	0.0	0.0	0.0	40.0
chipping sparrow	3	2	0.0	0.0	66.7	0.0	33.3	0.0	0.0	0.0	0.0
broad-winged hawk	3	2	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3
unidentified hawk	2	2	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0
unidentified gull	2	2	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
sharp-shinned hawk	2	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
snow bunting	2	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
purple martin	2	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix 1. Flight directions of birds observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2008.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
cedar waxwing	2	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
brown thrasher	2	2	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
blue jay	2	2	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
unidentified swallow	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
spotted sandpiper	1	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
song sparrow	1	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
northern cardinal	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
indigo bunting	1	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
American coot	1	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Grand Total	**8428**	**1633**	**31.7**	**11.2**	**8.1**	**1.4**	**6.8**	**2.8**	**9.2**	**6.0**	**22.9**

Fall Avian Survey 2007

Lee-DeKalb Wind Resource Area

"Business Confidential"

Lee Counties and DeKalb, Illinois

Prepared for

FPL Energy, LLC

September 2008

TETRA TECH EC, INC.

EXECUTIVE SUMMARY

Tetra Tech, EC, Inc. (TtEC) was contracted by FPL Energy, LLC (FPLE) to undertake fall avian use surveys for the proposed Lee-DeKalbWind Resource Area (WRA) in Lee and DeKalb Counties, Illinois. The studies were conducted to identify potential avian impacts associated with building and/or operating the wind conversion facility. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures. Weekly fall surveys were performed at the Lee-DeKalb WRA from August 30 to November 16, 2007. Fixed point count surveys (800-meter radius) were conducted at 14 points distributed throughout the Lee-DeKalb WRA.

A total of 9,422 birds of 47 identified and 11 unidentified species groups were recorded during 168 fixed-point count surveys within the Lee-DeKalb WRA. The most frequently observed species seen were the brown-headed cowbird (26.8 percent of all birds observed), European starling (23.7 percent), red-winged blackbird (6.0 percent), and Canada goose (4.6 percent). Each remaining identified species comprised 2.8 percent or less of the total number of birds observed. Overall mean bird use within the Lee-DeKalb WRA was (56.08 birds/20 min).

Songbirds had the highest mean use out of all species groups observed (48.01 birds/20 min). The two most commonly observed species; the brown-headed cowbird (15.03 birds/20 min) and European starling (13.96 birds/20) are both widespread species and have relatively stable populations (Sauer et al. 2007). Further, the European starling is a non-native invasive species, an agricultural pest, and is not protected by the Migratory Bird Treaty Act. After European starling mean use was removed, songbird mean use was reduced to 34.05 birds/20 min and was comprised mostly of brown-headed cowbirds and red-winged blackbirds. Thus, any local mortality of resident species is not expected to have population level consequences.

Overall raptor use at the Lee-DeKalb WRA was low in the fall 2007 surveys (0.54 birds/20 min) and appeared to peak in late September-mid October. The raptor species with the highest use was the red-tailed hawk (0.23 birds/20 min), followed by American kestrel (0.11), turkey vulture (0.10), northern harrier (0.06), and Cooper's hawk (0.02).

Listed and Sensitive Species

Only one state-listed species, northern harrier, was observed during the fall avian surveys. The northern harrier is listed as Endangered in Illinois. The northern harrier is a migratory species that is common across much of North America, with a habitat preference for open fields and wetlands; northern harriers are often observed flying low over open fields in search of prey, although they will soar higher during dispersal and courtship. However, northern harriers rarely suffer turbine-related mortality. Of the 10 individuals observed, all were flying below the rotor swept area, thus minimizing the mortality risk for this state-endangered species.

TABLE OF CONTENTS

EXECUTIVE SUMMARY iii

1.0 INTRODUCTION 1

2.0 METHODS 3

2.1 DIURNAL FIXED-POINT AND INCIDENTAL AVIAN USE SURVEYS 3
2.2 ANALYSIS 5

3.0 RESULTS 6

3.1 LEE-DEKALB WRA 6
3.2 SPECIES COMPOSITION 6
3.3 AVIAN USE 6
3.4 FREQUENCY OF OCCURRENCE 10
3.5 FLIGHT HEIGHT AND ENCOUNTER RATE 10
3.6 FLIGHT DIRECTION 10
3.7 INCIDENTAL SURVEYS 10

4.0 DISCUSSION AND RECOMMENDATIONS 10

4.1 RAPTOR USE AND ENCOUNTER RATE 10
4.2 NON-RAPTOR USE AND ENCOUNTER RATE 11
4.3 LISTED AND SENSITIVE SPECIES 12
4.4 COMPARISON WITH SPRING 2007 SURVEYS 12
4.5 LEE-DEKALB PROJECT AREA CONCLUSIONS AND RECOMMENDATIONS 13

5.0 REFERENCES 14

List of Figures

Figure 1. Lee-DeKalb Wind Resource Area Location Map
Figure 2. Lee-DeKalb Point Count Location Map
Figure 3. Mean non-raptor use by point count location (fall 2007)
Figure 4. Mean non-raptor use by survey date (fall 2007)
Figure 5. Mean raptor use by point count location (fall 2007)
Figure 6. Mean raptor use by survey date (fall 2007)

List of Tables

Table 1. Lee-DeKalb Wind Resource Area, 2007 fall point count survey dates
Table 2. Avian species observed during fall point count surveys at the Lee-DeKalbWind Resource Area, 2007.
Table 3. Avian species, by species grouping, observed during fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.
Table 4. Avian species observed by point during fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.
Table 5. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA) during fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.
Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) for species at risk of collision at the Lee-DeKalb Wind Resource Area, 2007.
Table 7. Flight directions of birds observed during fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.
Table 8. Incidental observations of birds during fall point counts at the Lee-DeKalb Wind Resource Area, 2007.
Table 9. Comparison of raptor and other bird use per 20-minute survey with other studies of wind projects using the similar survey methodology.

Appendix A. Spring 2007 Avian Report

1.0 INTRODUCTION

FPL Energy, LLC. (FPLE) is planning to develop a wind energy conversion facility in Lee and DeKalb Counties, Illinois. The Lee-DeKalb Wind Resource Area (WRA) is located approximately 5 miles southwest of DeKalb, IL (Figure 1). FPLE is committed to environmental due diligence and has contracted Tetra Tech EC, Inc. (TtEC) to conduct a fall avian migration survey at the Lee-DeKalb WRA to quantify local avian use in the area and to identify potential avian impacts associated with building and/or operating the proposed facility.

The Lee-DeKalb WRA is approximately 46,000 acres and is located in the Prairie Parkland (Temperate) Ecological Sub-region, North Central Glaciated Plains Province (ECOMAP 1993). The predominately flat project area is located in a semi-rural setting with scattered residences surrounding Lee, Illinois, which is partially in DeKalb County and partially in Lee County. Land use in the project area is primarily corn and soybean agricultural fields.

Wind energy provides a clean, renewable energy source that is in high demand. As wind power has become more common, the need to address potential environmental impacts has increased. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures (Erickson et al. 2005, Drewitt and Langston 2006). Specifically, raptors and migrant passerines (e.g., songbirds) were found more often in post-construction mortality monitoring compared to other groups of birds (Erickson et al. 2005, Drewitt and Langston 2006).

To evaluate avian risk at wind energy facilities, standardized protocols for pre-construction point counts have been established and were used here. Data collected from these counts can then be used to identify species or species groups of concern and may provide additional information for micro-siting to minimize impacts to birds. To facilitate identifying species at risk, results in this report are presented in terms of species groupings, and highlight federally listed species, state listed species, and species of concern.

Illinois has 345 documented bird species, not including rare vagrant species, and is situated primarily within the Mississippi Flyway, one of the main bird migratory routes (INHS 2002, BNC 2004). The Mississippi Flyway runs from Canada through the mid-western portion of the United States and subsequently, the Lee-DeKalb WRA, eventually reaching the Gulf of Mexico (BNC 2004).

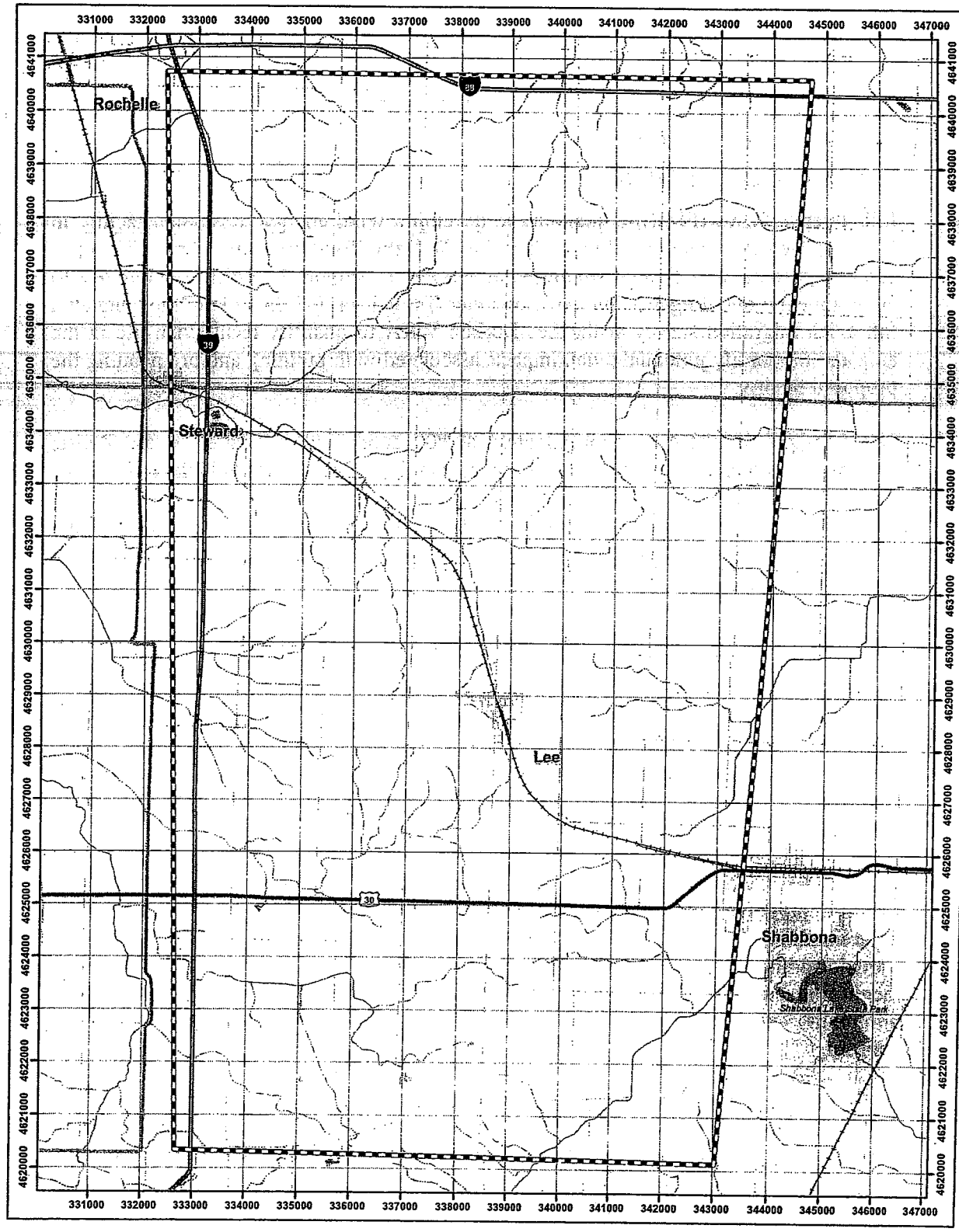


FIGURE 1. Lee & DeKalb project area Location Map

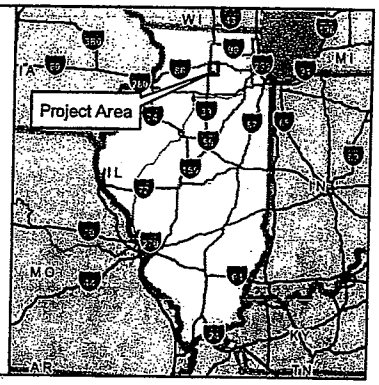
Miles

0 0.250.5 1 1.5 2

1:70,000

9/19/2006

Project Area Boundary



2.0 METHODS

2.1 Diurnal Fixed-point and Incidental Avian Use Surveys

Fixed-point Surveys

Avian point count surveys were conducted to evaluate avian use, behavior, and species composition during fall migration at the Lee-DeKalb WRA. Fixed-point surveys (described below) were conducted for 20 minutes at 14 circular plots (Figure 2). Survey dates and locations of survey points were selected to occur during migration, to cover a diversity of habitats, and to ensure the best possible viewshed. Fall surveys were conducted weekly between August 30 and November 16 (Table 1).

Data were collected on all birds observed within an 800-meter radius circle centered on the point count location. Birds outside the 800-meter radius circle were recorded as incidentals (see below). Surveys at each point lasted for 20 minutes, during which time the observer continuously scanned for birds and recorded any visual or auditory observations. Point counts were conducted sequentially, by one observer. Counts were scheduled to cover all daylight hours. Data that were recorded and used in the analysis include species, number of individuals, time, height above ground, behavior, and flight direction. The order in which point count locations were surveyed differed among weeks to account for species variation during the day. Flight heights and distances from the observer were estimated by experienced field ornithologists, who had existing meteorological towers, local transmission lines, and topographic maps available for reference.

The survey protocol used in this study was designed to collect data on all bird species and to provide results that are comparable with other studies of avian use at wind farms (see discussion), rather than to target specific taxa. The benefit of using this method is that it estimates avian use throughout the day and captures activity by a variety of bird species. During the breeding season, songbirds are most active in the morning and can be difficult to detect during the afternoon. In contrast, raptors become active as the sunlight heats the air and creates thermals, which individuals use for soaring (Ballam 1984). Raptors are more readily detected several hours after sunrise. Thus, the survey method used in this study is appropriate for the bird community using the Lee-DeKalb WRA.

