

**BREEDING BIRD SURVEY FOR THE
CEDAR RIDGE WIND POWER PROJECT
FOND DU LAC COUNTY, WISCONSIN**

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Breeding Bird Study for the Cedar Ridge Wind Power Project

Fond du Lac County, Wisconsin

Executive Summary

To examine the nesting bird community at the Cedar Ridge Wind Power Project (hereafter, the "Project") site in Fond du Lac County, Wisconsin, a study of birds breeding within the Project boundary was conducted. The study was conducted after an avian risk assessment demonstrated that marginally suitable nesting habitat was present on and near the site for Wisconsin threatened species and state species of special concern. In addition, biologists from the Wisconsin Department of Natural Resources suggested a nesting bird study to determine the status of listed species and, or species of concern that might be present. The habitats identified in the avian risk assessment as being suitable for listed species and, or species of concern were farm fields that resemble natural grasslands and a sizeable wetland near the center of the project area. Some grassland nesting species are thought to be at risk of disturbance and displacement from wind turbine construction and presence.

A total of 12 point counts were established within the Project site. Point count locations were selected in the highest quality grassland nesting bird habitats present on the Cedar Ridge site. The habitat assessment was based on a site visit in 2004, associated with a Phase I avian risk assessment, and on aerial photographs, as well as a map showing likely turbine locations. The point count sites were generally spaced by at least 400 m. Point count surveys and focused searches for listed species were conducted on May 25, 26, 27, and 28, 2006. Incidental observations were also made on a daily basis, when traveling between point count locations and other activities on site. Three complete rounds of point counts were conducted during of nesting season activity. Each point count location was surveyed daily for 5 minutes during which time birds seen or heard were recorded. Also recorded were the distance and compass direction of each bird from the point count location.

A total of 1,841 individuals of 80 species were detected at the 12 point counts and another 18 species were observed incidental to establishing the point count locations and traveling around the site during the study (but not during the actual 5-minute point count observations). All but a few of the 98 species observed likely nest within the Project boundary or nearby. The assemblage of species nesting on the Cedar Ridge site is a diverse assemblage of species found in forest, forest edge, brush, and grassland habitats. Songbirds accounted for majority of species (with few raptors, waterfowl, or shorebirds. Five species (Red-winged Blackbird, Savannah Sparrow, European Starling, American Robin, and Song Sparrow) accounted for 46.1% of all birds observed at point count locations. Ten of the 80 species (12.5%) accounted for 61.8% of all birds observed during point counts. These birds are all songbirds that nest mostly in brush and forest edge, as well as fragmented grasslands and farm fields. The grassland nesting bird community was only a partial representation of the community that is found in larger

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contiguous prairies or unfragmented grasslands. Also present were a few forest interior birds, obligate grassland nesting species, raptors, waterfowl, and gamebirds, along with a few migrating species and species that nest off site.

No federally endangered or threatened species were observed or are likely to nest at the Cedar Ridge site. Two Wisconsin threatened species, Great Egret and Red-shouldered Hawk were observed. The former species was observed foraging on site and likely nests several miles to the south at known rookeries for this species. The Red-shouldered Hawk was a bird in immature plumage. It was high overhead, seemingly migrating northward. Neither of these threatened species is likely to nest on site.

Seven Wisconsin species of special concern were observed. Of these, two are not likely to nest within the Project boundary. Tennessee Warbler is a migrant from farther north and Great Blue Heron likely nests within the County but not on site. Small numbers of Dickcissel, Northern Harrier, Orchard Oriole, Red-headed Woodpecker, and Yellow-billed Cuckoo were seen either during point count surveys or incidental to those observations. Northern Harrier likely nests on site, perhaps near turbine number 19. This bird could be displaced from a nesting area by turbine construction, although these birds do habituate to turbines and are not killed in large numbers at turbine locations. Of the other species, Dickcissel could be displaced by turbines to some extent, although the oriole, woodpecker, and cuckoo are less likely to be displaced because they dwell mostly in forests and few turbines will be placed in those habitats. Overall, the project will not likely impact large numbers of these birds, so impacts to them are not likely to be biologically significant from the perspective of regional or North American populations.

Biologically significant collision fatalities of nesting birds at the Cedar Ridge project are not likely. The species that nest in forest, brush, and grassland on or immediately adjacent to the site seldom fly above the forest canopy at heights that would bring them near turbine rotors, with the exception of Horned Lark, swallows, American Kestrel, Red-tailed Hawk, Turkey Vulture, and perhaps others. Horned Larks, however, do have a propensity for colliding with turbines during aerial courtship displays. Also, Red-tailed Hawk and American Kestrels have shown a slight propensity for collisions while hunting.

Disturbance and displacement from project operations, turbines, and roads may result in impacts to grassland nesting species such as Vesper Sparrow, Eastern Meadowlark, Bobolink, Savannah Sparrow, and others. Immediately following construction of the turbines, some individuals, mostly of grassland nesting species, will likely be displaced from the areas surrounding turbines out to distances of 50 to more than 200 m. This will mean reduced nesting densities of some species in these portions of the wind farm, but will not result in complete extirpation of individual species. The impacts will be local and are not likely to be biologically significant from a county or regional perspective.

Based on the findings of the breeding bird study and impacts known from other wind power project sites, the following recommendations are made.

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- To reduce habitat disturbance and impacts, habitat restoration (including tilled agricultural areas) surrounding the turbines, meteorology towers, roads, and other infrastructure should be implemented as soon as possible after construction is completed.
- A post-construction fatality study would be helpful for understanding whether avian species that nest in or adjacent to farm fields with wind turbines collide with turbines in numbers that could impact local populations.

Introduction

Wind power projects are being proposed at a record rate, both across the United States and at farmland sites in Wisconsin. Wind power has generally proven to be a clean and renewable electricity source in the United States and Europe, having less impact to humans and wildlife than traditional fossil fuel electric generation. However, impacts to birds do occur, although those impacts have not been shown to be biologically significant. That is, the impacts do not appear to have caused declines in regional or global populations at the species level. Because impacts have been reported from sites such as the Altamont Pass Wind Resource Area in California, some environmental organizations, animal rights groups, and permitting agencies ask that extensive preconstruction research be conducted at wind plants to determine the likely magnitude and types of impacts. In addition, those organizations and agencies would like to see studies to determine the biological significance of impacts.

Most studies that have been conducted in the United States have focused on fatalities caused by birds colliding with wind turbines. In Europe the focus has been different, with emphasis placed on determining the degree of disturbance and displacement of individual birds and species that nest, forage, or otherwise use a particular site. The issue of disturbance and subsequent displacement of birds is now being considered more seriously by wildlife agencies and environmental organizations in the United States. Of the habitat disturbance and displacement studies conducted at wind plants in the United States, most have assessed the impacts on grassland birds after projects have been developed. Those species are mostly birds that nest in farm fields, grazing land, and other open habitats (reviewed in Kerlinger 2005).

