Density and Habitat Associations of Great Horned Owls in North-Central Oklahoma

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The great horned owl (*Bubo virginianus*) is a wide-ranging species that breeds regularly in Oklahoma (Baumgartner and Baumgartner 1992, Sutton 1967, Tyler 1995) and occurs throughout the United States (Bent 1938, Houston et al 1998, Johnsgard 1988). In 1995 and 1996, we monitored great horned owls during the breeding season (January—May) to assess pair density and to quantify habitat associations of reproductive and non-reproductive owls in a 1,155-ha linearly configured habitat island of riparian forest at Salt Plains National Wildlife Refuge (NWR), in Alfalfa County, north-central Oklahoma (36°47'N, 98°11'W; Fig. 1). We predicted that habitat associations of breeding pairs would contain the greatest proportions of preferred habitats.

The forested study area was primarily climax vegetation dominated by American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoides*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), red mulberry (*Morus rubra*), and eastern red cedar (*Juniperus virginiana*). No fire management, logging, or rangeland activities had occurred in the forest since the 1940s. An expansive, salt-encrusted alkaline flat occurred west of the study area on the refuge, while cattle grazing and dryland agriculture were common land uses north and east of the study area off the refuge (Fig. 1). The study area was relatively flat with an average elevation of 347.9 m above mean sea level. Average annual rainfall was 65 cm.

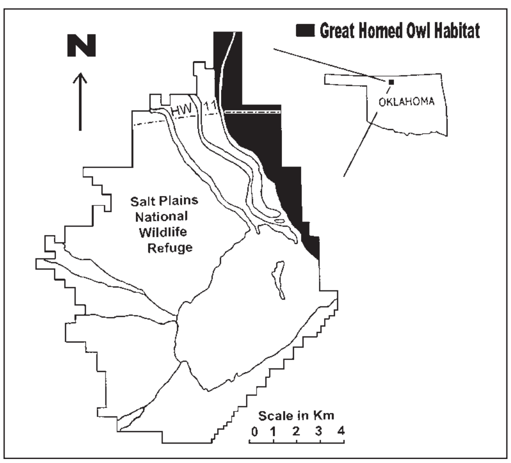

Figure 1. The 1,155-ha habitat island surveyed for great horned owls in the northeastern corner of Salt Plains National Wildlife Refuge in north-central Oklahoma in 1995 and 1996.

Tape-playback calls (Johnny Stewart brand) of conspecific vocalizations (Emlen 1972, Laidig and Dobkin 1995, Mazur et al 1997, McGarigal and Fraser 1984, Morrell et al 1991, Winton 1997) were used during daylight hours (0700 to 2100 h) to solicit male and female great horned owls. We assumed that great horned owl pairs were on or near the nest when sighted. Taped calls were played systematically at 1-km intervals along a 14-km survey route during periods of low wind and no precipitation (Laidig and Dobkin 1995). The sampling period (January to May) coincided with the timing of territorial defense when great horned owls are most responsive (Bent 1938, Morrell and Yahner 1995). All sighting locations were revisited 1–3 times each year at 3–10 d intervals to verify observations, to search for nests, and to best approximate core areas for habitat association computations (Winton et al 1994). Incidental daytime sightings also were recorded.

We classified 7 habitats in our study area from 1:16,600 aerial photographs taken on 2 December 1989; no significant events (e.g.,

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fires, tornados, or ice storms) had altered the area from 1989 to the present (R. Shepperd, Salt Plains NWR, pers. commun., 2003). Habitats included: (1) closed-canopy forest (>40% tree cover), (2) open-canopy forest (<40% tree cover), (3) farmed agricultural field, (4) fallow agricultural field, (5) treeless land / open areas (grasslands and sandbars), (6) water (pond, river, and the Great Salt Plains Reservoir), and (7) anthropogenic features (i.e., roads, buildings).

