

## STATUS AND ATTEMPTED REINTRODUCTION OF BURROWING OWLS IN MINNESOTA, U.S.A.

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**ABSTRACT.**—Burrowing Owls (*Athene cunicularia*) have been recorded nesting in most of Minnesota's western counties. Considered common in the early 1920s, by the mid-1960s only 9–10 breeding pairs were known with estimates of no more than 20 pairs in the west-central part of the state. Ten breeding records exist for the period 1965–85. In 1984, Burrowing Owls were listed as Endangered by the State of Minnesota. In 1986, we began surveys and site management for nesting Burrowing Owls and experimented with a reintroduction program. From 1986–90, 13 nests were found at eight sites, with a mean reproductive success of 3.5 fledglings/pair. The maximum number of breeding pairs/yr was four. Nest burrows were found in alfalfa fields (37.5%), pastures (37.5%), roadside ditches (12.5%), and fencelines between row crop fields (12.5%). We released 105 wild, preflighted juveniles: nine in 1986, 18 in 1987, 21 in 1988, 27 in 1989, and 30 in 1990. Young owls were kept in hack pens with roofs and sides made from cotton mesh fish netting. Burrows inside each pen and in surrounding fields were available to the owls. Crippled adults were placed in each pen with the juveniles but were not released. We documented eight mortalities, all of which were fledglings recovered in the release area. No owls were found, or reported, after leaving their hack sites. No successful nestings occurred from 1992–98.

**KEY WORDS:** *Burrowing Owl*; *Athene cunicularia*; *reintroduction*; *status*; *endangered species*; *Minnesota*.

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Estado y reintroducción fallida de Búhos Cavadores en Minnesota, U.S.A.

**RESUMEN.**—Los Búhos Cavadores (*Athene cunicularia*) han sido registrados anidando en la mayoría de condados del occidente de Minnesota. Considerado común a principios de 1920, para la mitad de los 60's únicamente se conocían 9–10 parejas reproductoras con un estimativo de no mas de 20 parejas en la parte oeste-central del estado. Diez registros de reproducción existían para el periodo 1965–85. En 1984, los Búhos Cavadores fueron puestos en la lista de especies en peligro para el estado de Minnesota. En 1986, nosotros iniciamos prospecciones, el manejo de un sitio para anidación de Búhos Cavadores y experimentamos con un programa de reintroducción. De 1986–90, 13 nidos fueron encontrados en ocho sitios, con una media en el éxito reproductivo de 3.5 volantones por pareja. El máximo numero de parejas reproductoras/año fue cuatro. Las cuevas nido fueron encontradas en campos de alfalfa (37.5%), pastos (37.5%), zanjas de carreteras (12.5%) y líneas de cercas entre las filas de los campos de cultivo (12.5%). Nosotros liberamos 105 juveniles previamente adiestrados para volar: nueve en 1986, 18 en 1987, 21 en 1988, 27 en 1989, y 30 en 1990. Los jóvenes búhos permanecieron en encierros de caballos con los techos y los lados cubiertos con mallas de pescar hechas de algodón. Estuvieron disponibles para los búhos cuevas dentro de cada corral y en los campos circundantes. Los adultos lisiados fueron colocados en cada corral con los juveniles pero no se liberaron. Documentamos ocho muertes, cada una de las cuales fueron volantones recuperados en el área de liberación. Ningún búho fue encontrado, o reportado, después de abandonar sus sitios de encierro. No ocurrió ninguna nidada exitosa de 1992 a 1998.

