



Great Horned Owl (*Bubo virginianus*) Productivity and Home Range Characteristics in a Shortgrass Prairie

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Abstract.—We studied movements and breeding success of resident Great Horned Owls (*Bubo virginianus*) at the Rocky Mountain Arsenal National Wildlife Refuge from 1994-1996. We captured adult owls prior to nest initiation and outfitted them with radio transmitters. Twelve, 5, and 11 pairs nested each year, respectively. Eleven nests successfully hatched and produced 24 owlets in 1994, 3 nests produced 6 owlets in 1995, and 10 nests produced 29 owlets in 1996. We documented three cases in which a single parent successfully fledged owlets. We recorded three cases of nest site reuse. Ninety-five percent adaptive kernel mean home range size did not differ between ages or sexes.

We studied movements and breeding success of resident Great Horned Owls (*Bubo virginianus*) at the Rocky Mountain Arsenal National Wildlife Refuge from 1994-1996. The Rocky Mountain Arsenal is a large, open space in the midst of the Denver metropolitan area. The site was used for weapons production during World War II, and for pesticide production following the war. Production practices of that era led to soil and ground water contamination on the surrounding landscape. The site is being cleaned and transformed into an urban wildlife refuge through cooperative efforts by the United States Army, Shell Oil Corporation, and the U.S. Fish and Wildlife Service. The Great Horned Owl may be used by the U.S. Fish and Wildlife in their long term biomonitoring program on the Refuge. We collected productivity and home range information as part of a study to gather baseline data about Great Horned Owls on the Refuge.

STUDY AREA

The Rocky Mountain Arsenal National Wildlife Refuge (Refuge) is located in south-central Adams County, Colorado, and is bordered to the north and east by agricultural and commercial districts. Its southern border is

adjacent to Denver city limits and is approximately 16 km northeast of the metropolitan area. The facilities encompass 6,900 ha of open grassland, rolling hills, and wetlands, providing an island of wildlife habitat in a heavily urbanized area. The Refuge supports diverse plant and animal communities and was designated to be an urban wildlife refuge in 1992.

The climate is semi-arid, with low humidity, light rainfall, and moderate to high winds. Average annual precipitation is approximately 38 cm. Elevation on the Refuge ranges from 1,534 m to 1,625 m above sea level. Historically, the area was covered by short grass prairie vegetation. The vegetation on the Refuge is currently dominated by five major communities: cheatgrass (*Bromus* spp.)/perennial grassland, weedy forbs, cheatgrass /weedy forbs, crested wheatgrass (*Agropyron cristatum*), and native perennial grassland (Environmental Science and Engineering 1989).

TRAPPING AND BODY SIZE

We trapped adult Great Horned Owls from February through late April in 1994, late December through late March in 1995, and early January through April in 1996. We used quonset-shaped bal-chatri traps (Berger and Hamerstrom 1962) with avian and rodent lures, pigeon harnesses, leghold traps, and dhogaza traps (Bloom 1987) to trap adult owls. We

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captured 20 adult Great Horned Owls between 1994-1996. Seven of the owls were captured using bal-chatri traps with rodent and avian lures. We trapped six owls using pigeons in a harnesses with nylon nooses. During the incubation stage, we trapped three adult male owls using a dho gaza trap with a stuffed Great Horned Owl and a tape recording of Great Horned Owl calls as a lure. During the nestling stage, we captured two adult females and one adult male using a dho gaza trap and a live Red-tailed Hawk (*Buteo jamaicensis*) as the lure. We trapped one adult owl using a padded leghold trap with a rodent lure. Great Horned Owls, like most raptors, exhibit reversed sexual size dimorphism; the males are smaller than the females. As expected, adult females (1,388 g) were slightly larger than adult male owls (1,194 g) on the Refuge (table 1).

PRODUCTIVITY

Nesting Success

Five to 12 nesting pairs have been documented on the Refuge per year (1990-1996) (USFWS

1994, Frank and Lutz 1997). In 1994, 1995, and 1996, 12, 5, and 11 pairs nested each year, respectively (table 2). In 1994, 12 pairs of Great Horned Owls initiated nests; three other pairs separated prior to the breeding season or failed to initiate nests. Of the 12 nesting pairs, one member from each of four pairs died prior to the next breeding season. One owl was electrocuted, but the causes of death were undetermined for the other three owls. In 1995, 11 pairs of owls exhibited signs of courtship and pair bonding, yet only five pairs initiated nests. It is uncertain whether this difference in breeding effort was a result of differences in environmental conditions between years, or due to the high number of newly established pairs. In 1996, 11 of 12 owl pairs on the Refuge initiated nests. Eleven nests hatched and produced 24 owlets in 1994, three nests produced six owlets in 1995 and 10 nests produced 29 owlets in 1996.