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

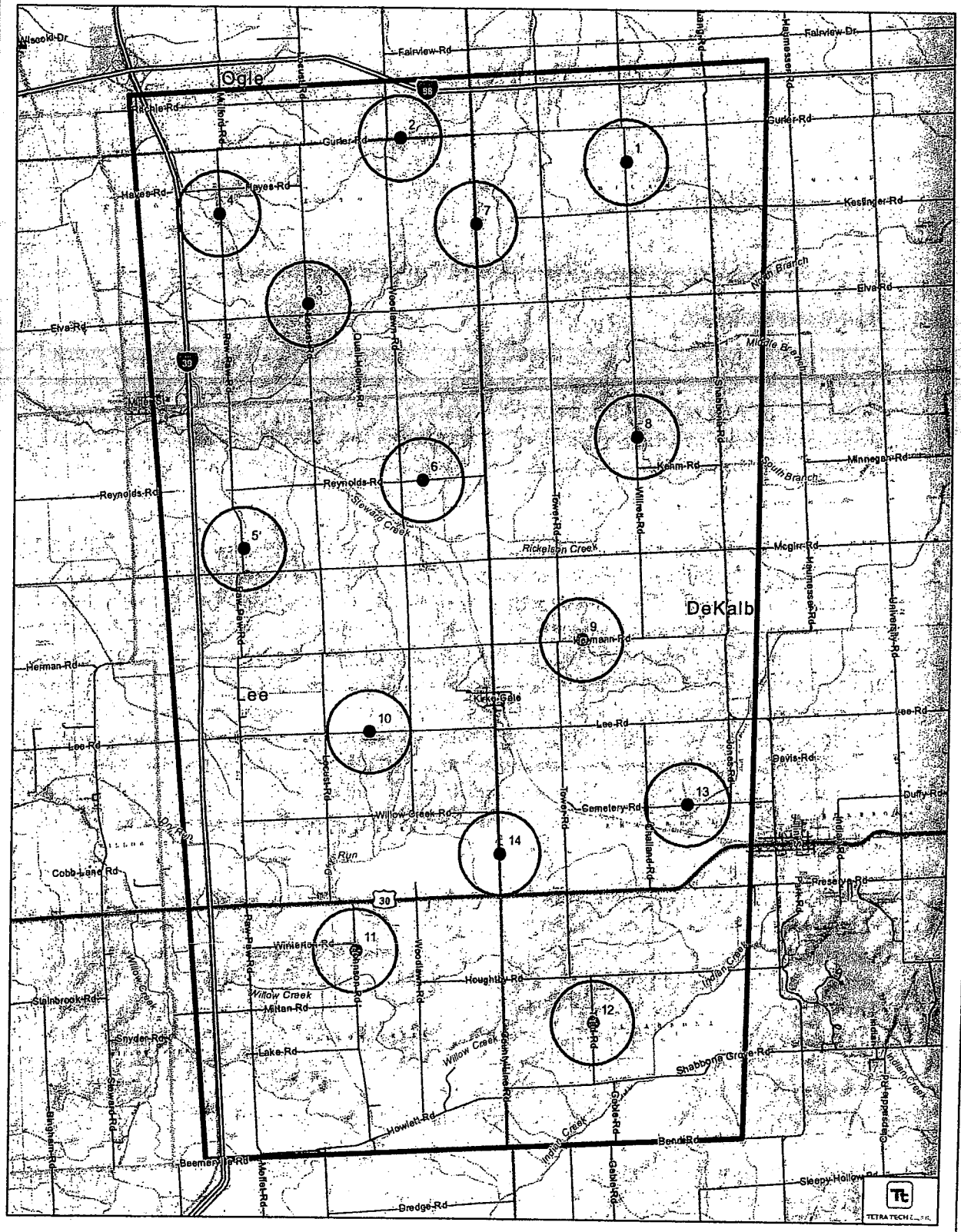


Figure 2. Lee/DeKalb Avian Survey Map

Lee and DeKalb Counties, IL

1:70,000

0 1 2

Miles

January 21, 2008

Project Area

County Boundary

Transportation

Interstate

Highway

Major Road

Local Road

Avian Survey Points

800m Buffer Avian Survey Points

Water Bodies

Perennial Stream

Intermittent Stream

Lakes/Reservoirs

P:\GIS_2006_PROJECTS\FPL_Beverly\Impact\Avian_Report\FPL_Beverly_WRA_Figure_2_Avian_Survey_Point_080607.mxd

Detectability varies among species and potentially not all individuals within the 800-meter survey were 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). Birds not easily identifiable, such as those seen under low light conditions, were identified to the lowest taxonomic level possible. Hence, unidentified birds are presented in the results.

Incidental Observations

Incidental observations were those recorded outside of the official 20-minute survey period and beyond 800 m from the point count sites. Incidental observations included observations that occurred 1) during travel between points, 2) before or after the official 20-minute survey period, and 3) outside the 800-meter radius circular plot. These observations were recorded on separate data sheets and were not used in the formal analysis; however, a summary of incidental birds is presented to provide additional information about species found in the local area.

Data Quality Assurance/Quality Control

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

2.2 Analysis

Species Groupings

We considered two primary groups of interest: raptors and non-raptors. We defined raptors as vultures, hawks, eagles, falcons, and owls. The flight behavior of vultures is similar to raptors and they are often included as raptors in other studies; therefore, we have included them with raptors for the purpose of our analyses. Non-raptors were defined as all other species groups.

Avian Use of the Lee-DeKalb WRA

Avian use of the Lee-DeKalb WRA was derived by calculating the average number of birds observed per point count location. To evaluate the diversity and composition of avian species using the Lee-DeKalb WRA, the number of individuals and species were summarized. In addition, the number of observations is also presented, where an observation can be either an individual bird or a discrete flock of birds. This information helps evaluate if a high mean use is driven by a single event (e.g., flock of birds moving through the rotor swept area).

Flight Behavior

Flight behavior was evaluated by calculating the proportion of flying birds that were observed below, within, or above the turbine rotor swept area (RSA). Turbines proposed for this site are GE 1.5 XLEs. Therefore, an RSA between 38.75 and 121.25 meters

above ground was used. A bird was considered to have flown within the RSA if any of its recorded heights overlapped the RSA. That is, if a bird flew at heights that correspond to the RSA at any time during the survey, it was considered to have occurred within the RSA.

Encounter Rate

To estimate the rate at which a species flies though the anticipated RSA, the following equation was applied to every species observed in the WRA:

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

where A is the mean number of birds/20 min for a given species, P_f is the proportion of all activity observations for a given species that were flying; and P_t is the proportion flying observations that were within the turbine RSA for a given species. The encounter rate provides information on the rate at which a species moves through the RSA. This information is an important component in evaluating risk; however, this number alone does not indicate risk to a species.

3.0 RESULTS

3.1 Lee-DeKalb WRA

About 2,432 acres of the Lee-DeKalb WRA were surveyed during point count surveys, covering 3.8 percent of the total area of the Lee-DeKalb WRA. The 14 point count locations were surveyed 12 times, which resulted in 168 20-minute surveys.

3.2 Species Composition

A total of 9,422 birds of 47 identified and 11 unidentified species groups were recorded during 168 fixed-point count surveys. The most frequently observed birds seen were the brown-headed cowbird (26.8 percent of all birds observed), European starling (23.7 percent), red-winged blackbird (6.0 percent), and Canada goose (4.6 percent; Table 2). Each remaining identified species comprised 2.8 percent or less of the total number of birds observed.

3.3 Avian Use

Overall mean bird use within the Lee-DeKalb WRA was 56.08 birds/20 min, ranging from zero to 532 birds per 20-minute point count. Overall mean use was highest at point 7 (105.1 birds/20 min) and lowest at point 6 (18.1 birds/20 min).

Overall mean use for non-raptors was 55.5 birds/20min. Non-raptor mean use was highest at point 7 (104.3 birds/20 min) and lowest at point 6 (17.4 birds/20min; Figure 3). Among species groups, mean use was highest for songbirds (48.01 birds/20 min; Table 3), a group which comprised 85.6 percent of all bird detections. The European starling is a non-native invasive species, an agricultural pest, and is not protected by the Migratory Bird Treaty Act. After European starling mean use was removed, songbird mean use was reduced to 34.05 birds/20 min and was comprised mostly of brown-headed cowbirds and

red-winged blackbirds. The only species in any group with mean use higher than 10 birds/20 min were the brown-headed cowbird (15.03 birds/20 min) and European starling (13.29 birds/20 min; Tables 2 and 3). These two species accounted for 59.0 percent of songbird detections and 50.5 percent of all bird detections (Table 3). All other identified species had mean use values of less than 4 birds/20min (Table 2 and 3).

There were no discernible trends in non-raptor species mean use over the survey period (Figure 4). Highest mean use was observed on 13 September (75.9 birds/20 min) and 11 October (75.5 birds/20 min); lowest mean use was observed on 24 October (28.1 birds/20 min).

Raptors, because of their propensity to fly at heights similar to those encompassed by a turbine RSA, are a group of special interest. Overall mean use for raptors was 0.54 birds/20 min. The raptor species with the highest use was the red-tailed hawk (0.23 birds/20 min), followed by American kestrel (0.11 birds/20 min), turkey vulture (0.10 birds/20 min), northern harrier (0.06 birds/20 min), and Cooper's hawk (0.02 birds/20 min).

Mean use by raptors was highest at point 12 (1.33 birds/20 min) and lowest at points 8 and 13 (0.08 birds/20 min; Figure 5). A total of 16 birds from 4 raptor species were detected at point 12, of which 56 percent (n = 9) were turkey vultures.

Raptor mean use numbers appear to reach a peak in late September to mid-October (Figure 6). Highest mean use was observed on 20 September (1.21 birds/20 min), whereas lowest mean use was observed on 6 September (0.14 birds/20 min).

Figure 3: Mean non-raptor use by point count location (fall 2007)

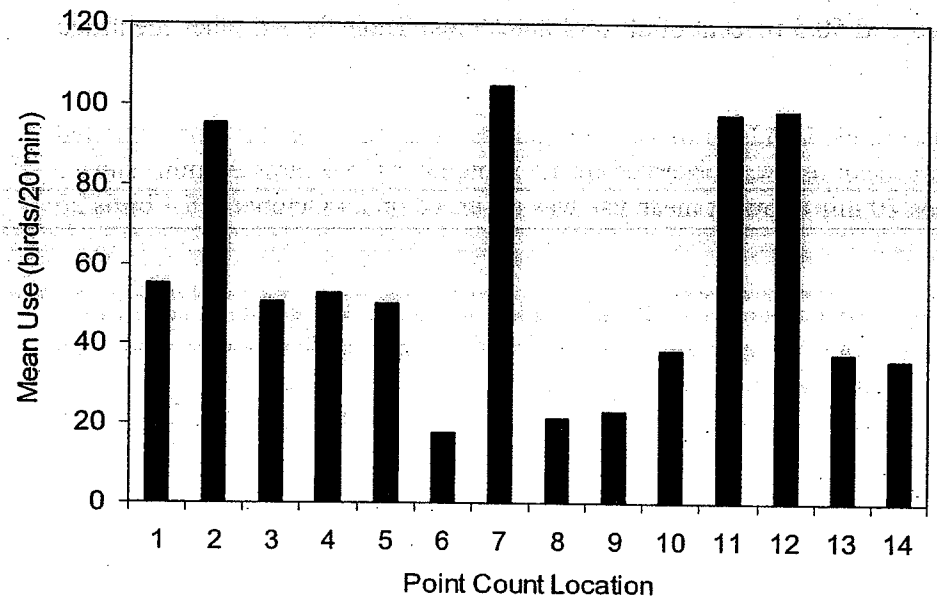


Figure 4: Mean non-raptor use by survey date (fall 2007)

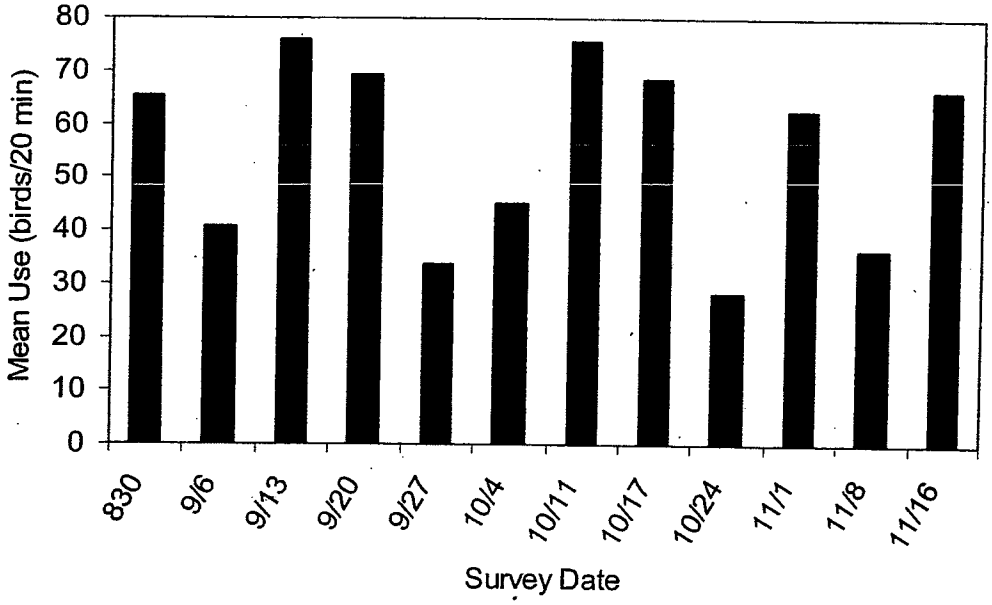


Figure 5: Mean raptor use by point count location (fall 2007)

