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Diet and Habitat Analysis of Barn Owls (*Tyto alba*)

Nesting at Ponca State Park

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The Barn Owl is among the most widespread of all birds occurring on six continents and in most of the lower 48 states (Marti et al. 2005). However, Barn Owl populations have declined in many parts of the U.S., especially in the Midwest. Barn Owls have been listed as endangered, threatened, species of concern, or species at risk in 17 states including Nebraska, Iowa and South Dakota (Marti et al. 2005). Sharpe et al. (2001) reported sightings in the 1990s in Cedar and Wayne Counties, both less than 50 miles from Ponca State Park. However, Barn Owls were not observed within 100 miles of Ponca State Park in two Nebraska Breeding Bird Atlas Projects, with the nearest confirmed nest in Nebraska over 200 miles away (Mollhoff 2016). In the South Dakota Breeding Bird Atlas Project II, the majority of confirmed nests were in the



Figure 1. The seven Barn Owl nestlings inside the nest site (photo by Bill Huser).

middle of the state in natural cavities along the Missouri River (Drilling et al. 2016). One nest was found along the Missouri River less than 50 miles from Ponca State Park. Drilling et al. reported that Barn Owls were considered common in South Dakota in cliff holes along the Missouri River below Gavins Point Dam. In Iowa where Barn Owls are listed as endangered, the Iowa Breeding Bird Atlas (1985-1990) reported only one confirmed nest and that was in the southern part of the state (Jackson et al. 1996). More recently, the Iowa Department of Natural Resources has sponsored a nest box program for Barn Owls with record numbers of nests reported including 17 nests in 2016 and 38 in 2017 (<http://www.iowadnr.gov/About-DNR/DNR-News-Releases/ArticleID/1603/Barn-Owl-Nesting-Bonanza>). Although Barn Owls were not found in northwest Iowa prior to 2017, nesting was confirmed in Sioux County, Iowa, in 2017. Barn Owl reports on ebird (<https://ebird.org>) from March-July 2015; the nearest sighting was over 100 miles away on the Yankton Reservation in South Dakota. Expanding the time period to 2000-2015 resulted in several reports nearer, most from near Gavins Point Dam in South Dakota.

In 2015 Barn Owls (*Tyto alba*) nested on the floor of a grain bin in Ponca State Park, Dixon County. Seven nestlings were observed (Figure 1). It is believed that 6 fledged (one carcass was found on the floor of the bin September 26). Barn Owls were not observed the following spring (Jan Johnson, personal communication). Because there are few records of Barn Owls in the region, we collected data to better understand the Barn Owl nesting in Ponca State Park. Barn Owl prey and their importance to reproductive success has been well documented (Marti et al. 2005; Gubanyi et al. 1991); therefore, we analyzed Barn Owl pellets to determine their prey and used GIS software to analyze prey habitat near the nest site.

Methods

On a field trip to Ponca State Park September 26 during the 2015 Nebraska Ornithologists' Union (NOU) fall meeting at South Sioux City, the junior author collected approximately 250 pellets from the Barn Owl nest site. The pellets were brought back to the biology lab at Concordia University and were analyzed in spring and summer 2016. Barn Owl pellets were dissected by soaking 5 pellets at a time in warm water and then teasing them apart to separate fur from bones. Small mammal skulls and jawbones were cleaned and used to identify prey items. Mammal prey were identified to taxon based on skull shape and dentition. *Peromyscus leucopus* (white-footed mouse) and *Peromyscus maniculatus* (deer mouse), both of which are expected in the diet, are difficult to distinguish based on skull shape and dentition and were listed as *Peromyscus* sp. Bird bones were present in the pellets, but were not identified to genus or species.

The Ponca State Park Barn Owl nest site was in the North Addition which is floodplain habitat along the Missouri River. The Missouri River bounds the floodplain to the north, east, and southeast and deciduous forest foothills bound the floodplain on the west side. A 768 ha rectangle (approximately 1898 acres or 3 mi²) was drawn mostly within the floodplain (Figure 2) with the nest site roughly in the middle. The

