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David S. Gilmer  
*US Fish and Wildlife*

John M. Wiehe  
*North Dakota State University - Main Campus*

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# Nesting by Ferruginous Hawks and Other Raptors on High Voltage Powerline Towers

David S. Gilmer  
U.S. Fish and Wildlife Service  
Northern Prairie Wildlife Research Center  
Jamestown, North Dakota 58401  
and

John M. Wiehe  
Department of Zoology  
North Dakota State University  
Fargo, North Dakota 58102

High voltage powerlines form a spider-web pattern across North Dakota as they radiate outward from electric generating sources at Garrison Dam and nearby lignite-fired power plants. In 1976 there were approximately 1100 miles of high voltage powerline in the state, which required approximately 4500 large steel or aluminum towers for support (G. R. Anderson, personal communication). Moreover, officials of power cooperatives and privately-owned utilities anticipate the construction of over 900 additional miles of high voltage lines by 1981. As North Dakota coal resources are developed the powerline network will probably continue to grow.

Our interest in powerlines was stimulated several years ago when we learned that raptors were nesting on towers supporting high-voltage lines maintained by the U.S. Bureau of Reclamation (USBR). To learn more about the use of towers by raptors we requested in 1973 that USBR personnel report all raptors and nests they observed on these structures during routine aerial inspections. In the spring of 1976 we were able to monitor closely a number of raptor nests built on powerline towers throughout North Dakota. Our objectives were to: (1) identify the raptor species using tower sites for nesting, (2) estimate the frequency of nest occurrence along selected powerlines, (3) report the success and productivity of these nests during the 1976 season, and (4) compare the productivity of nests constructed on towers to nests in non-tower sites.

## PROCEDURES

Aerial searches for nests on 230-kv powerline towers were conducted along five powerlines during mid-April, and early and late June, 1976. Three other lines were checked at less frequent intervals. Aerial line surveys made approximately every 2 months by USBR personnel provided supplementary data on nest locations. On-the-ground visits to the nest sites identified in the April aerial

search were conducted during mid-May to confirm species identification and location and status of the nest, and in mid-June to count the nestlings. Counts of raptors perched on towers or flying nearby were also recorded during each aerial survey. Just before the fledging period in late June we made an aerial survey to obtain a second count of nestlings. A ground visit to most nests was also accomplished just before fledging.

To minimize nest abandonment and egg damage (Olendorff 1973:58-59, Fyfe and Olendorff 1976), we did not approach incubating birds closer than about ¼ mile during our ground checks. During the nesting period, information was recorded at each nest site on the number and approximate age of young, nest construction, food remains, and surrounding land use. Visits to the nest were concluded as rapidly as possible to avoid prolonged exposure of young. Towers were climbed under the supervision of USBR personnel. Nests in non-tower situations were accessible without special equipment or with the aid of an aluminum ladder.

Several hours of flight time were devoted specifically to searching for non-tower nests, mostly in Kidder County. Low-level aerial searches were effective for locating hawk nests in most situations. Incubating birds in tower and non-tower nest sites did not appear to be disturbed by the aircraft.

## RESULTS

### Distribution and Status of Nests

Powerlines surveyed were located within the major biotic regions of North Dakota (Stewart 1975) and represented a total of 890 line-miles (Fig. 1). Ferruginous hawks (*Buteo regalis*), red-tailed hawks (*B. jamaicensis*), and great horned owls (*Bubo virginianus*) were observed to occupy tower nests. The greatest number of nests observed was 29 during late April (Table 1) of which 21 were occupied by ferruginous pairs. Kidder County accounted for the greatest percentage of tower nests (24 percent); the remaining nests were in six other counties in North Dakota and Campbell County, South Dakota. We did not observe any ferruginous hawks or great horned owls nesting in towers west of the Missouri River. Nests in towers constructed by red-tailed hawks were observed only along the Missouri River breaks and in the Badlands. No raptor nests were observed along 200 miles of USBR powerline between Jamestown and Fargo in 1976, although one nest was observed by USBR personnel in 1974. Much of the area traversed by the Jamestown-Fargo lines provided marginal habitat for most raptors because of intensive agriculture.

