BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Firelands Wind, LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Huron and Erie Counties, Ohio.	)))))	Case No: 18-1607-EL-BGN

DIRECT TESTIMONY OF

Christopher J. Farmer
Senior Ecologist
Western EcoSystems Technology, Inc.

on behalf of
Firelands Wind, LLC

September 11, 2020

/s/ Christine M.T. Pirik
Christine M.T. Pirik (0029759)
(Counsel of Record)
Terrence O'Donnell (0074213)
William Vorys (0093479)
Jonathan R. Secrest (0075445)
Madeline Fleisher (0091862)
DICKINSON WRIGHT PLLC
150 East Gay Street, Suite 2400
Columbus, Ohio 43215
(614) 591-5461

James M. Lynch (PHV 21869-2020)
Adam N. Tabor (PHV 21870-2020)
K&L Gates LLP
925 Fourth Avenue, Ste. 2900
Seattle, Washington 98104
(206) 370-7652

1. Please state your name, current title, and business address.

My name is Christopher Farmer. I am employed by Western EcoSystems Technology, Inc. ("WEST") as the Senior Ecologist and Project Manager for our Lemoyne, Pennsylvania Office. My business address is 1017 Mumma Rd. Ste. 103, Lemoyne, Pennsylvania 17043.

2. Please summarize your educational background and professional experience.

I received a Bachelor of Science degree in Biology and a Master of Science degree in Science Education from The University at Albany, and a Doctorate of Philosophy in Ecology from the State University of New York, College of Environmental Science and Forestry. Prior to joining WEST, I was the Principal Biologist for DNV GL, an international energy advisory company. Prior to DNV GL, I was a Senior Ecologist at Tetra Tech, Inc., and a Senior Research Biologist at Hawk Mountain Sanctuary. My research interests include predator-prey interactions, ungulate demography, avian breeding biology and raptor migration ecology. At WEST, I provide technical and strategic expertise for energy projects, and serve as a subject area expert for eagles and wind energy, focusing on agency consultation support for complex wildlife-related issues at wind- and solar-energy facilities. I have worked across a broad range of sensitive species including bald and golden eagles, Delmarva fox squirrel, gray wolf, lesser prairie-chicken, whooping crane, Indiana bat, and northern long-eared bat. My consulting experience includes avian, bat, and eagle surveys, post-construction fatality monitoring, Eagle Conservation Plans, Bird and Bat Conservation Strategies, and state and county permitting for energy facilities.

I have 21 years of experience conducting wildlife research across the United States ("U.S."). I have completed projects for private industry, environmental conservation organizations, and various state and federal agencies. At Hawk Mountain Sanctuary, I collaborated on development of the Raptor Population Index Project ("RPI"), which uses hawk migration counts as an index to population change in migratory raptors. I served as the primary statistical analyst for the RPI project from 2004 – 2010, and authored numerous scientific publications detailing our methods and findings. While at Hawk Mountain Sanctuary, I also served as one of the staff migration observers; an activity that I still undertake on a volunteer basis for Hawk Mountain. I also volunteer my time as an

Associate Editor for the Journal of Raptor Research.

At Tetra Tech and DNV GL, I provided consulting and third party review services to energy projects and lenders throughout the U.S and Canada. My primary roles were technical leadership and mentoring of the biological teams and providing technical support for coordination with regulatory agencies. At DNV GL, I performed due diligence reviews of large numbers of projects seeking financing from banks or seeking to sell assets to other energy companies. As a result, I have thorough knowledge of typical risk to eagles from wind projects, as well as patterns of observed fatalities. At WEST, I provide technical leadership for projects with respect to bald and golden eagles, and I also manage projects in the Western, Central, and Eastern U.S.

I have authored or coauthored 21 scientific journal articles and book chapters, and 38 oral papers or posters at professional conferences. In addition to research and consulting, I have taught a variety of ornithology, conservation biology, evolution, and ecology courses as an adjunct instructor for Cedar Crest College, Penn State University, Montana State University, and the State University of New York, College of Environmental Science and Forestry. My resume is attached as Attachment CF-1.

3. On whose behalf are you offering testimony?

I am testifying on behalf of the Applicant, Firelands Wind, LLC ("Applicant" or "Firelands"), which is seeking to develop the proposed Emerson Creek Wind Farm (the "Project").

4. What is the purpose of your testimony?

The purpose of my testimony is to support the portions of the Application for Certificate of Environmental Compatibility and Public Need ("Application") regarding ecological information addressing the presence, abundance, and behavior of bald and golden eagles. I provide support regarding migrating, wintering, and breeding eagles in the Project area. I am also sponsoring certain Exhibits attached to the Application, all of which I have reviewed in my professional capacity. My testimony, together with the other witnesses for

Firelands testifying in this case, confirms that the Joint Stipulation and Recommendation ("Stipulation"), which was filed in this docket on September 11, 2020, and is being offered in this proceeding as Joint Exhibit 1, supports a finding by the Ohio Power Siting Board ("Board") that the Stipulation represents the minimum adverse environmental impact, considering the state of available technology, and is in the public interest.

5. Please describe the history of your involvement with the Emerson Creek Project?

I was asked in February of 2020 to examine the Project's history of eagle-related surveys, and to provide testimony describing WEST's interpretation of the results of these surveys. Prior to that, I was not involved in the Project.

6. Please generally describe the studies that you are sponsoring.

a. Application Exhibit R – Raptor Nest Survey and Monitoring Reports:

- May 17, 2018 - Raptor Nest Surveys prepared by WEST: WEST completed a survey to detect raptor nests, which included the northern portion of the current Project area. The purpose of the survey was to document the presence of bald eagle nests within 2 miles of the Project, and other large raptor nests within one mile of the Project. Surveys were completed in accordance with the ODNR ("Ohio Department of Natural Resources") On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio (ODNR 2009) ("ODNR Protocol") and agency recommendations.

  The surveys occurred on March 12-15, 2018, before the development of leaves on deciduous trees. They were conducted by a WEST biologist slowly driving public roads and visually searching all areas of suitable nesting habitat, such as riparian forests, woodlots, and shelter belts for large stick nests. The biologists found five occupied bald eagle nests and one unoccupied bald eagle nest within 2 miles of the Project. Two of the occupied eagle nests were located within the Project (Nests #11 and #12; see Attachment CF-2) and the other three occupied nests were located outside the Project. The unoccupied nest (#20) was located 0.8 miles south of the Project and was previously occupied in 2017. A two-day

follow-up monitoring survey of the unoccupied nest was conducted on April 4 and 11 to verify whether it remained unoccupied. The unoccupied nest was monitored for 4 hours on each day, and no eagle activity was detected at the nest. The Project was modified to avoid the occupied nests within the 2018 boundary, and these nests are currently 0.96 miles (Nest #11) and 0.73 miles (Nest #12) outside the Project boundary. Other occupied bald eagle nests within two miles of the current boundary during the 2018 surveys were Nests #15 and #19 (Attachment CF-2)

- <u>September 27, 2018 - Eagle Nest Monitoring Surveys prepared by WEST</u>: WEST completed eagle nest monitoring surveys for the proposed Project. Surveys were completed at two known active bald eagle nests within the northern portion of the Project area to understand how the birds utilized the area around the nests and inform siting of turbines in this area. Eagle nest monitoring consisted of 60-minute, point-count surveys completed twice a week at four points per nest, totaling eight fixed-point locations per nest per week. Nest #11 was monitored between April 17 and June 27, 2018, and Nest #12 (Attachment CF-2) was monitored from May 2 to June 28, 2018 for a total of 160 point-count surveys (160 survey hours). Flight paths of eagles were drawn on field maps and subsequently digitized into a GIS for analysis.

  WEST recorded a total of 235 observations of bald eagles, 160 in flight and 75 perched. The majority of observations were recorded at Nest #11 (115 adult, 25 subadult, and 14 juvenile); 81 observations were recorded at Nest #12 (70 adult, 7 subadult, 4 juvenile). Bald eagle activity was concentrated within 0.5-1.0 miles of the nests. The mean extent of areas defined as high density use (3 or more flight paths) was 0.40 miles for Nest #11 and 0.25 miles for Nest #12. Most frequent movement directions to and from Nest #11 were north and northeast; for Nest #12 they were north and northwest. Nest #11 produced two offspring and Nest #2 produced three offspring in 2018.

- <u>June 13, 2018 - Raptor Nest Surveys prepared by WEST</u>: WEST completed a survey to detect raptor which included the southern portion of the current

Project area. The purpose of the survey was to document the presence of large raptor nests within one mile of the Project and confirm the status of historical bald eagle nests within 2 miles of the Project area. Surveys were completed in accordance with ODNR Protocol and agency recommendations.

The surveys occurred on April 9-10, 2018, slightly before the development of leaves on deciduous trees. They were conducted by a WEST biologist slowly driving public roads and visually searching all areas of suitable nesting habitat, such as riparian forests, woodlots, and shelter belts for large stick nests. Two occupied and one unoccupied bald eagle nest were documented by the survey. One occupied bald eagle nest (#24) was already known, 1.49 miles outside the current Project area. The other occupied bald eagle nest (#23) was previously unknown, and was within the Project boundary. The unoccupied bald eagle nest (#20) was previously known from the March 2018 survey of the northern portion of the Project. An additional 4-hour monitoring survey was conducted at Nest #20 to confirm that it was unoccupied, and no eagle activity was observed at the nest. Subsequent to the 2018 survey, the Project design was modified to ensure that no turbines were sited within 1.08 miles of occupied bald eagle nests.

- October 2, 2015 - Raptor Nest Surveys Huron County, Ohio, Spring 2014, prepared by WEST: The Project area as of 2014, which is the southern portion of the current Project, was previously surveyed by Tetra Tech EM, Inc. ("Tetra Tech") in 2011, 2012 and 2013. WEST conducted raptor nest surveys outside of the area surveyed by Tetra Tech and to determine if there were any nesting bald eagles within 3 miles and any raptor nests within 1 mile of the Project addition to the south of the previous Project boundaries. Additionally, 6 previously recorded bald eagle nests were checked for breeding activity. The survey consisted of visual searches of suitable nesting areas from public roads by a WEST biologist. The ground-based survey was conducted on April 29 - May 1, 2014.

Three occupied bald eagle nests (#15, #17, and #21) and three unoccupied bald eagle nests (#18, #20, and #22) were documented during the survey; all were previously known. Additionally, one large stick nest potentially large enough to be built by bald eagles was found to the northwest of Nest #22; no birds of any species were observed near this nest.

- November 6, 2013 Stage 2-Site Specific Bald Eagle Survey Report; 2013 Nest Productivity Update, prepared by Tetra Tech, Inc.: In 2011 - 2013, Tetra Tech performed eagle nest and productivity surveys of the Project, which corresponded approximately to the northern portion of the current Project area. The scope of work was conducted in accordance with the Avian and Bat Study Plan dated March 23, 2011, which was submitted to Ms. Melanie Cota of the United States Fish and Wildlife Service ("USFWS") Columbus, Ohio Field Office and Ms. Jennifer Norris of ODNR. Approval of the Avian and Bat Study Plan was received from USFWS in an email dated April 27, 2011 and ODNR on May 21, 2011. Additionally, the Bald Eagle surveys followed the ODNR Protocols, the 2011 USFWS Draft Land-Based Wind Energy Guidelines ("USFWS Guidelines"), and the survey recommendations outlined in correspondence received by Tetra Tech on May 21, 2011, from ODNR Wind Energy Lead, Jennifer Norris.

  Ground-based nest searches were performed within the Project area plus a 10-mile buffer in March 2011 and March 2012, and around a revised Project area plus 10-mile buffer in April 2013. Nest productivity was monitored in April, May, and June of 2011, 2012, and 2013; nests identified by USFWS were incorporated into the 2013 monitoring.

  Tetra Tech detected 8 bald eagle nests (7 occupied, 1 unoccupied) in 2011 and 11 bald eagle nests (8 occupied and 3 unoccupied) in 2012; 6 additional bald eagle nests were identified within the revised Project area plus 10-mile buffer by the USFWS in 2013; whereas 3 previously detected nest locations were no

longer within 10 miles of the revised Project area. Tetra Tech determined the ½-mean Project-area internest distance to be 0.85 miles based on survey data. Productivity surveys of the occupied nests indicated that five nests produced a total of 9 offspring in 2011, and the other two nests failed or were unoccupied. In 2012, four nests produced a total of 10 offspring, and the other nests failed or were unoccupied. In 2013, nine nests produced a total of 16 offspring, and two monitored nests failed or were unoccupied. Occupied bald eagle nests documented by Tetra Tech in 2013 were Nests #1, #2, #3, #4, #5, #7, #10, #13, #15, #17, #18, #20, #21, and #22. Nests #1, #4, #7, #13, #15, #17, #18, #20, and #21 were documented to be productive. Occupied Nests #2, #5, and #22 were not monitored for productivity. Nest #6 was not occupied (Attachment CF-2).

- May 9, 2012 Spring 2012 Raptor Nest Survey Results, prepared by WEST: WEST conducted ground-based raptor nest surveys at the Project area to locate raptor nests within approximately one mile of the southern portion of the current Project boundary, per the ODNR Protocols. Suitable raptor nesting habitat is present in the Project area in the form of deciduous trees, shelterbelts, grasslands, and man-made structures such as power poles. One survey for raptor nests, including potential northern harrier nesting habitat, was conducted from March 29 to 31, 2012. The survey consisted of searching suitable nesting areas from public roads and leased areas within the Project area and a 1-mile buffer.

  WEST found 2 occupied, active bald eagle nests, both outside of the Project boundary, but within 1 mile. The nests detected in the 2012 survey were #20 and #22; WEST did not monitor the nests for productivity (Attachment CF-2).

- May 6, 2011 Spring 2011 Raptor Nest Survey Results, prepared by WEST: WEST conducted ground-based raptor nest surveys at the Project area to locate raptor nests within approximately 1 mile of the southern portion of the current project boundary, per the ODNR Protocols. Suitable raptor nesting habitat is present in the Project area in the form of deciduous trees, shelterbelts,

grasslands, and man-made structures such as power poles. One survey for raptor nests, including potential northern harrier nesting habitat, was conducted from April 1 to 9, 2011. The survey consisted of searching suitable nesting areas from public roads and leased areas within the Project area and a 1-mile buffer.

WEST found one unoccupied bald eagle nest outside the Project boundary but within one mile of the Project. The nest detected in the 2011 survey was #20 (Attachment CF-2).

- September 10, 2010 Bald Eagle Monitoring Report for Proposed Firelands Wind Farm, prepared by Arcadis: Arcadis conducted bald eagle nest monitoring near the Firelands Wind Project from April 16, 2010 to July 21, 2010. Bald eagle Nest #15 was monitored by Arcadis twice per week from April 20 – May 7, 2010 and once per week from May 12 – July 21, 2010. Nest #15 successfully fledged two juvenile bald eagles in June, 2010. Arcadis documented that most of the flights associated with the nest during monitoring were oriented away from the Project.

- June 2009 Raptor Nest Survey and Monitoring, prepared by BHE Environmental ("BHE"): BHE conducted ground-based surveys for eagle nests within the northern portion of the current Project (then called I-80 Wind Farm) plus a two-mile buffer. The surveys were designed to identify and subsequently monitor raptor nests, with an emphasis on bald eagles, in accordance with the ODNR Protocol.

BHE found two bald eagle nests within two miles of the Project. Nest #14 was occupied, active and #16 was unoccupied. Due to the proximity of these nests, it is my opinion that they represented alternate nests within a single bald eagle territory. BHE monitored the occupied nest for four hours per day on March 4-5, April 2-3, and May 4-5, 2009, and determined that the nest contained 2 juvenile eagles. Flights documented in association with the nest were primarily

in a direction away from the proposed Project location.

b. Application Exhibit S – Raptor Migration/Use Surveys:

- May 8, 2018 - Large Bird and Eagle Use Surveys prepared by WEST: WEST conducted year-round large bird and eagle use surveys at 23 representative points in the northern portion of the current Project area from September 30, 2016 to December 18, 2017. The surveys were completed in coordination with the USFWS and ODNR and in accordance with the tiered process outlined in the 2012 USFWS Final Land-Based Wind Energy Guidelines, USFWS Eagle Conservation Plan Guidance ("USFWS ECPG"), and the ODNR Protocols f. The surveys consisted of a 60-minute sample of use within 800 meters of each point during a monthly visit. WEST monitored all large birds during the first 20 minutes of each survey and focused only on eagles during the remaining 40 minutes of the survey.

  WEST observed a total of 52 bald eagles and no golden eagles during these surveys. Approximately 50% of the bald eagle observations occurred at three survey locations: points 2 (0.3 miles from a known nest), 40 (0.9 miles from a known nest), and point 4 (not near a known nest). Mean use recorded for eagles during this study was 0.19 eagles/survey plot/hour. A total of 68 minutes of bald eagle flight less than 200 meters above ground was recorded within the 800-meter-radius plots. Seventy-two percent of the bald eagle flight minutes were recorded at locations 1 and 2, which were nearest to a bald eagle nest north of the Project.

- September 20, 2018 - Large Bird and Eagle Use Surveys prepared by WEST: WEST completed year-round large bird and eagle use surveys for the southern portion of the current Project. The objectives of the large bird and eagle use point count surveys were to: 1) provide estimates of large bird use throughout the year; 2) evaluate species composition and seasonal and spatial use by birds, including special status species; 3) assess raptor migration during the spring and fall seasons; and 4) assess risk to eagles and special status species. The surveys

were completed in coordination with USFWS and ODNR and in accordance with the tiered process outlined in the USFWS Guidelines, the USFWS ECPG, and the ODNR Protocols. Surveys were completed monthly from September 16, 2016, to December 18, 2017, at 21 points established throughout the Project area. Surveys were 60-minutes in duration and consisted of large bird and eagle use surveys within an 800-meter (2,625-foot) radius of the surveyor. All large birds were recorded during the first 20 minutes of each 60-minute count, while only eagles and federal- and/or state-listed species were recorded for the remaining 40 minutes. Federal and state-listed species and eagles were recorded as incidental observations while in-transit between survey points, if observed.

WEST observed a total of 17 bald eagles and no golden eagles during these surveys. Approximately 40% of the bald eagle observations occurred at one survey locations: points 41, which was 0.7 miles from a known bald eagle nest. Mean use recorded for eagles during this study was 0.07 eagles/survey plot/hour. A total of 17 minutes of bald eagle flight less than 200 meters above ground was recorded within the 800-meter-radius plots. Seventy-two percent of the bald eagle flight minutes were recorded at locations 1 and 2, which were nearest to a bald eagle nest north of the Project. No golden eagles were observed during the surveys.

- <u>February 6, 2013 Wildlife Baseline Studies Seneca and Huron Counties, Ohio, prepared by WEST</u>: WEST conducted baseline surveys in the southern portion of the current Project area, following methods described in the final draft of wildlife study guidelines from ODNR. Wildlife surveys, conducted from September 1, 2010 through August 30, 2011 at the Project, fulfilled a portion of the methods recommended in final ODNR guidelines and included ground-based raptor nest surveys, passerine migration surveys, raptor migration surveys, bald eagle point-count surveys, acoustic bat surveys, and incidental wildlife observations. Eagle point-count surveys were conducted in an area within 3 miles of a known bald eagle nest

During 26 fall and 21 spring raptor migration surveys, WEST recorded observations of 38 bald eagles; 13 in fall and 25 in spring. WEST completed 374 20-minute eagle point-count surveys, and recorded 22 observations of bald eagles, for a mean use rate of 0.07 eagles/20 minutes in breeding season and 0.04 eagles/20 minutes during winter. WEST also recorded 28 bald eagles observed incidentally (not during sampling periods). No golden eagles were observed during the surveys.

c. Application Exhibit U – Eagle Use Surveys:

- July 2012 - Stage 2 –Site Specific Bald Eagle Survey Report, prepared by Tetra Tech: Tetra Tech conducted various surveys and studies required for successful permitting and development of the northern portion of the current Project. Tetra Tech prepared this report to document the site specific bald eagle surveys conducted and includes a description of the Project, background information, a description of the existing site conditions, survey methodology, results, and discussion. As specified in the USFWS Draft ECPG dated January 2011, the purpose of the Stage 2 site specific Bald Eagle surveys is to report bald eagle activity and quantify bald eagle use (i.e. exposure) in the Project area. Tetra Tech conducted eagle point-count surveys at 40 locations within and surrounding the Project area for 13 months. Each eagle point-count survey lasted for 30 minutes, and a total of 508 hours of surveys were conducted. In addition, raptor nest searching and monitoring, and diurnal raptor and bird migration surveys were completed.

  Tetra Tech recorded bald eagles at 32 of the 40 survey locations, and recorded a total of 226 minutes of eagle flight time. Bald eagle use was highest at four survey points outside of the Project area; within the Project area, relatively higher use was recorded in the northern and southern portions than in the center of the Project. An additional 14 bald eagles were observed during 336 hours of diurnal raptor/bird surveys at a point located near the center of the Project; five in spring and nine in fall.

7. Have there been any additional surveys conducted in the Project area?

Yes. Additional Eagle Use Surveys and Eagle Nest Surveys were conducted in 2018, 2019, and 2020. These are in the additional exhibits described below.

a. April 2020, WEST Inc. Bald Eagle Nest Status Table and Maps (Attachment CF-2): WEST prepared this exhibit to provide a clear summary of eagle nest locations and status across all years of survey for the Project. This exhibit provides a single, non-redundant numbering system for identification of known eagle nests. Prior to creation of this exhibit, all of the information was contained in separate reports previously filed as exhibits; however, each report had its own nest identification, which made tracking of nest status over time difficult. The exhibit is provided to facilitate understanding of the status of eagle nests across the different survey areas and time frames relevant to the Project.

A total of 25 bald eagle nests were discovered within 10 miles (16.1 km) of the Project over the seven different survey years. The nest numbers provided in this table are used throughout my testimony to identify specific nests. There is one additional known nest not shown on the map and table; it is located on the Plum Brook NASA Glenn Research Center. Nest surveys for the Project were not able to access that property. The table includes one bald eagle nest that was newly discovered in 2020. This nest (#25) was observed by myself and Mr. Good on March 5, 2020 during a site visit and confirmed by an independent aerial survey conducted by Copperhead Environmental Consulting ("Copperhead") on March 11-12, 2020. Additionally, because it was a newly discovered nest in 2020, Nest 25 was monitored by WEST for 4 hours from 4 different observation points from April 3 – July 8. Although this nest was occupied by an adult in incubating position during the March nest survey, adult activity near the nest waned by May, and no nestlings or fledglings were observed, leading WEST to conclude that the breeding attempt failed in 2020.

b. May 2020, Copperhead Environmental Consulting, Raptor Nest Survey Report for the Proposed Emerson Creek Wind Project (Attachment CF-3): Copperhead completed an aerial raptor nest survey for the Project in Huron, Erie, and Seneca

counties. The purpose of the survey was to document bald eagle nests within 1.2 miles of the Project. This distance was based on the previously-measured internest distance for bald eagle nests at the Project. The survey was conducted from fixed wing aircraft by flying transects spaced 1 mile apart at low level throughout the search area. Survey dates were March 10-12 and April 1, 2020. Copperhead classified eagle nests as in use or alternate consistent with the terminology provided in the USFWS ECPG. In-use nests were those containing eggs, young or adults, tended by adults nearby, or near displays of courtship behavior or nest building. Alternate nests were defined as bald eagle nests not meeting the above criteria.

The survey identified four in-use bald eagle nests and no alternate nests. Two nests were within the Project boundary (Nests #23 and #25 on Attachment CF-2) and the remaining two nests were 0.4 (Nest #15) and 0.6 miles (Nest #11) from the Project boundary.

c. April 3, 2020, WEST, Inc., Large Bird and Eagle Use Surveys for the Proposed Emerson Creek Wind Project (Attachment CF-4): WEST performed surveys for large birds and eagles once per month from February 8, 2018 to April 23, 2019, at 54 points established throughout the Project area. Surveys were 60-minutes in duration and consisted of large bird and eagle use surveys within an 800-meter (m; 2,625-foot) radius of the surveyor. All large birds (including eagles) were recorded during the first 20 min of each 60-min count, whereas only eagles and sensitive species were recorded for the remaining 40 min. In accordance with the USFWS ECPG, flight time of eagles was recorded in 1-minute intervals within 800-meter-radius by 200-meter-height cylinders to provide a standardized estimate of eagle exposure.