To determine the magnitude and significance of potential impacts to birds at the proposed Cedar Ridge Wind Power Project (hereafter the "Project") in Fond du Lac County, Wisconsin, a Phase I Avian Risk Assessment was conducted (Kerlinger 2005). That risk assessment suggested collision impacts to birds would not likely be biologically significant, although a nesting bird study was recommended to learn more about the species and numbers of birds present at the Project site. Likewise, the Wisconsin Department of Natural Resources (WDNR) also suggested nesting bird studies for this project. The rationale for the nesting bird study was mostly to inventory the grassland and other nesting species that were present within the Project boundary during the nesting season including those that are listed by WDNR as endangered or threatened, or species of special concern. Because the habitat on site suggested that some species of concern and possibly listed species could be present.

A nesting bird study was conducted at the Cedar Ridge project site during spring 2006. The results of that study are reported herein, providing data and information regarding the nesting species at the Project site. In addition, the numbers and location of listed species and species of concern are provided. The results of the nesting bird study may serve to determine which species may be impacted by the Project and as baseline

data regarding whether nesting species are displaced after construction of the facility. Thus, the information can be used to better assess risk at the Cedar Ridge site and to evaluate impacts following construction of turbines.

Methods

To provide quantitative information on the species of birds that nest within and, in some cases, immediately adjacent to the Project site (Figure 1) point count locations were established to sample nesting birds (Figure 2). The locations of the sampling points/point counts correspond in many cases to the same fields where turbines would likely be located within the Project boundaries. Point count locations were chosen after the habitat was evaluated to determine which areas were most suitable for nesting by grassland and listed species, and species of special concern. Those habitats included the largest, contiguous fields within the Project boundary, especially those that had hay or other grassland like vegetation. The latter included some fallow fields, alfalfa, and a few other low growing crops, as well as wetlands present within the Project boundary. Not all turbine locations were examined because of the poor quality of the nesting habitat at those sites. These are mostly fields that are completely tilled for crops such as corn.

A total of 12 point count locations were established on the site. Point count locations were spaced rather widely and none were within about 400 m of each other (Table 1, Figure 2). Each point count location was marked for future use and a GPS location was taken for all point count locations. Most species could easily be heard at distances out to 150-200 m or more, so most of the areas within the larger fields where turbines and roads between turbines would be constructed were included within the area surveyed. The point counts were, in most cases, widely distributed throughout the site. The areas not sampled were deemed not suitable for nesting by federally or Wisconsin endangered or threatened species. Similarly, these habitats are not likely to be suitable for Wisconsin species of special concern.

In some places, point counts were along roads, similar to the U.S.G.S. Breeding Bird Survey protocol, whereas in others, the observer (James Dowdell¹) walked for hundreds of meters to the point count locations.

The general locations of point counts were established prior to the site visit using the 2004 site visit and aerial photographs. During the 2004 site visit, habitat was examined throughout the site, facilitating site selection for the nesting bird study. The precise locations of the point counts were determined on May 25, 2006.

¹ The field technician, James Dowdell, is an experienced field technician who has more than two decades of experience observing and listening to forest and grassland birds in the United States. He is very knowledgeable regarding the songs and plumages of species that are likely to be encountered in fields and forests of central New York State. His expertise includes all North American bird species. Dowdell is contracted to conduct avian surveys (endangered and threatened species as well as more common species) for the New Jersey Department of Environmental Protection (Endangered and Nongame Species Program), the Nature Conservancy, Izaak Walton League, New Jersey Conservation Foundation, New Jersey Audubon Society, and other nonprofit environmental organizations. He was twice a member of the winning team of the World Series of Birding.

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While establishing the point counts, the field technician also examined the area for territorial displays and songs of rare, threatened, and endangered avian species. Actual point count survey research was conducted on three days (May 26, 27, and 28, 2006; Table2) during the peak nesting season for birds in this portion of Wisconsin. After the point counts were conducted on each day and while driving and walking between point count locations, searches were undertaken for rare, threatened and endangered birds. These searches focused on the best available habitat for these species within the Project boundary. Thus, additional hours were spent on these dates in an effort to find Wisconsin listed species and species of special concern.

The point count surveys and observations on other days commenced just before sunrise, when there was enough light to see birds and after they commenced singing. The earliest observations were made just before 05:00 hours EDT (Eastern Daylight Time) and the latest point count observations were made at about 10:15 hours EDT. Observations were made on the three dates listed above and were done in weather that was conducive to observing and hearing birds (no rain or strong wind). A total of at least 5 minutes was spent at each point count location on each of the three rounds of surveys. During that time the observer listened and looked for birds. This amount of time corresponds to the protocols used by the U.S.G.S. Breeding Bird Survey. Additional time was taken to record data on some occasions at point count locations.

For each bird seen or heard at each point count, a distance (in meters) and direction (one of eight cardinal points) was recorded. In addition, if birds were flying over the site that behavior was noted along with whether or not they landed nearby (only in the case of listed species and species of special concern).

During non-point count hours on site, birds were tallied as they were observed. These are called incidental observations. The purpose of these additional or incidental observations was to look for bird species that could have been missed on the point counts to provide a more complete characterization of the types of birds that nest mostly in or adjacent to the project site including in farm fields, woodlots, and wetlands on site. A separate list was recorded for incidentally observed species, as opposed to those seen during the two rounds of point counts. GPS coordinates were gathered for all listed species and species of special concern. Some of those locations are noted as distance and direction of a bird from a given point count location.

Results and Discussion

A diverse assemblage of species was observed during point count surveys and incidental observations at the Project site. A total of 98 bird species was observed at during the four days of observations in May 2006 (Tables 3 and 4). A total of 1,840 individual sightings of 80 species were observed during the actual point count surveys (Table 3). This means that 18 species of birds were present on the Project site and seen during non-point count observations (Table 4). These were not within about 200-300 m of the point count locations. One species, Chestnut-sided Warbler, was present at a point count site, but not seen during the period when incidental observations were being conducted.

It is likely that most of these species nest on or immediately adjacent to the Project site. It is likely that 91 of the 98 species nest on the project site or immediately adjacent to the site. Seven species observed do not likely nest on site: Great Blue Heron, Great Egret, Semipalmated Plover, Ring-billed Gull, Tennessee Warbler, Yellow-rumped Warbler, and Dark-eyed Junco, and possibly Northern Waterthrush. Whereas these species, with the exception of Semipalmated Plover nest in Wisconsin, the habitat at the Project site does not seem suitable for these species. Tennessee Warbler, Yellow-rumped Warbler, and Dark-eyed Junco generally nest to the north of Fond du Lac County.

Species composition of birds observed was dominated by songbirds, which accounted for 63 of the 98 (64.3%) species observed. There were 7 species of raptors (including Turkey Vulture) and 5 species of woodpeckers observed on site, along with 6 species of songbird like birds (cuckoos, doves, Chimney Swift, and Ruby-throated Hummingbird), and 5 species each of waterbirds (herons, Sandhill Crane, Sora), 3 waterfowl (Canada Goose, Mallard, and Blue-winged Teal), 3 species of shorebirds, 1 gull species, 1 owl species and 2 gamebirds (Wild Turkey, Ring-necked Pheasant).