Of the 21 ferruginous hawk nests we examined, 16 were constructed in the center portion of the tower on horizontal structural members (Fig. 2). The other five were built in the corner of the structure where horizontal and vertical supports were bolted together (Fig. 3). The height of nests ranged from 16 to 55 feet ( $\bar{X}$  = 36 feet). The highest ferruginous hawk nest found in South Dakota by Lokemoen and Duebbert (1976) was 48 feet in a tree.

We observed five red-tailed hawk nests of which four were constructed near the peak of the tower in large cross-member structures (Fig. 4) at heights exceeding 90 feet. The other pair constructed a nest 25 feet above the ground.

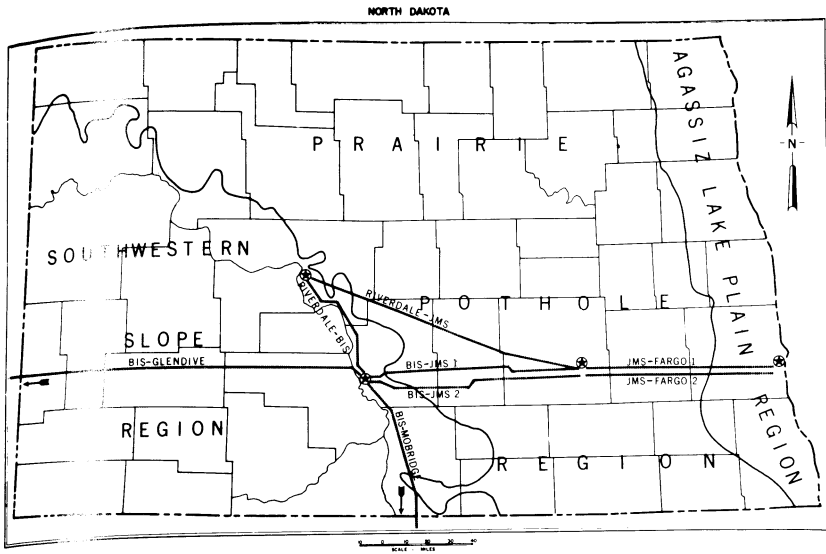


Figure 1. USBR powerline routes searched for raptor nests in 1976 in relation to the biotic regions (Stewart 1975) of North Dakota.

Table 1. Distribution and status of raptor nests constructed on USBR powerline towers monitored during the 1976 nesting season.

Powerline	Ferruginous hawk		Red-tailed hawk		Great horned owl	
	Successful	Total	Successful	Total	Successful	Total
Bis.-Jms. #1	2	2	0	0	0	0
Bis.-Jms. #2	4	7	0	0	0	0
Riverdale-Jms.	2	5	0	0	0	1
Riverdale-Bis.	3	3	0	1	1	1
Bis.-Mobridge	1	4	1	1	1	1
Bis.-Glendive	0	0	2	3 <sup>1</sup>	0	0
Jms-Fargo #1	0	0	0	0	0	0
Jms-Fargo #2	0	0	0	0	0	0
Total	12	21	3	5	2	3

<sup>1</sup>One nest may have been inactive.

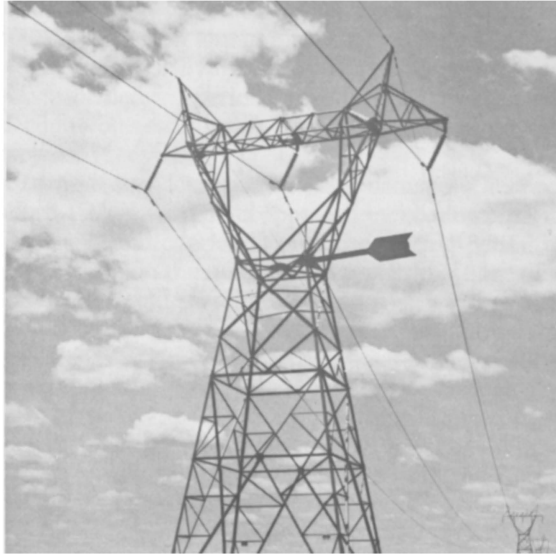


Figure 2. A ferruginous hawk nest (arrow) constructed in a 230 kv powerline tower in Kidder County. The ferruginous was the most common raptor nesting in towers in North Dakota. Most nests were constructed in the center of the tower where horizontal steel support members crossed at right angles. The height of this tower was approximately 100 feet.