Nest Failures

We monitored four nest failures during the 3 years. All failures occurred during the

Table 1.—Body measurements of adult Great Horned Owls captured at the Rocky Mountain Arsenal National Wildlife Refuge, near Denver, CO, 1994-1996.

Measurement	Male (n=10)		Female (n=8)		P
Weight (g)	1,194.7	(27.7) ¹	1,388.3	(52.6) ²	0.003
Wing chord (mm)	351.3	(5.6)	360.4	(9.2)	0.383
Tarsal width (mm)	10.1	(0.2)	10.6	(0.3)	0.211
Hallux length (mm)	22.3	(0.3)	23.8	(0.4)	0.010
Tail length (mm)	214.5	(4.6)	230.3	(7.6)	0.082
Culmen length (mm)	27.9	(0.6)	28.9	(0.5)	0.173

¹ Mean and (standard error)

² (n = 6)

Table 2.—Number of pairs and reproductive parameters for Great Horned Owls on the Rocky Mountain Arsenal National Wildlife Refuge near Denver, CO, 1994-1996.

Parameter	Year		
	1994	1995	1996
Pairs on Refuge	15	11	12
Pairs nesting	12	5	11
% Hatched	0.92	0.60	0.91
% Successful	0.92	0.60	0.91
Total young produced	24	6	29



incubation stage. In all cases, the adults survived and remained near the nest site after the failure. The first documented failure occurred in 1994. Two nests failed in 1995 and one nest failed in 1996. In three cases, we found small egg shell fragments in the nest structure. However, we were unable to determine if the eggs were depredated, or scavenged after being abandoned. We did not document any loss of chicks during the nestling period when chicks were observable (4-9 weeks).

Single Parent Nests

We documented three cases in which individual owls successfully fledged young. In 1995, an adult male from a nest in section 12 disappeared (fate unknown) early in the nestling stage. The female fed the two chicks; both fledged and dispersed off the Refuge. In 1996, a radio-marked male at a nest in the former South Plants production area of the Refuge died from dieldrin poisoning early in the nestling stage. The female fledged three chicks.

However, all three were electrocuted within weeks of fledging. Also in 1996, an unradio-marked adult female died late in the nestling period from dieldrin poisoning. The male fledged three owlets. One chick later died after suffering a wing injury.

MOVEMENT

Site Fidelity

Twenty-eight Great Horned Owl pairs nested on the Refuge during 1994-1996 (fig. 1). Four nesting areas were used in two or more years. In three cases, the same nest structure was used in multiple years. In general, old raptor and Black-billed Magpie (*Pica pica*) nests were used as nesting structures. However, an artificial raptor nest structure was used in 1995 and 1996. Two pairs of owls nested in buildings in 1996. Two pairs of owls nested in crooks of large cottonwood trees with no nesting materials.