Red-winged Blackbird was the most common species observed on site, accounting for nearly one-quarter (23.7%) of all birds observed during point counts. It was observed at all 12 point count locations and was common throughout the Project site. Five of the 80 species observed at point count locations, Red-winged Blackbird, Savannah Sparrow, European Starling, American Robin, and Song Sparrow accounted for somewhat less than one-half (46.1%) of all bird sightings on the point counts, yet these 5 species accounted for only 6.25% of the 80 species observed. These same species were observed at between 83.3% and 100% of all point count locations, showing that they were not only numerous at the Project site but that they were very widely distributed within the site.

The 10 most numerous species observed on the point count surveys accounted for nearly two-thirds of all bird sightings (1,137 of 1,840 sightings; 61.8%). These 10 species, however, accounted for only 12.5% of the 80 species observed at the point count locations. As with the 5 most numerous species, the other 5 species within the 10 most numerous species were observed at most of the point count locations (between 50.0% and

100% of all point count locations, showing that they too were very widespread within the Project site.

Most of the species found were common birds that nest and forage in grasslands, croplands, brushy areas, residential areas, forest edge, and, to a very small degree wetlands and forest interior habitats. That Song Sparrow, Common Yellowthroat, Red-winged Blackbird, American Robin, American Goldfinch, European Starling, Common Grackle, and House Sparrow are so well represented on the point counts, suggests the Project site is a highly fragmented habitat with lesser representation of large grassland or forested tracts. Thus, 8 of the 10 most often observed species are species that nest in forest edge and brushy situations. These birds are also often associated with residential areas that have some brush or treed areas. They are not considered to be sensitive or species of concern.

That there are Bobolink and Savannah Sparrow, and to a lesser degree Red-winged Blackbird and Common Yellowthroat among the 10 most common species at the Cedar Ridge site, also suggests that there are grassland habitats available for species that specialize in grasslands. It is important to note that Bobolink and Savannah Sparrow are adapted to smaller grasslands than are the birds of western and Midwestern prairies such as Upland Sandpiper, Grasshopper Sparrow, meadowlark, Vesper Sparrow, Horned Lark, among others. Upland Sandpiper and Grasshopper Sparrow were not present on site, suggesting that the grassland like habitats on site are not large enough or of sufficient quality for these species. The fact that there were some Horned Larks, Eastern Meadowlark, Vesper Sparrow, and Eastern Meadowlark present suggests that the grassland-like habitats at the Cedar Ridge site are in some way suitable for these grassland nesting species.

Overall, the species list (Tables 3 and 4) has relatively few species that are either dwell in larger forests or in forest interior situations (American Redstart, Ovenbird, Rose-breasted Grosbeak, Scarlet Tanager, and Wood Thrush). None of these species account for more than 1% of sightings and in aggregate, these 5 species account for less than 2% of all sightings. It is noteworthy that Rose-breasted Grosbeak is more tolerant of smaller woodlots and edge and Red-eyed Vireo is sometimes considered a forest interior bird, although it apparently thrives in smaller forests and near edges. Some of the species listed above in this paragraph may have been migrants as the migration season was still underway at the time this study was conducted.

Many of the other nesting species on site nest in forest edge and brush habitats. For example, orioles, thrasher, cowbird, Chestnut-sided Warbler, Chipping Sparrow, various woodpeckers, doves, towhee, kingbird, some flycatchers, wrens, cardinal, sparrows, grackle, etc.). That there are this many forest edge and brush species present and the fact that they are present at so many point count situations, strongly suggests forest and grassland fragmented habitats on site.

No federally endangered or threatened species were found at the point count locations nor were these species observed incidental to conducting point counts or

moving within the Project site and surrounding areas. It is highly unlikely that any federally listed species nest on or adjacent to the Project. This was reported in the avian risk assessment (Kerlinger 2005) and confirmed by observations of birds and habitat during the May 2006 surveys.

Although no Wisconsin endangered species were observed during this study, two Wisconsin threatened species (Table 5) were observed. A single Red-shouldered Hawk was observed flying northward over the Project site on May 28, 2006. That bird was an immature bird and could still have been migrating. Great Egret was observed at point count #3 (near turbine #29) during a point count survey and was later observed nearby along Mink Road Ponds. It was foraging. There are no known heronries nearby. This bird could have been nesting at a site to the south of the Project site near the Theresa Marsh. These birds are colonial nesters, with other Great Egrets or herons (usually not including Great Blue Heron) and if a heronry were present on site, it would have been fairly obvious to the trained observer.

Seven species of special concern (Table 5) in Wisconsin were observed during point count surveys and incidental observations. These species included Dickcissel, Great Blue Heron, Northern Harrier, Orchard Oriole, Red-headed Woodpecker, Tennessee Warbler, and Yellow-billed Cuckoo. All, but the Tennessee Warbler are likely to nest on or near the Project site. That species has a more northerly breeding distribution and nest from northern Wisconsin into the boreal forest (Hughes 1999), across Canada. Wisconsin represents the southern terminus of this species, which is very common throughout its normal range (Table 5). The species is rated as an "S1" species in Wisconsin, which means it is critically imperiled, with fewer than 5 occurrences in the state. It will be present in Fond du Lac County during both spring and fall migration and individuals will be spread anywhere in the county. Those individuals will mostly be from the much larger population that is found in Canada, with those individuals not being rated as species of special concern.

Other facts about the rarity and status of these species of concern both in Wisconsin and beyond are provided in Table 5. All of the species of concern are globally secure, but appear to be relatively rare in Wisconsin. Dickcissel is mostly a grassland nesting bird that has declined throughout parts of its range. It is rated as an "S1" species (Table 5) in Wisconsin, being rare and only having 21-100 occurrences in the state. The three individuals found suggest that this species may be more common in Wisconsin than previously believed. Agricultural practices, including removal of prairies and suitable vegetation by intensive farming are thought to be responsible for its decline. In addition, central Wisconsin is near the northern terminus of its range (Temple 2002), which may also explain why it is not more common.

Great Blue Heron was observed incidentally on site. It is another globally secure species that is thought to be rare in the state, with "21-100 occurrences." This seems bizarre in light of the Breeding Bird Atlas results that show the species is likely nesting in virtually every county in the state. This species does not likely nest within the Project

boundary, but probably nests nearby. The presence of this species on site is likely to occur on a regular basis, with individuals coming from nesting areas nearby to forage.

Orchard Oriole is another "S3" species that is near the northern terminus of its distribution (Scharf and Kren 1996). By definition, birds at or near the boundary of their distribution are generally rare. The finding of 7 individuals at the Project site is surprising because "S3" species are thought to be represented by only "21-100 occurrences." Seven individuals would, therefore, represent about 7% to 33% of the state's population of this species. Because the habitat at the Project site is no different than the habitat for many miles surrounding the site and throughout southern and central Wisconsin, it is likely that this species is far more numerous than suggested by the species of special concern status. Evidence for this comes from the Wisconsin Breeding Bird Atlas which suggests the bird nests in, at least, 43 counties in the state.