Diurnal raptor use was 0.22/800-m plot/20-min survey, which was low overall compared to other projects having publicly available data (range: 0.06 to 2.34 raptors/800-m plot/20-min survey). Raptor migration during the spring and fall does not appear to be concentrated within the Project as diurnal raptor use was similar between fall and winter and lowest during the spring and summer. In 648 hours of survey effort over 15 months, WEST observed 42 bald eagles, including

33 within the sample plots, resulting in 52 bald eagle exposure minutes, as defined by the USFWS ECPG. No golden eagle observations were recorded during surveys or incidentally. Bald eagle observations were recorded year round and were concentrated near an active nest near the Project (Nest 20). Twenty-two of the bald eagle observations were recorded at survey points with viewsheds primarily within 1,000 meters of proposed turbine locations, and these observations resulted in 27 of the eagle exposure minutes recorded during the study.

d. July 22, 2020, WEST, Inc. Email from Jennie Geiger of Apex to Christopher Farmer of WEST (Attachment CF-5): In this email, Ms. Geiger forwarded to Dr. Farmer the April correspondence between USFWS and the Board's staff regarding the proposed certificate condition requiring the Project to obtain a USFWS Eagle Take Permit ("ETP") prior to operation of the Project. In the forwarded email, the USFWS states that it is reasonable to require preparation of an Eagle Conservation Plan ("ECP") and ETP application prior to operation of the Project, but that the process of permit evaluation and approval can take several years on the USFWS side; therefore the USFWS would likely be unable to issue an ETP prior to operations. The USFWS additionally noted that it does not approve an Eagle Conservation Plan, but rather uses this living document to inform their analysis of the Eagle Take Permit application.

8. Are you familiar with the ODNR On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocols for Commercial Wind Energy Facilities in Ohio, the USFWS Land-Based Wind Energy Guidelines, and the USFWS Eagle Conservation Plan Guidance?

Yes.

9. What is the half-mean inter-nest distance and how does the USFWS Eagle Conservation Plan Guidance recommend using it for eagle nests?

The half-mean inter-nest distance refers to one half of the average nearest-neighbor

distance between simultaneously occupied eagle nests. The USFWS ECPG recommends calculating this measure to estimate the spatial extent of eagle nesting territories (i.e., how far breeding eagles are likely to move from their nests during breeding season). The USFWS ECPG further indicates that eagle pairs nesting within the half-mean inter-nest distance of a wind project are the pairs most likely to be disturbed by the project, and should receive special attention and consideration. Appendix H of the USFWS ECPG provides an example of how the half-mean inter-nest distance can be used to redesign a project to avoid eagle nests by moving the project boundary back away from this distance where practicable. Additionally, nests within this distance of a project may be selected for more focused pre-construction monitoring, as the Applicant has done with some nests, or for post-construction monitoring. The USFWS ECPG does not prohibit project infrastructure within this distance of an eagle nest.

10. What is the role of you and you firm in regards to the studies listed in your Answer to Question 7 above?

Many, but not all, of the studies described above were conducted by WEST, and the design and execution of such studies is a major part of our business. My role is to interpret the data with respect to potential impacts to eagles.

11. Please discuss the standards that were followed when these various studies and reports were prepared.

The methodologies and protocols used for the avian studies conducted for the Project are very familiar to me. I have used the basic methodology and protocols to conduct similar studies at other wind energy projects in the United States and beyond. The agency recommended methods and protocols used for the Project that have been standard for many years (and some were accepted and used prior to the issuance of the ODNR Protocols, and the USFWS Guidelines, and the USFWS ECPG). The studies and reports for the Project were performed in accordance with the ODNR Protocols, the USFWS Guidelines, and the USFWS ECPG.

12. What degree of confidence do you have in the studies you are sponsoring that are set forth in Exhibits R, S, and U of the Application, as updated by the April and May, 2020 survey reports?

I have a high degree of scientific certainty in the results of the studies I am sponsoring. This conclusion stems from: 1) Development of the study designs to accord with the prevailing standard of care at the time of the surveys, including the ODNR Protocols, the USFWS Guidelines, and the USFWS ECPG, 2) The study plans were developed in coordination with ODNR and USFWS as appropriate, and were deemed sufficient by those agencies to answer relevant pre-construction questions, 3) My review indicates that the studies were conducted with a degree of scientific rigor appropriate for ecological monitoring of this type, 4) The studies were designed to answer questions of importance to regulatory agencies in their evaluations of potential project impacts, and 5) The Applicant has established a long time series of surveys that provide sufficient insight into interannual variation to assess likely impacts from Project operations.

13. Please discuss the process of the Applicant's consultation with ODNR and USFWS when preparing the various studies and reports.

Based on my review of the Project records, it is my understanding the Applicant consulted with ODNR and USFWS in preparing eagle study plans prior to conducting those studies. When preparing eagle study plans, the Applicant utilized the ODNR Protocols, the USFWS Guidelines, and the USFWS ECPG, or initial agency feedback to develop the study plan, and then discussed the plan with the ODNR and/or USFWS. Each study plan outlined how the surveys were in accordance with ODNR, USFWS, or ODNR and USFWS guidance. The study plans and their objectives were discussed with the applicable agencies. If updates were needed to each study plan, appropriate updates were made and then resubmitted to the agencies for review and approval. Once field surveys were completed, a final report was provided to ODNR and USFWS and next steps (if any) were determined in coordination with the agencies.

14. Please describe the process for obtaining an Eagle Take Permit from USFWS.

Obtaining an ETP from the USFWS is a voluntary process for projects that have sufficient risk of eagle fatalities that the owner's wish to obtain legal protection from the prohibition of take that is encoded in the Bald and Golden Eagle Protection Act (16 USC 668-668d [1940]). In terms of federal law, an ETP is not required to construct or operate a wind energy project. The process has been designed by USFWS with public input to ensure that any incidental eagle take approved under an ETP is sustainable. Risk of direct impacts to eagles is mostly associated with operations, rather than construction of a project, so most owners who apply seek coverage only for impacts of operations.

If a project owner decides to obtain an ETP, they follow a staged process that includes landscape-scale preliminary analysis, site-specific surveys, risk assessment, and preparation of an ECP. The multi-stage approach is designed to facilitate identification of potential risk factors at a project, and to provide off-ramps, or ways out of the analysis if risk appears negligible based on results of a stage. The eagle nest surveys, diurnal raptor migration surveys, and eagle and large bird use surveys conducted at Emerson Creek are examples of the site-specific surveys designed to reduce uncertainty regarding the potential eagle risk associated with a project. Once the data are collected, the project owner can coordinate with the USFWS to interpret the results and determine whether to pursue an ETP. If an ETP is sought, the owner of the project prepares an ECP that characterizes the eagle risk and provides a plan for avoidance, minimization, and ongoing adaptive management of the risk during project operations. The completed ECP is shared with the USFWS along with an ETP application form and application fee, and the USFWS initiates evaluation of the ETP via the National Environmental Policy Act ("NEPA"; 42 U.S.C. § 4321). The NEPA analysis evaluates the environmental impacts of the federal action, in this case, approval of a permit for the incidental take of eagles. At the completion of NEPA analysis, the USFWS will either approve the permit application, reject the permit application, or approve it with additional conditions.

15. How is the USFWS collision risk model used in the Eagle Take Permit process?

In the course of considering an application for an ETP, the USFWS uses a quantitative model, called the collision risk model, to estimate how many eagle fatalities may occur. It is important to note that this model is not the only information considered by USFWS in its evaluation of risk to eagles. The collision risk model forms the numerical basis for the take that is permitted under an ETP. It is built around data from older wind farms in California and elsewhere that relate eagle use of an area to the potential number of collisions with wind turbines. A weakness of the currently approved model is that it is based entirely on golden eagle data, so its predictions for bald eagles are likely conservative. Once a project has measured eagle use in an area of interest, those data are incorporated into the model to generate an estimate of eagle exposure to collision risk that is more site-specific than the baseline model. The estimated exposure is then combined with project-specific information, such as turbine rotor size, number of turbines, and annual daylight hours at the site to create what is called an expansion factor. The expansion factor essentially scales up the eagle exposure measured in a sample of the project site to the entire project. The final step of the model is to combine this expanded exposure with a collision probability derived from golden eagles at older wind farms to predict how many eagle fatalities may occur when a project is operational. The USFWS has stated that it wants the permitted take for a wind farm to be conservative (i.e. high) so that it is unlikely a project will experience higher than permitted take; to meet this management goal, the USFWS uses the 80% upper credible interval of the fatality estimate to determine how much take to allocate to a project. This means that, based on the model, there is an 80% probability that actual eagle fatalities at the project will be lower than the permitted take and only a 20% probability of fatalities exceeding permitted take.

16. To your knowledge, has the USFWS collision risk model been applied to data from the Project?

Yes. The Staff Report of Investigation for the Project states on page 43 that the USFWS "determined the preliminary risk to eagles is about 2.5 eagles/year". This appears to be derived from the USFWS collision risk model prediction. Due to the conservative nature of the model noted in my previous testimony, this should not be interpreted as the likely

eagle fatality rate for the Project, but rather the take rate the USFWS would be likely to use in preparing an ETP assuming it is based on all of the Project-specific data. The probability distribution of take estimates output by the collision risk model is skewed, which means an 80% credible interval can diverge considerably from the 50% (median) interval, which is what statisticians would interpret as the most likely take.

17. When you assess eagle risk for a wind project, what information do you consider?

The approach that I use in assessing eagle risk is to evaluate the weight of evidence from all of the information available for the Project. This includes eagle use rates, the collision risk model output, spatial patterns of eagle use, eagle nest locations, eagle nest status and history, migration patterns, eagle communal roost locations, locations of food resources, locations of concentrated movement corridors, and patterns of eagle fatalities in the vicinity of the Project. Most of the data are collected on-site during project development, but some are also collected via desktop work; for example researching any eagle fatalities in the vicinity.

18. Have you looked for eagle fatalities in the vicinity of the Project?

I searched for eagle fatalities at wind energy projects throughout the state of Ohio. To date there has been one bald eagle fatality reported in the news in Ohio; this is the only publicly available account I have found of a bald eagle fatality in the state. For context, Ohio has 39 operating wind projects, with a total of 419 turbines producing 864 megawatts of power. The total number of projects in the state include 11 projects that are close to the shore of Lake Erie, where bald eagle population densities are highest.

19. Are you aware of USFWS's position regarding the timing of the application for an Eagle Take Permit by the Applicant and the receipt of the permit, as it relates to the issuance of the certificate in this case by the Board?

It is my understanding from correspondence I reviewed (Attachment CF-5) that the USFWS informed the Board that they considered it reasonable for the Project to develop an ECP and apply for an ETP prior to operations, but noted that the processing of the permit application by USFWS can take up to several years, and it is unlikely that a permit could

be issued prior to operations. This statement by USFWS is consistent with my experience assisting wind companies with other ETPs throughout the country.

20. Have you reviewed the Stipulation that was filed in this docket on September 11, 2020?

Yes. The Stipulation includes Recommended Condition 31, which states that the Applicant will develop an ECP in coordination with USFWS prior to the start of turbine construction and that the Applicant will apply for an ETP prior to operation of the Project.

21. Is it your opinion that the conditions laid out in the Stipulation enable the Board to determine the probable environment impact from the facility?

Yes.

22. Is it your opinion that the conditions laid out in the Stipulation enable the Board to determine that the facility represents the minimum adverse environmental impact?

Yes. The approach described in Condition 31 is equivalent to standard industry practice for ECP development and ETP applications. I believe this condition is sufficiently protective of eagles to represent the minimum adverse environmental impact to this resource.

23. Are your opinions and conclusions in your testimony made with a reasonable degree of scientific certainty?

Yes.

24. Does this conclude your testimony?

Yes, it does, except that I reserve the right to update this testimony to respond to any further testimony, reports, and/or evidence submitted in this case.

CERTIFICATE OF SERVICE

The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced in the service list of the docket card who have electronically subscribed to these cases. In addition, the undersigned certifies that a copy of the foregoing document is also being served upon the persons below this 11th day of September, 2020.

/s/ Christine M.T. Pirik
Christine M.T. Pirik (0029759)

Counsel/Intervenors via email:

werner.margard@ohioattorneygeneral.gov
brett.kravitz@ohioattorneygeneral.gov
katherine.walker@ohioattorneygeneral.gov
norwichtwp1339@gmail.com
richardwiles@willard-oh.com
rstrickler@huroncountyohprosecutor.com
jstephens@huroncountyohprosecutor.com
ggross@eriecounty.oh.gov
heather@hnattys.com
jvankley@vankleywalker.com
pjleppla@leplaw.com
michael.gerrard@arnoldporter.com
hwa2108@columbia.edu
missyeb3@gmail.com
baanc@aol.com
r_ladd@frontier.com

Administrative Law Judges via email:

jay.agranoff@puco.ohio.gov
michael.williams@puco.ohio.gov

4839-6905-9764 v5 [59714-18]

Attachment CF-1

Resume

DICKINSON WRIGHT PLLC

Christopher Farmer, Ph.D., *Senior Ecologist*

PROFESSIONAL EXPERIENCE

2019-Present *Senior Ecologist,* Western EcoSystems Technology, Inc., Lemoyne, Pennsylvania
2016-2018 *Principal Biologist,* DNV GL, Chalfont, Pennsylvania
2010-2016 *Senior Ecologist,* Tetra Tech EC, Inc., Langhorne, Pennsylvania
2004-2010 *Senior Research Biologist,* Hawk Mountain Sanctuary, Kempton, Pennsylvania

EDUCATION

Ph.D.
SUNY College of Environmental Science and Forestry
Syracuse, New York
2002
Ecology

M.S.
State University of New York at Albany
Albany, New York
1987
Science Education

B.S.
State University of New York at Albany
Albany, New York
1986
Biology

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Raptor Research Foundation
Associate Editor- Journal of Raptor Research

Eastern Golden Eagle Working Group

ADDITIONAL TRAINING & EDUCATION

Statistical Analysis using R Statistical Package – National Conservation Training Center, 2012

OBFS/LTER Training Program in Ecoinformatics, 2016

SPECIALTY AREAS

Dr. Farmer is an ecologist with 21 years of experience studying birds, ungulates, and carnivores; specializing in eagle surveys and take permitting, study design, habitat studies, capture techniques, survival analysis, population ecology, population modeling, and statistical ecology. His career has spanned academia, nonprofit conservation organizations and environmental consulting. He has extensive experience in telemetry, raptor migration, statistical analysis, behavioral ecology and avian breeding biology.

His consulting experience includes providing strategic guidance and support to due diligence and permitting for energy projects including pre-construction wildlife surveys, mitigation plans, habitat conservation plans (HCP), eagle conservation plans (ECP), bird and bat conservation strategies (BBCS) and other documents required under the Endangered Species Act, Bald and Golden Eagle Protection Act, and other environmental rules and regulations. He frequently assists clients in negotiations with regulatory agencies, at permit hearings, and as an expert witness, and is widely recognized as an industry thought leader regarding the wildlife impacts of renewable energy development.

PROFFESIONAL SUMMARY

2019-Present <u>Senior Ecologist and Project Manager, WEST, Inc.</u>

National Renewable Energy Laboratory, Development of a Computational Framework for Predicting Eagle Risk Near Wind Farms, U.S. (2020). Principal Investigator and Technical Advisor for development of spatially explicit risk prediction models incorporating eagle behavior, topography, and weather.

Courtenay Wind Farm, ND, Eagle Take Permit Compliance Monitoring (2019-2020). Project Manager leading fatality monitoring to measure bald eagle fatality rate.

Confidential Wind Energy Client, WY (2019). Technical Expert leading development of Eagle Conservation Plan for a Project under development

Confidential Wind Energy Client, OK (2019-20). Technical Lead and Project Manager for development of an Eagle Conservation Plan and Eagle Incidental Take Permit application at an operational facility.

Confidential Wind Energy Client, KS (2019-20). Technical Lead and Project Manager for development of an Eagle Conservation Plan and Eagle Incidental Take Permit application at an operational facility.

Confidential Wind Energy Client, NC (2019-20). Technical Lead for development of an Eagle Conservation Plan and Eagle Incidental Take Permit application at an operational facility.

Bluestone Wind Project, NY (2019-2020). Technical Lead for development of an Eagle Conservation Plan and Net Conservation Benefit Plan for a project in development. Provided testimony regarding eagles in NY State Public Service Commission Siting Hearing.

2016-2018 Principal Biologist, Environmental and Permitting Services, DNV GL

American Wind Energy Association, Bayesian Collision Risk Model Prior Probabilities Evaluation, U.S. (2018). Technical lead and author of reports evaluating newly proposed priors for collision risk model using simulation modeling and comparison to known fatalities in North America.

Multiple Confidential Wind and Solar Energy Clients. Technical leader of wildlife due diligence assessments for Independent Engineer's Reports in support of project financing and acquisition.

Confidential Wind Energy Client, Eagle Conservation Plans, Eagle Take Permits, and Bird and Bat Conservation Strategies for Two Wind Projects, CA (2017). Biology technical lead for teams preparing ECPs, eagle take permit applications, bird and bat conservation strategies, and NEPA support for the developer of two wind farms in southern California.

Confidential Wind Energy Client, Eagle Surveys and Bird and Bat Conservation Strategy, MT (2016-Present): Biology Technical lead for teams performing eagle use and avian surveys and preparing a BBCS for a proposed wind farm.

Confidential Wind Energy Client, Eagle Surveys and Wildlife Conservation Strategy, ND (2017): Project Manager and technical lead for eagle-use surveys and preparation of a wildlife conservation strategy for a proposed wind project.

National Renewable Energy Laboratory (2016-2019): Member of Expert Panel. Provided advice to National Renewable Energy Laboratory on priorities for its Wind Wildlife Land-Based Collaborative. The expert panel convened annually to assist the Laboratory in identifying priorities, gaps, and opportunities for the program.

Confidential Wind Energy Client, Eagle Strategy Support, NE (2016): Project manager and technical lead for strategic evaluation, agency consultation, and planning support for a proposed wind farm.

Confidential Client, Avian Detection Market Analysis (2016): Project Manager and technical lead for a market analysis for a confidential customer developing an avian detection system for use in avoidance of impacts to raptors and other large birds.

Brady I and II Wind Farms, ND, Expert Witness Support (2016): Provided expert testimony and biological strategy in support of Public Siting Commission review of siting permit application. Testimony focused on due diligence and conservation planning with respect to bald and golden eagles.

Avian Detection and Deterrent Technology White Paper (2016-Present): Lead Biologist for team preparing a summary and synthesis of avian detection and deterrent devices available to the wind energy industry with an emphasis on technology readiness level and evidence of effectiveness.

Confidential Wind Energy Client, ME (2016-Present). Project Manager for grassland bird surveys focused on sensitive grassland species, particularly upland sandpiper at a proposed wind farm.

Canadian Wind Energy Association, (2016-Present): Technical author and reviewer, CanWEA Bats and Wind Energy Review. Reviewed all technical portions of Bat Toolkit during development to ensure technical accuracy and quality, and guided revision process.

American Wind Energy Association, Washington DC, Eagle Rule Support (2016-2017): Lead Biologist and Project Manager. Strategic support to the

American Wind Energy Association regarding proposed final eagle permit regulations under the Bald and Golden Eagle Protection Act.

American Wind Wildlife Institute, Washington, DC, Technology Verification Program, Peer Reviewer (2016). Project Manager. June 2016. Technical support of research proposal review for the American Wind-Wildlife Institute. Reviewed proposals for evaluation of eagle detection technology for technical merit.

2010-2016 Tetra Tech EC, Inc.
Biology Discipline Lead, 2015-2016
Senior Ecologist, 2010-2015
Confidential client, pre-construction surveys for wind farm and transmission line, KS (2015): Biology Technical Lead – provided leadership in design and implementation of avian and bat surveys at a proposed wind farm in Kansas. Developed strategy for dealing with proximity of the project and its transmission line to the white-nosed syndrome buffer zone for northern long-eared bats. Assisted client with agency coordination relative to avoidance of impacts to northern long-eared bat.

Confidential client, pre-construction surveys for three wind farms, ND (2015): Biology Technical Lead – provided leadership in design and implementation of avian and bat surveys at three proposed wind farms in North Dakota. Reviewed all technical products for consistency and represented the client in agency discussions. .Developed strategy for dealing with proximity of projects to the white-nosed syndrome buffer zone for northern long-eared bats. Provided expert witness testimony regarding impacts to eagles and threatened/endangered species.

Confidential client, pre-construction surveys for two wind farms, TX (2015): Biology Technical Lead – provided leadership in design and implementation of avian and bat surveys at two proposed wind farms in Texas. Surveys included raptor nest surveys, eagle point-count surveys, avian point-count surveys and bat acoustic surveys. Provided technical and strategic advice to the client based on survey findings.

U.S. Army Corps of Engineers, Wildlife Risk Assessment for Tooele Army Depot Renewable Energy Project, UT (2015): Project Manager and Biology Technical Lead – led technical team developing an assessment of risk of impacts to wildlife from development of a wind and/or solar energy project at the Tooele Army Depot, Tooele, Utah. Also designed and managed a raptor nest survey to document golden eagle nests within a 10-mile radius of the project.

Confidential solar client, avian and bat risk assessment for concentrated solar energy facility, NV (2015): Biology Technical Lead – led technical team reviewing available dockets and literature regarding avian impacts of concentrated (power tower) solar facilities and comparing to design of facility undergoing testing prior to full operations. Developed an assessment of avian risks and impacts and comparison to documented wind and solar impacts within the region to inform operational avoidance and minimization measures.

Sempra, Broken Bow Wind Farm, Eagle Risk Assessment and Bird and Bat Conservation Strategy (BBCS) for an Operational Wind Farm, NE (2014–2015): Biology Technical Lead – led technical team developing an assessment of risk to eagles and recommendations for next steps as well as a BBCS for an operational wind farm. Collected agency comments on draft BBCS and negotiated responses, avoidance and minimization measures and adaptive management plan with USFWS.

EDP Renewables, Eagle Surveys, Eagle Conservation Plan, and Bird and Bat Conservation Strategy for Waverly Wind Farm, KS (2014–15): Biology Technical Lead – coordinated bald eagle studies with USFWS and KDWPT on behalf of the client. Designed and implemented eagle point-count and nest

surveys to assess risk to eagles. Developed a BBCS and ECP in consultation with USFWS and provided strategic vision for negotiation of adaptive management approach. Assisted client in development of consultation strategy and preparation of an Eagle Take Permit.

Confidential client, eagle risk assessment for proposed wind farm, NM (2014–2015): Biology Technical Lead – synthesized results of previous avian studies and developed a preliminary assessment of risk to golden eagles, including recommendations for next steps and follow-up surveys. Provided support for agency coordination on potential ECP development for the project.

U.S. Army Corps of Engineers, Red Knot Surveys, NJ (2014–2015): Senior Technical Advisor – developed survey an analysis approach, provided technical leadership, and served as report reviewer on surveys for an endangered avian species (red knot) at beach nourishment projects along approximately 160 miles of coastline.

Confidential client, bird and bat conservation strategy for proposed wind farm, MI (2014–16): Biology Technical Lead – led technical team in development of BBCS demonstrating client's adherence to the USFWS Wind Energy Guidelines for protection of avian and bat species in development and operation of the project. Provided strategic vision for negotiation of avoidance and minimization measures and adaptive management plan with agencies.

Confidential client, eagle conservation plans for two operational wind farms, WY (2014–16): Senior Technical Advisor – in coordination with client team composed of Tetra Tech and two other consultants, developed ECPs and ETP applications under a Settlement Agreement for two operational wind farms with a record of golden eagle take. ECP development required intensive, iterative consultation with USFWS Field and Regional offices. Provided strategic vision for consultation/negotiation approach.

EDP Renewables, Eagle Surveys, Eagle Conservation Plan, and Bird and Bat Conservation Strategy for Arbuckle Wind Farm, OK (2013–15): Project Manager and Biology Technical Lead – prepared an eagle risk assessment and negotiated additional studies with USFWS and ODFW on behalf of the client. Designed and implemented eagle point-count and nest surveys demonstrating low risk to eagles despite proximity of an active nest. Developed a BBCS and ECP in consultation with USFWS Regional Eagle Coordinator and provided strategic vision for negotiation of adaptive management approach. Assisted client in development of consultation strategy and preparation of an Eagle Take Permit.