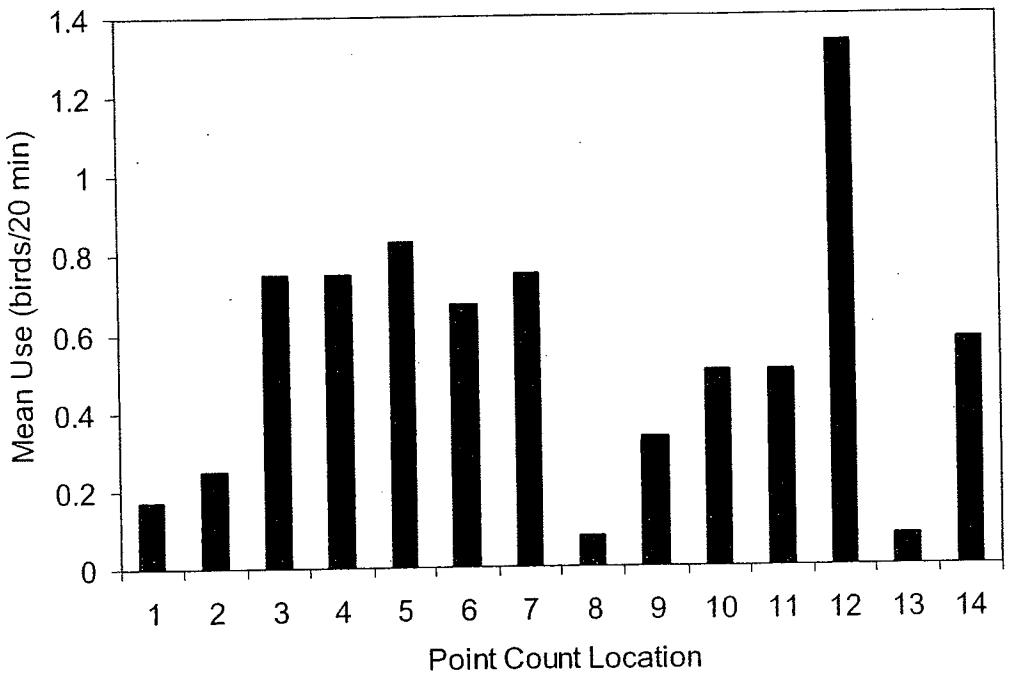
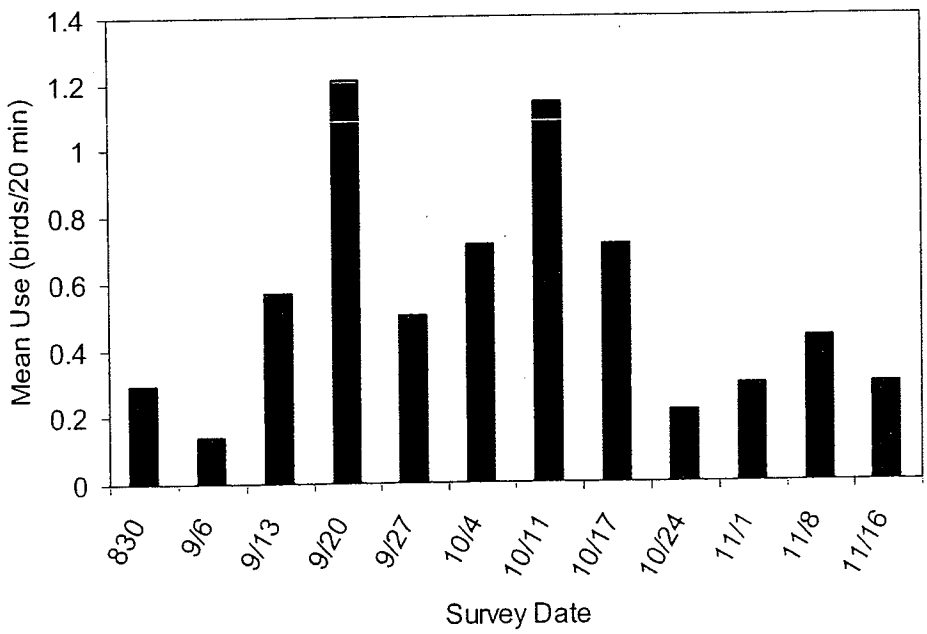


Figure 6: Mean raptor use by survey date (fall 2007)



3.4 Frequency of Occurrence

As with the use data, songbirds were the most frequently observed group (85.6 percent; Table 3); observations were comprised mainly of brown-headed cowbirds (26.8 percent) and European starlings (23.7 percent). Waterfowl were the second most frequently detected species group during the fall surveys (7.0 percent, n = 7 species; Table 3), with Canada goose as the most commonly detected species in this group (4.6 percent). Raptors were encountered on each survey visit and at most survey points but in low numbers (Tables 3 and 4).

3.5 Flight Height and Encounter Rate

During fall avian use surveys, behavioral data were collected for 97.5 percent of all birds observed during point count surveys. Of these birds, 81.2 percent were observed flying; flight height data were obtained for 77.5 percent of these flying-bird observations and flight direction for 98.0 percent. For raptors, 65.4 percent of flying individuals flew below the RSA, 30.8 percent flew within the RSA, and 3.8 percent flew above (Table 5). For all other species, 95.5 percent were observed flying below the anticipated RSA, 4.5 percent flew within the anticipated RSA, and 0 percent flew above the anticipated RSA.

European starlings had the highest encounter rate (1.38 birds flying within the RSA/20 min), followed by rock pigeon (0.34), red-tailed hawk and mourning dove (0.06 birds flying within the RSA/20 min), common grackle and turkey vulture (0.05 birds flying within the RSA/20 min), and the American crow (0.04 birds flying within the RSA/20 min). All other species had an encounter rate of <0.04 birds flying within the RSA/20 minutes.

3.6 Flight Direction

There were no discernable trends in flight directions for all observations combined (Table 7).

3.7 Incidental Surveys

During incidental fall surveys, staff documented 21 species from 7 species groups, and a total of 681 birds (Table 8). Brown-headed cowbirds were the most commonly recorded species during incidental surveys within the Lee-DeKalb WRA (n = 425 birds). Three species – broad-winged hawk, pied-billed grebe, and purple finch – were documented as incidentals but were not detected during fall point count surveys. Several raptor species were observed both as incidentals and during the point count surveys including American kestrel, Cooper's hawk, northern harrier, red-tailed hawk, and turkey vulture.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Raptor Use and Encounter Rate

Overall raptor use at the Lee-DeKalb WRA was low in the fall 2007 surveys (0.54 birds/20 min) and appeared to peak in late September-mid October. The highest raptor use was detected at point 12 (16 total raptors, included 2 northern harriers). The habitat at

this location is not noticeably different than the other locations, with the exception of a slightly higher amount of non-agricultural vegetation.

The Lee-DeKalb WRA ranked 18th out of 25 when compared to raptor use rates in fall reported for existing wind energy facilities throughout the western and mid-western regions of the country (Table 9). Because studies of avian use do not share identical methodologies (e.g., length of survey period), comparisons of avian use represent generalizations only. High raptor use has been associated with high raptor mortality at wind farms (Erickson 2007). Similarly, raptor mortality appears to be low when raptor use is low (<1.0 birds/20 min; Erickson 2007).
Red-tailed hawks, American kestrels, turkey vultures, northern harriers, and Cooper's hawks were observed on most survey dates and at most point count stations at the Lee-DeKalb WRA, although generally in low numbers (Tables 3 and 4). Three raptors had encounter rates greater than zero during the fall surveys. The red-tailed hawk displayed the highest encounter rate of the raptors, flying within the RSA 35.7 percent of the time. The turkey vulture displayed the second highest encounter rate and flew within the RSA 50.0 percent of the time and the American kestrel had the third highest encounter rate, flying within the RSA 20.0 percent of the time (Table 6). Although American kestrels tend to have higher turbine-related mortality rates than expected based on mean use (Young et al. 2002), its population, and those of red-tailed hawks and turkey vultures, are relatively stable (Sauer et al. 2007); therefore, potential population-level impacts of turbine-related mortality are minimal. The remaining two raptor species, northern harrier and Cooper's hawk, had encounter rates of zero due to the fact that they were never observed flying within the RSA. Additionally, three Fall 2007 avian surveys conducted with the same methodology within the Midwest (Iowa, Illinois, Wisconsin) produced similar results as the Lee-Dekalb study for the northern harrier, specifically. Of 35 northern harrier observations between the 3 studies, only 1 observation was within an RSA of 32 m – 128 m. Ninety-seven percent of observations were below given RSAs. Each survey area fell within similar migratory range of the northern harrier.

4.2 Non-Raptor Use and Encounter Rate

Overall use by non-raptors at Lee-DeKalb was high in the fall 2007 surveys (55.5 birds/20 min), but there was no consistent trend in the mean use data over the survey period. The two most commonly detected species, brown-headed cowbird and European starling, form flocks during the non-breeding season and often forage and travel in large groups. Flock size may be increased when individuals that breed outside of the area join the group for the winter. Mortality of brown-headed cowbirds and European starlings are unlikely to cause much concern from regulatory agencies. The brown-headed cowbird is an obligate brood parasite that lays its eggs in the nests of other species whose populations are often controlled to protect vulnerable migratory bird species. European starlings are a non-native invasive species and, as such, are not protected by the Migratory Bird Treaty Act. Highest non-raptor use was detected at point 7 (104.3 birds/20 min, n = 1252 individuals), and included high numbers of Canada geese, brown-headed cowbirds, and European starlings. The habitat at this location is not noticeably different than the other locations, with the exception of a slightly higher amount of non-agricultural vegetation.

The Lee-DeKalb WRA ranked fourth out of 17 when compared to non-raptor use rates in fall reported for existing wind energy facilities throughout the western and mid-western regions of the country (Table 9). Songbirds had the highest mean use out of all groups (48.01 birds/20 min), and mean use was less than 4.0 birds/20 min for each remaining species groups. The most commonly observed species, the brown-headed cowbird and the European starling, had markedly different encounter rates. European starlings exhibited the highest encounter rate of all species, a finding that likely has more to do with the large number of detections than a tendency to fly within the RSA (11.3 percent of flying observations). Despite large numbers, the brown-headed cowbird had an encounter rate of <0.1 as they were not observed flying within the RSA.

4.3 Listed and Sensitive Species

Only one state-listed species, the northern harrier, was observed during the fall avian surveys. The northern harrier is listed as Endangered in Illinois, a ranking defined as "any species which is in danger of extinction as a breeding species in Illinois" (IESPB 2006). The northern harrier is a migratory species that is common across much of North America, with a habitat preference for open fields and wetlands; northern harriers are often observed flying low over open fields in search of prey. Of the 10 individuals observed, all were flying below the RSA. On average, the mortality risk posed by turbines for this state-endangered species is low, an opinion supported by data from previous studies (e.g., Orloff and Flannery 1992). Spring surveys will help determine if northern harriers breed in the Lee-DeKalb WRA, which would be evidenced by observations of males and females throughout the breeding period, beginning in April and continuing though July.

4.4 Comparison with Spring 2007 Surveys

Point count surveys were performed on 4 dates at 14 locations during Spring 2007 (13 June through 5 July; Appendix A). A total of 1,394 individual birds were detected during the spring surveys, compared to 9,422 during the fall surveys; when broken down into a per survey basis, half as many birds were detected during each spring survey (348.5 birds/survey) than during the fall (785.2 birds/survey). A total of 37 identified and 6 unidentified species groups were recorded during the four visits, implying much higher bird diversity during the spring (9.25 identified species per spring visit, 3.87 identified species per fall visit). Importantly, there was limited overlap in the species complements of each season; 15 species detected in the spring were not detected in the fall, 24 species detected during the fall were not detected in the spring. Most of the spring-only species were long-distance migrants that had likely departed on migration before the onset of the fall surveys. Most of the fall-only species were shorebirds and waterfowl, likely already on their southward migration journeys.

Overall mean use during the spring was approximately half that observed during the fall (24.9 birds/20 min and 56.1 birds/20 min, respectively). Overall mean non-raptor use was lower (24.6 birds/20 min) than in fall (55.5 birds/20 min) as was overall mean raptor use (spring: 0.30 birds/20 min; fall: 0.54 birds/20 min).

As in the fall, songbirds were the most commonly detected group (90.4 percent of all detections) in the spring. The five most commonly detected songbirds were red-winged black-bird (28.3 percent of detections), European starling (17.9 percent), common grackle (2.89 percent), American robin (4.8 percent), and brown-headed cowbird (4.2 percent). Of these species, only the starling and the cowbird were detected in large numbers during the fall surveys.

In spring, raptors ranked as the fourth most commonly detected group (1.2 percent of all detections) which is similar to their fall numbers. However, far fewer raptors were detected during the spring surveys (4.3 birds/survey, n = 17 total in spring; 7.6 raptors per survey, n = 91 total in fall). Only three raptor species were detected during the spring surveys: turkey vulture (n = 11), red-tailed hawk (n = 3), and American kestrel (n = 3). The lack of spring northern harrier observations implies that the birds detected during the fall surveys were migrants and not breeding birds.

A much higher percentage of birds were observed flying within the RSA during the spring surveys than during the fall surveys. Raptors were observed flying within the RSA 64.3 percent of detections (30.8 percent in fall). Non-raptors were observed flying within the RSA 16.0 percent of detections (4.5 percent in fall). As in the fall, the European starling had the highest encounter rates (1.68 birds within RSA/20 min). Of the raptors detected in spring, only the turkey vulture had a measurable encounter rate (0.16 birds with RSA/20 min).