Northern Harrier, another "S3" species, was observed both at one point count location and during incidental survey work. The species undoubtedly nests locally and one nesting location appeared to be at turbine number 19. The species will forage in agricultural fields.

Red-shouldered Hawk is somewhat more abundant in Wisconsin and is rated "S3-S4" which means it is "rare" to "apparently secure" in the state. Habitat within the project area is generally not suitable for nesting by this species, except perhaps in the wooded swamp near the center of the Project site. No nesting birds were observed and the single individual observed was in immature plumage (not sexually mature) so it was not a nesting bird. It was apparently flying northward, perhaps in migration?

Red-headed Woodpecker, rated as an "S3" species in Wisconsin was observed at one point count location. The species uses forests with open understory, or oak savannah type habitats. It does not seem to be a rare species within Wisconsin, despite its official status. The Breeding Bird Atlas shows a broad distribution of this species, with only about 5 (perhaps 7) counties in the state not having probable or confirmed nesting records. These birds will be present in forested areas and will fly across openings between forests in which it forages and nests. It is probably nesting within the Project boundary.

Yellow-billed Cuckoo, rated as an "S3" species in Wisconsin is close to the northern terminus of the species' distribution (Hughes 1999). It likely nests within the Project boundary in brushy areas and forest edges. It will generally be confined to forested areas and edges, and not use farm fields as foraging or nesting areas. None were found at point count locations, but one was noted a short distance away.

Assessment of Impacts to Nesting Birds

Risk of Mortality or Injury Due to Collisions

Turbine collision mortality involving the species that nest in the open fields, forest edge, and brushland at the Project site is likely to be minimal. Fatalities at wind power facilities rarely involve forest or edge nesting species during the nesting season (Erickson et al. 2001, Howe et al. 2002, Kerns and Kerlinger 2003). A majority of species that nest in forest, forest edge, and brush at the Project site rarely fly above the treetops during the nesting season. These species would, therefore, not likely be at rotor height (about 125-400 feet [~40-122m] above the ground). Most of the species that nest on site spend their time below or only a few feet above the forest canopy during the nesting season. The time these birds may fly above the treetops at rotor swept height is during dispersal in later summer and during migration.

There are some exceptions. A few species engage in aerial displays or forage at heights that are within the range of rotors. Those that do so that nest on or near the project site include swallows, Red-tailed Hawk, Turkey Vulture, American Kestrel, Northern Harrier (Wisconsin species of concern), and Horned Lark. Biologically significant impacts to these species are not expected given the low collision rates reported for species like vultures at wind farms in the Altamont, California area, where dozens of these birds nest and forage regularly. Many of these species are present at several western, eastern, and Midwestern wind power facilities, including the 31 turbine wind power project in northeastern Wisconsin, the 89 turbine Top of Iowa project, and the Buffalo Ridge project in Minnesota. Yet, very few individuals of these species are killed by turbines.

Red-tailed Hawks and American Kestrels nest on the Project site. These species are known to be at greater risk of colliding with turbine rotors (Erickson et al. 2001, Orloff and Flannery 1992, 1996, Curry & Kerlinger 2006 [recent findings from High Winds project in California]). At eastern and Midwestern sites however, very few of these birds collide with wind turbines. At the Mountaineer project site on Backbone Mountain in northern West Virginia, a single Red-tailed Hawk was killed by the turbines. At other wind projects in farmland in the Midwestern and eastern United States, very few individuals of these species have been killed (Kerlinger 2001, 2002, Nicholson 2002, Johnson et al. 2002, Koford et al. 2005). These findings suggest that impacts to these species will not likely to be biologically significant at the Cedar Ridge site.

Northern Harriers have been killed in very small numbers at wind power sites, and do not seem terribly susceptible to collisions, even at sites where they are present year-round and where there are large numbers of turbines (Orloff and Flannery 1992, 1996). Use of locations such as the Altamont and High Winds sites in California, as well as their presence in the grasslands of the Buffalo Ridge in Minnesota suggest that they are not highly susceptible to collisions. During courtship displays, however, these birds fly to more than 100 feet above the landscape and "sky dance," putting them at greater risk of collision. While hunting these birds tend to fly low, usually less than 100 feet

above the ground. Risk to this species has yet to be documented or suggested to be significant, although there are few studies where turbines are located within harrier territories where sky dancing occurs.

Horned Larks are likely to be at greater risk than other species. These birds have aerial displays that involve circling upward to >100 feet above the ground, while emitting vocalizations. It is believed that because of this behavior, Horned Larks are the bird most commonly killed at wind turbines in farmland settings. This was the case at the State Line Project in Washington-Oregon, where 42% of all fatalities were Horned Larks (Erickson et al. 2003). Other projects, such as the Ponnequin project in Colorado have also reported that Horned Larks were killed in larger numbers than any other species. It should be remembered that Horned Larks are very common in native prairie states and the impacts from wind turbines have not been considered biologically significant. For example, at the Ponnequin site, perhaps two dozen Horned Larks are killed each year by wind turbines from a state population that numbers about 2 million nesting birds (Kingery 1998). Rich et al. (2004) have estimated that there are slightly less than about 100 million Horned Larks in North America. Biologically significant risk is not likely at these sites.

Northern Harrier, a Wisconsin species of special concern, nests are sometimes mowed during the process of harvesting hay. Horned Larks, Vesper Sparrows, as well as most other grassland nesting birds (Bobolink, Savannah Sparrow, Red-winged Blackbird, Upland Sandpiper, Sedge Wren, etc.) are also routinely killed as farmers mow their nests, including eggs, young, and even adults that remain on nests during the haying process. In Wisconsin alone, in part because of three to four hay cuttings per year, hay mowing probably accounts for tens of thousands of bird deaths annually, despite the fact that such killing violates state and federal law. The species composition of species killed during grass mowing includes both common and rare species. Some of the grassland nesting birds that are killed during hay mowing at sites in and around Fond du Lac County could be state listed species such as the threatened Henslow's Sparrow, and species of special concern including Upland Sandpiper, Northern Harrier, Grasshopper Sparrow, perhaps Dickcissel, and perhaps others.

Experience from other farmland situations suggests that few nesting birds are likely to collide with turbines at the Cedar Ridge project and such collisions are not likely to be biologically significant. The impact of such fatalities on Horned Larks may be larger than for other species because of the relatively small numbers at the site. However, the impacts will be very local and unlikely to jeopardize the population of these and other species in Fond du Lac and adjoining counties.

While it is possible that a small number of listed species or species of special concern may collide with turbines, the likelihood is rather remote. Neither Red-shouldered Hawk nor Great Egret is present on the site enough to put them at significant risk. The same is the case for species of special concern.