NextEra Energy Resources, Bird and Bat Conservation Strategy, Genesis Solar Energy Project, CA August (2013–2014): Senior Biologist – prepared a revised Bird and Bat Conservation Strategy in response to agency concerns about avian impacts at solar facilities throughout California. Represented the client in agency meetings and tours of the facility.

Confidential solar client, bird and bat conservation strategy, two solar PV projects, CA (2013–2014): Senior Biologist – supervised avian point-count and radar surveys and developed Bird and Bat Conservation Strategies for two proposed large-scale solar PV projects in southern California. Represented the client in agency meetings and conference calls.

Confidential Client, Avian and Bat Surveys for a Proposed Wind Project on Chesapeake Bay, MD (2013–15): Biology Technical Lead – developed and implemented a survey plan incorporating surveys for eagles and eagle nests following the 2012 ECP Technical Appendices in coordination with USFWS personnel, general avian surveys, breeding bird surveys and bat acoustic surveys for a wind energy site in an area with potentially high bald eagle use. Represented the client in technical assistance meetings with USFWS eagle

coordinator and the Chesapeake Bay Field Office. Coordinated data collection with the ECP consultant.

Confidential client, eagle conservation plan for operational wind farm, Tehachapi, CA (2012–2014): Senior Ecologist – developed eagle fatality projections using the USFWS Bayesian modeling approach for an operational wind energy facility with a history of golden eagle fatalities. Helped client develop a risk assessment based on fatality modeling and a novel approach to predicting the spatial distribution of collision risk based on modeling terrain-based updrafts.

Pioneer Green Energy, Eagle Conservation Plan and Agency Consultation for Proposed Great Bay Wind Energy Center on Chesapeake Bay, MD (2012–2014): Biology Technical Lead – developed eagle fatality projections using the USFWS Bayesian modeling approach for a wind energy site with very high Bald Eagle use. Led the project technical team in development of the eagle conservation plan and a bird and bat conservation strategy. Evaluated a variety of potential development scenarios to identify the lowest impact design, and provided guidance to the client regarding implications for seeking an incidental take permit for eagles under BGEPA. Developed several novel avoidance and minimization and mitigation strategies. Represented the client in technical assistance meetings with USFWS eagle coordinator and modelers, as well as in Section 7 consultation process for the endangered Delmarva Fox Squirrel, and developed an Eagle Take Permit application for the project.

CalWEA, Golden Eagle Mitigation Strategies for the DRECP process, CA (2012): Senior Ecologist – developed a summary of sources of golden eagle fatalities in the state of California. Used the summary to suggest fatality sources that appeared feasible for mitigation of wind-energy related impacts in the BLM desert region, and developed mitigation strategies for each of those sources.

BP Wind Energy, Eagle Conservation Plan, Mohave Wind Project, AZ (2011–2012): Senior Ecologist – developed an Eagle Conservation Plan for golden eagles for a wind energy project in Arizona. Developed an eagle risk assessment that includes comparison to other projects, quantitative fatality modeling based on observed use, and a qualitative assessment of risk factors. Developed a novel approach to take mitigation that has since been adopted by USFWS in its Eagle Conservation Plan Guidance. Obtained an acknowledgment letter from USFWS indicating that the ECP was acceptable for use in application for an eagle take permit. Also developed separate Avian Conservation Strategy and Bat Conservation Strategy documents.

EDP Renewables and EnXco, Eagle Conservation Plan Guidance Comments (2011): Task Lead – worked with teams from two confidential wind clients to develop detailed technical comments on the USFWS Eagle Conservation Plan (ECP) Guidance during the public comment period. Economic implications of the draft guidance are far reaching for wind energy projects, and much of the biological rationale for the guidance is either unclear or questionable. Goal of the work was to help USFWS produce implementation guidelines for eagle take permits that protect eagles and also allow for development of wind energy projects.

Confidential client, article 11 permit application, NY (2011–2012): Senior Ecologist – worked with a confidential wind client to develop a comprehensive application for an incidental take permit for a state-endangered species (northern harrier) at an operating wind farm under Article 11 of the N.Y. Environmental Conservation Law. Developing population and habitat assessment models in support of the application. Working with NYSDEC and the client to develop the permit application and finalize permit terms.

Confidential client, avian and bat protection plan, PA (2011): Biology Technical Lead – working with a confidential wind client to develop an avian and bat protection plan for a proposed wind energy project. As part of plan development, designing and undertaking surveys for golden eagles in consultation with USFWS to collect data for an eagle risk assessment under BGEPA Eagle Conservation Plan Guidance. Providing technical leadership on eagle risk consultation with USFWS and PGC.

Confidential client, eagle risk studies, ME (2011–2012): Senior Ecologist – worked with a confidential wind client to develop strategies to monitor bald and golden eagles in the vicinity of a potential wind energy facility and evaluate the risk of incidental takes. Represented client interests in consultation meetings with state and federal agencies and served as senior reviewer on eagle survey reports.

Confidential client, bald eagle use study and avian and bat protection plan, OH (2011–2012): Senior Project Biologist – working with a confidential wind client to design and implement a year-round, pre-construction survey plan for bald eagles, including nest surveys, flight behavior surveys, and migration surveys. Aiding client with USFWS and ODNR consultation regarding avian and bat species, and developing an avian and bat protection plan that details the assessment of risk for bald eagles and Indiana Bats at the project.

Confidential client, golden eagle use study and eagle conservation plan, CA (2011–2012):Senior Ecologist – worked with a confidential wind client to evaluate the behavior of golden eagles in the vicinity of a wind energy facility and develop appropriate avoidance and minimization measures. Designed ground and aerial behavioral surveys and telemetry research using GPS-GSM transmitters to gather high resolution information about eagle movements. Lead efforts to team with academic researchers to create products useful to eagle risk analysis in the vicinity of the project. Results assisted the client in evaluating mitigation strategies and reaching a decision regarding a potential Eagle Take Permit.

BP Wind Energy, Post-construction Mortality Monitoring, Goshen Wind Farm, ID (2011): Senior Ecologist – member of design team for a post-construction mortality study for the Goshen Wind Farm. Post-construction mortality monitoring study included bias correction trials for scavenging and searcher efficiency. Performed initial plot setup and clearance and aided in field crew training and the design of the project report.

SELECTED PROFESSIONAL PUBLICATIONS

Watson, R.T., P.S. Kolar, M. Ferrer, T. Nygard, N. Johnston, W. G. Hunt, H.A. Smit-Robinson, **C.J. Farmer**, M. Huso, and T.E. Katzner. 2018. Raptor Interactions with Wind Energy: Case Studies from Around the World. Journal of Raptor Research 52(1): 1-18.

Farmer, C.J., A. Klehr, and E. Crivella. 2016. Does Utility-scale Solar Pose a Major Threat to Birds? Solar Industry Magazine.

Goodrich, L.J., **C.J. Farmer**, D.R. Barber, and K.L. Bildstein. 2012. What Banding Tells us About the Movement Ecology of Raptors. Journal of Raptor Research 46: 21-35.

Katzner, T, B.W. Smith, T.A. Miller, D.Brandes, J.Cooper, M. Lanzone, D.Brauning, **C.J. Farmer**, S. Harding, D. E. Kramar, C. Koppie, C. Maisonneuve, M. Martell, E. K. Mojica, C. Todd, J. A. Tremblay, M. Wheeler, D. F. Brinker, T. E. Chubbs, R. Gubler, K. O'Malley, S. Mehus, B. Porter, R. P. Brooks, B. D. Watts, and K. L. Bildstein. 2011. Status, Biology, and Conservation Priorities for North America's Eastern Golden Eagle (*Aquila chrysaetos*) Population. Auk 129: 168-176 (2012)

Farmer, C.J., K. Safi, D.R. Barber, I. Newton, M. Martell, and K.L. Bildstein. 2010. Efficacy of Migration Counts for Monitoring Continental Populations of Raptors: An Example Using the Osprey (*Pandion haliaetus*). The Auk 127:863-870.

Farmer, C.J. 2010. American Kestrel, *Second Pennsylvania Breeding Bird Atlas*.

Farmer, C.J. 2010. Red-shouldered Hawk, *Second Pennsylvania Breeding Bird Atlas*.

Farmer, C.J. and J.P. Smith. 2010. Seasonal Differences in Migration Counts of Raptors: Utility of Spring Counts for Population Monitoring. Journal of Raptor Research 44:101-112.

Farmer, C.J. and J.P. Smith. 2009. Migration Monitoring Indicates Widespread Declines of American Kestrels (*Falco sparverius*) in North America. Journal of Raptor Research 43:261-273.

Bildstein, K.L., M.J. Bechard, **C.J. Farmer**, and L. Newcomb. 2009. Narrow Sea Crossings Present a Significant Barrier to Migrating Griffon Vultures *Gyps fulvus*, ibis 151: 382-391.

Bildstein, K.L., **C.J. Farmer**, and R. Yosef. 2009. Raptor Population Monitoring: Examples from Migration Watchsites in North America, Avocetta 33: 43-51**Farmer, C.J.** and D.J.T. Hussell. 2008.The Raptor Population Index in Practice, pages 165-178 *in* K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza, and R. Veit (eds.), *State of North America's Birds of Prey*. American Ornithologists' Union and Nuttall Ornithological Club, Series in Ornithology, No. 3.

Klem, D, **C.J. Farmer**, N. Delacretaz, Y. Gelb, and P. Saenger. 2009. Architectural and Landscape Risk Factors Associated with Bird-glass Collisions in an Urban Environment. Wilson Journal of Ornithology 121: 126-134.

Kunkle, D., B. Silfies, L.J. Goodrich, D. Barber, **C.J. Farmer**, and K.L. Bildstein. 2009. Movements of Red-tailed Hawks Color-marked During Autumn Migration on the Kittatinny Ridge, Eastern Pennsylvania, Hawk Migration Studies 34:18-24.

Farmer, C. J., L.J. Goodrich, R. Bell, B. Drolet, E. Greenstone, D. Grove, D.J.T. Hussell, D. Mizrahi, F. Nicoletti, and J. Sodergren, Trends in Autumn Counts of Migratory Raptors in Northeastern North America, 1974-2004. 2008. pages 179-216 *in* K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza, and R. Veit (eds.), *State of North America's Birds of Prey*. American Ornithologists' Union and Nuttall Ornithological Club, Series in Ornithology, No. 3.

Farmer, C. J., L.J. Goodrich, E. Ruelas, and J. Smith,. 2008. Conservation Status of North American Raptors. pages 303-420 *in* K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza, and R. Veit (eds.), *State of North America's Birds of Prey*, American Ornithologists' Union and Nuttall Ornithological Club, Series in Ornithology, No. 3.

Smith, J.P., **C.J. Farmer**, S.W. Hoffman, G.S. Kaltenecker, K.Z. Woodruff, and P. Sherrington. 2008. Trends in Autumn Counts of migratory Raptors in Western North America, 1983-2005, pages 217-252 in K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza, and R. Veit (eds.), *State of North America's Birds of Prey*, American Ornithologists' Union and Nuttall Ornithological Club, Series in Ornithology, No. 3.

Smith, J.P., **C.J. Farmer**, S.W. Hoffman, C.A. Lott, L.J. Goodrich, J. Simon, C. Riley, and E. Ruelas Inzunza. 2008. Trends in Autumn Counts of Migratory Raptors Around the Gulf of Mexico, 1995-2005, pages 253-278 in K.L. Bildstein, J.P. Smith, E. Ruelas Inzunza, and R. Veit (eds.), *State of North America's Birds of Prey*, American Ornithologists' Union and Nuttall Ornithological Club, Series in Ornithology, No. 3.

Farmer, C. J., D. J. T. Hussell, and D. Mizrahi. 2007. Methods for Detecting Population Trends in Migratory Birds of Prey, The Auk 124: 1047-1062.

Farmer, C. J., and M.D. Kirchhoff. 2007. Ecological Classification of Deer Habitat in the Tongass National Forest, Alaska, Northwestern Naturalist 88: 73-84.

Bildstein, K.L., M.J. Bechard, P. Porras, E. Campo, and **C.J. Farmer**. 2007. Seasonal Abundances and Distributions of Black Vultures (*Coragyps atratus*) and Turkey Vultures (*Cathartes aura*) in Costa Rica and Panama: Evidence for Reciprocal Migration in the Neotropics. pages 47-60 in K.L. Bildstein, D.R. Barber and A. Zimmerman (eds.), *Neotropical raptors*, Hawk Mountain Sanctuary, Orwigsburg, PA, USA.

Farmer, C. J., D. K. Person, and R. T. Bowyer. 2006. Risk Factors and Mortality of Sitka Black-tailed Deer in a Managed Forest Landscape. Journal of Wildlife Management 70: 1403-1415.

SELECTED PROFESSIONAL PRESENTATIONS

Ostridge, C. and **C. Farmer**. 2018. Understanding the true costs of bat curtailment. Bats and wind energy collaborative science meeting, Broomfield, CO.

Farmer, C.J. 2018. (Session Moderator). Eagles II – (Not!) For the Nerds. AWEA Siting and Environmental Compliance Conference, Memphis, TN.

Hiester, T., **C. Farmer**, and K. Peters. 2018. Machine vision field survey data and implications for risk modeling. Poster presentation at AWEA Siting and Environmental Compliance Conference, Memphis, TN.

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Attachment CF-2

April 2020, WEST Inc. Bald Eagle Nest Status Table and Map

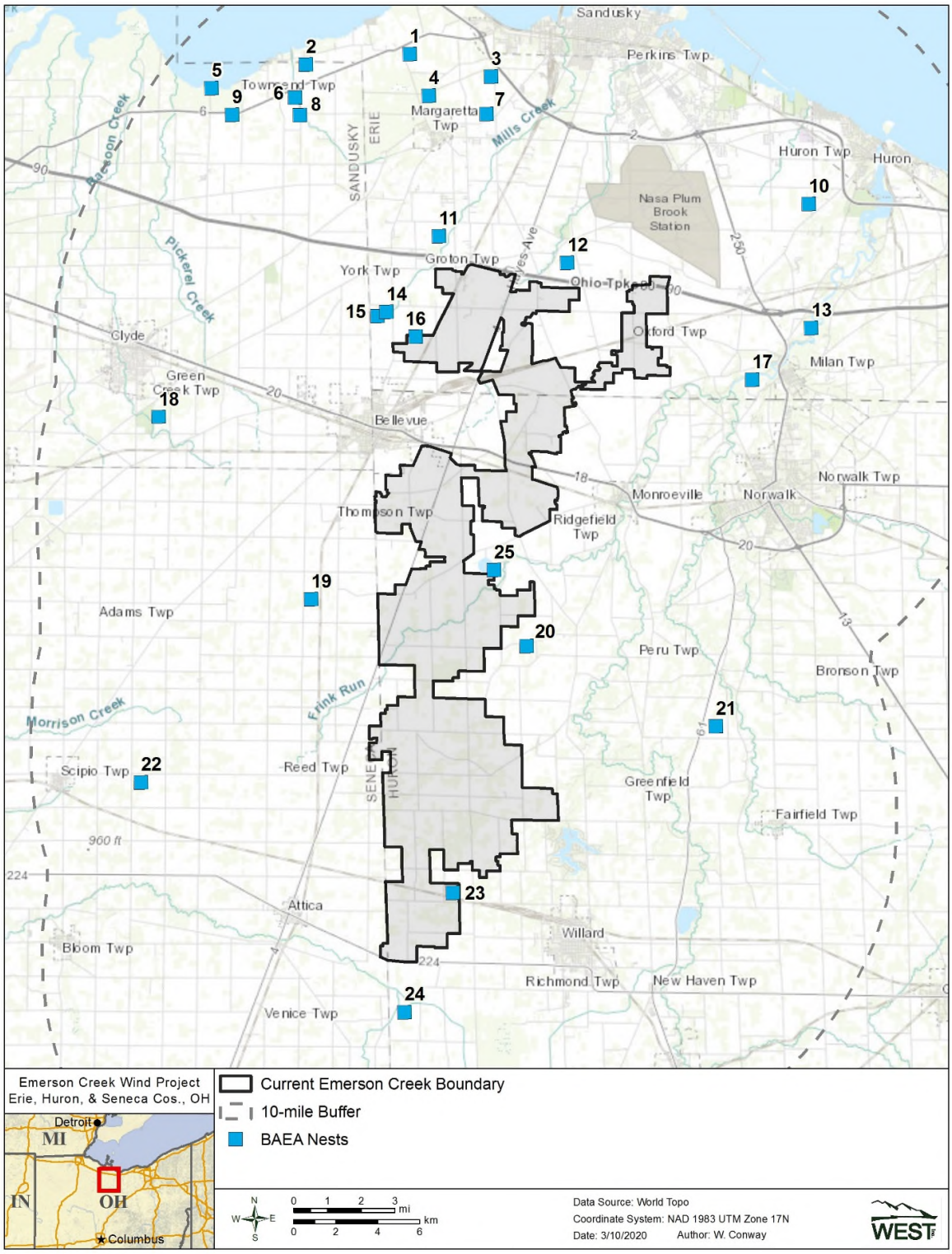
Bald Eagle Nest Status within 10 miles of Emerson Creek Wind Project, 2009 – 2020, as of April 14, 2020

Nest ID	2009 Status	2011 Status	2012 Status	2013 Status	2014 Status	2018 Status	2020 Status[1]	Miles from Project
1	not reported	not reported	occupied, active, unproductive	active, productive	not reported	not reported	outside search area	6.40
2	not reported	not reported	not reported	active, not monitored for productivity	not reported	not reported	outside search area	7.15
3	not reported	not reported	not reported	active, unproductive	not reported	not reported	outside search area	5.58
4	not reported	not reported	not reported	active, productive	not reported	not reported	outside search area	5.13
5	not reported	not reported	occupied, active, productive	active, not monitored for productivity	not reported	not reported	outside search area	8.51
6	not reported	not reported	occupied, active, productive	inactive	not reported	not reported	outside search area	6.54
7	not reported	not reported	not reported	occupied, active, productive	not reported	not reported	outside search area	4.47
8	not reported	occupied, active, productive	not present	not present	not reported	not reported	outside search area	6.05
9	not reported	occupied, active, productive	not present	not present	not reported	not reported	outside search area	7.54
10	not reported	not reported	not reported	occupied, active, unproductive	not reported	not reported	outside search area	4.64
11	not reported	not reported	not reported	not reported	not reported	occupied, active	occupied, active	0.96

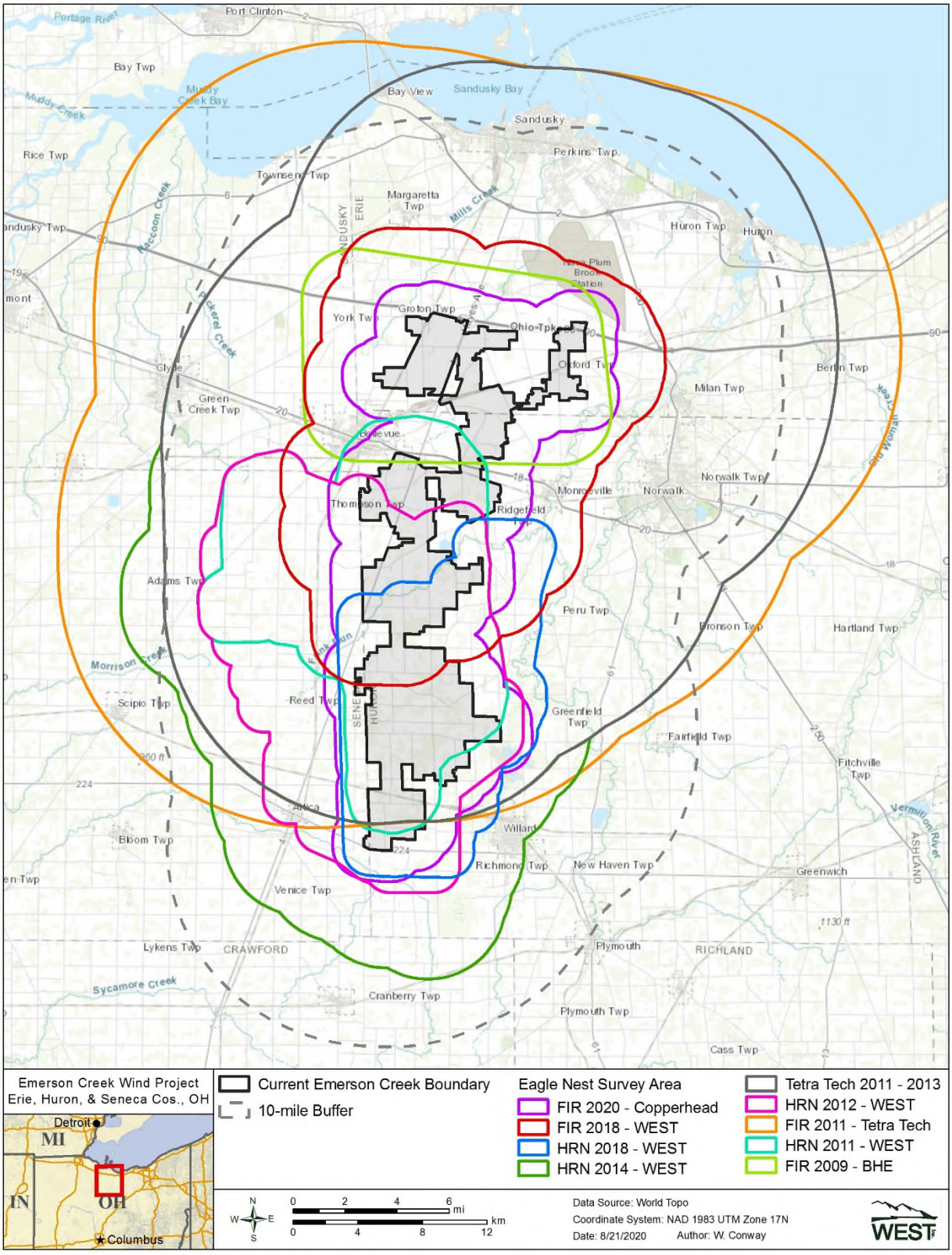
12	not reported	not reported	not reported	not reported	not reported	occupied, active	not reported	0.73
13	not reported	occupied, active, productive	occupied, active, unproductive	occupied, active, productive	not reported	not reported	outside search area	4.27
14	occupied, active	occupied, abandoned for nearby nest	unoccupied	not present	not reported	not reported	not present	0.90
15	not reported	occupied, productive	occupied, active, productive	occupied, active, productive	occupied, active	occupied, active	occupied, active	0.91
16	unoccupied	not reported	not reported	not reported	not reported	not reported	not present	0.00
17	not reported	occupied, productive	occupied, active, unproductive	occupied, active, productive	occupied, active	occupied, active	outside search area	2.44
18	not reported	not reported	not reported	occupied, active, productive	inactive	not reported	outside search area	6.80
19	not reported	not reported	not reported	not reported	not reported	occupied, active	occupied, active	1.97
20	not reported	unoccupied,	occupied, active,	occupied, active, productive	inactive	unoccupied, inactive	occupied, active	0.63
21	not reported	not reported	not reported	occupied, active, productive	inactive	not reported	outside search area	5.10
22	not reported	not reported	occupied, active, unproductive	occupied, active, not monitored for productivity	inactive	not reported	outside search area	6.79
23	not reported	not reported	not reported	not reported	not reported	occupied, active	occupied, active	0.00
24	not reported	not reported	not reported	not reported	not reported	occupied, active	occupied, active	1.49

25	not present	not present	not present	not present	not present	not present	occupied, active	0.10

[1]ground-based reconnaissance within Project area and aerial survey within Project plus 1.18-mile (1/2-mean internest distance) buffer



Bald Eagle Nests Within 10 Miles of Emerson Creek Wind Project, 2009 - 2020



Eagle Nest Search Areas at Emerson Creek Wind Project, 2009-2020

Attachment CF-3

May 2020 Copperhead Environmental Consulting, Raptor Nest Survey Report for the Proposed Emerson Creek Wind Project

DICKINSON WRIGHT PLLC

COPPERHEAD
ENVIRONMENTAL CONSULTING

2020 Raptor Nest Survey Report for the Proposed Emerson Creek Wind Project Huron, Erie, and Seneca Counties, OH

Gregg Janos, Shelby Patterson, and Richard Borthwick
Copperhead Environmental Consulting Inc.
471 Main St.
Paint Lick, KY 40461

8 May 2020

COPPERHEAD ENVIRONMENTAL CONSULTING, INC.
P.O. BOX 73 ■ 471 MAIN STREET ■ PAINT LICK, KENTUCKY 40461
(859) 925-9012 OFFICE (859) 925-9816 FAX

www.copperheadconsulting.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

INTRODUCTION

Copperhead Environmental Consulting, Inc. (Copperhead) completed an aerial raptor nest survey for the proposed Emerson Creek Wind Project (Project) in Huron, Erie, and Seneca counties, Ohio (Figure 1). The purpose of the survey was to document bald eagle (*Haliaeetus leucocephalus*) nests within 1.2 miles of the Project and other non-eagle raptor (raptor) nests within 0.5 miles of the Project. Bald eagles are the only eagle species with the potential to nest in the Project area. The survey was completed in accordance with the U.S. Fish and Wildlife Service (USFWS) Eagle Conservation Plan Guidance (ECPG 2013) and Eagle Incidental Take and Eagle Nest Take Regulations (50 CFR 13 and 22; USFWS 2016).