In summary, the apparent differences in the spring and fall survey results imply that the risk of turbine-related mortality for birds using the Lee-DeKalb WRA will be highly seasonal in nature and a more complete spring survey is recommended.

4.5 Lee-DeKalb Project Area Conclusions and Recommendations

Non-raptor use at the Lee-DeKalb WRA ranked first among 8 studies, and most non-raptors detected were songbirds. Songbirds had the highest mean use out of all species groups observed (55.5 birds/20 min). The two most commonly observed species, the brown-headed cowbird and the European starling, are both widespread species and have relatively stable populations (Sauer et al. 2007). Thus, local mortality of resident species is not expected to have population level consequences. However, night migrants may pass through the Lee-DeKalb WRA and would not be detected by the survey methods used in this study. Although nocturnal migrants were not surveyed, mortality of migrants at the Lee-DeKalb WRA is not expected to have population implications because less than 0.01 percent of nocturnal migrants that fly through wind farms are killed (Erickson 2007).

Overall impact on raptors is likely to be low based on mean use and encounter rate. Although raptor use was highest at point 12, there is no specific landscape feature that would make this point more attractive.

5.0 REFERENCES

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Avian Power Line Interaction Committee (APLIC) and U.S. Fish and Wildlife Service. 2005. Avian Protection Plan Guidelines. Edison Electric Institute, APLIC, and the U.S. Fish and Wildlife Service.

Ballam, J.M. 1984. The use of soaring by the red-tailed hawk (*Buteo jamaicensis*). Auk 3:519-524.

Birdnature.com (BNC) 2004. North American Migration Pathways (map). Available at http://www.birdnature.com/flyways.html. Accessed December 9, 2007.

Drewitt, A.L., and R.H.W. Langston. 2006. Assessing the impacts of wind farms on birds. Ibis 148:29-42.

ECOMAP. 1993. Ecological subregions of the United States. United States Forest Service Publication WO-WSA-5.

Erickson, W.P. 2007. Summary of methods and results for prediction and estimation of impacts and risk. Presented at NWCC Probability of Impact Workshop, 13 November 2007, Golden, CO.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Final Report, July 2001 – December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka, and R.E. Good. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordination Committee Publication. http://www.nationalwind.org/pubs/default.htm

Erickson, W.P., G.D. Johnson, and D.P. Young, Jr. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and comparison of baseline avian and bat use, raptor

nesting and mortality information from proposed and existing wind developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Erickson, W., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003. Wildlife Baseline Study for the Wild Horse Wind Project, Summary of Results from 2002-2003 Wildlife Surveys. Prepared for Zilkha Renewable Energy, Portland, Oregon.

Evans, W.R., Y. Akashi, N.S. Altman, and A. M. Manville II. 2007. Response of night-migrating birds in cloud to colored and flashing light. A report to the Communications Tower Working Group.

Illinois Endangered Species Protection Board (IESPB). 2006. 2006 endangered and threatened species list. Available at dnr.state.il.us/espb/datelist.htm. Accessed January 10, 2008.

Illinois Natural History Survey (INHS). 2002. Birds of Illinois. Available at www.inhs.uiuc.edu/cbd/ilspecies/birdsplist.html. Accessed 10 January 10, 2008.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual report for the Maple Ridge wind power project postconstruction bird and bat fatality study – 2006. Prepared by Curry and Kerlinger, LLC for PPM Energy, Horizon Energy, and Technical Advisory Committee for the Maple Ridge project.

Johnson, G.D., W. P Erickson, and J. D. Jeffrey. 2006. Analysis of potential wildlife impacts from the Windy Point wind energy project, Klickitat County, Washington. Technical Report prepared by Western EcoSystems Technology, Inc., for Ecology and Environment, Portland, Oregon.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. *Wildlife Society Bulletin* 30: 879-887.

Johnson, G.D., D.P. Young Jr., W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000. Wildlife monitoring studies, SeaWest Windpower Project, Carbon County, Wyoming. 1995-1999. Technical Report prepared by Western EcoSystems Technology, Inc., for SeaWest Energy Corporation and Bureau of Land Management.

Kerlinger, P., L. Culp, and R. Curry, 2005. Post construction avian monitoring study for the High Winds wind power project. Solano County, California. Prepared for High Winds, LLC. FPL Energy. 70 pgs.

Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: annual report for 2003. Technical report prepared by Curry and Kerlinger, LLC. For FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in CRP grasslands. Wilson Bulletin 111:100-104.

Mabee, T.J., B.A. Cooper, and C. Grinnell. 2005. Baseline Avian Use at the Klondike III Wind Project, Oregon, Winter 2004/2005. Prepared by ABR, Inc.—Environmental Research and Services for David Evans & Associates, Inc. 22 p.

Macwhirter, R.B., and K.L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/210

Orloff, S., and A. Flannery. 1992. Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final report prepared by Biosystems Analysis, Inc. for Alameda, Contra Costa, and Solano Counties and the California Energy Commission.

Pickwell, B. 1931. The Prairie Horned Lark. St. Louis Academy of Sciences Transactions 27: 1-153.

Pitman, J.C., C.A. Hagen, R.J. Robel, T.M. Loughin, and R.D. Applegate. 2005. Location and success of lesser prairie-chicken nests in relation to vegetation and human disturbance. Journal of Wildlife Management 69:1259-1269.

Sauer, J.R., J.E. Hines, and J. Fallon. 2007. The North American Breeding Bird Survey, Results and Analysis 1966 - 2006. Version 10.13.2007. USGS Patuxent Wildlife Research Center, Laurel, MD.

Thompson, W.L. 2002. Towards reliable bird surveys: accounting for individuals present but not detected. Auk 119:18-25.

URS Corporation, WEST, and Northwest Wildlife Consultants. 2001. Final Report – Ecological Baseline Study for the Condon Wind Project. Prepared for Bonneville Power Administration and SeaWest Windpower, Inc.

URS Corporation and WEST. 2001. Avian Baseline Study for the Stateline Project. Prepared for ESI Vansycle Partners, L.P.

Western EcoSystems Technology, Inc.(WEST). 2005. Wildlife and Habitat Baseline Study for the proposed Biglow Canyon wind power project, Sherman County, Oregon. Prepared for Orion Energy LLC. 66 p.

Western EcoSystems Technology Inc. (WEST) and Northwest Wildlife Consultants (NWC). 2004. Stateline Wildlife Monitoring Final Report. July 2001-December 2003. Prepared for FPLE, Stateline Technical Advisory Committee, and Oregon Department of Energy. 105 p.

Young, D., W. Erickson, K. Bay, R. Good, and K Kronner. 2002. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report prepared for Bonneville Power Administration.

Table 1. Lee-DeKalb Wind Resource Area, 2007 Fall point count survey dates.

Survey number	Date
1	August 30
2	September 6
3	September 13
4	September 20
5	September 27
6	October 4
7	October 11
8	October 17
9	October 24
10	November 1
11	November 8
12	November 16

Table 2. Avian species observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Observations	Mean Use (Birds per 20 min)	Frequency (% of surveys detected)	Percent Composition
brown-headed cowbird	2525	72	15.03	27.4	26.8%
European starling	2233	144	13.29	46.4	23.7%
unknown bird	680	69	4.05	20.8	7.2%
red-winged blackbird	562	39	3.35	14.3	6.0%
unidentified songbird	463	81	2.76	28.0	4.9%
Canada goose	435	20	2.59	6.5	4.6%
unidentified blackbird	307	31	1.83	16.1	3.3%
American goldfinch	268	109	1.60	36.3	2.8%
rock pigeon	234	24	1.39	11.3	2.5%
unidentified swallow	233	25	1.39	11.3	2.5%
unidentified sparrow	223	85	1.33	29.8	2.4%
horned lark	212	41	1.26	14.3	2.3%
common grackle	144	24	0.86	10.7	1.5%
barn swallow	115	43	0.68	14.9	1.2%
killdeer	108	51	0.64	23.2	1.1%
mourning dove	99	46	0.59	18.5	1.1%
mallard	99	3	0.59	1.8	1.1%
American crow	95	40	0.57	20.2	1.0%
northern shoveler	90	3	0.54	1.8	1.0%
red-tailed hawk	38	37	0.23	20.2	0.4%
blue jay	26	21	0.15	9.5	0.3%
American robin	21	14	0.13	7.1	0.2%
house sparrow	20	3	0.12	1.8	0.2%
green-winged teal	20	1	0.12	0.6	0.2%
greater yellowlegs	20	3	0.12	1.8	0.2%
American kestrel	19	19	0.11	10.7	0.2%
turkey vulture	16	11	0.10	5.4	0.2%
dark-eyed junco	16	4	0.10	2.4	0.2%
unidentified duck	10	2	0.06	1.2	0.1%
northern harrier	10	10	0.06	6.0	0.1%
chipping sparrow	9	4	0.05	2.4	0.1%
eastern meadowlark	7	6	0.04	3.6	0.1%
lesser yellowlegs	5	1	0.03	0.6	0.1%
great blue heron	5	5	0.03	3.0	0.1%
common snipe	5	2	0.03	1.2	0.1%
song sparrow	4	4	0.02	2.4	0.0%
gadwall	4	1	0.02	0.6	0.0%
eastern bluebird	4	2	0.02	1.2	0.0%
white-throated sparrow	3	2	0.02	1.2	0.0%

Table 2. Avian species observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Observations	Mean Use (Birds per 20 min)	Frequency % of surveys detected	Percent Composition
unidentified swift	3	1	0.02	0.6	0.0%
unidentified buteo	3	3	0.02	1.8	0.0%
tree swallow	3	3	0.02	1.8	0.0%
palm warbler	3	1	0.02	0.6	0.0%
Cooper's hawk	3	3	0.02	1.8	0.0%
Brewer's blackbird	3	2	0.02	1.2	0.0%
unidentified hawk	2	2	0.01	1.2	0.0%
northern flicker	2	2	0.01	1.2	0.0%
lesser scaup	2	1	0.01	0.6	0.0%
canvasback	2	1	0.01	0.6	0.0%
unidentified warbler	1	1	0.01	0.6	0.0%
unidentified meadowlark	1	1	0.01	0.6	0.0%
sandhill crane	1	1	0.01	0.6	0.0%
ring-necked pheasant	1	1	0.01	0.6	0.0%
Lincoln's sparrow	1	1	0.01	0.6	0.0%
great egret	1	1	0.01	0.6	0.0%
downy woodpecker	1	1	0.01	0.6	0.0%
cliff swallow	1	1	0.01	0.6	0.0%
belted kingfisher	1	1	0.01	0.6	0.0%
Grand Total	**9422**	**1130**	**56.08**		

Table 3. Avian species, by species grouping, observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species Grouping / Species	Number of Birds	Number of Observations	Mean use: # birds per 20 mins.	Frequency: % of surveys detected	Percent Composition
Songbirds					
brown-headed cowbird	2525	72	15.03	27.4	26.8%
European starling	2233	144	13.29	46.4	23.7%
unknown bird	680	69	4.05	20.8	7.2%
red-winged blackbird	562	39	3.35	14.3	6.0%
unidentified songbird	463	81	2.76	28.0	4.9%
unidentified blackbird	307	31	1.83	16.1	3.3%
American goldfinch	268	109	1.60	36.3	2.8%
unidentified swallow	233	25	1.39	11.3	2.5%
unidentified sparrow	223	85	1.33	29.8	2.4%
horned lark	212	41	1.26	14.3	2.3%
common grackle	144	24	0.86	10.7	1.5%
barn swallow	115	43	0.68	14.9	1.2%
American robin	21	14	0.13	7.1	0.2%
house sparrow	20	3	0.12	1.8	0.2%
dark-eyed junco	16	4	0.10	2.4	0.2%
chipping sparrow	9	4	0.05	2.4	0.1%
eastern meadowlark	7	6	0.04	3.6	0.1%
song sparrow	4	4	0.02	2.4	0.0%
eastern bluebird	4	2	0.02	1.2	0.0%
white-throated sparrow	3	2	0.02	1.2	0.0%
unidentified swift	3	1	0.02	0.6	0.0%
tree swallow	3	3	0.02	1.8	0.0%
palm warbler	3	1	0.02	0.6	0.0%
Brewer's blackbird	3	2	0.02	1.2	0.0%
unidentified warbler	1	1	0.01	0.6	0.0%
unidentified meadowlark	1	1	0.01	0.6	0.0%
Lincoln's sparrow	1	1	0.01	0.6	0.0%
cliff swallow	1	1	0.01	0.6	0.0%
Group Total	**8065**	**813**	**48.01**		**85.6%**
Raptors/Vultures/Owls					
red-tailed hawk	38	37	0.23	20.2	0.4%
American kestrel	19	19	0.11	10.7	0.2%
turkey vulture	16	11	0.10	5.4	0.2%
northern harrier	10	10	0.06	6.0	0.1%
unidentified buteo	3	3	0.02	1.8	0.0%