Risk of Habitat Disturbance and Displacement of Nesting Birds

Studies conducted at other wind power sites have demonstrated that species from different habitats react in different ways to the presence of tall structures, including wind turbines. Grassland and open country birds in particular are disturbed and displaced to varying degrees by wind turbines. A study of several nesting songbird species in Minnesota, on Conservation Reserve Program grasslands showed that some species avoided the area within 100 or more meters of turbines (Leddy et al. 1999). In Wyoming, Mountain Plovers would generally not nest within 200 m of turbines (Johnson et al. 2000). At the Ponnequin Wind Energy Facility in Colorado, Horned Larks foraged directly beneath turbines and that species, along with Western Meadowlarks foraged near the bases of turbines in the Altamont of California. Similarly, anecdotal information from upstate New York and Pennsylvania (personal observations) shows that Bobolinks may not be displaced greatly by wind turbines placed in hay and alfalfa fields. Some grassland birds in the Altamont Pass Wind Resource Area also perched on lattice turbine towers (Curry & Kerlinger, LLC observations), strongly suggesting these birds were not greatly disturbed by these structures or that they habituated to the presence of such structures over a decade or more.

A pattern similar to that found in Minnesota (Leddy et al. 1999) was found among Golden Plover and some geese in Europe (Larsen and Madsen 2000). Golden Plovers stopping over in migration would not forage within several hundred meters of operating wind turbines in farm fields. Geese, however, foraged closer to turbines. Some shorebirds, including Purple Sandpipers, showed a different pattern from golden plovers and did not avoid the area directly beneath turbines on jetties in the sea at Blythe Harbor, UK. In Denmark, Pink-footed Geese foraged less within about 100 m of turbines, whereas Barnacle Geese would forage within 25-50 m of turbines, demonstrating slightly different patterns among closely related species (Larsen and Madsen 2000; see Kerlinger 2005 risk assessment for a more complete list of references and examples). For open country birds, the pattern varies among species and there seems to be evidence that some species can and do habituate to turbine presence. It will be several years before these patterns can be determined with certainty because habituation sometimes requires several generations to be manifested.

Forest nesting birds have been studied in North America only at the Searsburg, Vermont. At that mixed conifer-hardwood forest site, disturbance from habitat modification and turbine presence was found to be minimal, although a few species were reported to avoid the clearings where the turbines were located. Although Blackpolls, White-throated Sparrows, Dark-eyed Juncos and some others sang in close proximity to the forest edge and the turbines one year after construction, other species, most notably Swainson's Thrush, seemed to move away from the turbine areas and deeper into the forest. Whether they moved away from the clearing or the turbine is not known. The Searsburg site was not studied long enough or intensely enough to provide clear answers, although the fact that several species occupied the forest within 20-30 m of the turbines during the post-construction surveys strongly suggests that some species do habituate to the presence of wind turbines and clearings in the forest. A long-term study at that site

and other forested wind power sites would provide insight into whether or not these birds do habituate and how much they habituate to turbines. Such a study would also provide insight as to which species habituate and which are displaced permanently.

Because forest nesting birds have a canopy over their heads, it is conceivable that tall structures like wind turbines do not cause undue adverse disturbance and do not displace birds great distances. It is also possible that some habituation to the turbines may occur over time. The Searsburg site also did not show major fragmentation impacts (Kerlinger 2002) including invasion/colonization by Brown-headed Cowbirds and American Crows. However, some edge species, fragmentation indicator species, were more numerous in the year after the forest was partially cleared for turbines and roads.

The construction of turbines at the Project site is likely to disturb and displace some species of open country birds. The actual construction process, during which earth is moved and heavy equipment is present, along with large numbers of workers, some species may be displaced from territories within 100 or more meters of construction activity. This disturbance will vary by species, but should be limited mostly to the period of active construction and shortly thereafter. The degree of disturbance will be lessened if construction occurs in the latter part or after the nesting season. These impacts will probably be ephemeral in that after construction equipment and workers leave the site and habitats are restored to farmland or left fallow, birds will return to much of the areas previously inhabited during the nesting season. In tilled agricultural fields, there may be no impacts because far fewer birds use these habitats as opposed to non-tilled habitats. Because many of the turbines in the Project are in tilled fields, impacts in those fields will likely be minimal or nonexistent. Ironically, the clearing of fields for roads and turbine areas will attract species that prefer nearly barren surfaces, including Horned Lark and Killdeer. The latter species will even nest on gravel and bare dirt.

Clearing for roads and turbines and the presence of tall turbines after construction will likely cause some disturbance to and displacement of some nesting species. Forest nesting birds and birds of forest edge are not likely to be disturbed to the degree that open country, grassland nesters will be disturbed for the reasons listed above. Some of the latter species do not appear to respond favorably, at least in the short term, to tall structures that break the open "prairie" skyline. As was stated previously, the degree of impact is likely to vary among species with some ignoring turbines and others leaving the area within a few hundred meters of turbines. However, habituation may occur over the course of several years, but the rate and degree of habituation if it occurs is unknown.

The birds that are likely to be displaced most are obligate grassland nesting species that are onsite including Bobolink, Horned Lark, Savannah Sparrow, Vesper Sparrow, Eastern Meadowlark, and perhaps some others. Some of these species were present in reduced numbers close to turbines at the Buffalo Ridge project site in southwestern Minnesota (Leddy et al. 1999). Densities of these and a few other species in aggregate were found to be lower within 180 m of turbines as opposed to farther away. These species did nest near turbines, but their numbers were approximately one-half at 40 m from a turbine the numbers at about 80 m from the turbines. From 80 to 180 m the

numbers doubled again and beyond about 180 m, the numbers did not seem to be significantly impacted. This means that within an area of about 0.5 ha. surrounding each turbine (40 m radius) the density of some nesting species will be only about one-quarter the density about 200 m out from the turbine. Within about 80 m, an area of about 2.0 ha, around each turbine, nesting density would be about ½ of nesting densities beyond about 180-200 m. From these figures, a rough idea of the overall reduction in nesting birds in the entire project area may be calculated. However, because these birds nest at reduced densities in tilled agricultural fields like those at the Project site, there are unlikely to be impacts at turbine locations in these types of fields at Cedar Ridge.

It is significant that the Leddy et al. (1999) and other studies did not address habituation. Ideally, a habituation study would examine the gradient in abundance of birds going out from turbines in the year after construction and then again at later dates. To examine habituation, the gradients could be examined at intervals of 5 years out to 10 or 15 years following construction. Because wind power is so new to most habitats, we may not know for a decade whether or not habituation actually occurs and the degree of that habituation.

Overall, there is unlikely to be displacement of any listed species or species of concern that were found at or near the Project site, with the possible exception of Northern Harrier and Dickcissel. Northern Harriers apparently nests near turbine number 19. Northern Harriers are a species of concern and they could be displaced farther from the turbines.

Displacement of Great Egret and Red-shouldered Hawks is unlikely because neither nest on or near turbine locations. Similarly, Great Blue Herons and Tennessee Warblers, species of special concern, do not nest on site and, therefore, will not be displaced. Displacement of other species of special concern, such as Red-headed Woodpecker, Yellow-billed Cuckoo, and Orchard Oriole is possible but unlikely because their nesting locations are in forested areas, rather than in open fields. Furthermore, such displacement is not likely to be biologically significant because it will not impact populations of these species within Wisconsin.