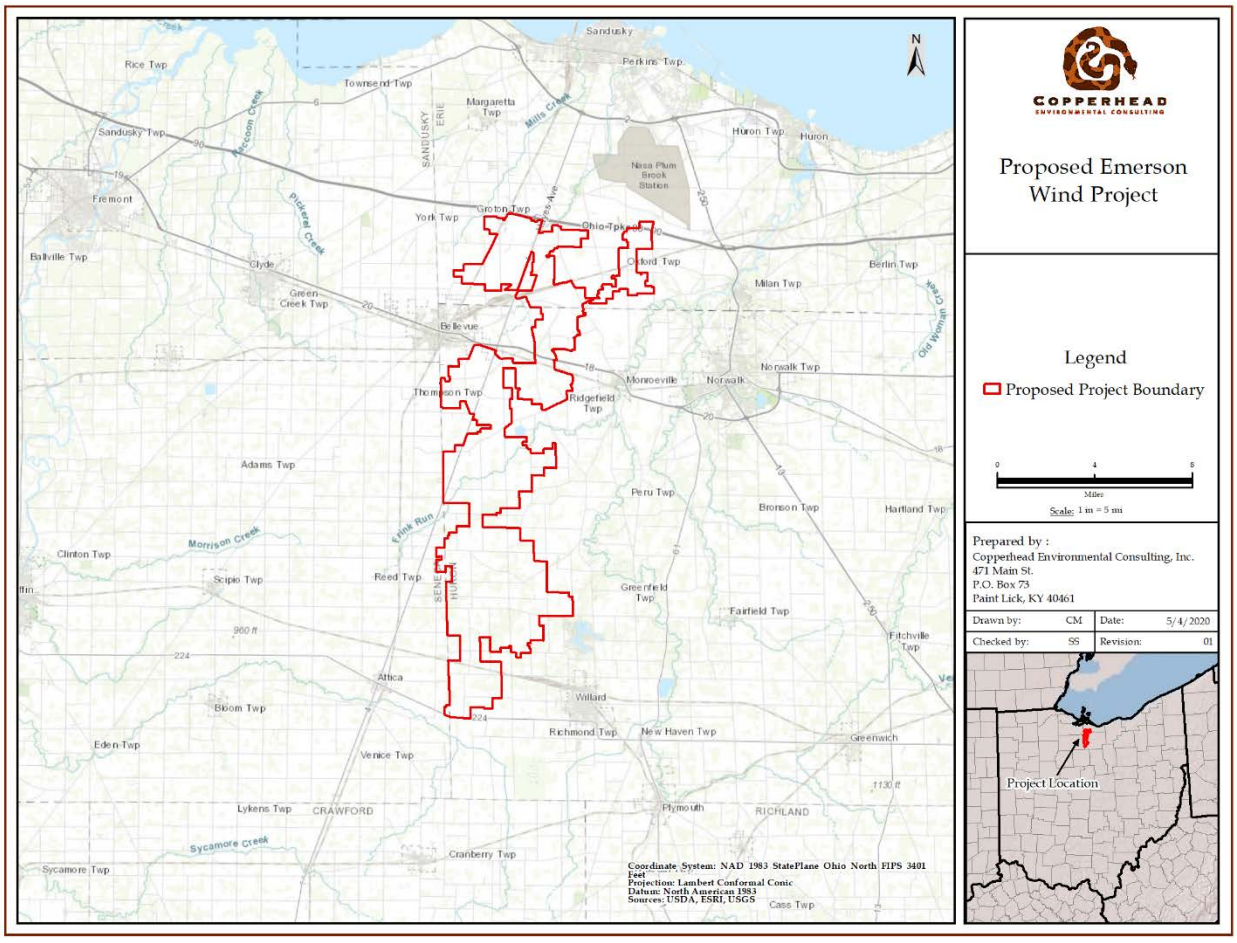


Figure 1. Boundary for the proposed Emerson Creek Wind Project, Huron, Erie, and Seneca Counties, OH.

PROJECT AREA

Using the U.S. Geological Survey's National Land Cover Database (NLCD) landcover classification, the predominant land cover/use type within the Project and 1.2-mile buffer is cultivated crops (82%), which offer limited nesting habitat for eagles. Land cover/use types generally optimal for eagle and raptor nesting include large trees suitable of holding relatively substantial nests (Anthony and Isaacs 1989). Eagles are also known to nest in close proximity to open water, which is rare within the surveyed area (Andrew and Mosher 1982, Anthony and Isaacs 1989). Suitable raptor/eagle nesting habitats account for approximately 9% of the combined Project boundary and 1.2-mile buffer area (Figure 2, Table 1; NLCD 2011; Homer et al. 2020).

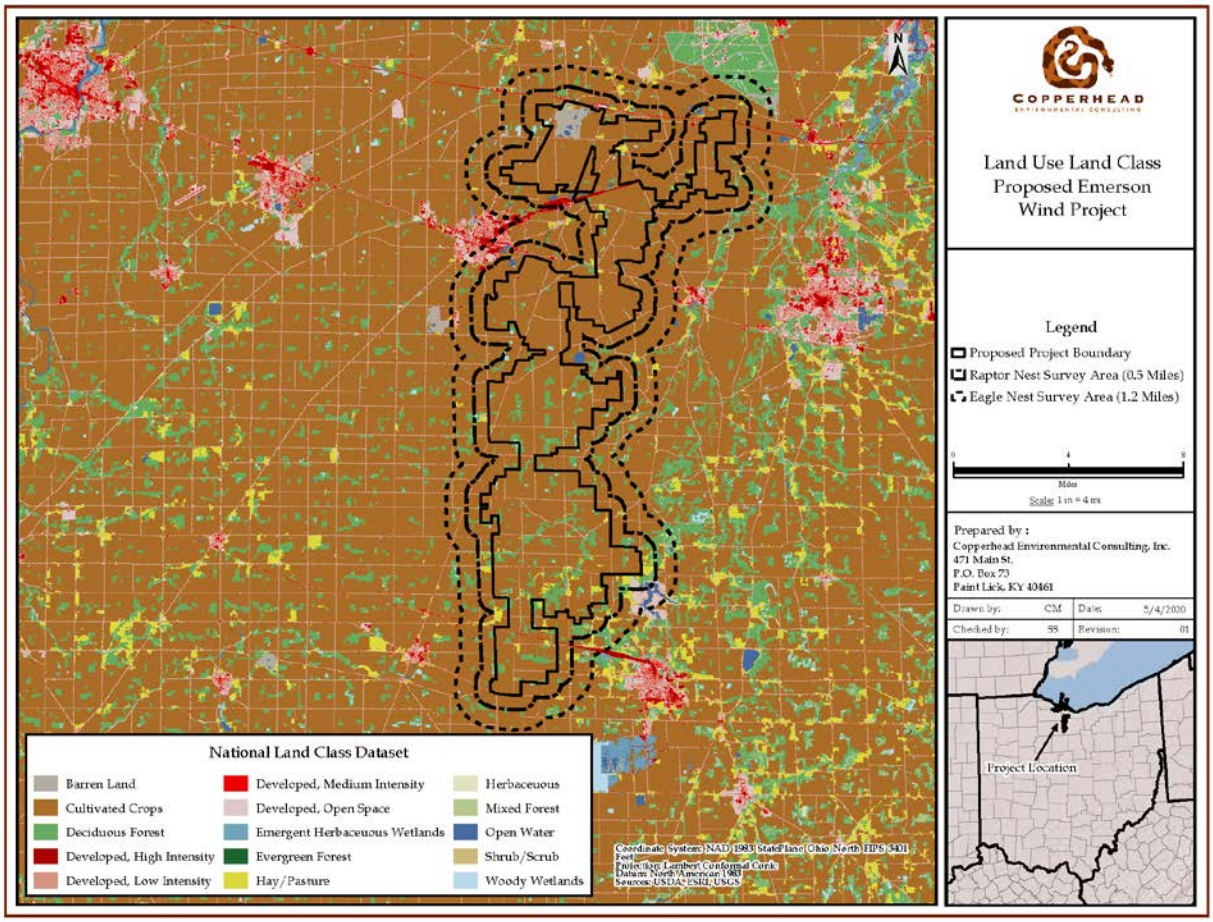


Figure 2. Landcover classifications from the NLCD for the proposed Emerson Creek Wind Project and aerial survey buffers.

Table 1. Land use and land cover proportions within the proposed Emerson Creek Wind Project and 1.2-mile buffer.

Land Use/Land Cover Classification	Project (acres)	1.2-Mile Buffer (acres)	Potential Eagle Nest Habitat
Cultivated Crops	34,536	85,386	No
Deciduous Forest	3,255	8,538	Yes
Developed, Open Space	1,698	6,729	No
Barren Land	610	762	No
Hay/Pasture	474	1,879	No
Woody Wetlands	156	442	Yes
Open Water	95	596	Yes
Mixed Forest	40	264	Yes
Shrub/Scrub	9	12	No
Herbaceous	3	40	No
Evergreen Forest	3	40	Yes
Emergent Herbaceous Wetlands	2	26	No

METHODS

Copperhead completed an aerial raptor nest survey on 12 and 13 March and 1 April 2020, from a Cessna 172 aircraft carrying one pilot and two wildlife biologist observers experienced with aerial raptor nest searches. Nest searches within the Project and 0.5-mile buffer documented all eagle and raptor nests, while the survey out to 1.2 miles focused only on identifying potential eagle nests. The aerial survey focused on locating stick nest structures in suitable eagle and raptor nesting substrate (e.g., trees, artificial structures, etc.).

To ensure adequate coverage, the Project, 0.5-mile buffer, and 1.2-mile buffer were flown with 1-mile-wide transects, with each observer covering approximately 0.5 mile viewshed. High-quality habitat for all eagles and raptors was surveyed more intensively. Specifically, additional passes or unconventional flight patterns were utilized to maximize visibility in areas of deemed potential eagle nesting habitat. Flight paths are included in Appendix A. All observed nest locations were recorded using DeLorme mapping software. For each nest, the following data were collected whenever possible: location, species, and occupancy status. Photos were collected of each nest when possible.

Eagle nests were classified as "In Use" or "Alternate" nests consistent with definitions amended from the ECPG and presented in the Eagle Incidental Take and Eagle Nest Take Regulations (50 CFR 13 and 22; USFWS 2016). Under these definitions, an In Use classification was applied if eagles were observed displaying courtship or nest building behavior in proximity to the nest, or if any of the following were observed: (1) an adult eagle in an incubating position, (2) eggs, (3) nestlings or fledglings, (4) occurrence of a pair of adult eagles (or, sometimes subadults, e.g., Steenhof et al. 1983) at or near a nest through at least the time incubation normally occurs, (5) a

newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed early in the breeding season, or (6) "A recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath" (Postupalsky 1974). If no eagles, courtship behavior, or nest-building were observed, and the nests did not appear to have any of the aforementioned use indicators, the nest was classified as Alternate.

For raptor nests, occupancy status can be challenging to confirm from the air. Where occupancy status could be confirmed, nests were classified as occupied if one of the following were observed: (1) an adult raptor in an incubating position, (2) occurrence of an of adult raptor at or near a nest, or (3) if there was evidence of new material in the nest. If none of the aforementioned occupancy indicators were observed, the nest was classified as unoccupied. The raptor species was recorded if it was possible to confirm which species the nest belonged to. When species could not be confirmed, the nest was recorded as an unknown raptor nest.

RESULTS

Eagles

Four In Use and no Alternate bald eagle nests were documented during the surveys. Two nests were within the Project boundary (BAEA2 and BAEA4) and the remaining two nests were 0.4 (BAEA1) and 0.6 miles (BAEA3) from the Project boundary (Table 2, Figure 3). All nests were located in trees, no nests were found in artificial structures. Photos of eagle nests are included in Appendix B.

Table 2. Eagle nest locations and occupancy status within the proposed Emerson Creek Wind Project and 1.2-mile buffer, 12-13 March and 1 April 2020.

Nest ID	Occupancy Status	Distance to Project (mi)	Latitude	Longitude	Habitat
BAEA1	In Use	0.4	41.32115	-82.83835	Woodlot
BAEA2	In Use	Inside	41.07411	-82.79435	Wood Row
BAEA3	In Use	0.6	41.35676	-82.80764	Woodlot
BAEA4	In Use	Inside	41.21178	-82.77184	Woodlot

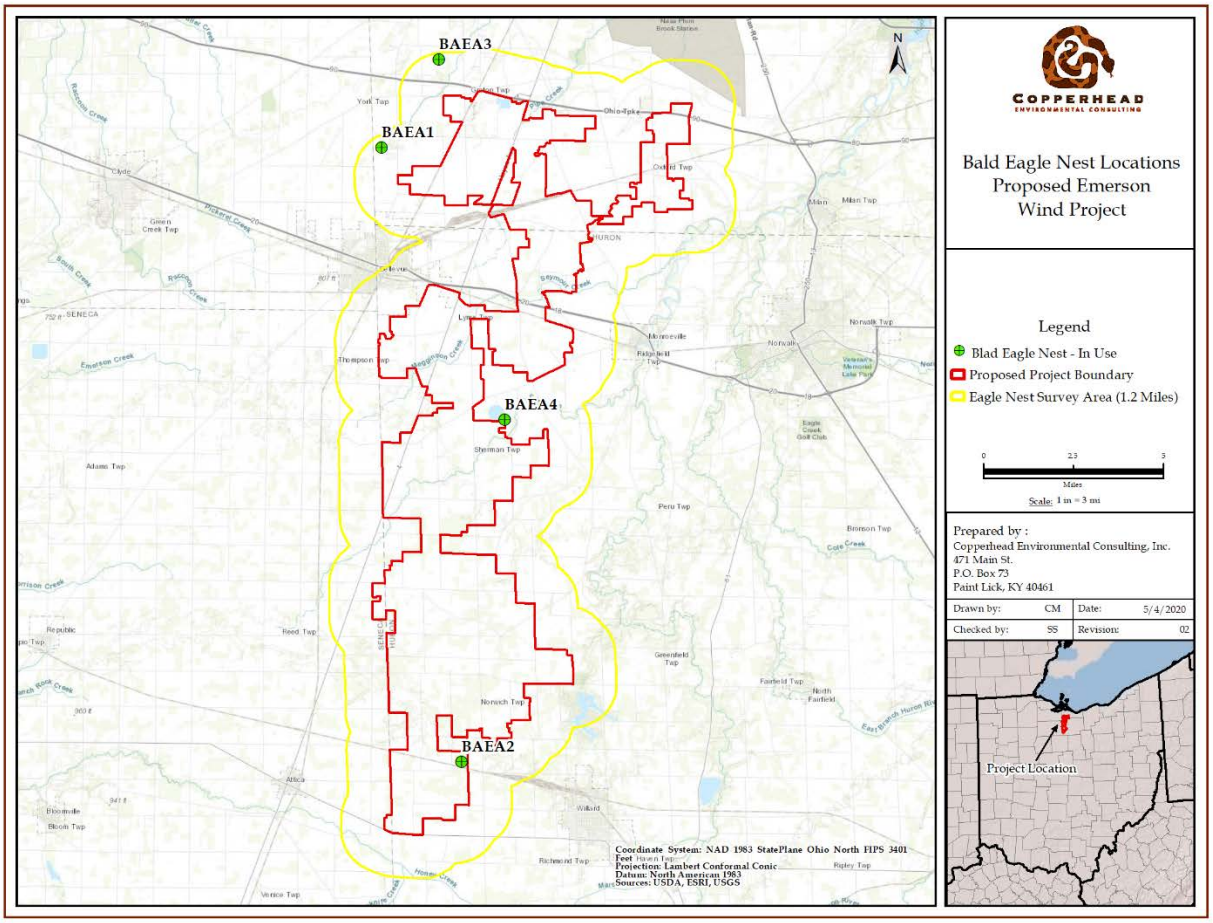


Figure 3. Eagle nest locations within the proposed Emerson Creek Wind Project and 1.2-mile buffer during 12-13 March and 1 April 2020.

Raptors

Twelve raptor nests (11 occupied and one unoccupied) were located within the Project boundary and six (three occupied and three unoccupied) were located < 0.1 miles to 0.4 miles from the Project boundary (Table 3, Figure 4). Eight of the nests were confirmed as red-tailed hawk (*Buteo jamaicensis*) nests via the presence of a bird in an incubation position. A pair of great horned owls (*Bubo virginianus*) were observed in RAPT16. Five of the remaining nine nests were considered occupied due to new material in the nest but no bird was present during the aerial survey so species could not be confirmed. All unknown raptor nests were too small to be potential eagle nests.

Table 3. Raptor nest locations and occupancy status within the proposed Emerson Creek Wind Project and 0.5-mile buffer, 12-13 March and 1 April 2020.

Nest ID	Species	Occupancy Status	Distance to Project (mi)	Latitude	Longitude	Habitat
RAPT1	Unknown	Unoccupied	0.4	41.12834	-82.84739	Woodlot
RAPT2	Unknown	Occupied	0.1	41.13270	-82.84325	Woodlot
RAPT3	Red-tailed Hawk	Occupied	Inside	41.24039	-82.81454	Woodlot
RAPT4	Unknown	Occupied	Inside	41.14074	-82.82122	Woodlot
RAPT5	Unknown	Occupied	Inside	41.09723	-82.82531	Woodlot
RAPT6	Unknown	Occupied	Inside	41.09855	-82.79412	Woodlot
RAPT7	Unknown	Occupied	Inside	41.19779	-82.79910	Woodlot
RAPT8	Red-tailed Hawk	Occupied	Inside	41.19196	-82.79689	Woodlot
RAPT9	Red-tailed Hawk	Occupied	Inside	41.25602	-82.78648	Woodlot
RAPT10	Red-tailed Hawk	Occupied	Inside	41.30309	-82.78356	Woodlot
RAPT11	Red-tailed Hawk	Occupied	Inside	41.25158	-82.76212	Woodlot
RAPT12	Unknown	Unoccupied	Inside	41.11265	-82.77551	Woodlot
RAPT13	Red-tailed Hawk	Occupied	Inside	41.11358	-82.74517	Woodlot
RAPT14	Unknown	Unoccupied	0.1	41.21094	-82.75868	Woodlot
RAPT15	Red-tailed Hawk	Occupied	0.3	41.34222	-82.75624	Woodlot
RAPT16	Great Horned Owl	Occupied	0.1	41.32902	-82.72873	Woodlot
RAPT17	Red-tailed Hawk	Occupied	Inside	41.23203	-82.73525	Woodlot
RAPT18	Unknown	Unoccupied	0.1	41.30510	-82.70658	Woodlot

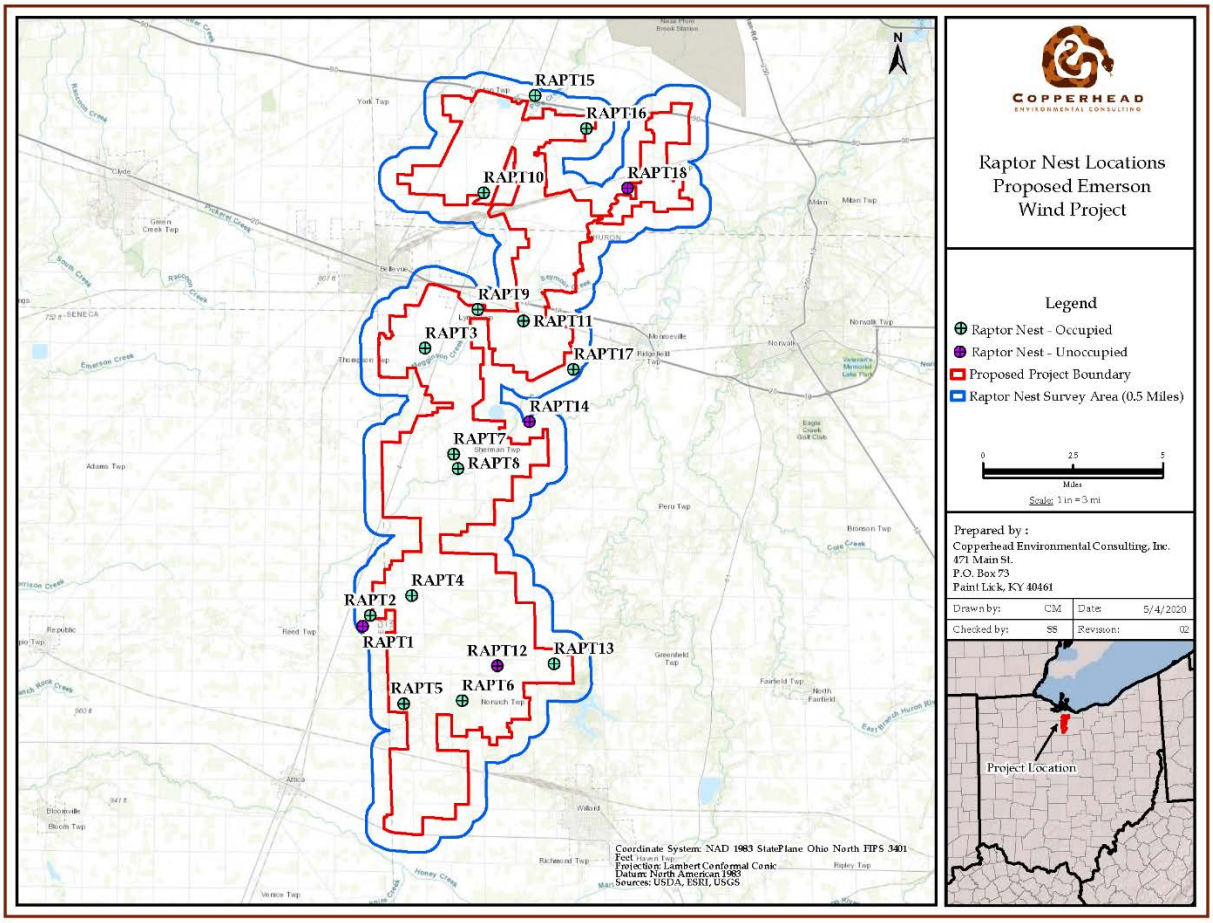


Figure 4. Non-eagle raptor nest locations within the proposed Emerson Creek Wind Project and 0.5-mile buffer during 12-13 March and 1 April 2020.

CONCLUSION

The bald eagle population has increased 150% within the state of Ohio since the species was removed from the state threatened species list in 2012, with 15, 32, and 24 confirmed nests documented in Huron, Erie, and Seneca counties respectively by the state this year (ODNR, 2020). Four In Use eagle nests were found within the Project and 1.2-mile buffer. Two of these nests (BAEA2 and BAEA4) were located within the Project area. Based on the survey results, suitable bald eagle nesting habitat is scattered throughout the Project area. The presence of bald eagle nests within the Project and 1.2-mile survey buffer may warrant management consideration.

Eighteen additional raptor nests were observed in the Project or within 0.5 miles of the boundary. Eight of these nests were attributed to red-tailed hawks, which are the most abundant hawk species in Ohio. A pair of great horned owls were observed in another nest. Residual woodlots throughout the region provide perching and nesting opportunities for raptors and the prevalence of large tracts of cultivated cropland provide foraging potential.