Table 3. Avian species, by species grouping, observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species Grouping / Species	Number of Birds	Number of Observations	Mean Use # birds per 30 min	Frequency % of surveys detected	Percent Composition
Cooper's hawk	3	3	0.02	1.8	0.0%
unidentified hawk	2	2	0.01	1.2	0.0%
Group Total	**91**	**85**	**0.54**		**1.0%**
Waterfowl					
Canada goose	435	20	2.59	6.5	4.6%
mallard	99	3	0.59	1.8	1.1%
northern shoveler	90	3	0.54	1.8	1.0%
green-winged teal	20	1	0.12	0.6	0.2%
unidentified duck	10	2	0.06	1.2	0.1%
gadwall	4	1	0.02	0.6	0.0%
lesser scaup	2	1	0.01	0.6	0.0%
canvasback	2	1	0.01	0.6	0.0%
Group Total	**662**	**32**	**3.94**		**7.0%**
Woodpeckers					
northern flicker	2	2	0.01	1.2	0.0%
downy woodpecker	1	1	0.01	0.6	0.0%
Group Total	**3**	**3**	**0.02**		**0.0%**
Crows and Allies					
American crow	95	40	0.57	20.2	1.0%
blue jay	26	21	0.15	9.5	0.3%
Group Total	**121**	**61**	**0.72**		**1.3%**
Cranes/Rails					
sandhill crane	1	1	0.01	0.6	0.0%
Group Total	**1**	**1**	**0.01**		**0.0%**
Gamebirds					
ring-necked pheasant	1	1	0.01	0.6	0.0%
Group Total	**1**	**1**	**0.01**		**0.0%**
Pigeons/Doves					
rock pigeon	234	24	1.39	11.3	2.5%
mourning dove	99	46	0.59	18.5	1.1%
Group Total	**333**	**70**	**1.98**		**3.5%**
Shorebirds					
killdeer	108	51	0.64	23.2	1.1%
greater yellowlegs	20	3	0.12	1.8	0.2%
lesser yellowlegs	5	1	0.03	0.6	0.1%
common snipe	5	2	0.03	1.2	0.1%
Group Total	**138**	**57**	**0.82**		**1.5%**

Table 3. Avian species, by species grouping, observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use birds per 20 min	Frequency % of surveys detected	Percent Composition
Cooper's hawk	3	3	0.02	1.8	0.0%
unidentified hawk	2	2	0.01	1.2	0.0%
Group Total	**91**	**85**	**0.54**		**1.0%**
Waterfowl					
Canada goose	435	20	2.59	6.5	4.6%
mallard	99	3	0.59	1.8	1.1%
northern shoveler	90	3	0.54	1.8	1.0%
green-winged teal	20	1	0.12	0.6	0.2%
unidentified duck	10	2	0.06	1.2	0.1%
gadwall	4	1	0.02	0.6	0.0%
lesser scaup	2	1	0.01	0.6	0.0%
canvasback	2	1	0.01	0.6	0.0%
Group Total	**662**	**32**	**3.94**		**7.0%**
Woodpeckers					
northern flicker	2	2	0.01	1.2	0.0%
downy woodpecker	1	1	0.01	0.6	0.0%
Group Total	**3**	**3**	**0.02**		**0.0%**
Crows and Allies					
American crow	95	40	0.57	20.2	1.0%
blue jay	26	21	0.15	9.5	0.3%
Group Total	**121**	**61**	**0.72**		**1.3%**
Cranes/Rails					
sandhill crane	1	1	0.01	0.6	0.0%
Group Total	**1**	**1**	**0.01**		**0.0%**
Gamebirds					
ring-necked pheasant	1	1	0.01	0.6	0.0%
Group Total	**1**	**1**	**0.01**		**0.0%**
Pigeons/Doves					
rock pigeon	234	24	1.39	11.3	2.5%
mourning dove	99	46	0.59	18.5	1.1%
Group Total	**333**	**70**	**1.98**		**3.5%**
Shorebirds					
killdeer	108	51	0.64	23.2	1.1%
greater yellowlegs	20	3	0.12	1.8	0.2%
lesser yellowlegs	5	1	0.03	0.6	0.1%
common snipe	5	2	0.03	1.2	0.1%
Group Total	**138**	**57**	**0.82**		**1.5%**

Table 3. Avian species, by species grouping, observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species Grouping / Species	Number of Birds	Number of Observations	Mean Use (birds per 10 min)	Frequency (% of surveys recorded)	Percent Composition
Wadingbirds					
great blue heron	5	5	0.03	3.0	0.1%
great egret	1	1	0.01	0.6	0.0%
Group Total	**6**	**6**	**0.04**		**0.1%**
Other					
belted kingfisher	1	1	0.01	0.6	0.0%
Group Total	**1**	**1**	**0.01**		**0.0%**
Grand Total	**9422**	**1130**	**56.08**		

Table 4. Avian species observed by point during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs	Points 1	2	3	4	5	6	7
brown-headed cowbird	2525	72	2	571	31	53	0	110	167
European starling	2233	144	359	80	101	284	304	41	107
unknown bird	680	69	56	39	17	9	140	6	139
red-winged blackbird	562	39	2	5	261	129	18	0	14
unidentified songbird	463	81	27	204	8	15	4	3	13
Canada goose	435	20	45	1	0	0	33	0	289
unidentified blackbird	307	31	6	1	42	81	1	8	53
American goldfinch	268	109	15	6	15	16	4	6	9
rock pigeon	234	24	23	130	0	2	0	8	0
unidentified swallow	233	25	15	60	25	2	4	0	41
unidentified sparrow	223	85	12	2	7	5	7	2	8
horned lark	212	41	27	8	43	6	60	2	22
common grackle	144	24	5	23	6	5	2	3	50
barn swallow	115	43	4	4	8	10	0	1	11
killdeer	108	51	3	3	21	1	13	2	39
mourning dove	99	46	19	4	1	3	6	3	15
mallard	99	3	4	0	0	0	0	0	95
American crow	95	40	21	3	11	6	3	7	12
northern shoveler	90	3	0	0	0	0	0	0	90
red-tailed hawk	38	37	0	1	4	6	6	5	1
blue jay	26	21	3	0	1	2	0	1	2
American robin	21	14	4	0	2	1	1	2	0
house sparrow	20	3	3	1	0	0	0	0	0
green-winged teal	20	1	0	0	0	0	0	0	20
greater yellowlegs	20	3	0	0	0	0	0	0	20
American kestrel	19	19	1	0	0	1	0	2	7
turkey vulture	16	11	0	0	3	0	2	0	0
dark-eyed junco	16	4	0	0	2	0	0	0	0
unidentified duck	10	2	4	0	0	0	0	0	6
northern harrier	10	10	0	2	2	1	1	0	1
chipping sparrow	9	4	0	0	0	0	0	1	0
eastern meadowlark	7	6	0	0	0	0	0	2	2
lesser yellowlegs	5	1	0	0	0	0	0	0	5
great blue heron	5	5	1	0	0	0	0	0	3
common snipe	5	2	0	0	0	0	0	0	5
song sparrow	4	4	0	0	0	0	1	0	0
gadwall	4	1	0	0	0	0	0	0	4
eastern bluebird	4	2	0	0	0	0	0	0	0
white-throated sparrow	3	2	0	0	2	0	0	0	0
unidentified swift	3	1	0	0	0	0	0	0	0

Table 4. Avian species observed by point during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs	Points 1	2	3	4	5	6	7
unidentified buteo	3	3	1	0	0	0	0	0	0
tree swallow	3	3	0	1	0	0	0	0	0
palm warbler	3	1	0	0	0	0	0	0	3
Cooper's hawk	3	3	0	0	0	1	1	1	0
Brewer's blackbird	3	2	0	0	0	0	0	0	2
unidentified hawk	2	2	0	0	0	0	0	0	0
northern flicker	2	2	0	0	0	0	0	0	0
lesser scaup	2	1	0	0	0	0	0	0	2
canvasback	2	1	0	0	0	0	0	0	2
unidentified warbler	1	1	0	0	1	0	0	0	0
unidentified meadowlark	1	1	0	0	0	0	1	0	0
sandhill crane	1	1	0	0	0	0	0	0	1
ring-necked pheasant	1	1	0	0	0	0	0	0	0
Lincoln's sparrow	1	1	0	0	0	0	0	0	0
great egret	1	1	0	0	0	0	0	0	1
downy woodpecker	1	1	0	0	0	0	0	0	0
cliff swallow	1	1	0	0	1	0	0	0	0
belted kingfisher	1	1	0	0	0	0	0	1	0
Grand Total	**9422**	**1130**	**662**	**1149**	**615**	**639**	**612**	**217**	**1261**

Table 4. Avian species observed by point during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs	Points 8	9	10	11	12	13	14
unidentified buteo	3	3	0	0	0	0	0	1	1
tree swallow	3	3	0	0	0	1	1	0	0
palm warbler	3	1	0	0	0	0	0	0	0
Cooper's hawk	3	3	0	0	0	0	0	0	0
Brewer's blackbird	3	2	0	0	1	0	0	0	0
unidentified hawk	2	2	0	0	1	0	0	0	1
northern flicker	2	2	1	0	1	0	0	0	0
lesser scaup	2	1	0	0	0	0	0	0	0
canvasback	2	1	0	0	0	0	0	0	0
unidentified warbler	1	1	0	0	0	0	0	0	0
unidentified meadowlark	1	1	0	0	0	0	0	0	0
sandhill crane	1	1	0	0	0	0	0	0	0
ring-necked pheasant	1	1	0	0	1	0	0	0	0
Lincoln's sparrow	1	1	0	0	0	0	1	0	0
great egret	1	1	0	0	0	0	0	0	0
downy woodpecker	1	1	0	0	0	0	0	0	1
cliff swallow	1	1	0	0	0	0	0	0	0
belted kingfisher	1	1	0	0	0	0	0	0	0
Grand Total	**9422**	**1130**	**259**	**280**	**468**	**1175**	**1194**	**453**	**438**

Table 5. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA)[1] during Fall point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

	Observations		Individuals	
	Number	Percentage	Number	Percentage
Non-raptors				
Above RSA (>121.25m)	1	0.2%	2	0.0%
Below RSA (<38.75m)	594	96.9%	5612	95.5%
Within RSA (38.75m–121.25m)	18	2.9%	265	4.5%
Raptors/Vultures/Owls				
Above RSA (>121.25m)	2	4.3%	2	3.8%
Below RSA (<38.75m)	28	60.9%	34	65.4%
Within RSA (38.75m–121.25m)	16	34.8%	16	30.8%

[1]These values assume a rotor diameter of 82.5 (m) and a hub height of 80 (m)

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Fall 2007.

Species	Encounter Rate	Mean Use #birds/20 min (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
European starling	1.38	13.29 (9.72 - 16.86)	91.8	88.7	11.3	0.0
rock pigeon	0.34	1.39 (0.37 - 2.41)	86.3	72.0	28.0	0.0
mourning dove	0.06	0.59 (0.36 - 0.82)	70.7	84.8	15.2	0.0
red-tailed hawk	0.06	0.23 (0.17 - 0.29)	76.3	64.3	35.7	0.0
unidentified swallow	0.06	1.39 (0.57 - 2.21)	86.3	95.0	5.0	0.0
common grackle	0.05	0.86 (0.25 - 1.47)	95.8	93.3	6.7	0.0
turkey vulture	0.05	0.10 (0.02 - 0.18)	100.0	50.0	50.0	0.0
American crow	0.04	0.57 (0.38 - 0.76)	62.1	88.5	11.5	0.0
killdeer	0.03	0.64 (0.37 - 0.91)	58.3	92.9	7.1	0.0
barn swallow	0.02	0.68 (0.35 - 1.01)	82.6	96.7	3.3	0.0
American kestrel	0.01	0.11 (0.07 - 0.15)	63.2	80.0	20.0	0.0
unidentified bird	0.01	4.05 (2.36 - 5.74)	97.2	99.4	0.3	0.3
unidentified buteo	0.01	0.02 (0.00 - 0.04)	100.0	0.0	33.3	66.7
unidentified hawk	0.01	0.01 (0.00 - 0.02)	100.0	50.0	50.0	0.0
white-throated sparrow	0.00	0.02 (0.00 - 0.04)	33.3	0.0	0.0	0.0
unidentified warbler	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
unidentified swift	0.00	0.02 (-0.01 - 0.05)	100.0	100.0	0.0	0.0
unidentified sparrow	0.00	1.33 (0.82 - 1.84)	81.6	100.0	0.0	0.0
unidentified songbird	0.00	2.76 (0.64 - 4.88)	56.8	100.0	0.0	0.0
unidentified meadowlark	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
unidentified duck	0.00	0.06 (-0.01 - 0.13)	40.0	0.0	0.0	0.0
unidentified blackbird	0.00	1.83 (0.91 - 2.75)	92.2	100.0	0.0	0.0
tree swallow	0.00	0.02 (0.00 - 0.04)	100.0	100.0	0.0	0.0
song sparrow	0.00	0.02 (0.00 - 0.04)	50.0	100.0	0.0	0.0
sandhill crane	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
red-winged blackbird	0.00	3.35 (0.49 - 6.21)	99.3	100.0	0.0	0.0

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Fall 2007.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
ring-necked pheasant	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
palm warbler	0.00	0.02 (-0.01 - 0.05)	0.0	0.0	0.0	0.0
northern shoveler	0.00	0.54 (-0.10 - 1.18)	0.0	0.0	0.0	0.0
northern harrier	0.00	0.06 (0.03 - 0.09)	100.0	100.0	0.0	0.0
northern flicker	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
mallard	0.00	0.59 (-0.27 - 1.45)	4.0	100.0	0.0	0.0
Lincoln's sparrow	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
lesser yellowlegs	0.00	0.03 (-0.02 - 0.08)	0.0	0.0	0.0	0.0
lesser scaup	0.00	0.01 (-0.01 - 0.03)	0.0	0.0	0.0	0.0
house sparrow	0.00	0.12 (-0.04 - 0.28)	100.0	100.0	0.0	0.0
horned lark	0.00	1.26 (0.56 - 1.96)	86.3	100.0	0.0	0.0
green-winged teal	0.00	0.12 (-0.08 - 0.32)	0.0	0.0	0.0	0.0
greater yellowlegs	0.00	0.12 (-0.01 - 0.25)	0.0	0.0	0.0	0.0
great egret	0.00	0.01 (0.00 - 0.02)	0.0	0.0	0.0	0.0
great blue heron	0.00	0.03 (0.01 - 0.05)	80.0	100.0	0.0	0.0
gadwall	0.00	0.02 (-0.02 - 0.06)	0.0	0.0	0.0	0.0
eastern meadowlark	0.00	0.04 (0.01 - 0.07)	14.3	0.0	0.0	0.0
eastern bluebird	0.00	0.02 (-0.01 - 0.05)	100.0	100.0	0.0	0.0
downy woodpecker	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
dark-eyed junco	0.00	0.10 (-0.01 - 0.21)	75.0	100.0	0.0	0.0
common snipe	0.00	0.03 (-0.01 - 0.07)	0.0	0.0	0.0	0.0
Cooper's hawk	0.00	0.02 (0.00 - 0.04)	100.0	100.0	0.0	0.0
cliff swallow	0.00	0.01 (0.00 - 0.02)	100.0	100.0	0.0	0.0
chipping sparrow	0.00	0.05 (0.00 - 0.10)	33.3	100.0	0.0	0.0
canvasback	0.00	0.01 (-0.01 - 0.03)	0.0	0.0	0.0	0.0
Canada goose	0.00	2.59 (0.80 - 4.38)	57.7	100.0	0.0	0.0

