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**Winter diet of Long-eared Owls at Lost Mound**

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## **Introduction:**

Long-eared owls (*Asio otus*) formerly nested in northern Illinois. They were removed from the Illinois Endangered Species list because the breeding population had been extirpated. Now long-eared owls occur in Illinois only in the winter, primarily in the northern part of the state. Protecting and maintaining significant winter roost areas may facilitate the establishment of a breeding population as occurred during the recovery of bald eagles (*Haliaeetus leucocephalus*) in the midwest.

Long-eared owls occur at the Lost Mound Unit of the Upper Mississippi River National Wildlife Refuge from November to March. The numbers and locations of owls vary each year. During the winter of 2003-04 a roost containing 30-40 birds was the largest report for the species during the Great Backyard Bird count in Feb. 2004 (so large in fact that staff from Cornell questioned the numbers sent in!). Although long-eared owls had been reported from this area in previous years, it appears that the number of owls at Lost Mound in winter has increased since grazing by cattle ceased in 1999. A better understanding of the winter habits of these owls may help with recovery efforts.

## **Project Objectives:**

The overall goal of this project was to evaluate the winter diet of long-eared owls at Lost Mound. The specific objectives originally included the following:

1. Determine relative abundance of prey species in Long-eared owl diet from the winters of 2002-03 and 2003-04.
2. Estimate the number of each rodent species eaten over the course of the winter.
3. Measure selected bones to estimate age classes of rodents eaten by the owls (Lyman et al. 2001).
4. Compare relative abundance of rodents in owl diet with past studies of small mammal abundance (Mankowski et al. 1994, Hofmann et al. 2000).
5. Compare the results from this study with other studies on owl diets in the Midwest (Cahn and Kemp 1930, Errington 1932, Voight and Glenn-Lewin 1978).
6. Involve volunteers with field station research.

These objectives turned out to be overly ambitious for a volunteer-run project. Identification of all skulls to species was too time-consuming and technical for the volunteers to do efficiently and with confidence. However, this work is on-going and will be reported at a later date. Estimating age classes by measuring certain bones was not possible because most pellets had multiple prey items of differing species. The original paper using measurements to estimate age class of rodents (Lyman et al. 2001) was apparently a unique situation in which the owl diet was composed primarily of two easily distinguished species. We found at least 7 species of mammals including two genera (*Microtus* and *Peromyscus*) each with two very similar species.

After recognizing these difficulties I revised the objectives to include:

- 1) Determine relative abundance of prey groups in Long-eared owl diet.

- 2) Estimate the number of each type of prey eaten over the course of the winter.
- 3) Compare relative abundance of mammal groups in owl diet with past studies of small mammal abundance.
- 4) Compare the results from this study with other studies on owl diets in the Midwest.

## Study Site

Lost Mound Unit (LMU) is part of the Upper Mississippi River National Wildlife and Fish Refuge, Savanna District. LMU is a 9800 acre portion of the former Savanna Army Depot in Carroll and Jo Daviess counties, northwestern Illinois. The owl roosts were in eastern red cedar (*Juniperus virginiana*) trees in sheltered locations. These included areas protected by topography or dense stands of cedars. All roosts were in Jo Daviess county and surrounded by remnant sand prairie of varying quality and plant composition (Robertson et al. 1997).

## Methods

Several thousand pellets were collected from three locations during the winters of 2002-03 and 2003-04. Pellets were collected on five occasions and are referred to below as the five collections (see also Table 1). Pellets were dried in a drying oven, and stored in a freezer. Each pellet was weighed and then dissected. Volunteers from Natural Area Guardians and Northwest Illinois Audubon Society assisted with the pellet analysis. Large bones such as femur, humerus, skull, and mandibles were removed from the pellet and stored in snap-lid vials. Skulls were identified as bird, shrew or rodent. Identification of skulls to species was beyond the scope of this phase of the project. This work is ongoing and will be reported upon completion.

Because pellets may break apart we defined a complete pellet as one with a jaw to skull ratio of 2. Data from the 349 complete pellets were used to calculate the average pellet mass and number of prey per gram of pellet. Estimates of total number of prey consumed were based on data from complete pellets.

## Results

Fifteen volunteers dissected 822 pellets, 734 from the winter of 2002-2003 and 88 from 2003-2004. An additional 573 pellets from 2003-2004 were dissected prior to this project and are not included here but will be included in future reports. The pellets dissected in this study contained 970 rodents, 46 shrews, and 16 birds (Table 1). Species identified thus far include *Microtus ochragaster* (prairie vole), *M. pennsylvanicus* (meadow vole), *Peromyscus maniculatus* (deer mouse), *P. leucopus* (white-footed mouse), *Reithrodontomys megalotis* (western harvest mouse), *Blarina brevicauda* (short-tailed shrew), *Sorex cinereus* (masked shrew). In addition, 13 pellets contained seeds, presumably ingested by the prey species before eaten by the owl.