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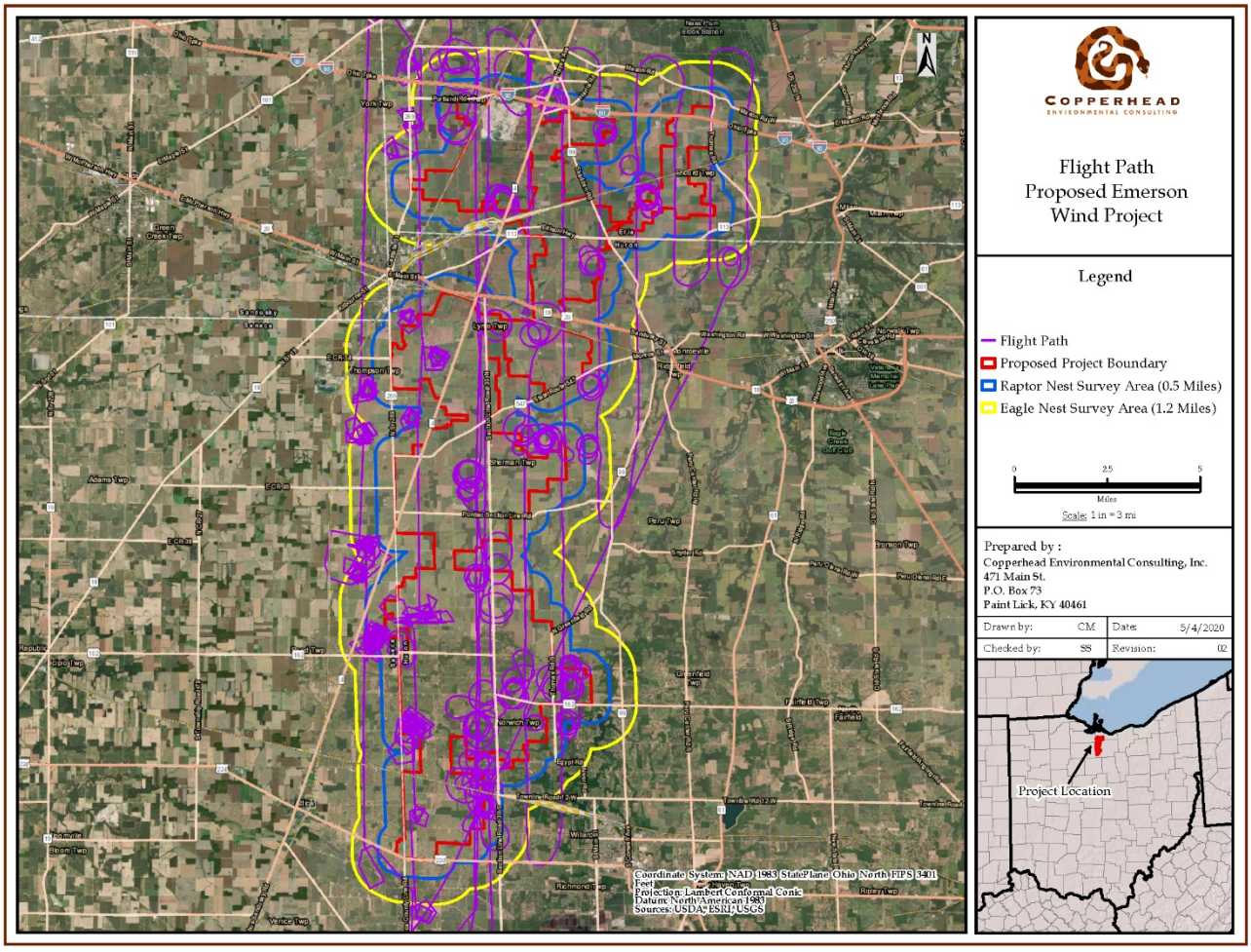
Appendix A: Flight Path of 2020 Emerson Creek Aerial Raptor Nest Survey



Appendix B: 2020 Eagle Nest Photographs

COPPERHEAD ENVIRONMENTAL CONSULTING	2020 Raptor Nest Survey Report for the Proposed Emerson Creek Wind Project Erie County, OH Photographic Record	
Project No.: **909**	**Counties, State: Huron, Erie, and Seneca Counties, OH**	**Client:** **Emerson Creek, LLC.**

Photo No. 1: BAEA1	
Dates: 12 March 2020	
Location: 41.32115, -82.83835	
Description: Aerial survey image of BAEA1 showing fresh nesting material and adult perched nearby.	

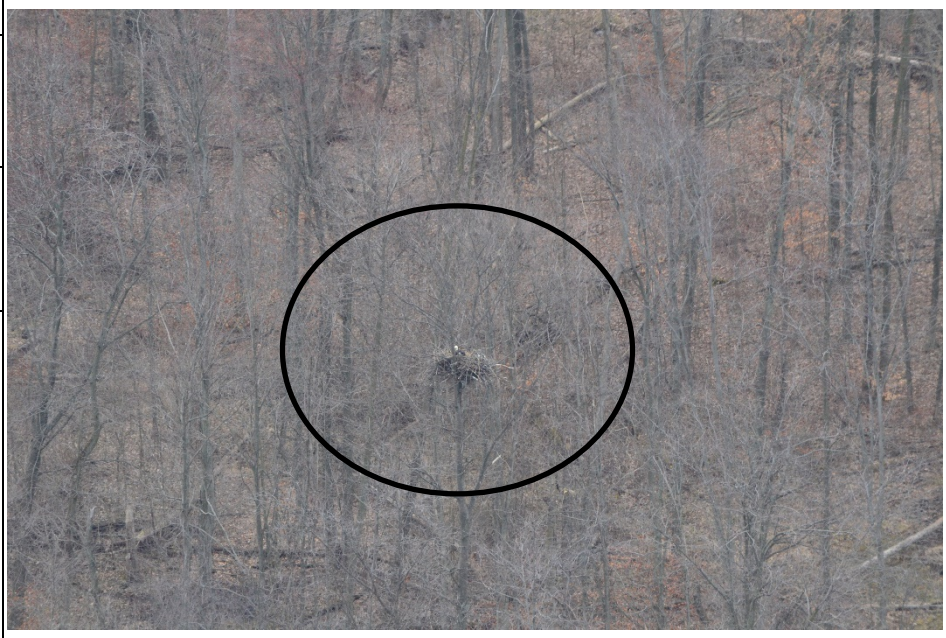
Photo No. 2: BAEA2	
Dates: 13 March 2020	
Location: 41.07411, -82.79435	
Description: Aerial survey image of BAEA2 showing an adult in an incubating position.	

Photo No. 3: BAEA3	
Dates: 13 March 2020	
Location: 41.35676, -82.80764	
Description: Aerial survey image of BAEA3 showing an adult in an incubating position.	

Photo No. 4: BAEA4	
Dates: 1 April 2020	
Location: 41.21178, -82.77184	
Description: Aerial survey image of BAEA4 showing an adult in an incubating position.	

Attachment CF-4

April 3, 2020, WEST Inc.,
Large Bird and Eagle Use Surveys for the Proposed
Emerson Creek Wind Project

DICKINSON WRIGHT PLLC

Large Bird and Eagle Use Surveys for the Proposed Emerson Creek Wind Project Seneca, Huron, and Erie Counties, Ohio

February 8, 2018 – April 23, 2019

Prepared by:

Karl DuBridge, Travis Brown, and Chad LeBeau

Western EcoSystems Technology, Inc.
408 West Sixth Street
Bloomington, Indiana 47404

April 3, 2020

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. completed year-round large bird and eagle use surveys for the proposed Emerson Creek Wind Project (Project) in Seneca, Huron, and Erie counties, Ohio. The objective of the surveys were to: 1) provide estimates of large bird use throughout the year; 2) evaluate species composition and seasonal and spatial use of the Project by large birds and eagles; and 3) assess raptor migration during the spring and fall seasons. The survey methods were consistent with recommendations outlined in the U.S. Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines*, the USFWS *Eagle Conservation Plan Guidance* (ECPG), the USFWS *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests*, and the Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio*.

Surveys were completed monthly from February 8, 2018 to April 23, 2019, at 54 points established throughout the Project area. Surveys were 60-minutes (min) in duration and consisted of large bird and eagle use surveys within an 800-meter (m; 2,625-foot) radius of the surveyor. All large birds (including eagles) were recorded during the first 20 min of each 60-min count, while only eagles and sensitive species were recorded for the remaining 40 min. The 20-min portion of the survey allowed for standardization and comparison of data with other wind energy facilities throughout the region and analysis of use of the Project by migrating raptors, while the 60-min eagle counts allowed for more robust evaluation of bald eagle use of the site in accordance with the ECPG. Observations of sensitive species (defined as species afforded protection under the Endangered Species Act, Bald and Golden Eagle Protection Act, listed as threatened or endangered by the state of Ohio, or birds of particular concern defined by USFWS Information for Planning and Consultation [IPaC]) were recorded any time they were observed.

Twenty-five large bird species (2,958 individual observations) were recorded during the 20-min surveys, of which five species were diurnal raptors. Seasonal diurnal raptor use was similar among seasons, ranging from a low of 0.22 bird/800-m plot/20-min survey (spring and summer) to a high of 0.27 (winter). Diurnal raptor use was low overall compared to other projects with publicly available data where diurnal raptor use ranged from 0.06 to 2.34 raptors/800-m plot/20-min survey. Raptor migration during the spring and fall does not appear to be concentrated within the Project as diurnal raptor use was similar between fall and winter and lowest during the spring and summer.

Forty-two bald eagle observations, resulting in 52 bald eagle risk minutes, as defined by the ECPG, were recorded during 648 hours of survey across approximately 15 months. No golden eagle observations were recorded during surveys or incidentally. Bald eagle observations were recorded year round and were concentrated near an active nest within the Project. Twenty-two of the bald eagle observations were recorded at survey points with viewsheds primarily within 1,000 meters of proposed turbine locations, and these observations resulted in 27 of the eagle risk minutes recorded during the study.

No federally threatened or endangered species were observed during the surveys. One state endangered species (northern harrier) was recorded during the surveys (n=28). The majority of the northern harrier observations (75%) were recorded below the rotor-swept height. There was minimal use of the Project by northern harrier during the summer breeding period, which is likely the result of limited breeding habitat within the Project due to the amount of cultivated croplands present. In addition, one bird of particular concern: red-headed woodpecker (n=1) was observed incidentally. Overall, the Project presents species composition and seasonal and spatial use patterns for birds typical for the region and is not likely to cause significant impacts to large bird populations.

STUDY PARTICIPANTS

Travis Brown	Project Manager
Chad LeBeau	Senior Reviewer
Karl DuBridge	Field Supervisor and Report Compiler
Carmen Boyd	Project Tracking and Data Manager
Julie Bushey	Statistician
Carissa Goodman	Data Analyst
Wes Conway	GIS Technician
Julia Preston-Fulton	Technical Editor
Dan Kramer	Field Technician

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

Western EcoSystems Technology, Inc. completed a second year of large bird and eagle use surveys for the proposed Emerson Creek Wind Project (Project) located in Seneca, Huron, and Erie counties, Ohio (Figure 1). The objectives of the surveys were to: 1) provide estimates of large bird use throughout the year; 2) evaluate species composition and seasonal and spatial use of the Project by large birds and eagles; and 3) assess raptor migration during the spring and fall seasons. The survey methods were consistent with recommendations defined in the U.S. Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012), the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), the USFWS *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests* (USFWS 2016), and Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* (ODNR 2009).

PROJECT AREA

The proposed 42,697 acre (ac; 17,279 hectare [ha]) Project is located directly east of Bellevue, Ohio and extends from US-224 in western Huron County north to the Ohio Turnpike in Erie County, Ohio. According to the National Land Cover Dataset (NLCD), the current Project area is dominated by cropland (83.0%; Table 1, Figure 1; Yang et al. 2018, Multi-Resolution Land Characteristics [MRLC] 2019) with corn (*Zea mays*) and soybeans (*Glycine max*) being the main crops grown. Deciduous forests (8.4%), developed areas (5.3%), hay/pasture (1.6%), and barren land (1.3%) are the next most common land cover types within the Project area (Table 1). All other land cover types compose less than 1.0% of the Project, combined (Table 1, Figure 1).

Table 1. Land cover types and composition within the proposed Emerson Creek Wind Project in Seneca, Huron, and Erie counties, Ohio.

Habitat	Acres	% Composition
Cultivated Crops	35,459	83.0
Deciduous Forest	3,601	8.4
Developed	2,257	5.3
Hay/Pasture	697	1.6
Barren Land	547	1.3
Open Water	84	0.2
Herbaceous	38	0.1
Woody Wetlands	3	<0.1
Shrub/Scrub	3	<0.1
Evergreen Forest	3	<0.1
Mixed Forest	3	<0.1
Emergent Herbaceous Wetlands	1	<0.1
Total	**42,697**	**100**

Data from Yang et al. 2018, Multi-Resolution Land Characteristics 2019.
Sum of values may not come to Total due to rounding.

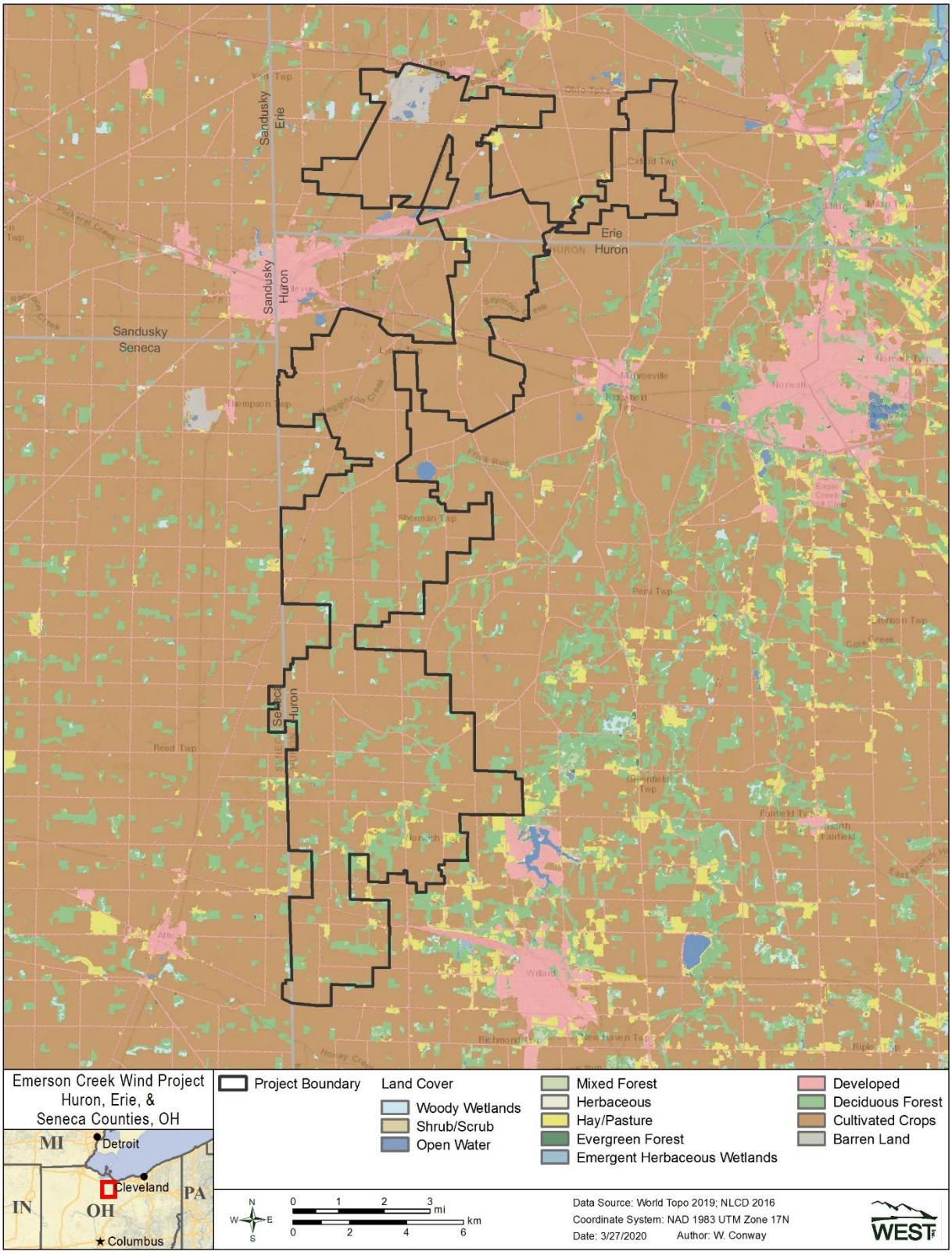

Figure 1. NLCD land cover within the proposed Emerson Creek Wind Project (Yang et al. 2018, Multi-Resolution Land Characteristics 2019) in Seneca, Huron, and Erie counties, Ohio.

METHODS

Large bird and eagle use surveys were completed monthly at 54 points throughout the Project from February 8, 2018 to April 23, 2019, using methods similar to Reynolds et al. (1980). Thirty-three points were sampled from February 2018 to January 2019 (sample points differentiated with the prefix "EN"), while the remaining 21 points were sampled from May 2018 to April 2019 (sample points differentiated with the prefix "EC"). Each survey point was chosen randomly, and then points were microsited to maximize viewshed within habitat that was representative of proposed turbine locations. Per USFWS (2016) guidance, WEST developed a minimum convex polygon (MCP) encompassing the hazardous area[1] around proposed turbine locations (Figure 1). The 800-meter (m; 2,625 feet [ft]) radius plots used in this evaluation are representative of potential development areas and encompass approximately 38% of the MCP as currently proposed (Figure 2).

Each survey point was surveyed for a total of 60 minutes (min). The large bird use surveys were completed during the first 20 min, during which all large birds within 800 m (2,625 ft) were recorded. The eagle use survey was completed for the entire 60-min period, during which all eagles within 800 m of the observer were recorded.

For purposes of this study, large birds were defined as waterbirds, waterfowl, shorebirds, diurnal raptors (kites, accipiters, buteos, eagles, falcons [*Falco* spp.], northern harrier [*Circus hudsonius*], and osprey [*Pandion haliaetus*]), vultures, upland game birds, doves and pigeons, large corvids, and goatsuckers. The 20-min portion of the survey allowed for standardization and comparison of data with other wind energy facilities throughout the region, while the 60-min eagle counts allowed for more robust evaluation of bald (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) use of the site in accordance with the USFWS ECPG (USFWS 2013). In addition, these surveys were used to assess raptor migration during the spring (March 15 to May 1) and fall (September 1 to October 31) in accordance with ODNR Protocols.

Observations of sensitive species (defined as species afforded protection under the Endangered Species Act [1973], Bald and Golden Eagle Protection Act [1940], listed as threatened or endangered by the state of Ohio [ODNR 2016], or Birds of Particular Concern [BCC] as listed on a county level USFWS Information for Planning and Consultation [IPaC] search [USFWS 2019]) were recorded throughout the 60-min surveys. Observations of sensitive species beyond the 800-m radius plot and in-transit were recorded as incidental observations to document occurrence on site, but were excluded from statistical analyses of mean use.

[1] Defined here as a 70-m (230-ft) buffer of turbine locations.

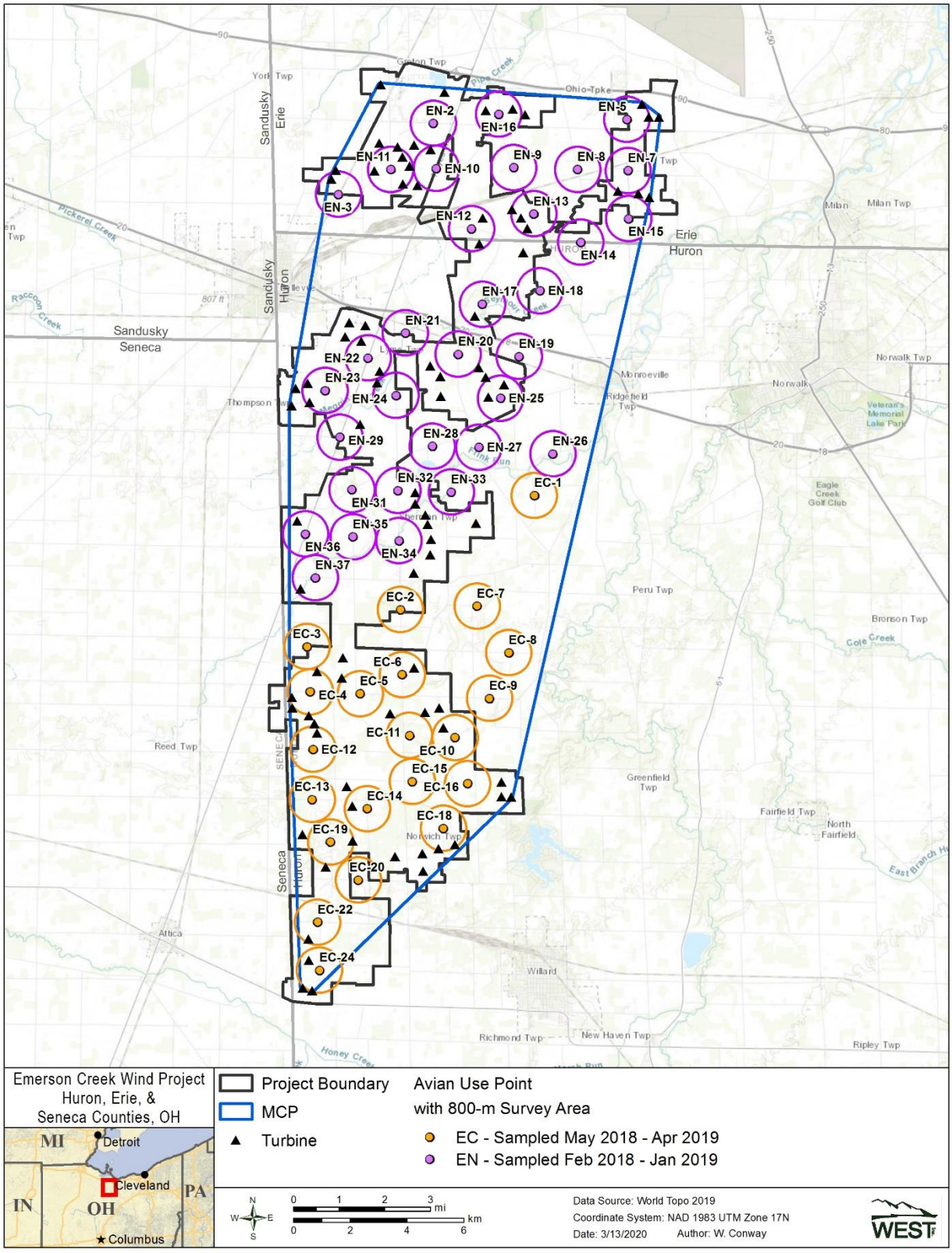

Figure 2. Observation point locations used during large bird/eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

At each survey point, the date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, flight height or altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 1-m (3-ft) interval. Eagle risk minutes (i.e., estimated minutes of eagles flying within the estimated risk cylinder, defined as the area within 800 m of the point and below 200 m [656 ft]) were documented in accordance with the ECPG. Locations of sensitive species were recorded on field maps by unique observation number. In addition, flight paths of eagles and sensitive species were recorded on aerial maps and labeled by the unique observation number corresponding to the mapped individual.

Statistical Analysis

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the surveys, including in the field, during data entry and analysis, and report writing. Observers were responsible for inspecting data forms for completeness, accuracy, and legibility following each field survey. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Data Compilation and Storage

A Microsoft® SQL database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent QA/QC and data analysis. All data forms and electronic data files were retained for reference.

Fixed-Point Count Avian Use Surveys

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once within the Project. Seasons were defined as spring (March 1 to May 31), summer (June 1 to August 30), fall (September 1 to November 30), and winter (December 1 to February 28). For comparison of raptor migration use to satisfy ODNR recommendations, spring was defined as March 15 to May 1 and fall was defined as September 1 to October 31, in accordance with ODNR protocol (ODNR 2009).

Bird Species Richness

Species richness is a count of species plus unidentified species groups, if a species from that group is not recorded during avian use surveys. A species list (with the number of individuals and the number of groups) was generated by season, including all observations of birds detected within 800 m. Species observed include those observed visually or aurally. In some cases, the count of observations may have represented repeated observations of the same individual.

The index to species richness is the average number of species observed within the observer viewshed per survey plot per visit within season (species observed/plot/visit/season). This metric is calculated by summing the total number of species observed within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within a season. The annual index to species richness was calculated as a weighted average of seasonal values by the number of days in each season. Species richness and index to species richness were compared among seasons for avian use surveys. These metrics were analyzed separately for small and large birds.