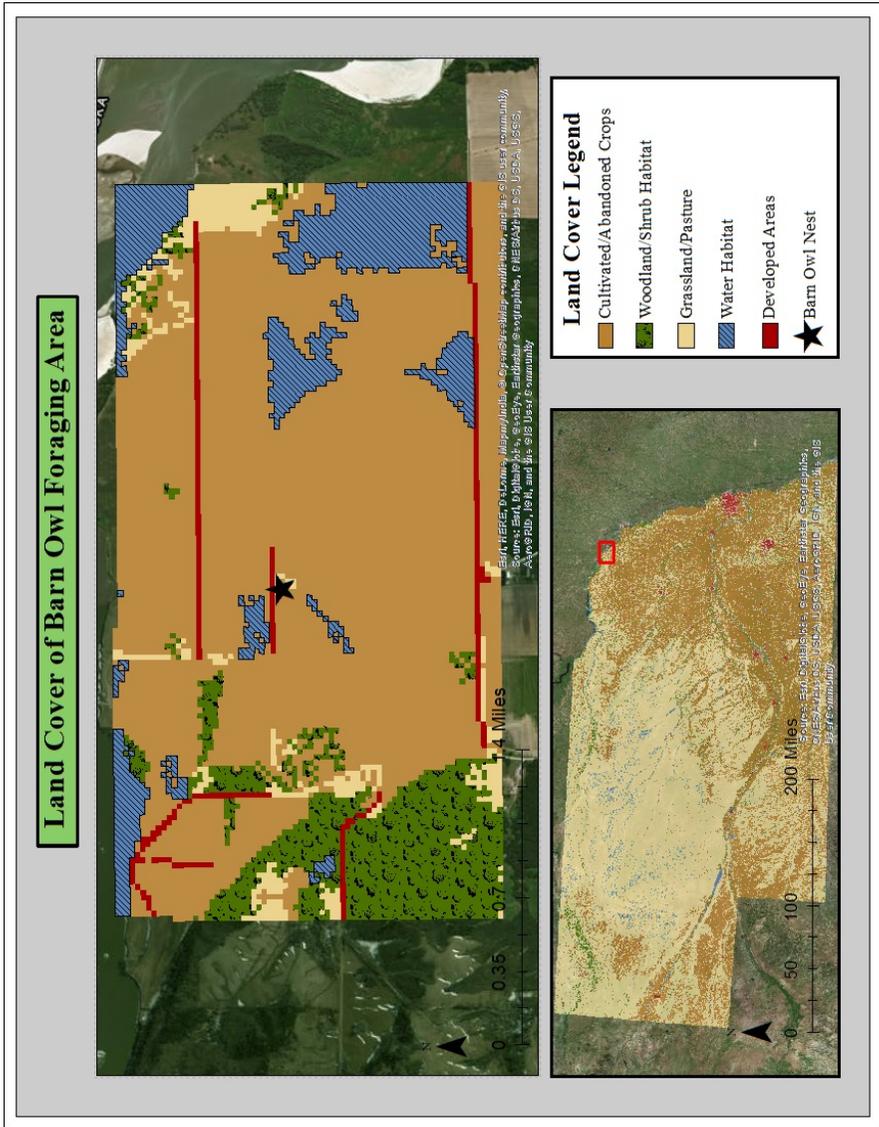


Figure 2. Location and landcover classification based on NLCD (2011) of the 768 ha plot surrounding Barn Owl nest at Ponca State Park.

map was created using ArcMap 10.5 software. GIS analysis was performed using the National Land Cover Database 2011 (NLCD 2011). The NLCD 2011 was the most recent land cover database available on the Multi-Resolution Land Characteristics Consortium (MRLC) website (<https://www.mrlc.gov/finddata.php>). The vector format of NLCD 2011 was presented at 30 m resolution.

Results

A total of 358 prey were identified from pellets and debris (Table 1). Ten taxa of mammals made up 95% of all prey with birds the remaining 5%. Sixty-eight percent of all prey consisted of two rodent species, *Reithrodontomys megalotis* (western harvest mouse) and *Microtus pennsylvanicus* (meadow vole). *Reithrodontomys megalotis* made up 39% of all species in the diet (Table 1).

Table 1. Number and percent of prey in Barn Owl pellets collected from the nest site at Ponca State Park 26 September 2015.