- + 1994
- 1995
- ▲ 1996
- * Multiple Years

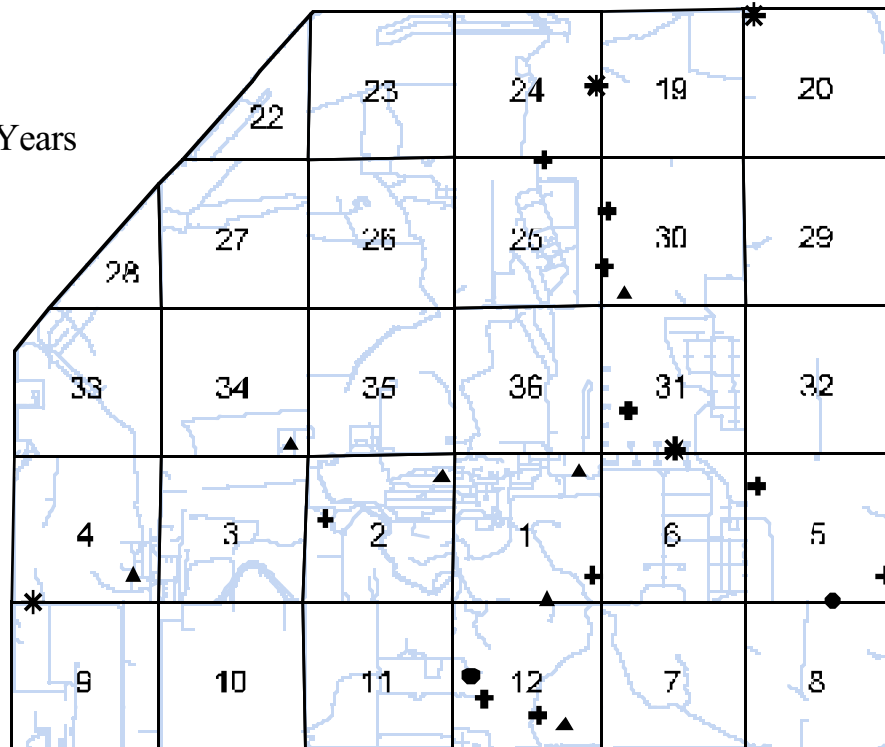


Figure 1.—Great Horned Owl nest locations by year at the Rocky Mountain Arsenal National Wildlife Refuge near Denver, CO, from 1994 through 1996.

Home Range Estimates

We collected 319 locations on nine adult and subadult owls in 1995 and 502 locations on 10 owls in 1996. We were able to calculate adaptive kernel home range (Worton 1989) estimates for seven owls in 1995 and nine owls in 1996. Home range estimates did not differ between years (50 percent home range contour, 67.43 ha [1995] vs. 61.00 ha [1996], $t = 0.182$, $P = 0.858$; 80 percent, 245.29 ha [1995] vs. 221.34 ha [1996], $t = 0.219$, $P = 0.830$; 95 percent, 671.86 ha [1995] vs. 612.67 ha [1996], $t = 0.191$, $P = 0.852$, 14 df) so we pooled them for analysis. The 50 percent home range contour estimate was greater for adult owls than subadult owls (75.97 ha vs. 27.25 ha, $t = 2.186$, $P = 0.049$, 14 df, fig. 2). We did not find any differences between sexes (fig. 2). Because of small sample sizes and fairly high variability, the power of these statistical tests was low (range = 0.07 to 0.21).

CONCLUSIONS

While the number of Great Horned Owl pairs on the Refuge remained somewhat constant over the 3 years of our study, we did observe some variation in the number of pairs that nested. We hypothesize that these variations might be due to differences in environmental conditions among years, or due to turnover within pairs. Owls tended to rely on existing stick structures for nest sites, but showed some adaptability by nesting in buildings and artificial structures. In three of 28 cases, the same nest structure was used in multiple years. All of the nest failures we observed occurred during the incubation stage. Even when one member of a pair died during the nestling period, a single parent (male or female) was able to successfully feed and protect nestlings until they fledged. Individual owl home ranges were variable in size. We could not distinguish any differences in home range size by age or sex.

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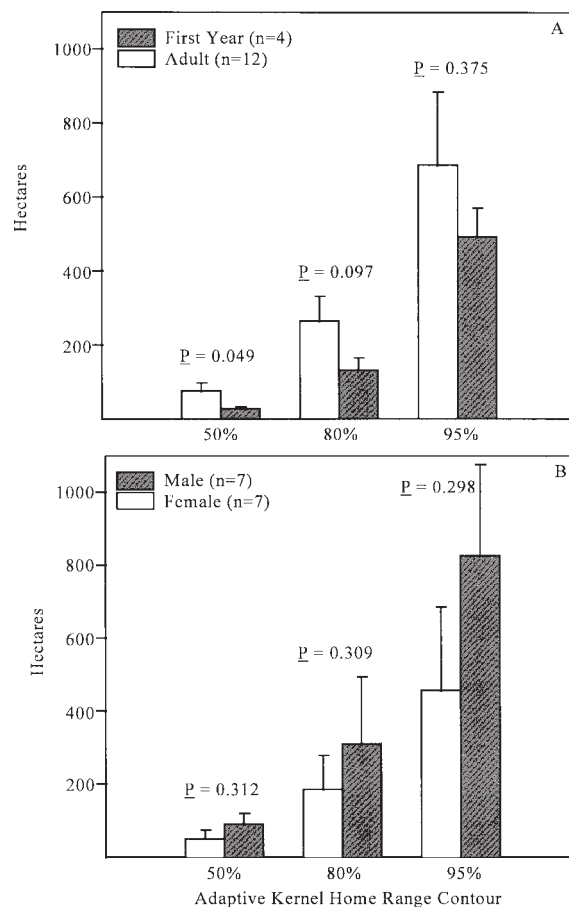


Figure 2.—Adaptive kernel contour home range size estimates of Great Horned Owls by age (A) and sex (B) at the Rocky Mountain Arsenal National Wildlife Refuge near Denver, CO, in 1995 and 1996.

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