Mean Use, Seasonal Variations, and Frequency of Occurrence

Large birds detected within the 800-m radius plot were used to calculate mean use and frequency of occurrence of large birds. The metric used to measure mean large bird use was number of birds per plot per 20-min survey. Seasonal large bird mean use was calculated by first averaging the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Mean use of raptors per 20-min survey was used to assess seasonal raptor use and was additionally compared to use by other wind energy projects with publicly available data in the Midwest.

Frequency of occurrence provides a relative measure of species exposure to the proposed facility and was calculated as the percent of surveys in which a particular bird type or species was observed.

Bird Flight Height and Behavior

The flight height recorded during the initial observation was used to calculate the percentage of birds flying within the rotor swept heights (RSH; estimated to be between 25 and 200 m [82 and 656 ft] above ground level) and mean flight height. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight heights recorded. Auditory only observations were excluded from flight height calculations.

Spatial Use and Mapping

Spatial use in the Project was evaluated by comparing mean use by point location and qualitative review of flight paths. Flight paths of all eagles were digitized and mapped in order to examine spatial patterns of use within the Project.

RESULTS

From February 8, 2018 to April 23, 2019, a total of 648 large bird and eagle use surveys were completed, resulting in 144 hours of 20-min large bird use surveys and 648 hours of ECPG-level eagle use surveys (Table 2). Details on the number of observations and groups recorded by species within the survey plots are presented in Appendix A, and details on mean use, percent of use, and frequency of occurrence are presented in Appendices B and C.

Table 2. Summary of index to species richness (species/plot[a]/20-minute survey), and sample size by season and overall during the fixed-point bird use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

				Index to Species Richness
Season	**# Visits**	**# Surveys Conducted**	**Species Richness**	**Large Birds**
Winter	4	162	15	0.26
Spring	5	162	19	0.37
Summer	3	162	17	0.29
Fall	3	162	13	0.31
Overall	**15**	**648**	**23**	**0.31**

Species Richness: The total number of unique species observed within viewsheds during avian use surveys.

Index to Species Richness: Average number of species observed within the observer viewshed/plot/visit within seasons.

[a] 800-meter (2,625-foot) radius plot.

Large Bird Use

Twenty-five species (2,958 individual observations) were recorded during large bird surveys (Appendix A1). Ring-billed gull (*Larus delawarensis*) was the most frequently recorded large bird observed (29.2%), followed by Canada goose (*Branta Canadensis*; 15.2%), turkey vulture (*Cathartes aura*; 12.8%), tundra swan (*Cygnus columbianus*; 9.6%), and American crow (*Corvus brachyrhynchos*; 5.9%). Dove/pigeon species represented 10.8% of observations combined (6.8% mourning dove [*Zenaida macroura*] and 4.0% rock pigeon [*Columba livia*]). All other species accounted for approximately 4.0% or fewer of the observations, individually (Appendix A1).

Species richness varied slightly by season, with the highest number of species observed in spring (n=19) and the lowest number observed in fall (n=13; Table 2). Overall, large bird mean use was highest during the winter (8.09 birds/800-m plot/20-min survey), followed by summer (5.06), spring (4.03), and fall (2.19; Table 3, Appendix B). Eagle and sensitive species use is discussed in more detail below and summarized with respect to the full 60-min surveys.

Table 3. Mean use (number of birds/plot[a]/20-minute survey), percent of total use (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

	Mean Use				% of Use				% Frequency			
Type / Species	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**
Waterbirds	**0**	**0.04**	**0.04**	**0.01**	**0**	**1.0**	**0.9**	**0.3**	**0**	**1.6**	**4.3**	**0.6**
Waterfowl	**1.18**	**0.92**	**1.89**	**0.77**	**14.5**	**22.8**	**37.3**	**35.2**	**8.1**	**12.7**	**2.5**	**3.7**
Shorebirds	**0.01**	**0.22**	**0.19**	**0.08**	**0.1**	**5.3**	**3.8**	**3.7**	**0.8**	**10.1**	**6.8**	**3.7**
Gulls/Terns	**6.09**	**1.02**	**0.52**	**0**	**75.3**	**25.2**	**10.2**	**0**	**2.4**	**4.7**	**1.9**	**0**
Diurnal Raptors	**0.27**	**0.22**	**0.22**	**0.26**	**3.3**	**5.5**	**4.4**	**11.8**	**20.6**	**17.2**	**17.3**	**20.4**
Accipiters	*0.02*	*0.01*	*0.03*	*0.03*	*0.2*	*0.2*	*0.6*	*1.4*	*2.0*	*1.0*	*3.1*	*3.1*
Buteos	*0.11*	*0.18*	*0.14*	*0.12*	*1.4*	*4.4*	*2.7*	*5.4*	*9.3*	*13.7*	*10.5*	*9.3*
Northern Harrier	*0.02*	*0.01*	*0.01*	*0.03*	*0.3*	*0.2*	*0.2*	*1.4*	*1.9*	*0.6*	*1.2*	*2.5*
Eagles	*0.04*	*0.02*	*0.01*	*0.04*	*0.5*	*0.4*	*0.2*	*1.7*	*2.6*	*1.6*	*1.2*	*3.1*
Falcons	*0.07*	*0.01*	*0.03*	*0.04*	*0.9*	*0.3*	*0.6*	*2.0*	*7.4*	*1.3*	*2.5*	*4.3*
Vultures	**0**	**1.09**	**0.72**	**0.51**	**0**	**27.1**	**14.3**	**23.4**	**0**	**43.4**	**32.1**	**21.6**
Doves/Pigeons	**0.33**	**0.33**	**0.89**	**0.46**	**4.0**	**8.2**	**17.6**	**20.8**	**6.2**	**8.5**	**25.3**	**14.2**
Large Corvids	**0.23**	**0.19**	**0.59**	**0.10**	**2.8**	**4.7**	**11.6**	**4.8**	**10.6**	**12.7**	**8.0**	**7.4**
Large Birds Overall	**8.09**	**4.03**	**5.06**	**2.19**	**100**	**100**	**100**	**100**				

[a] 800-meter (2,625-foot) radius plot.

Diurnal Raptors

Five diurnal raptor species (155 observations) were documented over the course of the 20-min large bird surveys (Appendix A1). Diurnal raptor use was similar among seasons but relatively higher during the winter (0.27 bird/800-m plot/20-min survey), followed by fall (0.26), spring (0.22), and summer (0.22; Table 3). Diurnal raptor use was primarily attributable to use of the area by red-tailed hawk (*Buteo jamaicensis*), which had the highest overall use of any diurnal raptor (Appendix B). Diurnal raptors accounted for 11.8% of large bird use in the fall, 3.3% in winter, 5.5% in the spring, and 4.4% in summer (Table 3, Appendix B). Diurnal raptor use at each observation point ranged from zero birds/800-m plot/20-min survey to 0.75, with the higher use being recorded at points EC-20, EC-5 and EN-8 (Figure 2; Appendix C).

Large Bird and Diurnal Raptor Flight Height and Behavior

During the large bird surveys, 1,160 large bird observations in 494 groups were recorded flying (Table 4). Overall, 69.9% of large bird observations were within the RSH, 27.2% below the RSH, and 2.9% above the RSH (Table 4). Waterfowl had the highest percentage of observations recorded within the RSH (94.8%), followed by vultures (87.4%). Diurnal raptors were estimated to be within the RSH 50.5% or more of the time during 800-m plot/20-min surveys. Eagles were observed within the RSH 63.6% of observations during the 20-min large bird surveys (Table 4).

Table 4. Group and individual observation flight height characteristics by bird type[a] and raptor subtype during fixed-point bird use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

Bird Type	# Groups Flying	# Obs Flying	Estimated Mean Flight Height (m)	% Obs Flying	% within Flight height Categories		
					0–<25 m	25–200 m[b]	>200 m
Waterbirds	**11**	**14**	**59.55**	**100**	**21.4**	**78.6**	**0**
Waterfowl	**41**	**233**	**56.88**	**29.6**	**5.2**	**94.8**	**0**
Shorebirds	**29**	**43**	**14.72**	**56.6**	**79.1**	**20.9**	**0**
Gulls/Terns	**11**	**28**	**45.00**	**2.7**	**39.3**	**60.7**	**0**
Diurnal Raptors	**98**	**105**	**89.09**	**67.7**	**40.0**	**50.5**	**9.5**
Accipiters	*12*	*12*	*35.42*	*80.0*	*58.3*	*41.7*	*0*
Buteos	*53*	*59*	*118.11*	*69.4*	*25.4*	*62.7*	*11.9*
Northern Harrier	*10*	*10*	*11.50*	*76.9*	*90.0*	*10.0*	*0*
Eagles	*11*	*11*	*153.64*	*61.1*	*9.1*	*63.6*	*27.3*
Falcons	*12*	*13*	*20.08*	*54.2*	*76.9*	*23.1*	*0*
Vultures	**193**	**373**	**87.56**	**98.2**	**6.2**	**87.4**	**6.4**
Doves/Pigeons	**57**	**208**	**19.67**	**65.4**	**53.4**	**46.6**	**0**
Large Corvids	**54**	**156**	**26.24**	**89.1**	**50.6**	**49.4**	**0**
Large Birds Overall	**494**	**1,160**	**64.94**	**39.2**	**27.2**	**69.9**	**2.9**

[a] 800-meter (m; 2,625-foot [ft]) radius plot.

[b] The likely rotor-swept height for potential collision with a turbine blade, or 25 to 200 m (82 ft to 656 ft) above ground level.

Raptor Migration

The spring and fall seasons defined in this analysis are comparable to those outlined in the ODNR Protocol for raptor migration surveys (e.g., spring [March 15 to May 1] and fall [September 1 to October 31]). A total of 37 raptor observations were recorded in spring, and 42 raptor observations recorded in the fall (Appendix A1). Raptor migration during the spring and fall does not appear to be concentrated within the Project as diurnal raptor use was similar between winter and spring and equal during the summer and fall (Table 3). Five raptor species (red-tailed hawk, Cooper's hawk [*Accipiter cooperii*], northern harrier, bald eagle, and American kestrel [*Falco sparverius*]), were observed during all the seasons at the Project (Appendix A1). Overall, concentrations of raptors were not observed during surveys with respect to spatial or temporal patterns.

Sensitive Species

No federally threatened or endangered species were recorded during the surveys or incidentally. One sensitive species was recorded during surveys: the state-endangered northern harrier. Twenty-eight northern harrier observations were recorded during 60-min surveys, with the majority of observations recorded in winter (12) and fall (9). Relatively few observations were recorded during spring (4) and summer (3; Appendix A2). In addition, one observation of a red-headed woodpecker [*Melanerpes erythrocephalus*] which is a bird of particular concern, (USFWS 2019*)* was recorded incidentally in the summer.

Eagles

A total of 70 individual bald eagle observations were recorded in 68 groups, and no golden eagles were observed during 648 hours of ECPG-level surveys (Appendix A2). Fifty-two eagle risk minutes from 33 observations were recorded during surveys within the MCP. (Tables 5a and 5b). The highest number of observations was recorded in fall (10 observations), followed by winter/spring (9 observations in each) and summer (5; Table 5a). Fifteen risk minutes were recorded in spring and fall (0.09 risk min per hour), followed by 13 in winter (0.08), and nine in summer (0.06; Table 5a). Bald eagles were observed at 23 of the 54 survey points and were scattered throughout the Project at relatively low levels. The highest concentration of eagle risk observations (3) and minutes (9) occurred at point EN-27, which is within 1.1 miles of an eagle nest (Table 5b, Figure 3). Eagle flight paths were distributed relatively evenly throughout the Project, with no clear areas of concentration (Figure 4). When considering only points within 1,000 m of proposed turbine locations, 22 bald eagles were observed flying within the estimated RSH, resulting in 27 eagle risk minutes.

Table 5a. The bald eagle minutes (min) and observations recorded during eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

Season	Bald Eagle Observations Flying Within the Estimated Risk Cylinder[a]	Bald Eagle Minutes Flying Within the Estimated Risk Cylinder[a]	Survey Hours	Bald Eagle Risk Min/Hour
Winter	9	13	162	0.08
Spring	9	15	162	0.09
Summer	5	9	162	0.06
Fall	10	15	162	0.09
Total	**33**	**52**	**648**	**0.08**

[a] Estimated Risk Cylinder defined as within the 800-meter radius plot and below 200-meters AGL

Table 5b. Number of bald eagle observations and estimated risk minutes within 800 meters (m) of the observer and below 200 m flight height during eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

Survey Location	Bald Eagle Observations Flying Within the Estimated Risk Cylinder[a]	Bald Eagle Risk Minutes Flying Within the Estimated Risk Cylinder[a]	Survey Effort (hours)	Bald Eagle Risk Min/Hour
EC-1	0	0	12	0
EC-2	0	0	12	0
EC-3	2	2	12	0.17
EC-4	0	0	12	0
EC-5	0	0	12	0
EC-6	1	1	12	0.08
EC-7	2	3	12	0.25
EC-8	0	0	12	0
EC-9	1	3	12	0.25
EC-10	1	3	12	0.25
EC-11	2	2	12	0.17
EC-12	0	0	12	0
EC-13	2	4	12	0.33
EC-14	1	1	12	0.08
EC-15	0	0	12	0
EC-16	0	0	12	0
EC-18	0	0	12	0
EC-19	0	0	12	0
EC-20	2	4	12	0.33
EC-22	0	0	12	0
EC-24	0	0	12	0
EN-2	0	0	12	0
EN-3	0	0	12	0
EN-5	1	1	12	0.08
EN-7	0	0	12	0
EN-8	0	0	12	0
EN-9	0	0	12	0
EN-10	0	0	12	0
EN-11	0	0	12	0
EN-12	1	2	12	0.17
EN-13	0	0	12	0
EN-14	0	0	12	0
EN-15	1	1	12	0.08

Table 5b. Number of bald eagle observations and estimated risk minutes within 800 meters (m) of the observer and below 200 m flight height during eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

Survey Location	Bald Eagle Observations Flying Within the Estimated Risk Cylinder[a]	Bald Eagle Risk Minutes Flying Within the Estimated Risk Cylinder[a]	Survey Effort (hours)	Bald Eagle Risk Min/Hour
EN-16	2	2	12	0.17
EN-17	2	2	12	0.17
EN-18	0	0	12	0
EN-19	0	0	12	0
EN-20	0	0	12	0
EN-21	0	0	12	0
EN-22	0	0	12	0
EN-23	2	2	12	0.17
EN-24	0	0	12	0
EN-25	0	0	12	0
EN-26	1	3	12	0.25
EN-27	3	9	12	0.75
EN-28	1	1	12	0.08
EN-29	2	2	12	0.17
EN-31	0	0	12	0
EN-32	1	1	12	0.08
EN-33	0	0	12	0
EN-34	1	2	12	0.17
EN-35	1	1	12	0.08
EN-36	0	0	12	0
EN-37	0	0	12	0
Total	**33**	**52**	**648**	0.08

[a] Estimated Risk Cylinder defined as within the 800-meter radius plot and below 200-meters AGL

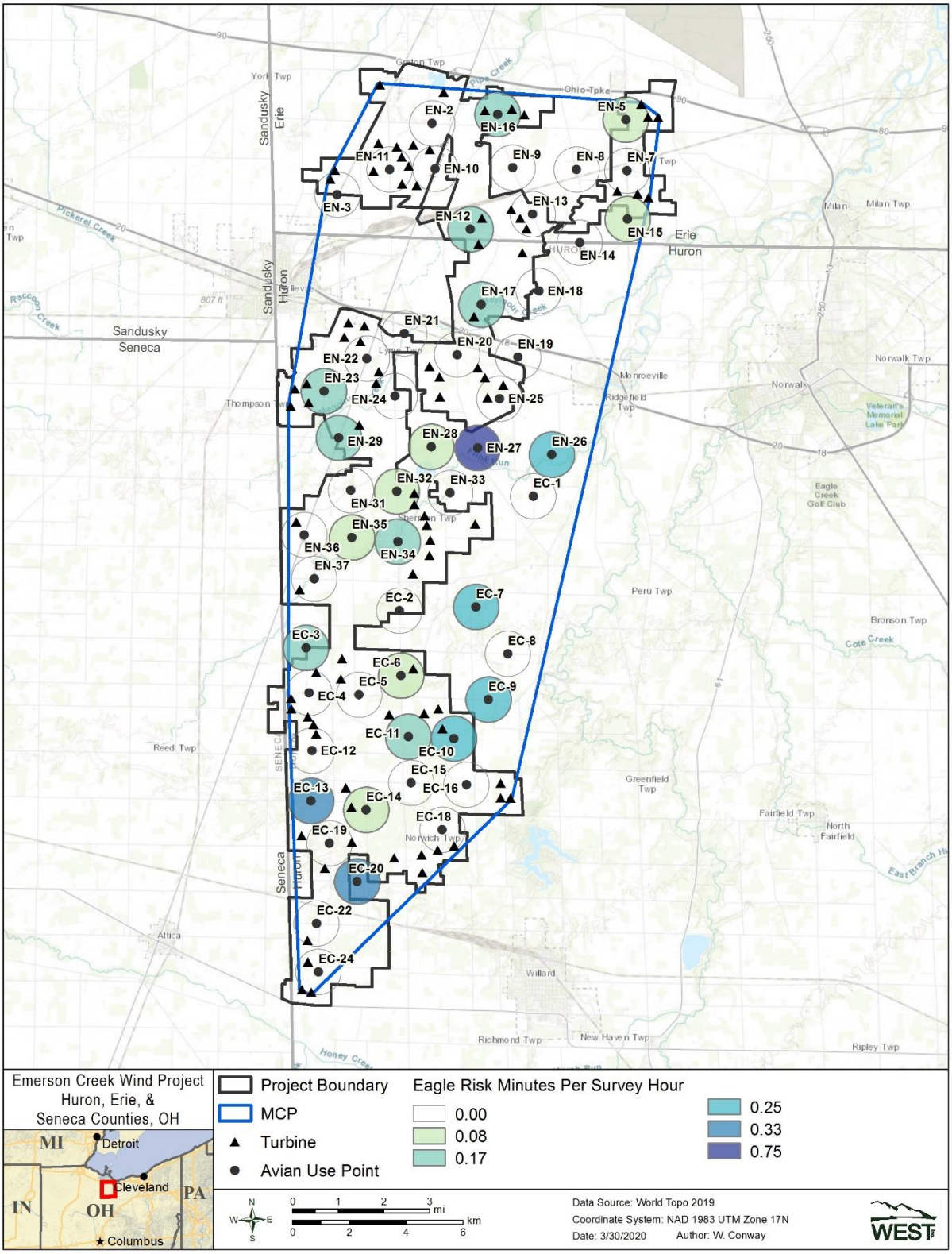

Figure 3. Bald eagle bald eagle risk minutes per survey hour recorded during large bird and eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

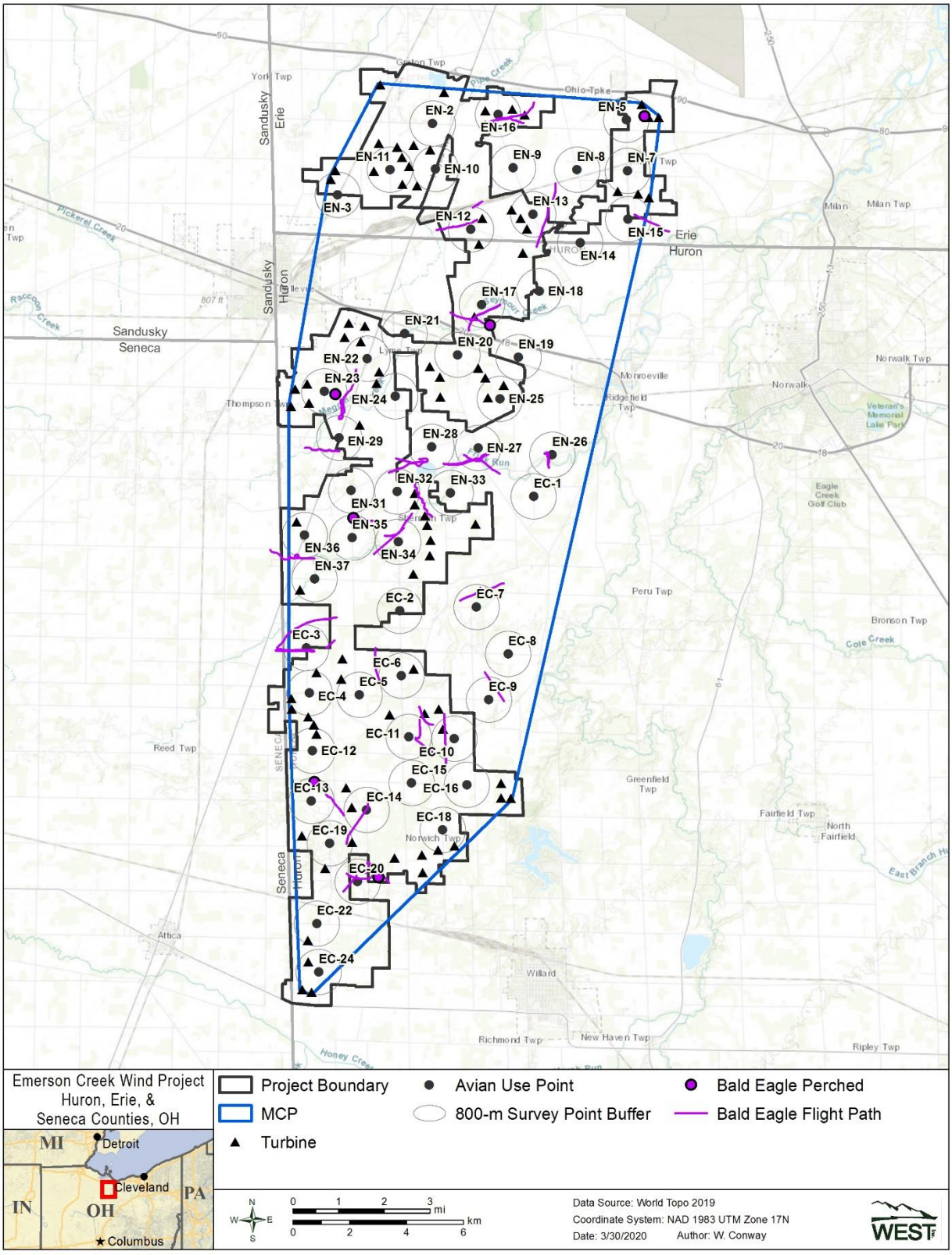

Figure 4. Bald eagle estimated flight paths recorded during large bird and eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019.

DISCUSSION

Large Birds

Large bird species most often observed in the 20-min surveys included Canada goose, turkey vulture, and ring-billed gull (Appendix A1). These large bird species are common, geographically abundant species whose populations are likely to be unaffected by any potential collision related to the Project. Results were similar to the first year of surveys in the southern half of the Project, where turkey vulture was the most commonly observed species (Iskali and LeBeau 2018a) and the northern half of the Project, where Canada goose was the most commonly observed species (Iskali and LeBeau 2018b). Any potential mortality impacts to the large bird species observed during all seasons are unlikely to be significant and would not result in population level impacts.

Diurnal Raptors

Five diurnal raptor species were observed in the Project during surveys: red-tailed hawk, Cooper's hawk, northern harrier, bald eagle (discussed in more detail below) and American kestrel (Appendix A1). With an increasing population trend in North America for red-tailed hawk and Cooper's hawk and a stable population of American kestrel (BirdLife 2016a, 2016b, 2016c), it is unlikely that the Project would create any instability in the local or regional populations of these species based on the data collected during surveys.

WEST compared the mean raptor use of the Project with 48 other publicly available wind energy facilities that implemented similar protocols and had data recorded for three or four seasons. The annual mean raptor use at these 48 wind energy facilities ranged from 0.06 to 2.34 raptors/800-m plot/20-min survey (Appendix D). Raptor use within the Project (0.24) is relatively low by comparison. In addition, raptor use was relatively similar across all seasons (the lowest use being in spring) and therefore the Project did not experience high raptor use during migration. Within the Midwest, diurnal raptor fatality rates have ranged from zero to 0.47 raptors/megawatt (MW)/year, with a mean of 0.07 raptors/MW/year (Appendix E). Potential diurnal raptor fatalities within the Project are expected to be relatively low, similar to other Midwestern wind projects with typical raptor use.

