EFFECTS OF WIND TURBINES ON NESTING RAPTORS AT BUFFALO RIDGE IN SOUTHWESTERN MINNESOTA

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ABSTRACT

Raptor surveys were conducted at the Buffalo Ridge Wind Resource Area (BRWRA) in southwestern Minnesota during the summers of 1994-95 to determine whether the nesting habits of locally breeding raptors were influenced by the presence of wind turbines. Red-tailed and Swainson's hawks, American kestrels, and northern harriers were the primary species recorded during surveys. Raptor abundance (raptors/10 km) was consistent between years of our study (2.08 in 1994, 2.07 in 1995) and was comparable to abundances reported for similar habitats in the region. Average raptor nest density (nests/100 km^2) for the 2 years on lands surrounding the windplant was 5.94. All raptor nests (n=31) within the 293 km^2 BRWRA were found on lands where wind turbines were absent (261 km^2) despite the presence of abundant treebelt and riparian habitat within the 32 km^2 windplant facility. We recommend that areas providing extensive raptor nesting habitat be avoided in future selections of windplant construction sites.

INTRODUCTION

Recent technological advances in equipment designed to harness windpower has made the cost of electricity from windpower generating plants competitive with that of electricity derived from fossil fuels. In response to decreased production costs, the windpower industry is expanding from California into the eastern United States and Canada, as well as Latin America (Nelson and Curry 1995). Although renewable energy resources such as windpower have received strong public support, impacts of wind turbines on avian communities have not been adequately researched. Avian mortality from collisions with wind turbines varies greatly from little or no mortality (Byrne 1983, Winkelman 1985 and 1990, Higgins et al. 1995) to substantial mortality (McCrary et al. 1983, Orloff and Flannery 1992). In addition to direct mortality from collisions, research also has indicated that bird densities surrounding turbines were lower compared to densities in similar habitats outside the vicinity of turbines (Leddy et al. 1999). The objective of this study was to determine

whether the nesting habits of breeding raptor populations in southwestern Minnesota were influenced by the presence of wind turbines. We hypothesized that raptor nest densities within a newly constructed windplant site would not differ from those in the surrounding area.

STUDY AREA AND METHODS

The Buffalo Ridge Wind Resource Area (BRWRA) in southwestern Minnesota is located along a 100 km segment of the Bemis Moraine that begins 3 km northeast of Holland, Minn., and extends 10 km northwest of Lake Benton, Minn. Elevation is 546-610 m. The 293 km^2 BRWRA is comprised of a 32 km^2 windplant and 261 km^2 of lands surrounding the windplant. The windplant within the BRWRA contains 73 wind turbines. The additional lands (261 km^2) within the BRWRA have been leased as future wind turbine development sites. Raptor breeding habitat within the BRWRA consists of deciduous treebelts and riparian woodlands in ravines comprising 3% of the landscape. Habitats other than woodlands include agricultural crops (i.e., corn *(Zea mays),* soybeans *(Glycine max),* and small grains), hay and pasturelands, and Conservation Reserve Program grasslands.

Raptor surveys were conducted biweekly (10 June to 14 September) or weekly (15 September to 26 October) ($\underline{n}$=13) in 1994 and weekly (22 March to 26 October) ($\underline{n}$=30) in 1995 along a survey route (Higgins et al. 1995) within the BRWRA to determine species composition and relative abundance of raptors. We recorded the number and species of raptors seen while driving at 40 kph along a 69 km survey route that bisected the BRWRA. Surveys began 2-3 hrs after sunrise. The north-south starting points for surveys were alternated to reduce biases associated with diurnal raptor activity patterns. We calculated relative abundance of raptors/10 km of survey route by dividing the number of raptors seen during all surveys within each year by 6.9.

Raptor nest searches also were conducted during April-May 1994 and 1995 to determine the location and species composition of breeding raptors on the BRWRA. We scanned all shelterbelts and woodlands for raptor nesting activity from all available roads within the BRWRA using spotting scopes and binoculars. Potential raptor nests were monitored weekly until nests became occupied or tree foliage obstructed our vision of the site. Location and species were recorded for all active raptor nests.