Table 7. Flight directions of birds observed during Fall point count surveys at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
dark-eyed junco	12	3	0.0	0.0	8.3	0.0	8.3	83.3	0.0	0.0	0.0
northern harrier	10	10	20.0	0.0	30.0	0.0	30.0	0.0	20.0	0.0	0.0
American kestrel	10	10	30.0	0.0	10.0	10.0	10.0	0.0	20.0	10.0	10.0
unidentified duck	4	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mallard	4	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
great blue heron	4	4	50.0	0.0	25.0	0.0	0.0	0.0	25.0	0.0	0.0
eastern bluebird	4	2	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
unidentified swift	3	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
unidentified buteo	3	3	33.3	0.0	33.3	33.3	0.0	0.0	0.0	0.0	0.0
tree swallow	3	3	33.3	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0
Cooper's hawk	3	3	33.3	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0
chipping sparrow	3	2	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
unidentified hawk	2	2	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
song sparrow	2	2	0.0	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0
northern flicker	2	2	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0
white-throated sparrow	1	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
sandhill crane	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
eastern meadowlark	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
downy woodpecker	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
cliff swallow	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Brewer's blackbird	1	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
belted kingfisher	1	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total	**7497**	**834**	**11.8**	**6.2**	**10.8**	**8.8**	**25.0**	**7.9**	**20.5**	**6.1**	**2.8**

Table 8. Incidental observations of birds during fall point counts at the Lee-DeKalb Wind Resource Area, 2007.

Species	Number of individuals
American kestrel	10
brown-headed cowbird	425
Brewer's blackbird	5
broad-winged hawk	1
Canada goose	75
chipping sparrow	2
Cooper's hawk	1
eastern meadowlark	6
European starling	15
great blue heron	2
great egret	2
greater yellowlegs	50
horned lark	5
mourning dove	5
northern flicker	2
northern harrier	2
northern shoveler	1
pied-billed grebe	4
purple finch	8
red-tailed hawk	21
turkey vulture	2
unknown bird	3
unidentified blackbird	15
unidentified hawk	3
unidentified sparrow	16
Grand Total	**681**

Spring 2007 Avian Survey Summary for the Lee-DeKalb Wind Resource Area

Prepared for:

FPL Energy

Prepared by:

TETRA TECH EC, INC

September, 2007

Tetra Tech, EC was contracted by FPL Energy to undertake spring avian use surveys for the proposed Lee-DeKalb Wind Resource Area (WRA) in DeKalb and Lee Counties, Illinois (Figure 1). Weekly spring surveys were performed at the Lee-DeKalb WRA from 13 June to 5 July, 2007 (Table 1). A total of 49 20-minute (min) fixed point count surveys (800-m radius) were conducted at 14 points distributed throughout the WRA (Figure 2). Thirty-seven species were identified, and a total of 1,394 birds from 8 taxonomic groups were recorded within the Lee-DeKalb WRA (Table 2). Overall mean avian use of the WRA was 25.9 birds/20 min (Table 3).

Mean raptor use at the Lee-DeKalb WRA was 0.3 birds/20 min (Table 3). Raptor species observed included turkey vulture (0.2 birds/20 min), red-tailed hawk (0.05 birds/20 min), and American kestrel (0.05 birds/20 min; Table 3). Turkey vultures, the major contributor to overall raptor use (0.2 birds/20 min), were commonly seen throughout the WRA (observed in 8.9% of all surveys; Table 4). Of the flight heights of all raptor individuals combined, 21.4 % were flying below, 64.3 % were flying within, and 14.3 % were flying above the turbine rotor swept area (RSA; Table 5). Turkey vultures also had the highest encounter rate (0.16 birds flying in the RSA/20 min) of all raptors observed; encounter rates were low (<0.01) for other raptor species (Table 6).

Use by non-raptor birds collectively at the Lee-DeKalb WRA was 21.8 birds/20 min (Table 3). Of the flight heights of all flying non-raptor observations combined, 83.7% were flying below, 16.0% were flying within, and 0.3% were flying above the RSA (Table 5). The most common non-raptor species within the WRA were: red-winged blackbird (7.05 birds/20 min), European starling (4.7 birds/20 min), common grackle (2.9 birds/20 min), American robin (1.2 birds/20 min), and brown-headed cowbird (1.05 birds/20 min; Table 2). Among each of these species, less than 14% of flying birds were seen within the RSA, with the exception of the European starling, of which 39.7% of flying birds were seen within the projected RSA, giving this species the highest encounter rate of all observed species within the WRA (1.68 birds flying within the RSA/20min; Table 6). Encounter rates for all other species were ≤ 0.30 birds flying within the RSA/20 minutes.

Table 4 indicates that avian use at various survey points was quite variable. Point 4 had the most use (195 birds seen) while Points 8 and 13 had low use (59 and 55 birds seen, respectively). There were no discernible trends concerning certain taxonomic groups of birds being attracted to particular points. Flight direction was also variable, with no direction more evident than others (Appendix 1).

The only bird observed outside of the point count surveys and not during point counts was an unidentified hummingbird, likely a ruby-throated hummingbird which is the only hummingbird normally occurring in Illinois (Table 7).

Much of the land within the Lee-DeKalb WRA is rural, with scattered residences and land primarily in agriculture, mostly corn and soybeans. Topography is generally flat, with an average elevation of approximately 290 m. There appear to be no habitat features

that will serve as wildlife attractants (e.g., wetlands) in the project area, though several minor creeks and streams are present.

References

APLIC (2006) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington,, D.C. and Sacramento, CA.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Erickson, W., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003. Wildlife Baseline Study for the Wild Horse Wind Project, Summary of Results from 2002-2003 Wildlife Surveys. Prepared for Zilkha Renewable Energy, Portland, OR. 75 p.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Johnson, G. D., D. P. Young Jr., W. P. Erickson, C. E. Derby, M. D. Strickland, and R. E. Good. 2000. Wildlife Monitoring Studies, SeaWest Windpower Project, Carbon County, Wyoming. 1995-1999. Technical Report prepared by Western EcoSystems Technology, Inc., for SeaWest Energy Corporation and Bureau of Land Management.

Johnson, G. D., W. P Erickson, and J. D. Jeffrey. 2006. Analysis of Potential Wildlife Impacts from the Windy Point Wind Energy Project, Klickitat County, Washington. Technical Report prepared by Western EcoSystems Technology, Inc., for Ecology and Environment, Portland, Oregon.

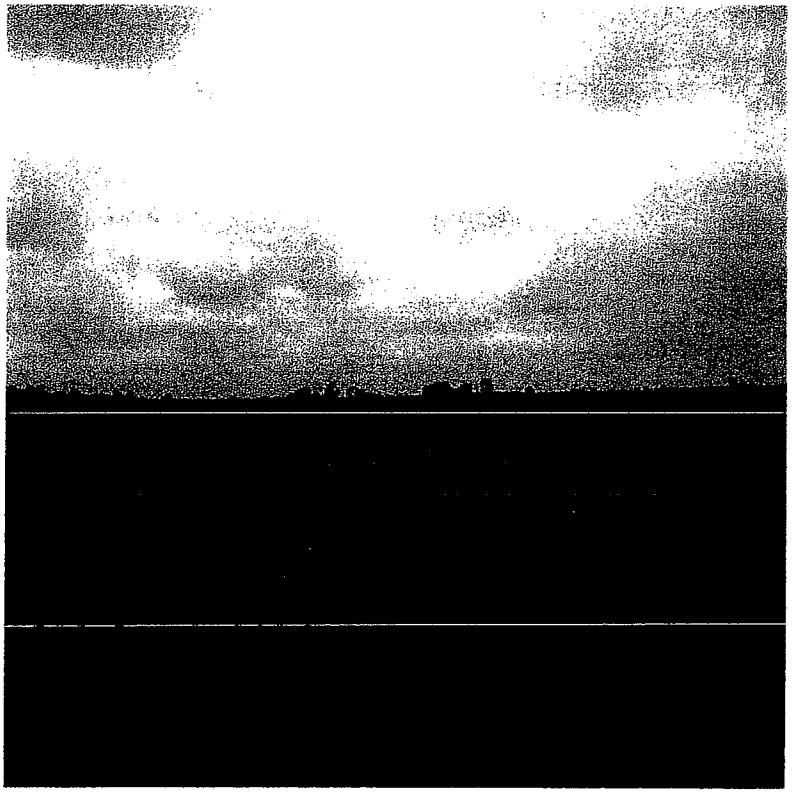
Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Prepared by Curry & Kerlinger LLC for High Winds, LLC, FPL Energy. 70 p.

Linz, G. M., R. A. Dolbeer, J. J. Hanzel, and L. E. Huffman. 1996. Controlling blackbird damage to sunflower and grain crops in the northern Great Plains. United States Department of Agriculture, Animal and Plant Health Inspection Service, Agriculture Information Bulletin No. 679. 15pp.

Spring 2007 Avian Survey Summary for the Lee-DeKalb Wind Resource Area

Prepared for:

FPL Energy



Prepared by:

TETRA TECH EC, INC

September, 2007

Tetra Tech, EC was contracted by FPL Energy to undertake spring avian use surveys for the proposed Lee-DeKalb Wind Resource Area (WRA) in DeKalb and Lee Counties, Illinois (Figure 1). Weekly spring surveys were performed at the Lee-DeKalb WRA from 13 June to 5 July, 2007 (Table 1). A total of 49 20-minute (min) fixed point count surveys (800-m radius) were conducted at 14 points distributed throughout the WRA (Figure 2). Thirty-seven species were identified, and a total of 1,394 birds from 8 taxonomic groups were recorded within the Lee-DeKalb WRA (Table 2). Overall mean avian use of the WRA was 25.9 birds/20 min (Table 3).

Mean raptor use at the Lee-DeKalb WRA was 0.3 birds/20 min (Table 3). Raptor species observed included turkey vulture (0.2 birds/20 min), red-tailed hawk (0.05 birds/20 min), and American kestrel (0.05 birds/20 min; Table 3). Turkey vultures, the major contributor to overall raptor use (0.2 birds/20 min), were commonly seen throughout the WRA (observed in 8.9% of all surveys; Table 4). Of the flight heights of all raptor individuals combined, 21.4 % were flying below, 64.3 % were flying within, and 14.3 % were flying above the turbine rotor swept area (RSA; Table 5). Turkey vultures also had the highest encounter rate (0.16 birds flying in the RSA/20 min) of all raptors observed; encounter rates were low (<0.01) for other raptor species (Table 6).

Use by non-raptor birds collectively at the Lee-DeKalb WRA was 21.8 birds/20 min (Table 3). Of the flight heights of all flying non-raptor observations combined, 83.7% were flying below, 16.0% were flying within, and 0.3% were flying above the RSA (Table 5). The most common non-raptor species within the WRA were: red-winged blackbird (7.05 birds/20 min), European starling (4.7 birds/20 min), common grackle (2.9 birds/20 min), American robin (1.2 birds/20 min), and brown-headed cowbird (1.05 birds/20 min; Table 2). Among each of these species, less than 14% of flying birds were seen within the RSA, with the exception of the European starling, of which 39.7% of flying birds were seen within the projected RSA, giving this species the highest encounter rate of all observed species within the WRA (1.68 birds flying within the RSA/20min; Table 6). Encounter rates for all other species were ≤ 0.30 birds flying within the RSA/20 minutes.

Table 4 indicates that avian use at various survey points was quite variable. Point 4 had the most use (195 birds seen) while Points 8 and 13 had low use (59 and 55 birds seen, respectively). There were no discernible trends concerning certain taxonomic groups of birds being attracted to particular points. Flight direction was also variable, with no direction more evident than others (Appendix 1).

The only bird observed outside of the point count surveys and not during point counts was an unidentified hummingbird, likely a ruby-throated hummingbird which is the only hummingbird normally occurring in Illinois (Table 7).

Much of the land within the Lee-DeKalb WRA is rural, with scattered residences and land primarily in agriculture, mostly corn and soybeans. Topography is generally flat, with an average elevation of approximately 290 m. There appear to be no habitat features

that will serve as wildlife attractants (e.g., wetlands) in the project area, though several minor creeks and streams are present.

References

APLIC (2006) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington,, D.C. and Sacramento, CA.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Erickson, W., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003. Wildlife Baseline Study for the Wild Horse Wind Project, Summary of Results from 2002-2003 Wildlife Surveys. Prepared for Zilkha Renewable Energy, Portland, OR. 75 p.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Johnson, G. D., D. P. Young Jr., W. P. Erickson, C. E. Derby, M. D. Strickland, and R. E. Good. 2000. Wildlife Monitoring Studies, SeaWest Windpower Project, Carbon County, Wyoming. 1995-1999. Technical Report prepared by Western EcoSystems Technology, Inc., for SeaWest Energy Corporation and Bureau of Land Management.