Figure 3. Ferruginous hawk nestlings approximately 40 days old in a tower nest between Bismarck and Mobridge, S.D. This nest was constructed in one corner of the tower where horizontal and vertical stanchions were bolted together.



Figure 4. Nests constructed near the top of towers (arrow) were typical of most red-tailed hawk nests we observed. This pair of red-tails was nesting in the North Dakota Badlands. Coulees containing trees were features common to the vicinity of towers with red-tailed hawk nests.

Great horned owls used nests that had been constructed by ferruginous hawks the previous year. Three owl nests were observed (Fig. 5), two in the center of the tower and one in the corner at heights ranging from 16 to 55 feet.

Ferruginous hawk nests tended to occur in clusters along some portions of the powerlines (Fig. 6). Five nests were found in a 10 mile-segment of powerline between Bismarck and Jamestown (Bis-Jms #2); the closest spacing between these nests was 0.8 mile. One nest of the five was abandoned but all others, including the most proximate two, were successful. Average spacing between ferruginous nests was approximately 23 miles along the five lines where these nests were observed. Lokemoen and Duebbert (1976) found nests separated by a minimum distance of about 0.9 miles. One ferruginous nest was located 0.4 mile from a great horned owl nesting on an adjacent tower (possibly the nest of the ferruginous pair the previous year). Both nests were successful. The closest tower nesting red-tailed and ferruginous hawks was 2.6 miles.

Several nests were blown out of structures. High winds accompanying a storm that passed through North Dakota on 11-12 June 1976 probably accounted for the loss of fledglings in five nests (4 ferruginous, 1 red-tailed). During ground checks conducted 14-17 June we observed 11 nestlings (9 ferruginous, 2 red-tailed) that had died from injuries caused by falling or from exposure. Four nests had been completely blown out of towers. Only a portion of a fifth nest remained.

In the spring and summer of 1975, USBR personnel observed a total of 23 raptor nests. Of these, 12 were still present in the spring of 1976 of which 11 were occupied. Some of these nests may have been freshly reconstructed on the

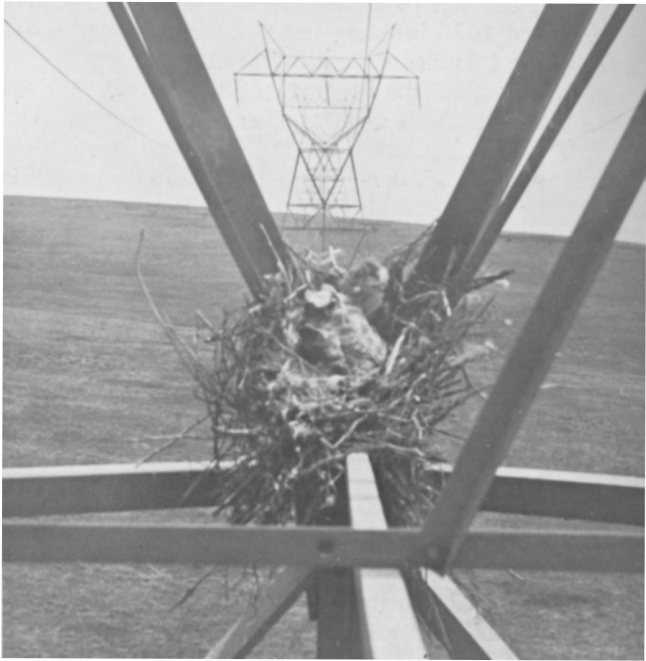


Figure 5. A great horned owl nest containing a large nestling in a tower near the Missouri River.