[Traducción de Victor Vanegas y César Márquez]

Minnesota's western counties are at the eastern edge of the Burrowing Owl's (*Athene cunicularia*)

breeding range in North America, excluding the disjunct Florida population (*A. c. floridana*, Haug et al. 1993). The species was first recorded in Minnesota in July 1881, and there are historical nesting

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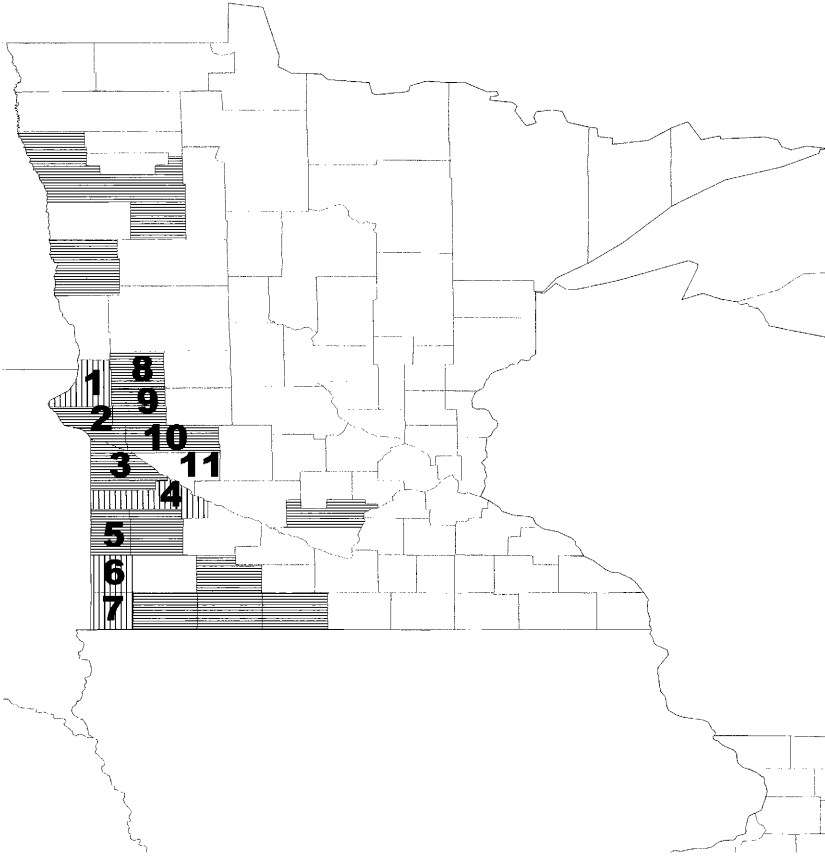


Figure 1. Minnesota counties with historical (1881–1886, horizontal hatch) and modern (1987–91, vertical hatch) Burrowing Owl nesting records. Counties: 1 = Traverse, 2 = Big Stone, 3 = Lac Qui Parle, 4 = Yellow Medicine, 5 = Lincoln, 6 = Pipestone, 7 = Rock, 8 = Grant, 9 = Stevens, 10 = Swift, 11 = Chippewa.

records for most of the state's western counties (Fig. 1). In the early 1920s Burrowing Owls were thought to nest commonly throughout Grant, Traverse, Pipestone, Lincoln, and Lac Qui Parle counties (counties 8, 1, 6, 5, 3; Fig. 1), as well as further north in the Red River Valley (Roberts 1932).

In the mid-1960s, Grant (1965) reported 9–10 breeding pairs in Stevens and Traverse counties, and estimated no more than 20 pairs of owls in the five-county area that included Stevens, Traverse, Grant, Big Stone, and Swift (counties 9, 1, 8, 2, 10; Fig. 1). Grant (1965) suggested the Burrowing Owl was no longer common in that part of the state. We found only 10 Minnesota breeding records for the 20-yr period from 1965–85 (Martell 1990). The species was state-listed as Endangered in 1984 (Coffin and Pfanmuller 1988).

To develop management strategies to recover

the species from its endangered status, we began to test reintroduction techniques (Martell 1990) and to survey for nesting Burrowing Owls in Minnesota in 1986. This paper summarizes methods and results of the reintroduction, as well as habitat use, population status, and reproductive performance of Burrowing Owls in Minnesota from 1986–98.

#### METHODS

**Monitoring of Wild Population.** To locate nesting Burrowing Owls, we solicited information from the public, conducted surveys in suitable habitat, and searched historical nest sites during the spring and summer of 1986–90. Less rigorous monitoring and public contact continued from 1991–98.