Sensitive Species

No federally endangered or threatened avian species were observed during surveys or incidentally, suggesting low risk to these species at the Project. One state-endangered bird species (northern harrier) and one bird of particular concern (red-headed woodpecker) were observed in very low numbers.

Northern harriers are commonly observed during avian use surveys at wind energy facilities, yet no fatalities of this species have been reported in publicly available reports from the Midwest (See Appendix F for a list of facilities and references). The lack of fatalities is likely due to the northern harrier's hunting and flight habits. Northern harriers generally hunt and fly at low elevations and therefore have a low risk of collision with modern wind turbines (Whitfield and Madders 2005).

The majority of northern harriers were observed flying below the RSH during the large bird use surveys. Northern harriers were more commonly observed in the fall and winter, and were only rarely observed during the breeding season. Northern harrier breeding habitat is rare within the Project, with only 1.7% of the Project classified as hayfields/pasture or herbaceous, and there are no grasslands according to NLCD data (Yang et al. 2018, MRLC 2019). In addition, northern harriers typically breed in areas with large grasslands or marshes, at least 250 ac (101 ha) in size (pers. comm. Erin Hazelton, ODNR Division of Wildlife, November 20, 2017). However, the largest areas of hayfields/pasture, herbaceous cover, and emergent wetland within the Project are < 250 ac [101 ha]) in size.

The red-headed woodpecker was observed incidentally during the summer. There is only one documented red-headed woodpecker fatality from an operating wind farm in the Midwest (see Appendix F for a list of facilities and references). The single individual observed, coupled with the single documented fatality, indicate low risk to this species as a result of Project development.

Eagles

The highest number of bald eagle risk minutes was observed during spring and fall, with slightly lower risk activity observed in winter and summer, respectively. The highest number of bald eagle observations and bald eagle risk minutes (approximately 9% of observations and 17% of all eagle risk minutes) was observed in the center of the Project (point EN-27), approximately 1.1 miles northeast from an active bald eagle nest. The results of this year of eagle surveys are similar to the pattern of use observed during year one surveys, during which the highest concentrations of bald eagle activity were observed near active nests. For example, 72% of all bald eagle risk minutes observed in the northern portion of the Project in year 1 were observed within 2.0 mi (3.2 km) of an active bald eagle nest (Iskali and LeBeau 2018a). Similarly, 29% of all eagle risk minutes observed in the southern portion of the Project in year 1 were observed within 0.7 mi (1.1 km) of an active eagle nest (Iskali and LeBeau 2018b).

Golden eagles are rare in the Midwest and eastern US, as they are most commonly found west of Texas and nest in mountain regions of western North America (Kochert et al. 2002). No golden eagles were observed within the Project during the 648 hours of avian use surveys or incidentally. Therefore, the risk of mortality to golden eagles is considered low and unlikely to occur.

CONCLUSIONS

Analysis of the data collected during the surveys generally indicates development of the Project is not likely to cause significant impacts to large bird populations, including diurnal raptors or sensitive species. The majority of species observed are widespread and abundant, suggesting low risk of adverse impacts to large bird populations. The one bird of particular concern observed (red-headed woodpecker) occurred in very low numbers, and has rarely been documented in post-construction fatality studies in the Midwest. The majority (90.0%) of the northern harrier observations were recorded below the RSH and the species has not been documented in publicly

available post-construction fatality studies in the Midwest. Therefore, it is expected that risk will be low to these sensitive species.

No golden eagles were observed in the Project; therefore, risk of mortality to golden eagles is considered low and unlikely to occur. Bald eagle populations in the region are expanding, and the most intense spatial concentrations of bald eagle activity continue to be observed around nests, as was observed in the initial year of study (Iskali and LeBeau 2018a, 2018b).

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Appendix A. Species Observed at the Emerson Creek Wind Project during 20-min Large Bird Point Surveys from February 8, 2018 to April 23, 2019

Appendix A1. Species Observed at the Emerson Creek Wind Project during 20-min Large Bird Point Surveys from February 8, 2018 to April 23, 2019

		Winter		Spring		Summer		Fall		Total	
Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**0**	**0**	**3**	**6**	**7**	**7**	**1**	**1**	**11**	**14**
great egret	*Ardea alba*	0	0	0	0	1	1	0	0	1	1
great blue heron	*Ardea herodias*	0	0	1	1	5	5	1	1	7	7
green heron	*Butorides virescens*	0	0	0	0	1	1	0	0	1	1
double-crested cormorant	*Phalacrocorax auritus*	0	0	2	5	0	0	0	0	2	5
Waterfowl		**16**	**209**	**22**	**147**	**4**	**306**	**7**	**125**	**49**	**787**
wood duck	*Aix sponsa*	1	3	0	0	0	0	0	0	1	3
mallard	*Anas platyrhynchos*	1	21	5	9	2	4	0	0	8	34
Canada goose	*Branta canadensis*	11	100	12	28	2	302	4	20	29	450
tundra swan	*Cygnus columbianus*	3	85	3	95	0	0	3	105	9	285
gadwall	*Mareca strepera*	0	0	1	14	0	0	0	0	1	14
common merganser	*Mergus merganser*	0	0	1	1	0	0	0	0	1	1
Shorebirds		**1**	**1**	**21**	**31**	**11**	**31**	**6**	**13**	**39**	**76**
killdeer	*Charadrius vociferus*	1	1	21	31	11	31	6	13	39	76
Gulls/Terns		**5**	**806**	**8**	**163**	**4**	**84**	**0**	**0**	**17**	**1,053**
Bonaparte's gull	*Chroicocephalus philadelphia*	0	0	2	5	0	0	0	0	2	5
herring gull	*Larus argentatus*	1	100	0	0	3	83	0	0	4	183
ring-billed gull	*Larus delawarensis*	4	706	6	158	1	1	0	0	11	865
Diurnal Raptors		**39**	**40**	**32**	**37**	**34**	**36**	**40**	**42**	**145**	**155**
Accipiters		*3*	*3*	*2*	*2*	*5*	*5*	*5*	*5*	*15*	*15*
Cooper's hawk	*Accipiter cooperii*	3	3	2	2	5	5	5	5	15	15
Buteos		*13*	*14*	*25*	*30*	*21*	*22*	*17*	*19*	*76*	*85*
red-tailed hawk	*Buteo jamaicensis*	13	14	25	30	21	22	17	19	76	85
Northern Harrier		*5*	*5*	*1*	*1*	*2*	*2*	*5*	*5*	*13*	*13*
northern harrier	*Circus hudsonius*	5	5	1	1	2	2	5	5	13	13
Eagles		*8*	*8*	*2*	*2*	*2*	*2*	*6*	*6*	*18*	*18*
bald eagle	*Haliaeetus leucocephalus*	8	8	2	2	2	2	6	6	18	18
Falcons		*10*	*10*	*2*	*2*	*4*	*5*	*7*	*7*	*23*	*24*
American kestrel	*Falco sparverius*	10	10	2	2	4	5	7	7	23	24
Vultures		**0**	**0**	**89**	**180**	**64**	**117**	**41**	**83**	**194**	**380**
turkey vulture	*Cathartes aura*	0	0	89	180	64	117	41	83	194	380

Appendix A1. Species Observed at the Emerson Creek Wind Project during 20-min Large Bird Point Surveys from February 8, 2018 to April 23, 2019

		Winter		Spring		Summer		Fall		Total	
Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Doves/Pigeons		**10**	**57**	**12**	**43**	**48**	**144**	**24**	**74**	**94**	**318**
rock pigeon	*Columba livia*	6	44	3	23	1	21	9	31	19	119
mourning dove	*Zenaida macroura*	4	13	9	20	47	123	15	43	75	199
Large Corvids		**14**	**30**	**21**	**33**	**14**	**95**	**12**	**17**	**61**	**175**
American crow	*Corvus brachyrhynchos*	14	30	21	33	14	95	12	17	61	175
Overall		**85**	**1,143**	**208**	**640**	**186**	**820**	**131**	**355**	**610**	**2,958**

[a] grps = groups; obs = observations.

Appendix A2. Species Observed at the Emerson Creek Wind Project during 60-min Eagle and Sensitive Species Surveys from February 8, 2018 to April 23, 2019

		Winter		Spring		Summer		Fall		Total	
Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
northern harrier	*Circus hudsonius*	10	12	4	4	3	3	9	9	26	28
bald eagle	*Haliaeetus leucocephalus*	11	11	11	11	8	8	12	12	42	42
Overall		**21**	**23**	**15**	**15**	**11**	**11**	**21**	**21**	**68**	**70**

[a] grps = groups; obs = observations.

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds Observed at the Emerson Creek Wind Project during 20-min Large Bird Surveys from February 8, 2018 to April 23, 2019

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds Observed at the Emerson Creek Wind Project during 20-min Large Bird Surveys from February 8, 2018 to April 23, 2019

	Mean Use				% of Use				% Frequency			
Type / Species	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**
Waterbirds	**0**	**0.04**	**0.04**	**0.01**	**0**	**1.0**	**0.9**	**0.3**	**0**	**1.6**	**4.3**	**0.6**
great egret	0	0	0.01	0	0	0	0.1	0	0	0	0.6	0
great blue heron	0	0.01	0.03	0.01	0	0.2	0.6	0.3	0	1.0	3.1	0.6
green heron	0	0	0.01	0	0	0	0.1	0	0	0	0.6	0
double-crested cormorant	0	0.03	0	0	0	0.8	0	0	0	0.6	0	0
Waterfowl	**1.18**	**0.92**	**1.89**	**0.77**	**14.5**	**22.8**	**37.3**	**35.2**	**8.1**	**12.7**	**2.5**	**3.7**
wood duck	0.02	0	0	0	0.3	0	0	0	0.8	0	0	0
mallard	0.10	0.06	0.02	0	1.2	1.4	0.5	0	0.5	2.9	1.2	0
Canada goose	0.66	0.20	1.86	0.12	8.2	4.9	36.8	5.6	6.7	7.9	1.2	2.5
tundra swan	0.39	0.58	0	0.65	4.9	14.3	0	29.6	1.4	1.8	0	1.2
gadwall	0	0.08	0	0	0	2.1	0	0	0	0.6	0	0
common merganser	0	0.01	0	0	0	0.2	0	0	0	0.6	0	0
Shorebirds	**0.01**	**0.22**	**0.19**	**0.08**	**0.1**	**5.3**	**3.8**	**3.7**	**0.8**	**10.1**	**6.8**	**3.7**
killdeer	0.01	0.22	0.19	0.08	0.1	5.3	3.8	3.7	0.8	10.1	6.8	3.7
Gulls/Terns	**6.09**	**1.02**	**0.52**	**0**	**75.3**	**25.2**	**10.2**	**0**	**2.4**	**4.7**	**1.9**	**0**
Bonaparte's gull	0	0.04	0	0	0	0.9	0	0	0	1.6	0	0
herring gull	0.76	0	0.51	0	9.4	0	10.1	0	0.8	0	1.9	0
ring-billed gull	5.33	0.98	0.01	0	65.9	24.3	0.1	0	2.4	3.1	0.6	0
Diurnal Raptors	**0.27**	**0.22**	**0.22**	**0.26**	**3.3**	**5.5**	**4.4**	**11.8**	**20.6**	**17.2**	**17.3**	**20.4**
Accipiters	*0.02*	*0.01*	*0.03*	*0.03*	*0.2*	*0.2*	*0.6*	*1.4*	*2.0*	*1.0*	*3.1*	*3.1*
Cooper's hawk	0.02	0.01	0.03	0.03	0.2	0.2	0.6	1.4	2.0	1.0	3.1	3.1
Buteos	*0.11*	*0.18*	*0.14*	*0.12*	*1.4*	*4.4*	*2.7*	*5.4*	*9.3*	*13.7*	*10.5*	*9.3*
red-tailed hawk	0.11	0.18	0.14	0.12	1.4	4.4	2.7	5.4	9.3	13.7	10.5	9.3
Northern Harrier	*0.02*	*0.01*	*0.01*	*0.03*	*0.3*	*0.2*	*0.2*	*1.4*	*1.9*	*0.6*	*1.2*	*2.5*
northern harrier	0.02	0.01	0.01	0.03	0.3	0.2	0.2	1.4	1.9	0.6	1.2	2.5
Eagles	*0.04*	*0.02*	*0.01*	*0.04*	*0.5*	*0.4*	*0.2*	*1.7*	*2.6*	*1.6*	*1.2*	*3.1*
bald eagle	0.04	0.02	0.01	0.04	0.5	0.4	0.2	1.7	2.6	1.6	1.2	3.1
Falcons	*0.07*	*0.01*	*0.03*	*0.04*	*0.9*	*0.3*	*0.6*	*2.0*	*7.4*	*1.3*	*2.5*	*4.3*
American kestrel	0.07	0.01	0.03	0.04	0.9	0.3	0.6	2.0	7.4	1.3	2.5	4.3
Vultures	**0**	**1.09**	**0.72**	**0.51**	**0**	**27.1**	**14.3**	**23.4**	**0**	**43.4**	**32.1**	**21.6**
turkey vulture	0	1.09	0.72	0.51	0	27.1	14.3	23.4	0	43.4	32.1	21.6

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds Observed at the Emerson Creek Wind Project during 20-min Large Bird Surveys from February 8, 2018 to April 23, 2019

	Mean Use				% of Use				% Frequency			
Type / Species	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**
Doves/Pigeons	**0.33**	**0.33**	**0.89**	**0.46**	**4.0**	**8.2**	**17.6**	**20.8**	**6.2**	**8.5**	**25.3**	**14.2**
rock pigeon	0.25	0.18	0.13	0.19	3.1	4.4	2.6	8.7	4.1	2.5	0.6	5.6
mourning dove	0.07	0.15	0.76	0.27	0.9	3.8	15.0	12.1	2.1	6.0	25.3	8.6
Large Corvids	**0.23**	**0.19**	**0.59**	**0.10**	**2.8**	**4.7**	**11.6**	**4.8**	**10.6**	**12.7**	**8.0**	**7.4**
American crow	0.23	0.19	0.59	0.10	2.8	4.7	11.6	4.8	10.6	12.7	8.0	7.4
Overall	**8.09**	**4.03**	**5.06**	**2.19**	**100**	**100**	**100**	**100**				

Sums of MG2 values may not add to the total MG1 values shown due to rounding.

Appendix C. Overall Mean Use by Point for All Large Birds and Major Large Bird Types at the Emerson Creek Wind Project during 20-min Large Bird Use Surveys from February 8, 2018 to April 23, 2019

Appendix C. Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EC-1**	**EC-10**	**EC-11**	**EC-12**	**EC-13**	**EC-14**	**EC-15**	**EC-16**	**EC-17**	**EC-18**
Waterbirds	**0**	**0**	**0**	**0**	**0**	**0**	**0.08**	**0**	**0.08**	**0**
Waterfowl	**0**	**1.08**	**0**	**0.25**	**0.33**	**0**	**0**	**0.33**	**0**	**0.08**
Shorebirds	**0**	**0**	**0**	**0.33**	**0.75**	**0.08**	**0.17**	**0.08**	**0.17**	**0**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.42**	**0**	**0**
Diurnal Raptors	**0.25**	**0**	**0.33**	**0.08**	**0.42**	**0.17**	**0.08**	**0.25**	**0.50**	**0.08**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*
Buteos	*0.17*	*0*	*0.33*	*0.08*	*0*	*0*	*0*	*0.17*	*0.08*	*0.08*
Northern Harrier	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0.08*	*0.08*	*0*
Eagles	*0*	*0*	*0*	*0*	*0.17*	*0.08*	*0*	*0*	*0.17*	*0*
Falcons	*0.08*	*0*	*0*	*0*	*0.17*	*0.08*	*0.08*	*0*	*0.08*	*0*
Osprey	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	**1.00**	**1.17**	**0.92**	**0.33**	**0.50**	**1.42**	**1.00**	**1.33**	**1.25**	**0.67**
Doves/Pigeons	**0**	**3.33**	**0.17**	**0.42**	**0.25**	**0.25**	**0**	**0**	**0.17**	**0.83**
Large Corvids	**1.08**	**0**	**1.33**	**0.33**	**0.17**	**0**	**0.08**	**0.42**	**0.25**	**0**
All Large Birds	**2.33**	**5.58**	**2.75**	**1.75**	**2.42**	**1.92**	**1.42**	**2.83**	**2.42**	**1.67**

Appendix C (continued). Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EC-19**	**EC-2**	**EC-20**	**EC-21**	**EC-22**	**EC-23**	**EC-24**	**EC-3**	**EC-4**	**EC-5**
Waterbirds	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Waterfowl	**0.33**	**0**	**0.17**	**0**	**0.25**	**4.33**	**0**	**0.33**	**0**	**0**
Shorebirds	**0**	**0**	**0**	**0**	**0**	**1.83**	**0.08**	**0**	**0**	**0**
Gulls/Terns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.17**	**0**
Diurnal Raptors	**0.25**	**0.25**	**0.75**	**0.50**	**0.33**	**0.58**	**0.25**	**0.58**	**0.17**	**0.67**
Accipiters	*0*	*0.08*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0.08*
Buteos	*0.17*	*0.17*	*0.17*	*0.08*	*0.25*	*0.17*	*0.08*	*0.33*	*0.08*	*0*
Northern Harrier	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0.17*
Eagles	*0*	*0*	*0.42*	*0.17*	*0*	*0.25*	*0*	*0.17*	*0*	*0*
Falcons	*0.08*	*0*	*0.17*	*0.25*	*0.08*	*0.08*	*0.08*	*0*	*0.08*	*0.42*
Osprey	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*
Vultures	**0.25**	**1.25**	**1.50**	**0.75**	**0.67**	**1.25**	**0.25**	**0.42**	**0.42**	**0.33**
Doves/Pigeons	**1.17**	**0.33**	**0.92**	**0.50**	**0.25**	**1.17**	**0**	**0**	**0**	**0.83**
Large Corvids	**0.42**	**0**	**0.33**	**0.17**	**0.50**	**0.08**	**0.08**	**0**	**0.25**	**0**
All Large Birds	**2.42**	**1.83**	**3.67**	**1.92**	**2.00**	**9.25**	**0.67**	**1.33**	**1.00**	**1.83**

Appendix C (continued). Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EC-6**	**EC-7**	**EC-8**	**EC-9**	**EN-10**	**EN-11**	**EN-12**	**EN-13**	**EN-14**	**EN-15**
Waterbirds	**0.08**	**0**	**0**	**0**	**0**	**0.08**	**0**	**0**	**0**	**0**
Waterfowl	**0**	**0.08**	**0.08**	**0.17**	**3.50**	**5.83**	**0**	**0.08**	**0.33**	**0.58**
Shorebirds	**0**	**0**	**0.58**	**0.33**	**0**	**0.25**	**0**	**0.08**	**0**	**0**
Gulls/Terns	**0**	**0**	**0.42**	**0.08**	**0**	**0**	**0**	**0**	**50.17**	**0**
Diurnal Raptors	**0.17**	**0.58**	**0**	**0.17**	**0.17**	**0.08**	**0.17**	**0.17**	**0.42**	**0.25**
Accipiters	*0*	*0.08*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*
Buteos	*0.17*	*0.17*	*0*	*0.08*	*0.17*	*0*	*0.17*	*0.08*	*0.42*	*0.08*
Northern Harrier	*0*	*0.17*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.17*
Eagles	*0*	*0.08*	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0*
Falcons	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*
Osprey	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	**1.33**	**1.00**	**0.08**	**0.50**	**0.50**	**0.08**	**1.58**	**0**	**0.17**	**0**
Doves/Pigeons	**0.17**	**0**	**0.58**	**0.75**	**0.08**	**0.75**	**0.08**	**0**	**0.25**	**0**
Large Corvids	**0.17**	**0.58**	**1.00**	**0.17**	**0**	**0.08**	**0**	**0**	**0.17**	**0.08**
All Large Birds	**1.92**	**2.25**	**2.75**	**2.17**	**4.25**	**7.17**	**1.83**	**0.33**	**51.50**	**0.92**

Appendix C (continued). Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EN-16**	**EN-17**	**EN-18**	**EN-19**	**EN-2**	**EN-20**	**EN-21**	**EN-22**	**EN-23**	**EN-24**
Waterbirds	**0**	**0.17**	**0**	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**
Waterfowl	**23.33**	**0**	**0**	**0.17**	**2.42**	**0**	**0**	**8.00**	**2.25**	**0.08**
Shorebirds	**1.67**	**0**	**0.08**	**0**	**0**	**0.08**	**0**	**0**	**0.25**	**0.08**
Gulls/Terns	**0**	**0**	**0**	**0.58**	**0.08**	**0**	**0.25**	**0**	**0**	**6.25**
Diurnal Raptors	**0.17**	**0.25**	**0.08**	**0.08**	**0.08**	**0.17**	**0.42**	**0.08**	**0.50**	**0.17**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*
Buteos	*0.17*	*0.17*	*0.08*	*0.08*	*0.08*	*0.08*	*0.42*	*0.08*	*0.33*	*0*
Northern Harrier	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*
Eagles	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*
Falcons	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0.08*
Osprey	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	**0.58**	**0.25**	**0.42**	**0.67**	**0.58**	**0.42**	**0.08**	**0**	**0.33**	**0.08**
Doves/Pigeons	**4.08**	**0.33**	**0.17**	**0**	**0.17**	**1.50**	**0.50**	**0.67**	**0.08**	**0**
Large Corvids	**0**	**0**	**0.08**	**0.17**	**0**	**0**	**0**	**0.17**	**0.33**	**0**
All Large Birds	**29.83**	**1.00**	**0.83**	**1.75**	**3.33**	**2.17**	**1.25**	**8.92**	**3.75**	**6.67**

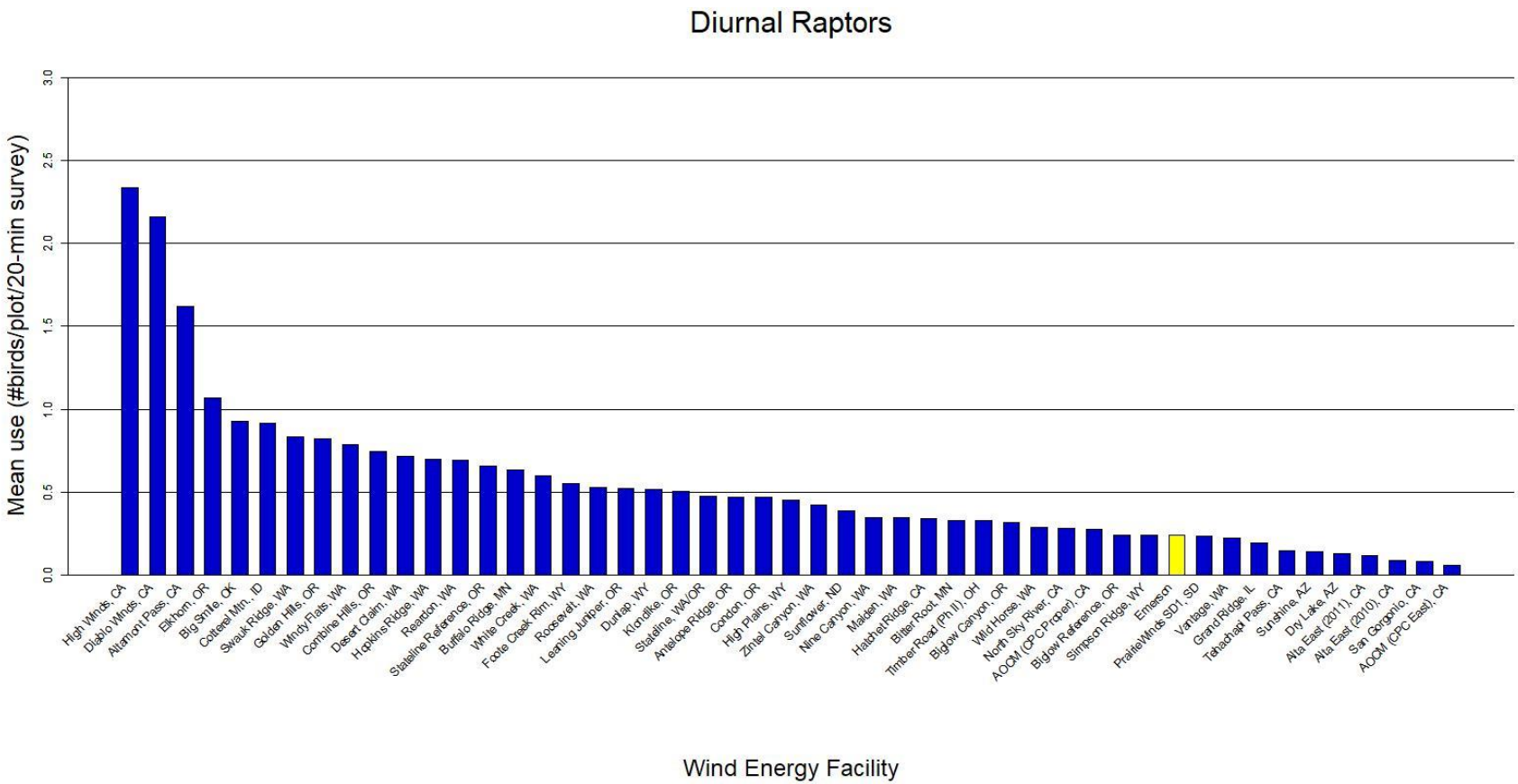
Appendix C (continued). Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EN-25**	**EN-26**	**EN-27**	**EN-28**	**EN-29**	**EN-3**	**EN-30**	**EN-31**	**EN-32**	**EN-33**
Waterbirds	**0**	**0.08**	**0.08**	**0**	**0**	**0.42**	**0**	**0**	**0**	**0.08**
Waterfowl	**0.92**	**2.00**	**0.08**	**8.50**	**0**	**1.75**	**0**	**0**	**0.08**	**0.33**
Shorebirds	**0.25**	**0.08**	**0**	**0.42**	**0.25**	**0**	**0.50**	**0**	**0**	**0**
Gulls/Terns	**16.67**	**0**	**0**	**0.17**	**0**	**0**	**0**	**0**	**0**	**0**
Diurnal Raptors	**0**	**0.17**	**0.50**	**0.08**	**0**	**0.17**	**0.17**	**0.42**	**0.17**	**0.17**
Accipiters	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0.08*
Buteos	*0*	*0*	*0.33*	*0*	*0*	*0.17*	*0.17*	*0.33*	*0*	*0.08*
Northern Harrier	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Eagles	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Falcons	*0*	*0*	*0.08*	*0.08*	*0*	*0*	*0*	*0*	*0.17*	*0*
Osprey	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	**0.83**	**0.67**	**0.58**	**0.08**	**0.83**	**0.33**	**0.25**	**1.92**	**0.25**	**0.25**
Doves/Pigeons	**0.92**	**0.25**	**0.17**	**0.25**	**0.42**	**0.75**	**0.08**	**0**	**0.25**	**0.67**
Large Corvids	**0.17**	**4.08**	**0.42**	**0.17**	**0**	**0.25**	**0**	**0.67**	**0**	**0.17**
All Large Birds	**19.75**	**7.33**	**1.83**	**9.67**	**1.50**	**3.67**	**1.00**	**3.00**	**0.75**	**1.67**

Appendix Ccontinued). Mean use (number of birds/20-minute survey) by point for large birds, major bird types, and diurnal raptor subtypes observed at the proposed Emerson Creek Wind Project during fixed-point bird use surveys from February 8, 2018 to April 23, 2019.