Note. The long-term viability of grassland nesting bird populations in Wisconsin, including those species that nest within the Project area is in jeopardy. Farmland, including hay and alfalfa fields that are suitable for grassland nesting birds is currently being mowed in a fashion that removes large numbers of birds from locally nesting populations. Because of the geographically large scale of this impact, it is possible that the regional impacts to populations of these grassland nesting species is occurring. That three to four hay cuttings per year occurs over such a large geographic area strongly suggests that this single impact may be responsible for the decline of many species. These impacts suggest that displacement of nesting species by wind turbines may be a moot issue because their nesting efforts will only be in vain. Hay cutting simply eliminates all or most nests from cut fields.

Recommendations

The following recommendations are made to reduce disturbance to and displacement of grassland nesting species resulting from wind turbine construction at the Cedar Ridge site.

- To reduce habitat disturbance and impacts, habitat restoration (including tilled agricultural areas) surrounding the turbines, meteorology towers, roads, and other infrastructure should be implemented as soon as possible after construction is completed.
- A post-construction fatality study would be helpful for understanding whether avian species that nest in or adjacent to farm fields with wind turbines collide with turbines in numbers that could impact local populations.

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Table 1. GPS locations for nesting bird study point counts at the Cedar Ridge Wind Power Project, Fond du Lac County, Wisconsin. Point counts #1 through #12 (see Figure 1) are the locations chosen for conducting point counts and are mostly in fields or near the locations where turbines would be located. Some point counts were placed to survey habitat that appeared to be suitable or marginally suitable to threatened or endangered species, or Wisconsin Species of special concern. “T” indicates wind turbine was at or nearby, with number given being number of turbine in site plan.

| Point Count | Latitude-Longitude | Habitat |
|--------------------|----------------------------|---|
| #1 | N 43°41.862 W 088°19.981 | Agricultural and plowed; T-36 |
| #2 | N 43°41.637 W 088°19.697 | Agricultural and plowed; T-38 |
| #3 | N 43°42.480 W 088°18.557 | Agricultural, plowed, near wetlands and woods; T-29 |
| #4 | N 43° 42.088 W 088 °17.696 | Agricultural and plowed; T-33 |
| #5 | N 43°43.586 W 088°17.455 | Grassland nearby, cut hay/alfalfa, plowed, agricultural; T-12, 13 |
| #6 | N 43°43.404 W 088°18.051 | Extensive grassland/hayfields; T - 11 |
| #7 | N 43°43.064 W 088°17.693 | Agricultural, hayfields, wetlands, shrub and sedge meadow; T-11, 12 |
| #8 | N 43°43.593 W 088°19.247 | Large agricultural fields, hay and plowed, small fallow field, small pond, nearby woodlot |
| #9 | N 43°44.089 W 088°18.960 | Agricultural, alfalfa, plowed; T-24, 5 |
| #10 | N 43°43.436 W 088°20.608 | Hayfields, fallow field, comm. tower, abandoned farmhouse; T-16 |
| #11 | N 43°42.958 W 088°19.557 | Agricultural, hay, wet meadow, pasture; T-18 |
| #12 | N 43°42.390 W 088°19.841 | Pasture, alfalfa, some plowed and corn stubble, nearby woodlot; T-17 |

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Table 2. Summary of dates, times, and weather conditions (temperature, wind direction and speed, and percent cloud cover) for breeding bird point counts conducted at the Cedar Ridge Wind Power Project, Fond du Lac County, Wisconsin. Weather conditions are temperature in degrees Fahrenheit, wind direction (one of eight+ cardinal directions, miles per hour), cloud cover (CC = percent of sky covered), and precipitation (if it occurred). Second set of times were for intensive searches for listed species and species of concern, after point counts were surveyed. Asterisks indicate point counts conducted on these dates.

| Date | Time Start-End | Weather Conditions |
|---------------|--------------------------|---|
| May 25, 2006 | 10:30-18:30 | Wind – W-10-15, 68-72 F, CC = 40-100%; rain in p.m. |
| May 26, 2006* | 05:15-10:00, 10:00-17:00 | Wind – N-NW-5-10, 58-70° F, CC=100-40%, fog – clearing; rest of day clear and warm |
| May 27, 2006* | 05:15-10:05, 10:05-15:00 | Wind – S-5-10, 58-75° F, CC = 50%, clear; rest of day clear and warm |
| May 28, 2006* | 04:55-09:40, 09:40-12:30 | Wind – SE-5-10, 65-80° F, CC = 70%; warm and clear for rest of day, CC = 20, ~85° F |

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Table 3. List of species, numbers of sightings (from visual observations and vocalizations heard) detected at the 12 point count locations at the Cedar Ridge Wind Power Project site, Fond du Lac County, Wisconsin, during three days (three rounds) of surveys on May 26, 27, and 28, 2006. Number/Percentage is the total number seen during the point count surveys/percentage of all birds seen during point count surveys. Frequency/Percentage is the number of point count locations at which a species was observed/percentage of all 12 point counts at which the species was observed. T = Wisconsin threatened species; SC = Wisconsin species of special concern.

| Species | Number/Percentage | Frequency/Percentage |
|--------------------------|--------------------------|-----------------------------|
| Alder Flycatcher | 1 - 0.05% | 1 pt. - 8.25% |
| American Crow | 29 - 1.57% | 10 pts. - 83.33% |
| American Goldfinch | 46 - 2.49% | 12 pts. - 100% |
| American Kestrel | 3 - 0.16% | 2 pts. - 16.67% |
| American Redstart | 2 - 0.10% | 1 pt. - 8.25% |
| American Robin | 97 - 5.26% | 12 pts. - 100% |
| Baltimore Oriole | 14 - 0.76% | 9 pts. - 75.00% |
| Barn Swallow | 26 - 1.41% | 5 pts. - 41.66% |
| Black-capped Chickadee | 5 - 0.27% | 3 pts. - 25.00% |
| Belted Kingfisher | 1 - 0.05% | 1 pt. - 8.25% |
| Brown-headed Cowbird | 39 - 2.11% | 9 pts. - 75.00% |
| Blue Jay | 13 - 0.70% | 7 pts. - 58.33% |
| Bobolink | 67 - 3.63% | 6 pts. - 50.00% |
| Brewer's Blackbird | 1 - 0.05% | 1 pt. - 8.25% |
| Brown Thrasher | 9 - 0.48% | 5 pts. - 41.66% |
| Blue-winged Teal | 2 - 0.10% | 1 pt. - 8.25% |
| Canada Goose | 11 - 0.59% | 1 pt. - 8.25% |
| Cedar Waxwing | 5 - 0.27% | 2 pts. - 16.67% |
| Chipping Sparrow | 29 - 1.57% | 9 pts. - 75.00% |
| Cliff Swallow | 1 - 0.05% | 1 pt. - 8.25% |
| Common Grackle | 49 - 2.66% | 10 pts. - 83.33% |
| Cooper's Hawk | 2 - 0.10% | 2 pts. - 16.67% |
| Common Yellowthroat | 51 - 2.77% | 11 pts. - 91.75% |
| Chestnut-sided Warbler | 3 - 0.16% | 1 pt. - 8.25% |
| Dickcissel - SC | 3 - 0.16% | 2 pts. - 16.67% |
| Downy Woodpecker | 3 - 0.16% | 3 pts. - 25.00% |
| Eastern Bluebird | 11 - 0.59% | 5 pts. - 41.66% |
| Eastern Kingbird | 17 - 0.92% | 6 pts. - 50.00% |
| Eastern Meadowlark | 31 - 1.68% | 8 pts. - 66.67% |
| Eastern Phoebe | 2 - 0.10% | 1 pt. - 8.25% |
| European Starling | 108 - 5.86% | 10 pts. - 83.33% |
| Eastern Wood Peewee | 7 - 0.38% | 5 pts. - 41.66% |
| Great-crested Flycatcher | 6 - 0.32% | 2 pts. - 16.67% |
| Gray Catbird | 12 - 0.65% | 6 pts. - 50.00% |
| Great Egret - T | 1 - 0.05% | 1 pt. - 8.25% |
| Green Heron | 5 - 0.27% | 2 pts. - 16.67% |
| House Finch | 2 - 0.10% | 2 pts. - 16.67% |