Johnson, G. D., W. P Erickson, and J. D. Jeffrey. 2006. Analysis of Potential Wildlife Impacts from the Windy Point Wind Energy Project, Klickitat County, Washington. Technical Report prepared by Western EcoSystems Technology, Inc., for Ecology and Environment, Portland, Oregon.

Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Prepared by Curry & Kerlinger LLC for High Winds, LLC, FPL Energy. 70 p.

Linz, G. M., R. A. Dolbeer, J. J. Hanzel, and L. E. Huffman. 1996. Controlling blackbird damage to sunflower and grain crops in the northern Great Plains. United States Department of Agriculture, Animal and Plant Health Inspection Service, Agriculture Information Bulletin No. 679. 15pp.

Mabee, T.J., B.A. Cooper, and C. Grinnell. 2005. Baseline Avian Use at the Klondike III Wind Project, Oregon, Winter 2004/2005. Prepared by ABR, Inc.—Environmental Research and Services for David Evans & Associates, Inc. 22 p.

Orloff, S., and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final report prepared by Biosystems Analysis, Inc. for Alameda, Contra Costa, and Solano Counties and the California Energy Commission.

URS Corporation, WEST, Inc., and Northwest Wildlife Consultants. 2001. Final Report – Ecological Baseline Study for the Condon Wind Project. Prepared for Bonneville Power Administration and SeaWest Windpower, Inc.

URS Corporation and WEST, Inc., 2001. Avian Baseline Study for the Stateline Project. Prepared for ESI Vansycle Partners, L.P.

U.S. Department of the Interior, Bureau of Land Management, Twin Falls District, Burley Field Office (USDI). 2005. Draft Environmental Impact Statement for the Proposed Cotterel Wind Power Project and Draft Resource Management Plan Amendment, Burley, Cassia County, Idaho.

Western EcoSystems Technology Inc. (WEST) and Northwest Wildlife Consultants (NWC). 2004. Stateline Wildlife Monitoring Final Report. July 2001-December 2003. Prepared for FPLE, Stateline Technical Advisory Committee, and Oregon Department of Energy. 105 p.

Westerm EcoSystems Technology Inc. (WEST). 2005. Wildlife and Habitat Baseline Study for the proposed Biglow Canyon wind power project, Sherman County, Oregon. Prepared for Orion Energy LLC. 66 p.

Young, D., W. Erickson, K. Bay, R. Good, and K Kronner. 2002. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report prepared for Bonneville Power Administration.

Preparers

Author: Jessica Piasecke
Peer Reviewer: Karl Kosciuch, Ph.D.

Table 1. Lee-Dekalb Wind Resource Area, Spring 2007 point count survey dates.

Survey number	Date
1	June 13
1	June 14
2	June 21
3	June 28
4	July 5

Table 2. Avian species observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs.	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
red-winged blackbird	395	247	7.05 (7.05 - 7.05)	94.6	28.3%
European starling	250	39	4.46 (4.46 - 4.46)	35.7	17.9%
common grackle	162	111	2.89 (1.99 - 3.79)	64.3	11.6%
American robin	67	64	1.20 (0.90 - 1.50)	60.7	4.8%
brown-headed cowbird	59	37	1.05 (0.56 - 1.54)	41.1	4.2%
unidentified blackbird	54	18	0.96 (0.96 - 0.96)	25.0	3.9%
mourning dove	46	32	0.82 (0.82 - 0.82)	37.5	3.3%
barn swallow	44	29	0.79 (0.43 - 1.15)	33.9	3.2%
unidentified bird	35	17	0.63 (0.63 - 0.63)	25.0	2.5%
song sparrow	35	35	0.63 (0.63 - 0.63)	44.6	2.5%
horned lark	34	29	0.61 (0.61 - 0.61)	33.9	2.4%
killdeer	32	24	0.57 (0.57 - 0.57)	32.1	2.3%
unidentified meadowlark	25	24	0.45 (0.45 - 0.45)	30.4	1.8%
rock pigeon	19	6	0.34 (0.34 - 0.34)	10.7	1.4%
cliff swallow	12	6	0.21 (-0.02 - 0.44)	5.4	0.9%
turkey vulture	11	5	0.20 (0.20 - 0.20)	8.9	0.8%
chipping sparrow	11	10	0.20 (0.09 - 0.31)	14.3	0.8%
American crow	11	7	0.20 (0.06 - 0.34)	10.7	0.8%
unidentified sparrow	10	10	0.18 (0.18 - 0.18)	12.5	0.7%
American goldfinch	10	9	0.18 (0.05 - 0.31)	10.7	0.7%
indigo bunting	8	8	0.14 (0.14 - 0.14)	8.9	0.6%
eastern kingbird	7	7	0.13 (0.13 - 0.13)	8.9	0.5%
ring-necked pheasant	6	6	0.11 (0.11 - 0.11)	10.7	0.4%
house sparrow	6	4	0.11 (0.11 - 0.11)	3.6	0.4%
field sparrow	6	6	0.11 (0.11 - 0.11)	8.9	0.4%
eastern meadowlark	5	5	0.09 (0.09 - 0.09)	5.4	0.4%
bobolink	4	4	0.07 (0.00 - 0.14)	5.4	0.3%

Species	Number of Birds	Number of Obs.	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
red-tailed hawk	3	3	0.05 (0.05 - 0.05)	5.4	0.2%
northern cardinal	3	2	0.05 (0.05 - 0.05)	3.6	0.2%
dickcissel	3	3	0.05 (0.05 - 0.05)	5.4	0.2%
common yellowthroat	3	3	0.05 (0.05 - 0.05)	3.6	0.2%
brown thrasher	3	3	0.05 (0.00 - 0.10)	5.4	0.2%
American kestrel	3	3	0.05 (0.00 - 0.10)	5.4	0.2%
vesper sparrow	2	1	0.04 (0.04 - 0.04)	1.8	0.1%
unidentified wren	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
unidentified swallow	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
northern mockingbird	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
northern flicker	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
house wren	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
grasshopper sparrow	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
great blue heron	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
common peafowl	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
black-capped chickadee	1	1	0.02 (-0.01 - 0.05)	1.8	0.1%
bank swallow	1	1	0.02 (-0.01 - 0.05)	1.8	0.1%
Grand Total	**1394**	**827**	**24.89** (21.04-28.74)		

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
Songbirds					
red-winged blackbird	395	247	7.05 (7.05 - 7.05)	94.6	28.3%
European starling	250	39	4.46 (4.46 - 4.46)	35.7	17.9%
common grackle	162	111	2.89 (1.99 - 3.79)	64.3	11.6%
American robin	67	64	1.20 (0.90 - 1.50)	60.7	4.8%
brown-headed cowbird	59	37	1.05 (0.56 - 1.54)	41.1	4.2%
unidentified blackbird	54	18	0.96 (0.96 - 0.96)	25.0	3.9%
barn swallow	44	29	0.79 (0.43 - 1.15)	33.9	3.2%
song sparrow	35	35	0.63 (0.63 - 0.63)	44.6	2.5%
horned lark	34	29	0.61 (0.61 - 0.61)	33.9	2.4%
unidentified meadowlark	25	24	0.45 (0.45 - 0.45)	30.4	1.8%
cliff swallow	12	6	0.21 (-0.02 - 0.44)	5.4	0.9%
chipping sparrow	11	10	0.20 (0.09 - 0.31)	14.3	0.8%
unidentified sparrow	10	10	0.18 (0.18 - 0.18)	12.5	0.7%
American goldfinch	10	9	0.18 (0.05 - 0.31)	10.7	0.7%
indigo bunting	8	8	0.14 (0.14 - 0.14)	8.9	0.6%
eastern kingbird	7	7	0.13 (0.13 - 0.13)	8.9	0.5%
house sparrow	6	4	0.11 (0.11 - 0.11)	3.6	0.4%
field sparrow	6	6	0.11 (0.11 - 0.11)	8.9	0.4%
eastern meadowlark	5	5	0.09 (0.09 - 0.09)	5.4	0.4%
bobolink	4	4	0.07 (0.00 - 0.14)	5.4	0.3%
northern cardinal	3	2	0.05 (0.05 - 0.05)	3.6	0.2%
dickcissel	3	3	0.05 (0.05 - 0.05)	5.4	0.2%
common yellowthroat	3	3	0.05 (0.05 - 0.05)	3.6	0.2%

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min.		Frequency % of surveys detected	Percent Composition
			(90% confidence interval)			
brown thrasher	3	3	0.05	(0.00 - 0.10)	5.4	0.2%
vesper sparrow	2	1	0.04	(0.04 - 0.04)	1.8	0.1%
unidentified wren	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
unidentified swallow	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
northern mockingbird	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
house wren	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
grasshopper sparrow	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
black-capped chickadee	1	1	0.02	(-0.01 - 0.05)	1.8	0.1%
bank swallow	1	1	0.02	(-0.01 - 0.05)	1.8	0.1%
Group Total	**1225**	**721**	**21.88**			**87.9%**
Raptors/Vultures/Owls						
turkey vulture	11	5	0.20	(0.20 - 0.20)	8.9	0.8%
red-tailed hawk	3	3	0.05	(0.05 - 0.05)	5.4	0.2%
American kestrel	3	3	0.05	(0.00 - 0.10)	5.4	0.2%
Group Total	**17**	**11**	**0.30**			**1.2%**
Woodpeckers						
northern flicker	1	1	0.02	(0.02 - 0.02)	1.8	0.1%
Group Total	**1**	**1**	**0.02**			**0.1%**
Crows and Allies						
American crow	11	7	0.20	(0.06 - 0.34)	10.7	0.8%
Group Total	**11**	**7**	**0.20**			**0.8%**
Gamebirds						
ring-necked pheasant	6	6	0.11	(0.11 - 0.11)	10.7	0.4%
common peafowl	1	1	0.02	(0.02 - 0.02)	1.8	0.1%

Table 3. Avian species, by species grouping, observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species Grouping Species	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition
Group Total	**7**	**7**	**0.13**		**0.5%**
Pigeons/Doves					
mourning dove	46	32	0.82 (0.82 - 0.82)	37.5	3.3%
rock pigeon	19	6	0.34 (0.34 - 0.34)	10.7	1.4%
Group Total	**65**	**38**	**1.16**		**4.7%**
Shorebirds					
killdeer	32	24	0.57 (0.57 - 0.57)	32.1	2.3%
Group Total	**32**	**24**	**0.57**		**2.3%**
Wadingbirds					
great blue heron	1	1	0.02 (0.02 - 0.02)	1.8	0.1%
Group Total	**1**	**1**	**0.02**		**0.1%**
Other					
unidentified bird	35	17	0.63 (0.63 - 0.63)	25.0	2.5%
Group Total	**35**	**17**	**0.63**		**2.5%**
Grand Total	**1394**	**827**	**24.89** (21.04-28.74)		

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs.	Points 1	2	3	4	5	6	7	8	9	10	11	12
red-winged blackbird	395	247	8	30	30	45	36	31	32	34	27	17	11	14
European starling	250	39	41	8	36	106	6	0	2	0	1	2	7	38
common grackle	162	111	21	32	11	18	13	1	1	0	17	9	5	4
American robin	67	64	5	5	12	8	3	7	3	1	2	9	4	6
brown-headed cowbird	59	37	2	2	4	3	3	3	9	4	0	2	3	17
unidentified blackbird	54	18	4	19	0	2	1	3	4	0	8	4	3	3
mourning dove	46	32	5	3	10	1	0	1	13	1	0	1	6	2
barn swallow	44	29	7	1	13	0	3	0	5	1	1	2	6	3
unidentified bird	35	17	2	5	7	1	2	2	1	8	3	1	0	0
song sparrow	35	35	5	3	3	2	0	3	1	1	3	3	5	3
horned lark	34	29	0	4	0	0	3	2	5	7	3	0	3	1
killdeer	32	24	0	0	1	0	11	4	6	0	4	1	3	1
unidentified meadowlark	25	24	0	1	1	2	0	7	4	0	5	1	0	1
rock pigeon	19	6	3	5	0	0	0	9	0	0	1	0	0	1
cliff swallow	12	6	0	0	0	0	0	0	0	0	0	0	3	0
turkey vulture	11	5	0	0	1	0	0	0	0	0	0	0	2	7
chipping sparrow	11	10	2	0	1	0	0	2	0	0	0	4	2	0
American crow	11	7	0	0	2	0	2	0	0	0	0	2	3	2
unidentified sparrow	10	10	1	0	0	0	0	1	1	0	1	0	6	0
American goldfinch	10	9	3	2	1	1	0	0	0	0	0	3	0	0
indigo bunting	8	8	1	0	0	1	0	0	0	0	0	6	0	0
eastern kingbird	7	7	0	1	0	0	0	0	0	0	0	3	0	1
ring-necked pheasant	6	6	0	0	2	0	0	0	2	0	0	2	0	0
house sparrow	6	4	0	0	0	0	0	0	5	0	1	0	0	0
field sparrow	6	6	0	0	0	0	0	0	0	0	1	2	1	0