In 1986, bird clubs and conservation organizations were contacted, and television, radio, and newspaper interviews were used to increase public awareness and encourage reporting of Burrowing Owls seen in the state

Table 1. Location, habitat, and number of young fledged at nests of wild Burrowing Owls in Minnesota, 1987–91.

COUNTY	HABITAT	NUMBER OF YOUNG FLEDGED				
		1987	1988	1989	1990	1991
Pipestone	Alfalfa	≥3	≥3	≥3	—	—
Pipestone	Roadside	≥3	—	—	—	—
Rock	Pasture	—	≥2	5	≥2	—
Yellow Medicine	Fenceline	—	≥2	—	—	—
Traverse	Pasture	—	≥2	—	—	—
Rock	Alfalfa	—	—	8	7	—
Rock	Pasture	—	—	2	—	—
Rock	Alfalfa	—	—	—	5	≥2

In 1988, a color poster featuring Burrowing Owls was distributed statewide to solicit nesting reports. During the spring of 1989, 1000 black-and-white posters that requested reports of Burrowing Owls and Short-eared Owls (*Asio flammeus*) were distributed to Minnesota Department of Natural Resources (MNDNR) personnel and posted in public locations throughout western Minnesota. In both 1989 and 1990, 10 000 copies of this poster were mailed to farmers in the southwest region of the state. An additional 10 000 copies were mailed in the northwest region in 1990.

Between 17 May–7 June 1988, a 150-km route was surveyed through Lac Qui Parle, Chippewa, Big Stone, and Stevens counties (counties 3, 11, 2, 9; Fig. 1). This route encompassed the reintroduction area (Martell 1990) and the area where historical concentrations of Burrowing Owls were recorded (Grant 1965). The route was driven between 0600–1000 H, three times/wk. Using binoculars and a 15–60X spotting scope, we searched for owls in fields and along roadsides. In 1989 we surveyed 1000 km of roads in nine southwestern Minnesota counties. All occupied nest sites were visited in years subsequent to their use, and all public reports of owls were checked in all years.

Nest sites were mapped and entered into the State of Minnesota's Natural Heritage database. Land use and ownership were recorded for each nest. We calculated the number of fledglings as the maximum number of prefledged juveniles seen at a burrow, minus known mortality prior to fledging. Reproductive success was measured as the number of young fledged/pair.

Land management focused on protection and enhancement of nesting sites. We encouraged landowners to maintain fields used by nesting owls in their current rotation (e.g., alfalfa), or enroll those fields in federal agricultural set-aside programs. In fall 1989, 24 artificial burrows (Henderson 1984) were placed near natural burrows to provide alternate nest sites for returning pairs of owls or their offspring in future years.

**Reintroduction.** Young owls were obtained for reintroduction by trapping on black-tailed prairie dog (*Cynomys ludovicianus*) colonies on the Fort Pierre National Grasslands, located approximately 8 km south of Pierre, South Dakota. Juvenile owls were trapped using "Haug traps" (Haug 1985), consisting of a piece of clear Plexiglas attached by a hinge to a 30-cm section of black drainage

pipe (10 cm diameter). This was positioned in the burrow entrance with the door opening out, allowing owls to leave but not reenter their burrow. The area above and immediately around the burrow entrance was covered with a chicken wire cage, enabling us to capture the birds without their escaping.

Release sites were located within historical Minnesota nesting range. The sites were available for future Burrowing Owl management needs, allowed us to control unwanted human intrusion during the release, and could be managed and modified to suit the needs of the project. Owls were kept in hack pens made from cotton-mesh fisheries netting (1.5 cm diameter) strung along metal fence poles. Pens were approximately 7.6 m long  $\times$  5.5 m wide  $\times$  1.7 m high. Wooden artificial burrows (40 cm  $\times$  40 cm, Henderson 1984) were placed 0.6 m underground and connected to the surface by a wooden tunnel.