	Survey Point									
Bird Type	**EN-34**	**EN-35**	**EN-36**	**EN-37**	**EN-4**	**EN-5**	**EN-6**	**EN-7**	**EN-8**	**EN-9**
Waterbirds	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Waterfowl	**0**	**1.83**	**0**	**0**	**1.00**	**0**	**0.83**	**0**	**0**	**0**
Shorebirds	**0**	**0**	**0.08**	**0**	**0.08**	**0**	**0**	**0.25**	**0.08**	**0**
Gulls/Terns	**0**	**12.50**	**0**	**0**	**58.33**	**0**	**83.33**	**0**	**0**	**0**
Diurnal Raptors	**0.42**	**0.17**	**0**	**0.17**	**0.58**	**0.08**	**0.08**	**0.08**	**0.67**	**0.58**
Accipiters	*0*	*0.08*	*0*	*0.08*	*0*	*0*	*0*	*0.08*	*0.08*	*0.17*
Buteos	*0.33*	*0*	*0*	*0.08*	*0*	*0*	*0.08*	*0*	*0.50*	*0.33*
Northern Harrier	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0.08*
Eagles	*0.08*	*0.08*	*0*	*0*	*0.58*	*0.08*	*0*	*0*	*0*	*0*
Falcons	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Osprey	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	**2.00**	**0.50**	**0.50**	**0.25**	**0**	**0.17**	**0.50**	**0.33**	**0.08**	**0**
Doves/Pigeons	**0.08**	**0.75**	**0**	**0.67**	**0**	**0.08**	**0**	**1.67**	**0.67**	**0**
Large Corvids	**0**	**0.08**	**0.33**	**0**	**0.25**	**0**	**0**	**0**	**0.08**	**0.17**
All Large Birds	**2.50**	**15.83**	**0.92**	**1.08**	**60.25**	**0.33**	**84.75**	**2.33**	**1.58**	**0.75**

Appendix D. Comparison of Diurnal Raptor Use at North American Wind Energy Facilities



Appendix D. Comparison of annual diurnal raptor use during large bird and eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019, and annual diurnal raptor use recorded at other North American wind energy facilities.

Appendix D (*continued*). Comparison of annual diurnal raptor use during large bird and eagle use surveys at the proposed Emerson Creek Wind Project from February 8, 2018 to April 23, 2019, and annual diurnal raptor use recorded at other North American wind energy facilities. Data from the following sources.

Study and Location	Reference	Study and Location	Reference
Emerson Creek, OH	**This study.**		
High Winds, CA	Kerlinger et al. 2005	High Plains, WY	Johnson et al. 2009b
Diablo Winds, CA	WEST 2006	Zintel Canyon, WA	Erickson et al. 2002a, 2003a
Altamont Pass, CA	Orloff and Flannery 1992	Sunflower, ND	Derby et al. 2014
Elkhorn, OR	WEST 2005a	Nine Canyon, WA	Erickson et al. 2001
Big Smile (Dempsey), OK	Derby et al. 2010c	Maiden, WA	Young et al. 2002
Cotterel Mtn., ID	BLM 2006	Hatchet Ridge, CA	Young et al. 2007b
Swauk Ridge, WA	Erickson et al. 2003c	Bitter Root. MN	Derby and Dahl 2009
Golden Hills, OR	Jeffrey et al. 2008	Timber Road (Phase II), OH	Good et al. 2010
Windy Flats, WA	Johnson et al. 2007	Biglow Canyon, OR	WEST 2005c
Combine Hills, OR	Young et al. 2003a	Wild Horse, WA	Erickson et al. 2003d
Desert Claim, WA	Young et al. 2003b	North Sky River, CA	Erickson et al. 2011
Hopkins Ridge, WA	Young et al. 2003c	AOCM (CPC Proper), CA	Chatfield et al. 2010
Reardon, WA	WEST 2005b	Biglow Reference, OR	WEST 2005c
Stateline Reference, OR	URS et al. 2001	Simpson Ridge, WY	Johnson et al. 2000b
Buffalo Ridge, MN	Johnson et al. 2000a	PrairieWinds SD1, SD	Derby et al. 2010d
White Creek, WA	NWC and WEST 2005	Vantage, WA	Jeffrey et al. 2007
Foote Creek Rim, WY	Johnson et al. 2000b	Grand Ridge, IL	Derby et al. 2009
Roosevelt, WA	NWC and WEST 2004	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Leaning Juniper, OR	Kronner et al. 2005	Sunshine, AZ	WEST and the CPRS 2006
Dunlap, WY	Johnson et al. 2009a	Dry Lake, AZ	Young et al. 2007a
Klondike, OR	Johnson 2002	Alta East (2011), CA	Chatfield et al. 2011
Stateline, WA/OR	Erickson et al. 2003b	Alta East (2010), CA	Chatfield et al. 2011
Antelope Ridge, OR	WEST 2009	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Condon, OR	Erickson et al. 2002b	AOCM (CPC East), CA	Chatfield et al. 2010

Appendix E. Midwest Raptor Fatality Summary Table

Appendix E. Wind energy facilities in the Midwest region of North America with comparable use and fatality data for diurnal raptors.

Project Name	Use Estimate[A]	Raptor Fatality Estimate[B]	No. of Turbines	Total MW
Emerson Creek, OH (2018-2019)	**0.24**			
Buffalo Ridge, MN (Phase I; 1999)	NA	0.47	73	25
Moraine II, MN (2009)	NA	0.37	33	49.5
Winnebago, IA (2009-2010)	NA	0.27	10	20
Buffalo Ridge I, SD (2009-2010)	NA	0.2	24	50.4
Thunder Spirit, ND (2016-2017)	NA	0.18	43	108
Cedar Ridge, WI (2009)	NA	0.18	41	67.6
PrairieWinds SD1, SD (2013-2014)	NA	0.17	108	162
Top of Iowa, IA (2004)	NA	0.17	89	80
Cedar Ridge, WI (2010)	NA	0.13	41	68
Ripley, ON (2008)	NA	0.1	38	76
Prairie Rose, MN (2014)	NA	0.08	119	200
Wessington Springs, SD (2010)	0.232	0.07	34	51
Rugby, ND (2010-2011)	NA	0.06	71	149
NPPD Ainsworth, NE (2006)	NA	0.06	36	20.5
Wessington Springs, SD (2009)	0.232	0.06	34	51
PrairieWinds ND1 (Minot), ND (2010)	NA	0.05	80	115.5
PrairieWinds ND1 (Minot), ND (2011)	NA	0.05	80	115.5
PrairieWinds SD1, SD (2012-2013)	NA	0.03	108	162
Elm Creek, MN (2009-2010)	NA	0	67	100
Rail Splitter, IL (2012-2013)	NA	0	67	100.5
Pioneer Prairie I, IA (Phase II; 2011-2012)	NA	0	62	102.3
Buffalo Ridge, MN (Phase III; 1999)	NA	0	138	103.5
Buffalo Ridge, MN (Phase II; 1998)	NA	0	143	107.25
Buffalo Ridge, MN (Phase II; 1999)	NA	0	143	107.25
Blue Sky Green Field, WI (2008; 2009)	NA	0	88	145
Elm Creek II, MN (2011-2012)	NA	0	62	148.8
Barton I & II, IA (2010-2011)	NA	0	80	160
PrairieWinds SD1, SD (2011-2012)	NA	0	108	162
Kewaunee County, WI (1999-2001)	NA	0	31	20.46
Lakefield Wind, MN (2012)	NA	0	137	205.5
Buffalo Ridge II, SD (2011-2012)	NA	0	105	210
Buffalo Ridge, MN (Phase I; 1996)	NA	0	73	25
Buffalo Ridge, MN (Phase I; 1997)	NA	0	73	25
Buffalo Ridge, MN (Phase I; 1998)	NA	0	73	25
Fowler I, IN (2009)	NA	0	162	301
Big Blue, MN (2013)	NA	0	18	36
Big Blue, MN (2014)	NA	0	18	36
Top of Iowa, IA (2003)	NA	0	89	80
Grand Ridge I, IL (2009-2010)	0.195	0	66	99

[A] Number of raptors/plot/20-minute survey.

[B] number of fatalities/mw/year.

MW = megawatts; NA = not available

Appendix E (*continued*). Wind energy facilities in the Midwest region of North America with comparable use and fatality data for diurnal raptors. Data from the following sources:

Project Name	Use Reference	Fatality Reference	Project Name	Use Reference	Fatality Reference
Emerson Creek, OH (16-17)	This study				
Barton I & II, IA (2010-2011)	NA	Derby et al. 2011b	Lakefield Wind, MN (2012)		Minnesota Public Utilities Commission 2012
Big Blue, MN (2013)	NA	Fagen Engineering 2014	Moraine II, MN (2009)	NA	Harvey & Associates 2013
Big Blue, MN (2014)	NA	Fagen Engineering 2015	NPPD Ainsworth, NE (2006)	NA	Derby et al. 2007
Blue Sky Green Field, WI (2008; 2009)	NA	Gruver et al. 2009	Pioneer Prairie II, IA (2011-2012)	NA	Chodachek et al. 2012
Buffalo Ridge, MN (Phase I; 1996)	NA	Johnson et al. 2000a	Prairie Rose, MN (2014)		Chodachek et al. 2015
Buffalo Ridge, MN (Phase I; 1997)	NA	Johnson et al. 2000a	PrairieWinds ND1 (Minot), ND (2010)	NA	Derby et al. 2011d
Buffalo Ridge, MN (Phase I; 1998)	NA	Johnson et al. 2000a	PrairieWinds ND1 (Minot), ND (2011)	NA	Derby et al. 2012d
Buffalo Ridge, MN (Phase I; 1999)	NA	Johnson et al. 2000a	PrairieWinds SD1, SD (2011-2012)	NA	Derby et al. 2012c
Buffalo Ridge, MN (Phase II; 1998)	NA	Johnson et al. 2000a	PrairieWinds SD1, SD (2012-2013)	NA	Derby et al. 2013
Buffalo Ridge, MN (Phase II; 1999)	NA	Johnson et al. 2000a	PrairieWinds SD1, SD (2013-2014)	NA	Derby et al. 2014
Buffalo Ridge, MN (Phase III; 1999)	NA	Johnson et al. 2000a	Rail Splitter, IL (2012-2013)	NA	Good et al. 2013b
Buffalo Ridge I, SD (2009-2010)	NA	Derby et al. 2010f	Ripley, Ont (2008)	NA	Jacques Whitford 2009
Buffalo Ridge II, SD (2011-2012)	NA	Derby et al. 2012a	Rugby, ND (2010-2011)	NA	Derby et al. 2011c
Cedar Ridge, WI (2009)	NA	BHE Environ-mental 2010	Thunder Spirit, ND (2016-2017)		Baerwald 2008
Cedar Ridge, WI (2010)	NA	BHE Environ-mental 2011	Top of Iowa, IA (2003)	NA	Jain 2005
Elm Creek, MN (2009-2010)	NA	Derby et al. 2010g	Top of Iowa, IA (2004)	NA	Jain 2005
Elm Creek II, MN (2011-2012)	NA	Derby et al. 2012b	Wessington Springs, SD (2009)	Derby et al. 2008	Derby et al. 2010e
Fowler I, IN (2009)	NA	Johnson et al. 2010b	Wessington Springs, SD (2010)		Derby et al. 2011a
Grand Ridge I, IL (2009-2010)	Derby et al. 2009	Derby et al. 2010a	Winnebago, IA (2009-2010)	NA	Derby et al. 2010a
Kewaunee County, WI (1999-2001)	NA	Howe et al. 2002			

Appendix F. Summary of Publicly Available Studies at Midwestern Wind Energy Facilities that Report Bird Fatalities

Appendix F. Summary of publicly available studies at Midwestern wind energy facilities that report bird fatalities.

Project Name	Reference	Project	Reference
Barton I and II	Derby et al. 2011b	Grand Ridge I	Derby et al. 2010a
Big Blue (2013)	Fagen Engineering 2014	Harrow (2010)	Natural Resources Solutions Inc. (NRSI) 2011
Big Blue (2014)	Fagen Engineering 2015	Heritage Garden (2012-2014)	Kerlinger et al. 2014
Bishop Hill (2012)	Simon et al. 2014a	Kewaunee County	Howe et al. 2002
Bishop Hill (2013_fall)	Simon et al. 2014b	Lakefield Wind	Minnesota Public Utilities Commission 2012
Bishop Hill (2014_fall)	Shoener Environmental 2015a	Melancthon I (2007)	Stantec Ltd. 2008
Bishop Hill (2014_spring)	Ritzert et al. 2014	Moraine II (2009)	Derby et al. 2010h
Bishop Hill (2015)	Shoener Environmental 2015b	NPPD Ainsworth (2006)	Derby et al. 2007
Blue Sky Green Field	Gruver et al. 2009	Odell (2016-2017)	Chodachek and Gustafson 2018
Buffalo Ridge (1994/1995)	Osborn et al. 1996, 2000	Pioneer Prairie II (2013)	Chodachek et al. 2014
Buffalo Ridge (2000)	Krenz and McMillian 2000	Pioneer Prairie phase II (2011-2012)	Chodachek et al. 2012
Buffalo Ridge (Phase I; 1996)	Johnson et al. 2000a	Pioneer Trail (2012-2013)	ARCADIS U.S., Inc. 2013
Buffalo Ridge (Phase I; 1997)	Johnson et al. 2000a	Pleasant Valley (2016-2017)	Tetra Tech 2017b
Buffalo Ridge (Phase I; 1998)	Johnson et al. 2000a	Prairie Rose (2014)	Chodachek et al. 2015
Buffalo Ridge (Phase I; 1999)	Johnson et al. 2000a	Prairie Winds SD1 (Crow Lake) 2012-2013	Derby et al. 2013
Buffalo Ridge (Phase II; 1998)	Johnson et al. 2000a	Prairie Winds SD1 (Crow Lake) 2013-2014	Derby et al. 2014
Buffalo Ridge (Phase II; 1999)	Johnson et al. 2000a	PrairieWinds ND1 (Minot) 2010	Derby et al. 2011d
Buffalo Ridge (Phase II; 2001/Lake Benton I)	Johnson et al. 2004	PrairieWinds ND1 (Minot) 2011	Derby et al. 2012d
Buffalo Ridge (Phase III; 1999)	Johnson et al. 2000a	PrairieWinds SD1 (Crow Lake) 2011-2012	Derby et al. 2012c
Buffalo Ridge (Phase III; 2001/Lake Benton II)	Johnson et al. 2004	Prince Wind Farm (2006)	NRSI 2008
Buffalo Ridge I (2010)	Derby et al. 2010f	Prince Wind Farm (2007)	NRSI 2008
Buffalo Ridge II (2011)	Derby et al. 2012a	Prince Wind Farm (2008)	NRSI 2009
Cedar Ridge (2009)	BHE Environmental 2010	Rail Splitter (2012-2013)	Good et al. 2013b
Cedar Ridge (2010)	BHE Environmental 2011	Ripley (2008)	Jacques Whitford 2009
Crescent Ridge	Kerlinger et al. 2007	Ripley (Fall 2009)	Golder Associates 2010
Crystal Lake II	Derby et al. 2010b	Rugby	Derby et al. 2011c
Elm Creek	Derby et al. 2010g	Thunder Spirit (2016-2017)	Derby et al. 2018
Elm Creek II	Derby et al. 2012b	Top Crop I and II (2012-2013)	Good et al. 2013c
Forward Energy Center	Grodsky and Drake 2011	Top of Iowa 2003	Jain 2005
Fowler I (2009)	Johnson et al. 2010a	Top of Iowa 2004	Jain 2005
Fowler I, II, III (2010)	Good et al. 2011	Waverly Wind (2016-2017)	Tetra Tech 2017a

Appendix F. Summary of publicly available studies at Midwestern wind energy facilities that report bird fatalities.

Project Name	Reference	Project	Reference
Fowler I, II, III (2011)	Good et al. 2012	Wessington Springs (2009)	Derby et al. 2010e
Fowler I, II, III (2012)	Good et al. 2013a	Wessington Springs (2010)	Derby et al. 2011a
Fowler III (2009)	Johnson et al. 2010c	Wildcat (2016)	Stantec Consulting Services, Inc. (Stantec Consulting) 2017
Fowler Ridge (2015)	Good et al. 2016	Wildcat (2017)	Stantec Consulting 2018
Fowler Ridge (2016)	Good et al. 2017	Winnebago	Derby et al. 2010a
Fowler Ridge (2017)	Good et al. 2018		

Attachment CF-5

July 22, 2020, WEST, Inc.
Email from Jennie Geiger of Apex to
Christopher Farmer of WEST

Christopher Farmer <cfarmer@west-inc.com>

FW: Emerson Creek wind project update: Eagle Take Permit and STaff Report

1 message

Jennie Geiger <jennie.geiger@apexcleanenergy.com> Wed, Jul 22, 2020 at 4:57 PM
To: "Joyce Pickle (jpickle@west-inc.com)" <jpickle@west-inc.com>, Christopher Farmer <cfarmer@west-inc.com>

Here is email b/t Mags and OPSB as requested.

JENNIE GEIGER

office: 434-260-6982 | cell: 720-320-9450

jennie.geiger@apexcleanenergy.com

From: Rheude, Margaret G <margaret_rheude@fws.gov>
Sent: Friday, April 24, 2020 9:35 AM
To: Jennie Geiger <jennie.geiger@apexcleanenergy.com>
Subject: Emerson Creek wind project update: Eagle Take Permit and STaff Report

Hi Jennie,

please find below my email to the Ohio siting board and their response. It sounds like they don't have an answer yet but they will take it into consideration.

Thanks,

Mags

Mags Rheude (she/her)

US Fish and Wildlife Service

New Address:

Midwest Migratory Bird Program

U.S. Fish and Wildlife Service

5600 American Blvd. West, Suite 990

Bloomington, MN 55437-1458

612-713-5438

margaret_rheude@fws.gov

Currently on a modified telework schedule due to Covid-19.

I am checking phone and email messages frequently.

Response time may be delayed due to modified schedule.

Thank you for your patience.

From: robert.holderbaum@puco.ohio.gov <robert.holderbaum@puco.ohio.gov>
Sent: Friday, April 24, 2020 10:27 AM
To: Rheude, Margaret G <margaret_rheude@fws.gov>
Subject: [EXTERNAL] RE: Emerson Creek wind project update: Eagle Take Permit and STaff Report

Thanks Mags! Hope you and your family are staying safe and healthy during this crazy time. I will speak with the project manager on this, but yes it seems reasonable to me.

Ashton

From: Rheude, Margaret G <margaret_rheude@fws.gov>
Sent: Wednesday, April 22, 2020 4:04 PM
To: Holderbaum, Robert <robert.holderbaum@puco.ohio.gov>; Seymour, Megan <megan_seymour@fws.gov>
Subject: Emerson Creek wind project update: Eagle Take Permit and STaff Report

Hey Ashton,

I hope you're doing well and able to get out and enjoy the spring weather. I wanted to follow-up with you about the recommendations in the staff report for Emerson Creek wind, with regards to recommendations for an eagle take permit. Condition 31 states:

(31) The Applicant shall develop and implement an Eagle Conservation Plan prior to the start of turbine construction.

The Eagle Conservation Plan shall be developed in coordination with the USFWS and in accordance with the

USFWS Eagle Conservation Plan Guidance document and 2016 Revised Eagle Take Permit Regulations (50 CFR 22). The Eagle

Conservation Plan shall be approved by the USFWS prior to the start of turbine construction.

Additionally, the Applicant shall obtain an Eagle Take Permit from the USFWS prior to the project becoming operational.

Further correspondence with the USFWS shall be provided to Sta.ff and filed on the docket to confirm compliance with

this condition, within seven days of receipt; but in no event, less than 30 days prior to turbine construction.

I appreciate the inclusion of eagles and associated conservation plans in the staff report - I have had meetings with the developer (APEX Clean Energy) and they are receptive to developing an eagle conservation plan and applying for an eagle take permit. I think it is reasonable for APEX to develop and Eagle Conservation Plan (in coordination with the Service) and work towards applying for an eagle take permit. However, the eagle take permit process can take up to several years, much of which time is due to the FWS's data analysis, environmental review, public outreach, as well as a current backlog of existing permit applications that have already been submitted. Additionally, the Eagle Conservation Plan is more of a "living" document that gets updated as we get more information - it is also the basis of the permit application, but we don't necessarily approve an ECP (although we usually incorporate parts of it into our environmental analysis and permit issuance).

I think it's reasonable for APEX to work with the FWS to develop an ECP prior to turbine construction, as well as submit a completed eagle take permit application prior to commercial operation (thought we will likely not be able to issue this permit until after the start of commercial operation).

Does that approach sound reasonable to you? Let me know your thoughts and you and/or I can update APEX on this conversation.

Thanks,

Mags

Mags Rheude (she/her)

US Fish and Wildlife Service

New Address:

Midwest Migratory Bird Program

U.S. Fish and Wildlife Service

5600 American Blvd. West, Suite 990

Bloomington, MN 55437-1458

612-713-5438

margaret_rheude@fws.gov

Currently on a modified telework schedule due to Covid-19.

I am checking phone and email messages frequently.

Response time may be delayed due to modified schedule.

Thank you for your patience.

Summary: Testimony - Direct Testimony of Christopher J. Farmer electronically filed by Christine M.T. Pirik on behalf of Firelands Wind, LLC