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs.	Points											
			1	2	3	4	5	6	7	8	9	10	11	12
eastern meadowlark	5	5	0	0	0	3	0	0	1	1	0	0	0	0
bobolink	4	4	0	0	2	0	0	0	0	0	0	0	0	2
red-tailed hawk	3	3	0	0	0	0	1	0	0	0	1	1	0	0
northern cardinal	3	2	1	0	0	0	0	0	0	0	0	2	0	0
dickcissel	3	3	0	0	1	0	0	0	1	0	0	0	1	0
common yellowthroat	3	3	0	0	0	2	0	0	1	0	0	0	0	0
brown thrasher	3	3	0	0	1	0	0	0	0	0	1	1	0	0
American kestrel	3	3	1	0	1	0	0	0	0	0	0	0	1	0
vesper sparrow	2	1	0	0	0	0	2	0	0	0	0	0	0	0
unidentified wren	1	1	0	0	0	0	0	0	0	0	0	1	0	0
unidentified swallow	1	1	0	0	0	0	0	0	0	0	0	1	0	0
northern mockingbird	1	1	0	0	1	0	0	0	0	0	0	0	0	0
northern flicker	1	1	0	0	0	0	0	0	0	0	0	1	0	0
house wren	1	1	0	0	0	0	0	0	0	0	0	1	0	0
grasshopper sparrow	1	1	0	0	0	0	0	0	0	0	0	0	0	1
great blue heron	1	1	0	0	0	0	0	0	0	0	0	0	0	1
common peafowl	1	1	0	0	0	0	0	0	0	1	0	0	0	0
black-capped chickadee	1	1	0	0	0	0	0	0	0	0	1	0	0	0
bank swallow	1	1	0	0	1	0	0	0	0	0	0	0	0	0
Grand Total	**1394**	**827**	**112**	**121**	**142**	**195**	**86**	**76**	**97**	**59**	**81**	**82**	**75**	**108**

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs.	Points											
			13	14	15	16	17	18	19	20	21	22	23	24
red-winged blackbird	395	247	34	46	0	0	0	0	0	0	0	0	0	0
European starling	250	39	0	3	0	0	0	0	0	0	0	0	0	0
common grackle	162	111	2	28	0	0	0	0	0	0	0	0	0	0
American robin	67	64	0	2	0	0	0	0	0	0	0	0	0	0
brown-headed cowbird	59	37	0	7	0	0	0	0	0	0	0	0	0	0
unidentified blackbird	54	18	1	2	0	0	0	0	0	0	0	0	0	0
mourning dove	46	32	0	3	0	0	0	0	0	0	0	0	0	0
barn swallow	44	29	2	0	0	0	0	0	0	0	0	0	0	0
unidentified bird	35	17	3	0	0	0	0	0	0	0	0	0	0	0
song sparrow	35	35	2	1	0	0	0	0	0	0	0	0	0	0
horned lark	34	29	1	5	0	0	0	0	0	0	0	0	0	0
killdeer	32	24	0	1	0	0	0	0	0	0	0	0	0	0
unidentified meadowlark	25	24	0	3	0	0	0	0	0	0	0	0	0	0
rock pigeon	19	6	0	0	0	0	0	0	0	0	0	0	0	0
cliff swallow	12	6	9	0	0	0	0	0	0	0	0	0	0	0
turkey vulture	11	5	0	1	0	0	0	0	0	0	0	0	0	0
chipping sparrow	11	10	0	0	0	0	0	0	0	0	0	0	0	0
American crow	11	7	0	0	0	0	0	0	0	0	0	0	0	0
unidentified sparrow	10	10	0	0	0	0	0	0	0	0	0	0	0	0
American goldfinch	10	9	0	0	0	0	0	0	0	0	0	0	0	0
indigo bunting	8	8	0	0	0	0	0	0	0	0	0	0	0	0
eastern kingbird	7	7	0	2	0	0	0	0	0	0	0	0	0	0
ring-necked pheasant	6	6	0	0	0	0	0	0	0	0	0	0	0	0
house sparrow	6	4	0	0	0	0	0	0	0	0	0	0	0	0
field sparrow	6	6	1	1	0	0	0	0	0	0	0	0	0	0

Table 4. Avian species observed by point during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of Birds	Number of Obs.	Points											
			13	14	15	16	17	18	19	20	21	22	23	24
eastern meadowlark	5	5	0	0	0	0	0	0	0	0	0	0	0	0
bobolink	4	4	0	0	0	0	0	0	0	0	0	0	0	0
red-tailed hawk	3	3	0	0	0	0	0	0	0	0	0	0	0	0
northern cardinal	3	2	0	0	0	0	0	0	0	0	0	0	0	0
dickcissel	3	3	0	0	0	0	0	0	0	0	0	0	0	0
common yellowthroat	3	3	0	0	0	0	0	0	0	0	0	0	0	0
brown thrasher	3	3	0	0	0	0	0	0	0	0	0	0	0	0
American kestrel	3	3	0	0	0	0	0	0	0	0	0	0	0	0
vesper sparrow	2	1	0	0	0	0	0	0	0	0	0	0	0	0
unidentified wren	1	1	0	0	0	0	0	0	0	0	0	0	0	0
unidentified swallow	1	1	0	0	0	0	0	0	0	0	0	0	0	0
northern mockingbird	1	1	0	0	0	0	0	0	0	0	0	0	0	0
northern flicker	1	1	0	0	0	0	0	0	0	0	0	0	0	0
house wren	1	1	0	0	0	0	0	0	0	0	0	0	0	0
grasshopper sparrow	1	1	0	0	0	0	0	0	0	0	0	0	0	0
great blue heron	1	1	0	0	0	0	0	0	0	0	0	0	0	0
common peafowl	1	1	0	0	0	0	0	0	0	0	0	0	0	0
black-capped chickadee	1	1	0	0	0	0	0	0	0	0	0	0	0	0
bank swallow	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	**1394**	**827**	**55**	**105**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 5. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA)[1] during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

	Observations		Individuals	
	Number	Percentage	Number	Percentage
Non-raptors				
Above RSA (>121.25m)	1	0.2%	3	0.3%
Below RSA (<38.75m)	439	90.9%	755	83.7%
Within RSA (38.75m–121.25m)	43	8.9%	144	16.0%
Raptors/Vultures/Owls				
Above RSA (>121.25m)	2	25.0%	2	14.3%
Below RSA (<38.75m)	3	37.5%	3	21.4%
Within RSA (38.75m–121.25m)	3	37.5%	9	64.3%

[1]These values assume a rotor diameter of 82.5 (m) and a hub height of 80 (m)

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Spring 2007.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
European starling	1.68	4.46 (4.46 - 4.46)	94.8	60.3	39.7	0.0
red-winged blackbird	0.30	7.05 (7.05 - 7.05)	60.0	93.0	7.0	0.0
turkey vulture	0.16	0.20 (0.20 - 0.20)	100.0	0.0	81.8	18.2
common grackle	0.13	2.89 (1.99 - 3.79)	72.2	93.9	6.1	0.0
brown-headed cowbird	0.12	1.05 (0.56 - 1.54)	86.4	86.3	13.7	0.0
horned lark	0.09	0.61 (0.61 - 0.61)	70.6	79.2	20.8	0.0
American robin	0.07	1.20 (0.90 - 1.50)	44.8	86.2	13.8	0.0
cliff swallow	0.05	0.21 (-0.02 - 0.44)	100.0	77.8	22.2	0.0
killdeer	0.04	0.57 (0.57 - 0.57)	37.5	81.8	18.2	0.0
mourning dove	0.04	0.82 (0.82 - 0.82)	71.7	93.8	6.3	0.0
rock pigeon	0.04	0.34 (0.34 - 0.34)	78.9	86.7	13.3	0.0
unidentified swallow	0.02	0.02 (0.02 - 0.02)	100.0	0.0	100.0	0.0
great blue heron	0.02	0.02 (0.02 - 0.02)	100.0	0.0	100.0	0.0
eastern kingbird	0.02	0.13 (0.13 - 0.13)	42.9	66.7	33.3	0.0
vesper sparrow	0.00	0.04 (0.04 - 0.04)	100.0	100.0	0.0	0.0
unidentified wren	0.00	0.02 (0.02 - 0.02)	100.0	100.0	0.0	0.0
unidentified sparrow	0.00	0.18 (0.18 - 0.18)	70.0	100.0	0.0	0.0
unidentified meadowlark	0.00	0.45 (0.45 - 0.45)	28.0	100.0	0.0	0.0
unidentified blackbird	0.00	0.96 (0.96 - 0.96)	64.8	100.0	0.0	0.0
unidentified bird	0.00	0.63 (0.63 - 0.63)	97.1	100.0	0.0	0.0
song sparrow	0.00	0.63 (0.63 - 0.63)	2.9	100.0	0.0	0.0
red-tailed hawk	0.00	0.05 (0.05 - 0.05)	33.3	100.0	0.0	0.0
ring-necked pheasant	0.00	0.11 (0.11 - 0.11)	0.0	0.0	0.0	0.0
northern mockingbird	0.00	0.02 (0.02 - 0.02)	0.0	0.0	0.0	0.0
northern flicker	0.00	0.02 (0.02 - 0.02)	100.0	100.0	0.0	0.0
northern cardinal	0.00	0.05 (0.05 - 0.05)	66.7	100.0	0.0	0.0

Table 6. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] at the Lee-Dekalb Wind Resource Area, during Spring 2007.

Species	Encounter Rate	Mean Use #birds/20 min (90% confidence interval)	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
indigo bunting	0.00	0.14 (0.14 - 0.14)	25.0	100.0	0.0	0.0
house wren	0.00	0.02 (0.02 - 0.02)	0.0	0.0	0.0	0.0
house sparrow	0.00	0.11 (0.11 - 0.11)	83.3	100.0	0.0	0.0
grasshopper sparrow	0.00	0.02 (0.02 - 0.02)	100.0	100.0	0.0	0.0
field sparrow	0.00	0.11 (0.11 - 0.11)	33.3	100.0	0.0	0.0
eastern meadowlark	0.00	0.09 (0.09 - 0.09)	0.0	0.0	0.0	0.0
dickcissel	0.00	0.05 (0.05 - 0.05)	0.0	0.0	0.0	0.0
common peafowl	0.00	0.02 (0.02 - 0.02)	0.0	0.0	0.0	0.0
common yellowthroat	0.00	0.05 (0.05 - 0.05)	0.0	0.0	0.0	0.0
chipping sparrow	0.00	0.20 (0.09 - 0.31)	63.6	100.0	0.0	0.0
brown thrasher	0.00	0.05 (0.00 - 0.10)	33.3	100.0	0.0	0.0
bobolink	0.00	0.07 (0.00 - 0.14)	50.0	100.0	0.0	0.0
black-capped chickadee	0.00	0.02 (-0.01 - 0.05)	0.0	0.0	0.0	0.0
barn swallow	0.00	0.79 (0.43 - 1.15)	95.5	100.0	0.0	0.0
bank swallow	0.00	0.02 (-0.01 - 0.05)	0.0	0.0	0.0	0.0
American kestrel	0.00	0.05 (0.00 - 0.10)	66.7	100.0	0.0	0.0
American goldfinch	0.00	0.18 (0.05 - 0.31)	50.0	100.0	0.0	0.0
American crow	0.00	0.20 (0.06 - 0.34)	36.4	25.0	0.0	75.0

[1]These values assume a rotor diameter of 82.5 (m) and a hub height of 80 (m)

Table 7. Incidental observations of birds during Spring point counts at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number of individuals
red-tailed hawk	3
American kestrel	2
unidentified hummingbird	1
unidentified hawk	1
Grand Total	7

Appendix 1. Flight directions of birds observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
European starling	225	34	6.7	2.2	15.6	0.9	4.4	26.2	35.6	8.4	0.0
red-winged blackbird	211	130	11.4	6.6	26.1	10.0	24.6	3.8	11.4	6.2	0.0
common grackle	115	93	17.4	7.8	19.1	11.3	12.2	9.6	12.2	10.4	0.0
brown-headed cowbird	49	27	42.9	16.3	14.3	2.0	4.1	14.3	4.1	2.0	0.0
unidentified bird	33	15	12.1	6.1	6.1	0.0	24.2	0.0	36.4	15.2	0.0
mourning dove	32	21	6.3	9.4	25.0	0.0	9.4	25.0	21.9	3.1	0.0
barn swallow	30	22	10.0	0.0	30.0	6.7	36.7	0.0	10.0	6.7	0.0
American robin	29	27	27.6	17.2	20.7	6.9	13.8	10.3	3.4	0.0	0.0
unidentified blackbird	28	15	17.9	0.0	32.1	3.6	25.0	0.0	7.1	14.3	0.0
horned lark	20	15	15.0	20.0	25.0	10.0	15.0	10.0	0.0	5.0	0.0
rock pigeon	14	3	14.3	0.0	0.0	21.4	64.3	0.0	0.0	0.0	0.0
killdeer	10	8	50.0	0.0	20.0	0.0	10.0	20.0	0.0	0.0	0.0
turkey vulture	9	3	0.0	11.1	0.0	0.0	0.0	0.0	11.1	77.8	0.0
cliff swallow	9	5	22.2	22.2	0.0	0.0	0.0	22.2	33.3	0.0	0.0
unidentified sparrow	6	6	16.7	0.0	33.3	0.0	16.7	16.7	16.7	0.0	0.0
unidentified meadowlark	6	6	83.3	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0
house sparrow	5	3	0.0	80.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
chipping sparrow	5	4	40.0	0.0	0.0	0.0	40.0	0.0	20.0	0.0	0.0
American goldfinch	5	4	40.0	0.0	40.0	20.0	0.0	0.0	0.0	0.0	0.0
American crow	4	2	75.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
eastern kingbird	3	3	0.0	0.0	0.0	0.0	33.3	0.0	0.0	66.7	0.0
vesper sparrow	2	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix 1. Flight directions of birds observed during Spring point count surveys at the Lee-Dekalb Wind Resource Area, 2007.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
indigo bunting	2	2	0.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0
field sparrow	2	2	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
bobolink	2	2	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0
American kestrel	2	2	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
unidentified wren	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
unidentified swallow	1	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
song sparrow	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
red-tailed hawk	1	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
northern flicker	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
grasshopper sparrow	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
great blue heron	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
brown thrasher	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Grand Total	**866**	**463**	**15.1**	**6.6**	**20.0**	**5.8**	**15.0**	**12.0**	**17.6**	**8.0**	**0.0**