While in the hack pens, owls were fed dead laboratory mice and weanling rats daily. Daily feeding of mice, weanling lab rats, European Starlings (*Sturnus vulgaris*), and House Sparrows (*Passer domesticus*) then continued for 33 d post-release. To protect released juveniles from predation by Great Horned Owls (*Bubo virginianus*), we used adult Burrowing Owls as "parental models," increased the number of burrows around the site, and removed local Great Horned Owls under federal and state permits.

**Banding and Marking.** Wild and released juveniles were banded with a standard U.S.G.S. band and one red, yellow, or green leg marker (Martell 1990).

## RESULTS

**Monitoring the Wild Population.** Between 1987–91, 14 successful nestings were recorded at eight sites in four counties (Rock, Pipestone, Traverse, and Yellow Medicine, counties 7, 6, 1, 4; Fig. 1) in western Minnesota (Table 1). Four of the eight sites were used only once. The maximum number of nests found within any year was four (1988 and 1989). A minimum of 49 young was produced for a minimum reproductive rate of 3.5 young/pair.

Table 2. Number of Burrowing Owls released, mortality, and number of days seen after release.

YEAR	NO. OF OWLS RELEASED	NO. OF MORTALITIES	MINIMUM NO. OF DAYS SEEN POST-RELEASE
1986	9	3	1.5
1987	18	1	37
1988	21	0	21
1989	27	2	30
1990	30	2	15.5
Total	105	8	

No nesting Burrowing Owls were recorded in Minnesota from 1992 through 1998.

All new nest records between 1987–98 were reported by local citizens or MNDNR personnel responding to posters or personal contacts. No nesting Burrowing Owls were located during road surveys. Fledging occurred during the last two weeks of July. Two adults and one immature bird died during our study: the immature and one adult were killed by collisions with vehicles, and the cause of death for the other adult was unknown.

Land uses at the eight nest burrows were alfalfa fields (37.5%), pastures (37.5%), roadside ditches (12.5%), and fencelines between row crop fields (12.5%; Table 1). Seven of 14 nestings (50%) were in alfalfa fields and produced 32 young (63% of total). All but one of the nests were located on privately-owned land. One pair of owls fledged seven young from an artificial burrow the year after their natural burrow collapsed. The artificial structure was located in the same field, approximately 40 m from the original burrow.

**Reintroduction.** From 1990–96, we released 105 juvenile Burrowing Owls (Table 2). We documented eight mortalities at or near release sites. With the exception of 1996, almost all birds were seen well past fledging (Table 2). No birds were found or reported after they left their hack sites.

#### DISCUSSION

**Current Status and Reproductive Success.** The Burrowing Owl is currently listed as Endangered by the state of Minnesota. The number of nesting owls found from 1987–91 was the highest recorded in Minnesota since the mid-1960s (Grant 1965), but this was likely a result of our intensive searches. Lack of nesting from 1992–98, despite continued interest and monitoring of sites, leaves little doubt

that the population is extremely small. Therefore, Endangered status is justified in Minnesota.

Reproductive success recorded during this study (3.5 fledglings/pair) was similar to the historical estimate of 3.8 fledglings/pair for Minnesota (Grant 1965). Our results were also similar to other productivity estimates of 2.2 fledglings/pair in California (Thomsen 1971), 4.0 in North Dakota (Konrad and Gilmer 1984), 4.4 in Saskatchewan (Wedgwood 1976), and 4.9 in New Mexico (Martin 1973). In our opinion, these estimates suggest that Burrowing Owl population size in Minnesota is not limited by reproduction. Other factors, historical and current, probably have caused the population decline.

**Reasons for Population Decline.** Burrowing Owl populations have declined in other parts of their breeding range, where habitat loss, predation, and pesticides have been identified as important problems (Haug 1985, James and Espie 1997). In Minnesota, the population decline has been attributed to three factors: intensive cultivation of agricultural lands, plowing of native prairie and pastureland, and the decimation of burrowing mammals in the western part of the state (Grant 1965). However, Coffin and Pfammuller (1988) noted that suitable unoccupied habitat still seemed to exist in the state, a situation also noted for Endangered populations in Canada (De Smet 1997, Schmutz 1997, Wellicome 1997). The use of alfalfa fields by nesting Burrowing Owls in our study indicates that these birds may have some capacity to adapt to agricultural habitats provided that burrows are available.