We indexed habitat associations of great horned owls (pairs and single owls) by placing a 0.65-km^2 square grid (~ 0.5 mi^2) on the aerial photograph over the center of the core areas identified from our playback-calls and nest searches. The square grid was aligned with existing north-south section lines. Each grid contained 650 pixels (1 pixel = 0.001 km^2) in which we identified the dominant habitat (>50%) within each pixel from the aerial photograph. However, rivers and roads were tallied as the dominant feature based on presence-absence (not >50% occurrence) to avoid underestimating narrow, linear features, and because we hypothesized these features, although they comprised such a small percentage of most areas, could significantly affect owl presence and / or distribution. We selected a square grid rather than a radius due to land use practices in and around the study area; we adjusted the grid for aerial photography scale. Chi-square analysis (Steel and Torrie 1980) with Bonferroni 95% confidence intervals (Byers et al 1984) was used to compare habitat associations of single owls and pairs at P < 0.05.

We recorded great horned owl sightings at 12 distinct locations throughout the study area (n = 23 owls; $\bar{x}$ = 1.92 owls / sighting). Three of 12 (25%) of our sightings were observed as a result of taped broadcasts, and nine (75%) were unsolicited sightings—most observed during non-crepuscular periods of the day. We made seven pair sightings (4 in 1995; 3 in 1996), which suggested that a minimum of 58% of all owls sighted during our study were likely breeders. We also made five single owl sightings (4 in 1995; 1 in 1996), which suggested, at most, 42% of all owls sighted during our study were likely non-breeders; however, we could not positively confirm that single owl sightings were not truly members of a breeding pair. We located two great horned owl nests (both active) as a result of our investigation. American crows (*Corvus brachyrhynchos*) discovered and mobbed great horned owls at two (17%) of our 12 sighting locations.

Habitat associations of single great horned owls and pairs differed (X^2 = 148.99, 6 df, P < 0.001). Open-canopy forest (<40% canopy) was the dominant feature in single owl sightings (27.7%), and closed canopy forest (>40% canopy) was the dominant feature in pair sightings (34.6%; Fig. 2). Single great horned owls had a higher association with farmed agricultural fields than pairs (20.9% versus 1.4%) and lower association with treeless land / open areas than pairs (15.2% versus 26.4%; Fig. 2). We re-sighted great horned owls at 5 of 8 sighting locations in 1995, and at 1 of 4 sighting locations in 1996, where we reconfirmed owl status (single or pair).

Density of great horned owl pairs was calculated as the number of pairs divided

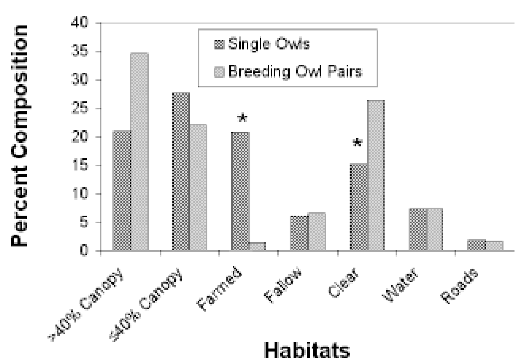

Figure 2. Percent composition of habitat features in 0.65 km^2 surrounding core areas of pair and single great horned owls at Salt Plains National Wildlife Refuge in north-central Oklahoma in 1995 and 1996. Asterisks indicate differences between pair and single owls based on Bonferroni 95% confidence intervals (Byers et al 1984).

by 1,155-ha, the size of our study area. We determined density for owl pairs only because this would best describe the status of the breeding population occupying the study area (Winton and Leslie 2004). We estimated that 3.5 pairs of great horned owls occupied our study area (1 pair / 330 ha).

We had hypothesized that single owls, as nonbreeders, would be unable to maintain territories and thus be relegated to less than optimal habitats. However, albeit differences in habitat associations occurred between pairs and single great horned owls, they were not significantly disparate overall and, therefore did not strongly support our hypothesis. Future research using radiotelemetry (Ganey and Balda 1994, Nicholls and Warner 1972, Sparks et al 1994) would best elucidate differences in habitat associations and refine area requirements between pairs and single great horned owls at Salt Plains NWR. Furthermore, we recommend that refuge personnel monitor and protect the isolated forest patch on the refuge and establish conservation measures to insure long-term protection of forest-dependent species.

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