RESULTS

A total of 187 raptors representing 6 species were recorded during 13 road surveys in 1994 (Table 1). In 1995, 428 raptors representing 7 species were recorded during 30 road surveys (Table 1). Red-tailed hawks, northern harriers, and American kestrels constituted 86% of all raptors seen in 1994 and 77.1% of all raptors seen in 1995. The relative abundance of raptors per 10 km along the survey route was 2.08 in 1994 and 2.07 in 1995 (Table 1). Fifteen occupied raptor nests representing 4 species were found on the BRWRA in 1994 (Table 2). In 1995, 16 occupied raptor nests of 3 species were found

Table 1. Total number and relative abundance (sightings/10 km) of raptors recorded during summer 1994 (n=13 surveys) and 1995 (n=30 surveys) along a 69 km road survey route at the Buffalo Ridge Wind Resource Area near Lake Benton, Minnesota.

	Total Numbers		Raptor Abundance (sightings/10 km)	
Species	1994	1995	1994	1995
All Species Combined	187	428	2.08	2.07
Red-tailed hawk *(Buteo jamaicensis)*	81	164	0.90	0.79
Northern Harrier *(Circus cyaneus)*	49	73	0.55	0.35
American Kestrel *(Falco sparverius)*	30	93	0.33	0.45
Swainson's hawk *(Buteo swainsoni)*	19	37	0.21	0.18
Great horned owl *(Bubo virginianus)*	3	4	0.03	0.02
Ferruginous hawk *(Buteo regalis)*	2	0	0.02	----
Rough-legged hawk *(Buteo lagopus)*	0	5	-----	0.02
Cooper's hawk *(Accipiter cooperii)*	0	1	-----	0.01
Unknown hawks	2	51	0.02	0.25

(Table 2). Overall raptor nest density (nests/100 km^2) was 5.94 on lands surrounding the windplant facility (261 km^2) where wind turbines were absent (Table 2). No raptor nests were found on the 32 km^2 windplant facility where turbines were present.

DISCUSSION

Species composition and relative abundance of raptors were consistent between years during our surveys on the BRWRA and were comparable to those reported for similar habitats in eastern South Dakota (Norelius 1984). Nests of red-tailed and Swainson's hawks, the most common above-ground nesting raptors on the BRWRA, were usually found in treebelt habitat that provided secure nesting cover. During our surveys on the BRWRA, we found no evidence of raptor nesting activity within the 32 km^2 windplant facility despite the presence of treebelt and riparian habitat that was comparable to the lands (261 km^2) surrounding the windplant where raptor nests were found. Research at the BR-

Table 2. Number and density (nests/100 km2) of occupied raptor nests found within the 261 km² area surrounding the windplant facility on the Buffalo Ridge Wind Resource Area near Lake Benton, Minnesota, 1994-95.

	Raptor Nests			
	1994		1995	
Species	#	Density	#	Density
Swainson's hawk *(Buteo swainsoni)*	9	3.46	6	2.30
Red-tailed hawk *(Buteo jamaicensis)*	4	1.53	8	3.06
Ferruginous hawk *(Buteo regalis)*	1	0.38	0	-----
Great horned owl *(Strix nebulosa)*	1	0.38	2	0.77
Totals	15		16	
Overall Nest Density/year		5.74		6.13
Nest Density/years combined		5.94		

WRA has indicated that no raptor mortalities have occurred due to collisions with wind turbines (Higgins et al. 1995, Nelson and Curry 1995, Osborn et al. 2000). Although wind turbines have not caused direct mortality, the presence of wind turbines may be indirectly affecting local raptor populations by decreasing the use of suitable nesting sites. Recent studies in the Netherlands have indicated that the mere presence of wind turbines has prevented waterfowl and wading bird species from using otherwise suitable habitat near wind turbines (Winkelman 1990, Pedersen and Poulsen 1991). As the demand for wind generated power increases in the future, so will the demand for information concerning the effects of wind turbines on nesting and migrating birds. Potential windplant construction sites that provide extensive habitat for nesting raptors should be avoided until additional information is available.

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