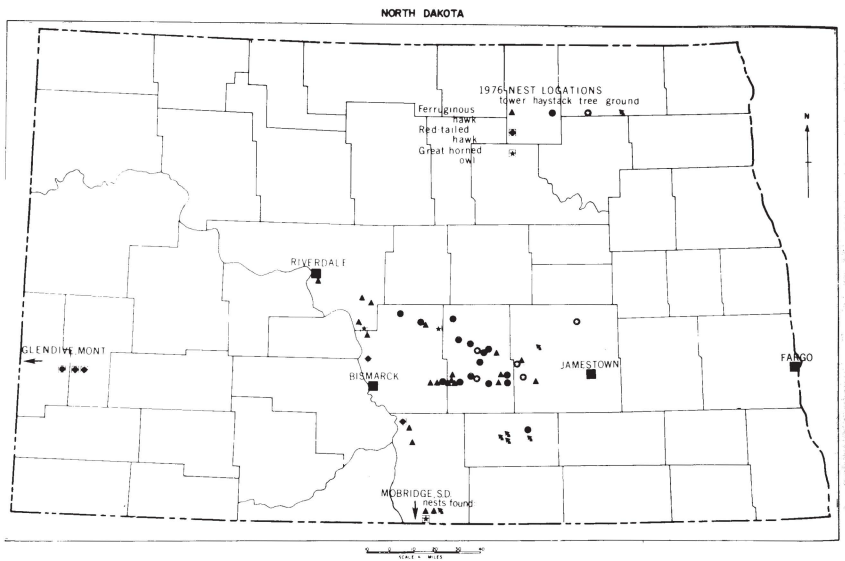


Figure 6. Approximate location of raptor nests observed during the 1976 breeding season.

original towers before our first 1976 survey. Of the 11 nests that were destroyed between the 1975 and 1976 breeding seasons, 3 new tower nests were constructed in 1976 within 1.5 miles of the site of a destroyed nest.

Based on our observations the Bis-Jms #2 and Riverdale-Jms lines had the highest combined rates for hawk and nest observations (Table 2). These lines were mainly within the southeastern half of the Missouri Coteau, where breeding ferruginous hawks are most commonly observed (Stewart 1975:94-95).

Table 2 Ferruginous hawks perched on or flying near USBR powerline towers and nests constructed on these structures observed during aerial surveys conducted in April and June 1976.

Powerline	No. of surveys	Avg. no. hawks/100 mi.	No. nests/100 mi.
Bis.-Jms. #1	3	7.3	2.0
Bis.-Jms. #2	3	12.3	7.0
Riverdale-Jms.	3	13.8	3.8
Riverdale-Bis.	3	6.7	4.3
Bis.-Mobridge	3	5.9	4.4
Bis.-Glendive	1	2.5	0
Jms.-Fargo #1	2	0	0
Jms.-Fargo #2	2	0	0

### Productivity of Ferruginous Hawks

In addition to the 21 ferruginous hawk nests found on towers, we were able to locate 24 nests in non-tower situations during the spring of 1976 (Fig. 5). Many were within 0.25 mile of powerline towers. Nests on haystacks were easily located, as were nests in trees, but the latter may be confused with Swainson's (*Buteo swainsoni*) and red-tailed hawk nests (ground checks were the only way to confirm species in many instances). Ground nests were less frequently encountered but were usually located where certain physiographic features were present. The ground nests we observed were in extensive tracts of unbroken prairie. In these situations pairs typically nested on rock outcroppings near the crest of a hill. Tree nests were usually in an isolated tree or small cluster of trees in large open areas. Two tree nests were within 300 yards of the Interstate Highway (I-94).

Hedging success of nests according to substrate is summarized in Table 3. The tower nests we found probably represent a majority of those built on these structures in North Dakota and adjacent areas in South Dakota. Our data, while not indicative of the proportion of the ferruginous hawk population that nest in these various sites, demonstrate the range of nest sites selected. Ferruginous nests



Table 3. Fledging success of ferruginous hawk nests according to nesting substrate (1976 breeding season).

Nest substrate	Total nests found	Percent nests fledging young	Counties where located <sup>1</sup>
Tower	21	57	Stutsman, Kidder, McLean, Burleigh, Emmons, Campbell (S.D.)
Haystack	15	87	Kidder, Logan, Burleigh
Ground	5	60	Logan, Campbell (S.D.)
Tree	4	100	Stutsman, Kidder
Total	45	71	

<sup>1</sup>North Dakota unless otherwise stated.

in North Dakota have been found in a wide range of sites (Stewart 1975, Bry 1976). In northern South Dakota ferruginous hawks most commonly nested in trees or on the ground; a few nests were found on haystacks (Lokemoen and Duebbert 1976). Data collected on breeding raptors in Colorado (Olendorff 1973:123) indicated that ferruginous hawks were the most versatile of those studied with regard to nest placement.