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| Species | Number/Percentage | Frequency/Percentage |
|----------------------------|--------------------------|-----------------------------|
| Horned Lark | 21 - 1.14% | 5 pts. - 41.66% |
| House Sparrow | 75 - 4.07% | 6 pts. - 50.00% |
| House Wren | 19 - 1.03% | 7 pts. - 58.33% |
| Indigo Bunting | 35 - 1.90% | 10 pts. - 83.33% |
| Killdeer | 38 - 2.06% | 11 pts. - 91.75% |
| Mallard | 9 - 0.48% | 2 pts. - 16.67% |
| Mourning Dove | 36 - 1.95% | 11 pts. - 91.75% |
| Northern Cardinal | 24 - 1.30% | 10 pts. - 83.33% |
| Northern Flicker | 11 - 0.59% | 7 pts. - 58.33% |
| Northern Harrier - SC | 1 - 0.05% | 1 pt. - 8.25% |
| Orchard Oriole - SC | 7 - 0.38% | 3 pts. - 25.00% |
| Ovenbird | 1 - 0.05% | 1 pt. - 8.25% |
| Rose-breasted Grosbeak | 6 - 0.32% | 5 pts. - 41.66% |
| Red-bellied Woodpecker | 9 - 0.48% | 5 pts. - 41.66% |
| Red-eyed Vireo | 8 - 0.43% | 3 pts. - 25.00% |
| Red-headed Woodpecker - SC | 1 - 0.05% | 1 pt. - 8.25% |
| Ring-necked Pheasant | 10 - 0.54% | 6 pts. - 50.00% |
| Rock Pigeon | 15 - 0.81% | 3 pts. - 25.00% |
| Red-tailed Hawk | 7 - 0.38% | 5 pts. - 41.66% |
| Ruby-throated Hummingbird | 1 - 0.05% | 1 pt. - 8.25% |
| Red-winged Blackbird | 437 - 23.7% | 12 pts. - 100% |
| Rough-winged Swallow | 2 - 0.10% | 1 pt. - 8.25% |
| Sandhill Crane | 29 - 1.57% | 10 pts. - 83.33% |
| Savannah Sparrow | 125 - 6.78% | 11 pts. - 91.75% |
| Scarlet Tanager | 2 - 0.10% | 2 pts. - 16.67% |
| Semipalmated Plover | 1 - 0.05% | 1 pt. - 8.25% |
| Sedge Wren | 5 - 0.27% | 1 pt. - 8.25% |
| Sora | 1 - 0.05% | 1 pt. - 8.25% |
| Song Sparrow | 82 - 4.45% | 12 pts. - 100% |
| Spotted Sandpiper | 6 - 0.32% | 2 pts. - 16.67% |
| Swamp Sparrow | 3 - 0.16% | 2 pts. - 16.67% |
| Tennessee Warbler - SC | 1 - 0.05% | 1 pt. - 8.25% |
| Tree Swallow | 17 - 0.92% | 1 pt. - 8.25% |
| Turkey Vulture | 2 - 0.10% | 1 pt. - 8.25% |
| Vesper Sparrow | 15 - 0.81% | 6 pts. - 50.00% |
| Warbling Vireo | 9 - 0.48% | 4 pts. - 33.00% |
| White-breasted Nuthatch | 1 - 0.05% | 1 pt. - 8.25% |
| Willow Flycatcher | 7 - 0.38% | 1 pt. - 8.25% |
| Wilson's Snipe | 1 - 0.05% | 1 pt. - 8.25% |
| Wild Turkey | 22 - 1.19% | 5 pts. - 41.66% |
| Wood Thrush | 2 - 0.10% | 2 pts. - 16.67% |
| Yellow Warbler | 19 - 1.03% | 5 pts. - 41.66% |
| Yellow-throated Vireo | 3 - 0.16% | 2 pts. - 16.67% |
| Total | 1,841 | |

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Table 4. List of species detected, via visual observations and vocalizations, incidental to conducting point counts in late May 2006, at the Cedar Ridge Wind Power Project, Fond du Lac County, Wisconsin. This list includes species not encountered during the point count surveys at point count locations. These species were detected while establishing the point count locations, during intensive searches for state listed species and species of concern after morning point counts were conducted, and while moving from point count to point count locations. These observations constitute incidental sightings. All but a few of these species likely nest on or adjacent to the Project site. T = Wisconsin threatened, SC = Wisconsin species of special concern. Asterisk indicates species was not seen during point counts.

| | | |
|-----------------------------|--------------------------|------------------------|
| Great Blue Heron - SC* - NB | Willow Flycatcher | Scarlet Tanager |
| Great Egret – T - NB | Alder Flycatcher | Chipping Sparrow |
| Green Heron | Least Flycatcher* | Clay-colored Sparrow* |
| Turkey Vulture | Eastern Phoebe | Field Sparrow* |
| Canada Goose | Great-crested Flycatcher | Vesper Sparrow |
| Mallard | Eastern Kingbird | Savannah Sparrow |
| Blue-winged Teal | Yellow-throated Vireo | Song Sparrow |
| Northern Harrier – SC | Warbling Vireo | Swamp Sparrow |
| Cooper’s Hawk | Red-eyed Vireo | Dark-eyed Junco* |
| Red-shouldered Hawk – T* | Blue Jay | Northern Cardinal |
| Broad-winged Hawk* | American Crow | Rose-breasted Grosbeak |
| Red-tailed Hawk | Horned Lark | Indigo Bunting |
| American Kestrel | Tree Swallow | Dickcissel - SC |
| Ring-necked Pheasant | N. Rough-winged Swallow* | Eastern Meadowlark |
| Wild Turkey | Bank Swallow* | Bobolink |
| Sora | Cliff Swallow | Red-winged Blackbird |
| Sandhill Crane | Barn Swallow | Brewer’s Blackbird |
| Semipalmated Plover | Black-capped Chickadee | Common Grackle |
| Killdeer | White-breasted Nuthatch | Brown-headed Cowbird |
| Spotted Sandpiper | House Wren | Orchard Oriole - SC |
| Wilson’s Snipe | Sedge Wren | Baltimore Oriole |
| Ring-billed Gull* - NB | Blue-gray Gnatcatcher* | House Finch |
| Rock Pigeon | Eastern Bluebird | American Goldfinch |
| Mourning Dove | Veery* | House Sparrow |
| Black-billed Cuckoo* | Wood Thrush | |
| Yellow-billed Cuckoo – SC* | American Robin | |
| Eastern Screech Owl* | Gray Catbird | |
| Chimney Swift* | Brown Thrasher | |
| Ruby-throated Hummingbird | European Starling | |
| Belted Kingfisher | Cedar Waxwing | |
| Red-headed Woodpecker – SC | Tennessee Warbler - SC | |
| Red-bellied Woodpecker | Yellow Warbler | |
| Downy Woodpecker | Yellow-rumped Warbler* | |
| Hairy Woodpecker* | American Redstart | |
| Northern Flicker | Ovenbird | |
| Eastern Wood Pewee | Northern Waterthrush* | |
| | Common Yellowthroat | |