Lack of suitable nest burrows may also contribute to the population decline in Minnesota. Burrow availability has been suggested as a factor limiting Burrowing Owl populations in other parts of the United States (Coulombe 1971, Zarn 1974). In Minnesota, Burrowing Owls have been reported to nest in burrows abandoned by badgers (*Taxidea taxus*) and Richardson's ground squirrels (*Spermophilus richardsonii*) (Roberts 1932, Grant 1965). We recorded no use of Richardson's ground squirrel burrows during our study, despite the presence of a large colony near the Rock County nest sites (B. Lane pers. comm.). Roberts (1932) stated that holes made by Minnesota's ground squirrels were too small to be used by Burrowing Owls until badgers enlarged them. Badgers may be a critical source of nesting burrows in Minnesota, a situation similar to that reported in Canada (Wellicome

1997) and in the Columbia Basin of Oregon (Green 1983).

Burrow and burrowing mammal (e.g., Richardson's ground squirrels, badgers) management may benefit Burrowing Owls in Minnesota. Artificial burrows are readily accepted by nesting pairs in other parts of their range (Collins and Landry 1977, Wellicome et al. 1997). Promotion of artificial burrow construction through a "Burrowing Owl Trails" program similar to that done for Eastern Bluebirds (*Sialia sialis*) and Wood Ducks (*Aix sponsa*) may benefit this species in Minnesota and in other parts of its range. However, with the current low population levels in Minnesota, location of burrows would be critical to success. Low priority should be given to this effort in Minnesota.

Causes of decline may also operate away from breeding areas. Burrowing Owls are migratory in the northern portion of their range (Bent 1938, Haug et al. 1993). No specific information exists on the migration routes or wintering areas of Minnesota Burrowing Owls. Based on nine band recoveries, Brenckle (1936) described the wintering range of the Northern Plains population as "central Texas and adjoining Oklahoma." Loss of grassland habitat in the wintering range has been suggested as the cause of decline in the midwestern population of Loggerhead Shrikes (*Lanius ludovicianus*) (Brooks and Temple 1990). This possibility also needs to be considered for Burrowing Owls.

Continued monitoring for Burrowing Owls in Minnesota is probably best accomplished through public contact. Landowner reluctance to report owls in some parts of their range (De Smet 1997) may argue against exclusive reliance on this means of locating breeding pairs. Publicity through posters, mailings, and media produced all nest reports during this study and seems to be an effective and efficient method for locating nesting pairs in Minnesota. Field surveys in areas traditionally used by Burrowing Owls were important to establish presence or absence of nesting owls. However, surveys proved ineffective in locating new sites.

**Feasibility of Reintroduction.** We suggest that reintroducing Burrowing Owls into western Minnesota is not a wise management strategy. The techniques used were successful in getting juvenile birds through the fledging stage, and we documented foraging, burrow use, and successful predator avoidance (Martell 1990), but no released owls returned to breed. Although the numbers of birds released was not large, enough were released

to expect some resightings in subsequent years. A return rate of 14% for fledglings was reported in British Columbia (Haug et al. 1993), although De Smet (1997) reported a return rate of only 3.5% from 538 wild-banded fledglings in Manitoba. Because we could not document any positive results from these translocations, we discontinued them.

**Conclusion.** Future conservation efforts for Burrowing Owls in Minnesota will depend on the status of the species and the priorities of Minnesota's Nongame Wildlife Program. Given the lack of recent breeding records and the uncertain future for this species in Minnesota, no management or research is planned beyond protection under current state and federal legislation (e.g., Migratory Bird Treaty Act, Minnesota Endangered Species Act). Should this situation change, habitat protection, management, and public education and cooperation will become important. Selective use of reintroduction may also be useful in enhancing these efforts (Martell 1990). Specific research needs include information on population demographics, migration, and winter ecology.

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