Prey Species	Common Name	No. (%)	Avg Weight ¹ (g)
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	138 (39)	13.3
<i>Microtus pennsylvanicus</i>	Meadow Vole	103 (29)	57.2
<i>Blarina brevicauda</i>	Short-tailed Shrew	43 (12)	25.5
<i>Peromyscus sp.</i>	White-footed or Deer Mouse	32 (9)	30.5
<i>Microtus ochrogaster</i>	Prairie Vole	9 (3)	60.1
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	7 (2)	47.8
<i>Sorex cinereus</i>	Masked Shrew	3 (1)	4
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	2 (1)	18.8
<i>Scalopus aquaticus</i>	Eastern Mole	1 (<1)	45.4
<i>Mus musculus</i>	House Mouse	1 (<1)	22.5
Unknown rodent species		1 (<1)	n/a
Bird species		18 (5)	n/a
TOTAL		358	
Two possible <i>Peromyscus sp.</i> : <i>Peromyscus maniculatus</i> , Deer Mouse and <i>Peromyscus leucopus</i> , White-footed Mouse are not easily identified from skulls			
1 – average weights are of adults (Jones et al. 1983)			

Cultivated land and abandoned fields made up 64.5% of the 768 ha mapped area surrounding the nest area (Table 2, Figure 2). Grassland and pasture/hay fields, the habitat most often associated with Barn Owl hunting habitat, made up only 7.8% of the mapped area. Habitat not associated with Barn Owl foraging, including

woodland/shrubs, water, and developed areas, made up 27.7% of the area (Table 2). Prey species found in the diet associated with habitat types were based on Jones et al. (1983; see Table 2).

Table 2. Percent of habitat types in a 768 ha plot surrounding the Barn Owl nest site at Ponca State Park North Addition. Expected prey species based on Jones et al. (1983). Although expected prey are listed for Woodland/Shrub Habitat, Barn Owls do not normally hunt in those habitats.

Habitat Types	Percent	Expected Prey
Cultivated/ Abandoned Crops	64.5%	1, 3, 4
Woodland/Shrub Habitat ^a	11.6%	1, 2, 3, 4, 6, 7, 8, 9
Grassland/Pasture	7.8%	1, 2, 3, 4, 5, 6, 9
Water Habitats ^b	12.2%	
Developed Areas ^c	3.9%	3, 4, 7, 10
TOTAL	100%	
Prey Species - 1. <i>R. megalotis</i> , 2. <i>M. pennsylvanicus</i> , 3. <i>B. brevicauda</i> , 4. <i>Peromyscus</i> sp., 5. <i>M. ochrogaster</i> , 6. <i>C. hispidus</i> , 7. <i>S. cinereus</i> , 8. <i>S. aquaticus</i> , 9. <i>Z. hudsonius</i> , 10. <i>M. musculus</i>		
a - includes deciduous forest, woody wetland, and shrub habitat		
b - includes open water and emergent herbaceous wetlands		
c - open water and developed areas (i.e., roads and sites with buildings)		

Discussion

It is significant that *R. megalotis* was the most common prey (39%) in the diet, as the average weight of adults is 13.3 g (Table 1). In contrast, the average weight of adult *Microtus* sp., considered the major prey of Barn Owls in much of North America, is 57-60 g. Daily food consumption of Barn Owls in North America is estimated to be 100-150 g/day (Marti et al. 2005). Based on these data, Barn Owls would have to capture 10+ *R. megalotis* in contrast to only 2-3 *Microtus* sp. to meet daily energy needs. In a three year Barn Owl study in Lincoln County, NE, in the 1980s, *Microtus* sp. made up 40% of prey with a high of 51% in 1986 (Gubanyi et al. 1991) while *R. megalotis* made up 18% of prey. Over the three year period of the study, the researchers found that when *Microtus ochrogaster* increased in the diet, *R. megalotis* decreased. In addition, in 1986 when the percent of *M. ochrogaster* was greatest, more nest attempts were successful and the mean number fledged per nest site was greater. In spite of having relatively low numbers of *Microtus* sp. and high numbers of *R. megalotis* in the diet, the Ponca State Park Barn Owls appeared to have successfully fledged 6 of 7 young suggesting food resources were adequate.