Table 5. Wisconsin state endangered, threatened, and species of concern observed during the May 2006 breeding bird surveys at the proposed Cedar Ridge Wind Power Project site, Fond du Lac County, Wisconsin. PC = Point Count, I = Incidental. * indicates the species is likely nesting within the Project boundary.

| Species | State Status/Global Status | North American Population | Number Observed on Point Counts | Point Count or Incidental | Notes |
|-----------------------|----------------------------|---------------------------|---------------------------------|---------------------------|---|
| Dickcissel | SC/S3B/G5 | 22 million* | 3 | PC and I | Nesting Locally |
| Great Blue Heron | SC/S3B/G5 | No source | 0 | I | Nests Nearby? |
| Great Egret | T/S1B/G5 | No source | 1 | PC and I | Migrant/Foraging |
| Northern Harrier | SC/S3B/G5 | 455,000* | 1 | PC and I | Nesting Locally |
| Orchard Oriole | SC/S3B/G5 | 3.7 million* | 7 | PC and I | Nesting Locally |
| Red-headed Woodpecker | SC/S3B/G5 | 2.5 million* | 1 | PC and I | Nesting Locally |
| Red-shouldered Hawk | T/S3-S4B/G5 | 825,000* | 0 | I | Migrant – immature bird moving over area to north |
| Tennessee Warbler | SC/S1B/G5 | 62 million* | 1 | PC and I | Migrant – no suitable habitat present |
| Yellow-billed Cuckoo | SC/S3B/G5 | 8.5 million* | 0 | I | Nesting Locally |

“G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery”

“S1 = Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.”

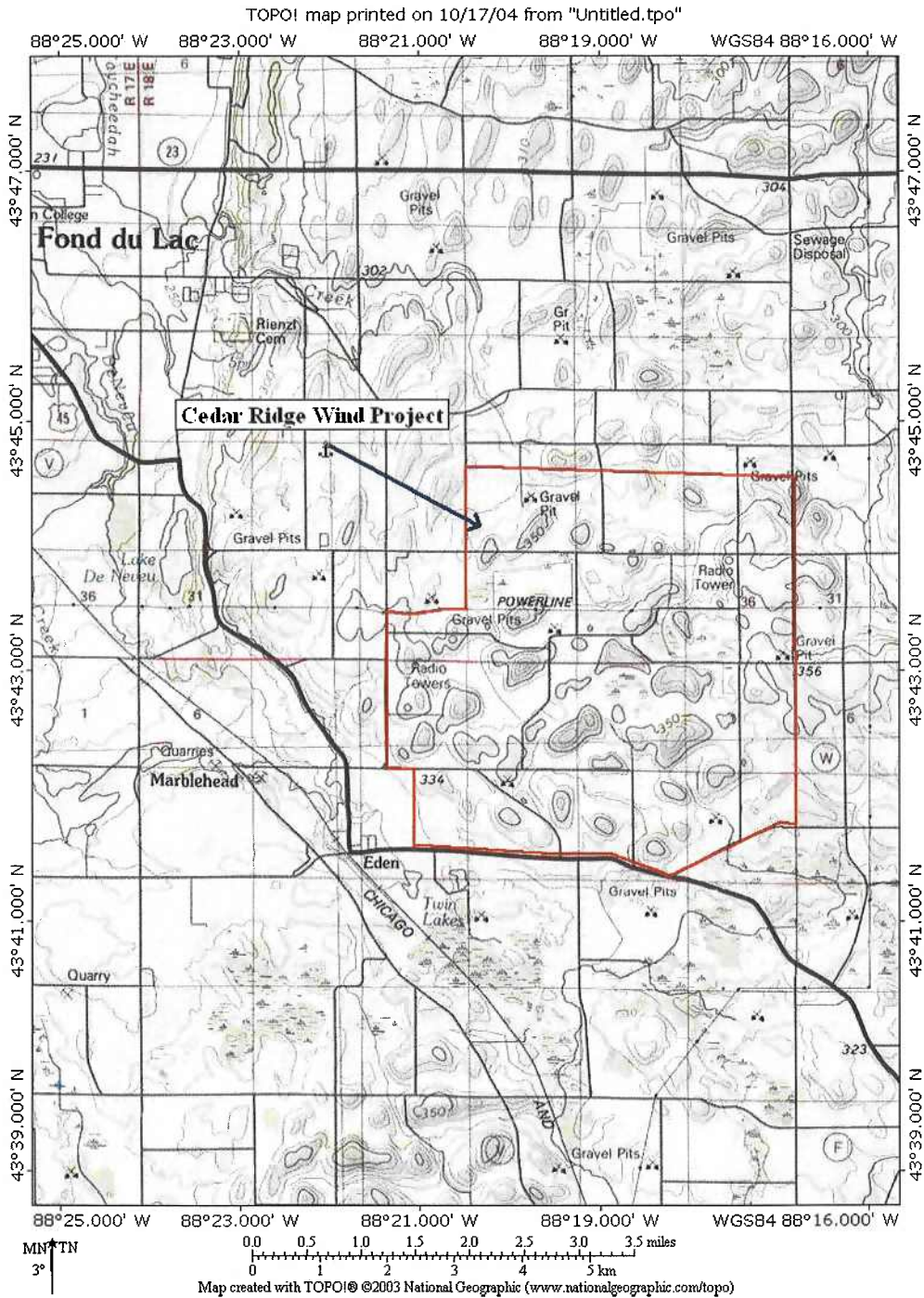
“S3 = Rare or uncommon in Wisconsin (21 to 100 occurrences).”

“S4 = Apparently secure in Wisconsin, with many occurrences.”

Source for status in Wisconsin: http://www.dnr.state.wi.us/org/land/er/working_list/taxalists/key.htm

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Figure 1. Map showing the location and boundaries of the Cedar Ridge Wind Power Project site, Fond du Lac County, Wisconsin.



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Figure 2. Location of the Cedar Ridge Wind Power Project in Fond du Lac County, Wisconsin. Red line is the outside Project boundary within which turbines would be located. Numbers indicate point count locations. For GPS coordinates, see Table 2.