The five collections were generally similar with rodents comprising 91-98% of prey items (Table 1). Shrews were more common than expected in the E-1408 roost and less common in the B-203 collection from April 2003 than expected ( $\chi^2 = 19.8$ ,  $df = 8$ ,  $P < 0.05$ ). This difference

may reflect the better-quality prairie in E-area compared to B-area.

The number of skulls per pellet ranged from 0 to 6 and the number of mandibles from 0 to 12. On average complete pellets (see definition in methods) weighed  $2.41 \pm 0.96$  grams (range 0.94 – 7.57g) and contained  $1.41 \pm 0.72$  skulls (range 1-6 skulls) the majority of which ( $1.34 \pm 0.7$  skulls) were rodents. Assuming an owl regurgitates one pellet each day and assuming 40 owls were present from November through March then approximately 6040 pellets were produced each winter. Using the average number of skulls per pellet from above then 8516 prey items were consumed each winter.

The prey items in owl pellets reflected the relative abundance of rodents and shrews estimated in two small mammal surveys (Table 2). Although the 1994 survey found a trend for more shrews than expected, the difference was not statistically significant ( $\chi^2 = 5.5$ ,  $df = 2$ ,  $P > 0.05$ ).

The results from Lost Mound were similar to data from Iowa, Wisconsin, and Urbana Illinois (Table 3). In each of these sites approximately 95% of prey were rodents. In Tennessee more shrews (15%) were eaten than in the upper Midwest. Wisconsin had the lowest percentage of shrews and highest percentage of rodent in owl diets (Table 3).

Overall the diet of Long-eared Owls at Lost Mound is not unusual compared to other sites or to the available prey. Thus, the primary goal for land managers at this site is to protect the known roosts from disturbance (including limiting the number of people visiting the sites to an absolute minimum). Presumably the owls spread out from the roosts to forage, so habitat in the surrounding prairie and savanna areas should be protected and enhanced if possible. Adjacent tenants and landowners should be aware that the presence of so many owls in one area is a sign of a healthy ecosystem. Owls are an economic asset because they eat so many rodents so poison bait for rodent control should be avoided.

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**Table 1.** Composition of Long-eared owl pellets from five collections at Lost Mound Unit.

Collection	site	year	month	pellets	mass	Skulls per pellet
1	B-203	2003	Jan	193	2.13 ± 0.86	1.33 ± 0.91
2	B-203	2003	Apr	214	2.24 ± 0.86	1.11 ± 0.74
3	B-203	2004	Mar	88	3.0 ± 1.01	1.48 ± 0.92
4	E-1408	2003	Mar	258	2.03 ± 0.72	1.28 ± 0.83
5	F-205	2003	Mar	69	1.71 ± 0.69	1.13 ± 1.01
	Total			822	2.18 ± 0.88	1.26 ± 0.86

**Table 1.** Continued

Collection	Rodents		Shrews		Birds		total
	#	%	#	%	#	%	
1	237	92.6	12	4.7	7	2.7	256
2	234	98.3	3	1.3	1	0.4	238
3	124	95.4	3	2.3	3	2.3	130
4	304	92.1	23	7.0	3	0.9	330
5	71	91.0	5	6.4	2	2.6	78
	970	94.1	46	4.5	16	1.6	1032

**Table 2.** Comparison of prey abundance (excluding birds) in Long-eared Owl pellets with small mammal abundance at Lost Mound. Mammal abundance from (Mankowski et al. 1994) and (Hofmann et al. 2000).

	pellets		1994 mammal survey		2000 mammal survey	
	#	%	#	%	#	%
Rodents	970	95.5	185	92.5	681	96.1
Shrews	46	4.5	15	7.5	26	3.7
Other	0	0	-	-	2	0.2
total	1016		200		709	

**Table 3.** Comparison of long-eared owl pellet composition from Lost Mound Unit with published studies. Sources for other studies as follows: Tennessee (Klippel and Parmalee 1982), Iowa (Voight and Glenn-Lewin 1978), Urbana, Illinois (Cahn and Kemp 1930), Wisconsin (Errington 1932).

site	Lost Mound		Tennessee		Iowa	
#owls	30-40		1		13	
	#	%	#	%	#	%
pellets	882		71 $\alpha$		-	
Rodents	970	94.1	251	78	-	95.9
Shrews	46	4.5	47	15	-	3.2
Birds	16	1.6	21	7	-	0.9
Other	0	0	0	0		0
total	1032		319		2112	

$\alpha$  Additional remains collected from area under owl roost, number of prey from complete pellets not given.

**Table 3.** continued

	Urbana, IL		Wisconsin	
#owls	5-7		-	
	#	%	#	%
pellets	1201		- $\beta$	
Rodents	1140	95.2	3233	98.8
Shrews	38	3.2	14	0.4
Birds	17	1.4	26	0.8
Other	3	0.2	0	0
total	1198		3273	

$\beta$  includes stomach contents and summer data.