The success of nests constructed in trees and on haystacks was very high, although the number of tree nests we located is small. Haystacks appear to be a good nesting substrate. Such sites provided some protection from predators, were rarely destroyed by windstorms, and provided a large platform on which young could grow and move about without the crowding we observed in some tree and tower nests. High winds caused the loss of three tower nests but only one haystack nest. Young were hatched in thirty-six (80 percent) of the 45 ferruginous nests we monitored, compared with 63 percent reported by Lokemoen and Duebbert (1976). Fledging success of nests in our study was 71 percent.

Based on one year of data, our preliminary findings (Table 4) indicated that tower nesting ferruginous pairs laid slightly larger clutches (3.7 eggs/nest) than birds nesting in other sites (3.2 eggs/nest).

Because of nest loss during windstorms and loss of young due to crowding conditions encountered as the nestlings grew older and increased in size and mobility, the number of young fledged per tower nest was lower (2.5 young fledged/nest) than in other nests (2.8).

## DISCUSSION

Our observations indicated that a portion of the breeding population of raptors in North Dakota accept powerline towers as nesting sites. Productivity of these nests in 1976 appeared to be good but affected to some extent by the incidence and severity of high winds during the nesting period. Nest site preference of ferruginous hawks is difficult to assess because so many variables are involved,

Table 4. Productivity of ferruginous hawk nests observed in 1976.

	Substrate	
	Tower	Other <sup>1</sup>
Number of occupied nests	21	24
Nests containing eggs	19	23
Eggs <sup>2</sup> /nest containing eggs	3.7	3.2
Young/nest containing eggs	3.5	2.9
Young fledged <sup>3</sup> /nest containing eggs	2.5	2.8

<sup>1</sup>Includes nests constructed in trees (4), haystack (15), ground (5).

<sup>2</sup>Minimum estimates based on spring ground check observation and post-hatch evidence.

<sup>3</sup>Based on observations within one week of fledging.

particularly because nests at other sites may have been overlooked and because of possible differences in preferences among pairs. In several instances we observed ferruginous pairs nesting on haystacks and in a tree immediately adjacent to towers, suggesting a preference for non-tower sites. On the other hand we noted pairs that selected towers for nesting when other nearby sites appeared equally suitable. Perhaps some pairs may alternate between towers and other sites. A host of intriguing questions remain unanswered at this time. Are young that are raised in tower sites likely to construct nests in towers in subsequent years? What are the long-term effects of high voltage electrical fields on the productivity and survival of these birds? Does the use of towers by ferruginous hawks for nesting sites reflect the deterioration of traditionally used nesting habitats as suggested by Olenhoff (1973: 134), who felt that habitat destruction caused by extensive cultivation may have resulted in a shift from ground nesting to tree nesting by ferruginous hawks in Colorado? Answers to most of these questions will be obtained only through long-term investigations.

It is too early to tell whether raptors benefit by nesting in towers, although these structures do provide security from some predators that have access to non-tower sites. Artificial nesting platforms constructed on USBR powerline towers may reduce the loss of nests due to high winds. Nesting platforms on transmission line structures in Idaho have been proposed for large raptors (Nelson and Nelson 1976). We have observed several new types of towers being constructed in North Dakota that may provide a secure nesting platform without modification. One must also consider the hazards to birds caused by towers, e.g., collisions with wires (Krapu 1974) and illegal shooting while birds are perched on these structures (Nelson and Nelson 1976). Mortality caused by electrocution (Boeker 1974) is a problem on some lines but has not been observed on the 230-kv powerline towers described in this study.

Trends in the number of ferruginous pairs nesting on towers will be interesting to follow in the future. Non-tower and tower sites suitable for nesting by ferruginous hawks appear to be abundant in most areas we observed. The availability and extent of grassland habitat is probably the most important factor influencing population levels of raptors breeding in North Dakota.

We thank personnel of the U.S. Bureau of Reclamation for their cooperation in providing nest and hawk observations and assistance in examining nests constructed in towers; particularly we are grateful to H. H. Pedersen, J. L. Johnson, A. R. Klaus, W. W. Williams, G. L. Jernigan, D. E. Colis, and L. Wandler. Suggestions in manuscript preparation were made by D. H. Johnson, J. W. Grier, J. T. Lokemoen, and H. H. Pedersen.

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