It is notable that less than 8% of the 768 ha plot consists of grassland and pasture/hay fields (Table 2, Figure 2), the habitat most associated with Barn Owl hunting (Marti et al. 2005). Much of the habitat in the 768 ha plot was cultivated, although part of the cultivated land was no longer farmed after the park added two tracts to the North Addition in 2001 and 2005. Restoration projects in the North Addition have included cottonwood forest regeneration, tall grass and wet-mesic prairie regeneration, wetland restoration, and oak savannah restoration (Scott Oligmueller, Superintendent Ponca State Park, personal communication). After the North Addition was added we estimate that an additional 200+ ha of cultivated fields in the 768 ha plot was changed to habitats that could have provided suitable prey habitat for Barn Owls. It should be noted that the Ponca State Park Barn Owls were not restricted to hunting in the area represented by the 768 ha map, and there is evidence in the diet that they may have hunted in areas outside of the floodplain. Both *Microtus ochrogaster* (prairie vole) and *Chaetodipus hispidus* (hispid pocket mouse) are species associated with drier grassland habitats and would not be expected in the floodplain. Looking at Google Earth (Imagery date 11 May 2017), there appears to be upland grassland habitat in the foothills about 2 miles west of the nest site where both species would be expected. This area is outside the 768 ha mapped area. Based on the habitat map and diet, it appears that the foraging habitat in the area surrounding the nest site is less than ideal for Barn Owls.

Tom Labeledz at the University of Nebraska State Museum of Natural History provided specimen records from Dixon County of prey species found in the Barn Owl diet. With the exception of *Mus musculus* (house mouse) and *Sorex cinereus* (masked shrew), there were museum specimens from Dixon County for all mammal species found in pellets. ArcGIS online mapping software was used to map locations of museum specimen records. Of 95 museum specimens from Dixon County, only *Peromyscus leucopus* was found within 3 miles of the nest site. Specimens from the museum represent a limited sample and do not imply that prey species found in the diet could not be closer to the nest site.

Although nesting is common in natural cavities in trees and cliffs, Barn Owls appear to be opportunistic when choosing nest sites as they have nested in a variety of enclosed areas such as church steeples, barns, grain bins (both full and empty), buildings, attics, and even spaces in stacks of hay (Marti et al. 2005). It appears that the grain bin met nest site needs for the Ponca State Park Barn Owls, and there was sufficient prey in the surrounding habitat for them to successfully fledge 6 of 7 nestlings. One can only speculate on why they did not return in 2016. It may be that they did not survive the winter or found a better site the following spring. Gubanyi (personal observation) noted nesting Barn Owls that were banded returned to the same nest sites the following year in Lincoln County, Nebraska.

Barn Owls need two things to nest: suitable hunting habitat and cavities for nesting. Iowa has had success in recent years with their Barn Owl nest box program putting up nest boxes in areas where there is good Barn Owl hunting habitat. We recommend that people in eastern Nebraska who would like to see Barn Owls return to the area consider putting up nest boxes where there is suitable habitat. We know there are Barn Owls in close proximity in both Iowa and South Dakota that might breed in eastern Nebraska if they can find a nest site. Information about Iowa's Barn Owl program including nest box design can be found at <http://www.iowadnr.gov/Conservation/Wildlife-Landowner-Assistance/Technical-Assistance/Barn-Owl>.

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Literature Cited

- Drilling NE, Sparks RA, Woiderski BJ, Beason JP. 2016. South Dakota Breeding Bird Atlas II: Final Report. Tech. Rep. M-SDBBA2-07. Rocky Mountain Bird Observatory, Brighton, CO.
- Gubanyi JA, Case RM, Wingfield G. 1991. Diet and nesting success of Barn Owls breeding in western Nebraska. *American Midland Naturalist*. 127. 224-232.
- Jackson LS, Thompson CA, Dinsmore J. 1996. The Iowa Breeding Bird Atlas. Iowa City (IA): The University of Iowa Press. 180-181.
- Jones KJ, Jr., Armstrong DM, Hoffman RS, Jones C. 1983. Mammals of the Northern Great Plains. Lincoln (NE): U of Nebraska. Print.
- Marti CD, Poole AF, Bevier LR. 2005. Barn Owl (*Tyto alba*), version 2.0. In *The Birds of North America* (P.G. Rodewald, editor). Cornell Lab of Ornithology, Ithaca (NY). (<https://doi.org/10.2173/bna.1>)
- Mollhoff WJ. 2016. The second Nebraska Breeding Bird Atlas. *Bulletin of the University of Nebraska State Museum*. 29. 112.
- Sharpe RS, Silcock WR, Jorgensen JG. 2001. *Birds of Nebraska: their distribution and temporal occurrence*. Lincoln (NE): University of Nebraska Press. 218-219.