basally dusky on the head and neck, with grayish white tips, giving the body a hoary effect..." Therefore, these young owls were probably between two and three weeks of age.

The last visit to the site was on 7 June when Gray found an adult owl and three young recently out of the nest, one perched on a lower limb of the nest tree and the other two in adjacent pines. The adult, probably the female, hissed and flapped her wings at Gray. Dangling from the nest tree was a rabbit (*Sylvilagus* sp.) skin. Bent (1937:160) stated: "...a very large proportion of its food, probably close to 80 or 90 percent on a seasonal average, consists of injurious rodents...among hundreds of records I can find only one record of a quail and two of ruffed grouse being killed, and very few records of young rabbits." Bent also alluded to a pellet analysis in Wisconsin that yielded more than 3,000 vertebrate prey items, only one of which was a cottontail (a juvenile).

In nearby Missouri, there are four published breeding records for *Asio otus* since 1950 (Robbins and Easterla 1992). Thompson and Ely (1989) reported no nests for southeastern Kansas.

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Route 1, Box 516 AA, Bartlesville, Oklahoma 74006, 31 October 1990.

GENERAL NOTES

Early nesting date for Great Horned Owl in Oklahoma. — The earliest date given in Baumgartner and Baumgartner (1992, Oklahoma bird life, Univ. Oklahoma Press, Norman, p. 194) for breeding activity of the Great Horned Owl (*Bubo virginianus*) was 28 December 1981. On that date, Paul W. Wilson found a pair at a nest three miles west of Picher in Ottawa County, northeastern Oklahoma. On 16 December 1990, Kenneth and Elizabeth Hayes discovered an incubating owl at a nest about 45 feet (14 m) up in a large, nearly dead ash tree in Tulsa near 156th Street North between Sheridan and Yale avenues during the annual Audubon Christmas Bird Count. It was an old Red-Tailed Hawk (*Buteo jamaicensis*) nest. They had no way of checking the contents of the nest, but subsequent visits by Paul W. Wilson, Jo Loyd, the author and others followed its progress. On 15 February, Wilson saw a young owl on the edge of the nest. On the 18th, one young was in the nest with either an adult or a second owlet preparing for flight. Two young birds were at the

nest on the 26th, appeared ready to fledge on 2 March, and did so sometime before 10 March, when seen flying (Wilson letter to J. D. Tyler of 21 August 1995).

The earliest date for breeding in Arkansas is 24 December (James, D.A., and J.C. Neal, 1986, Arkansas birds, Univ. Arkansas, Fayetteville). In Kansas, Thompson and Ely (1989, Birds in Kansas, Vol. 1, Univ. Kansas Mus. Nat. Hist., Lawrence) stated that "Courtship calling begins in December, and most females are incubating by mid-February; young fledge in late May." — Patricia Seibert, *2145 S. Florence Ave., Tulsa, Oklahoma 74114, 4 April 1991.*

Proximal nesting of Barred Owls, Great Horned Owls and Red-shouldered Hawks in Cleveland County, Oklahoma. — While there are documented incidences of the Great Horned Owl (*Bubo virginianus*) tolerating other nesting raptors near its nest (Smith, D.G., 1970, *Auk* 87:170–171; Dunstan, T.C., and B.E. Harrel, 1973, *Raptor Research* 7:49–54; Wiley, J.W., 1975, *Auk* 92:157–159), it rarely does so (Hagar, D.C., Jr., 1957, *Wilson Bull.* 69:263–272; Bent, A.C., 1938, Life histories of North American birds of prey, Part 2, *Bull. U.S. Natl. Mus.* No. 170, Wash., D.C., p. 296; Craighead, J.J., and F.C. Craighead, 1956, Hawks, owls and wildlife, Stackpole Co., Harrisburg, Pennsylvania, and Wildl. Manage. Inst., Wash., D.C., pp. 207–210; Wiley, J.W., *loc. cit.*).

Since moving to rural Norman, Cleveland County, central Oklahoma, in the fall of 1990, I have observed interactions between Great Horned Owls, Barred Owls (*Strix varia*) and Red-shouldered Hawks (*Buteo lineatus*), all of which reside in a belt of riparian woodland 50 to 400 m wide bordering Rock Creek and its tributaries. During the first year of our residence, only Barred Owls and Red-shouldered Hawks were in evidence. In February 1991, a pair of each of these raptors initiated nesting activity in trees only about 33 m apart and within 75 m of our house. The owls' nest was within the hollow trunk of a huge cottonwood snag that had broken off about 4 m from the ground. The hawks constructed their nest approximately 11 m up in the main fork of a 15 m ash tree.

The Barred Owls were incubating eggs by 14 February. Although the hawks began building their nest about 18 February, they did not start incubating until 14 March. The nests were partially concealed from one another by foliage, but I could see both from a spot halfway between the nest trees. The adults were in plain view of each other as they performed daily activities at their nests. Both pairs were at times quite vocal during the day, the owls also at night. This was especially true during the exchange of nest duties or when prey was brought to the nests. At least one young owl left the nest on 11 April and three Red-shouldered Hawk nestlings fledged much later, between 30 May and 5 June.

The young hawks were extremely vociferous as they begged for food, and although the owls sometimes roosted within 20 m of the hawks' nest, at no time did I notice any aggression or interaction between the two species. Both successfully reared their young to independence and continued to inhabit their territories during the summer and fall of 1991.

On 20 September 1991, I first heard a Great Horned Owl hooting in that section of the woods where the Barred Owls had nested. Throughout the fall and winter of 1991–1992, I continued to see the Barred Owls and Red-shouldered Hawks, but also a lone Great Horned Owl in and near the nesting areas of the previous spring.

Both the Barred Owls and the hawks were again proclaiming territories by 4 January 1992. The hawks often soared above or dove toward prospective nest trees and occasionally routed other diurnal raptors from the area. From 2000 to 2300 on the night of 19 January, a pair of Great Horned Owls and the resident Barred Owls called loudly back and forth in the vicinity of the previous year's Barred Owl nest. The quality and timing of the calls made it clear that the two species were strongly interacting. This interspecific hooting and calling was noted on several other nights during the last two weeks of January.

On 7 February I discovered the Great Horned Owls at a nest about 11 m up in the crotch of a 17 m cottonwood. This tree was approximately 100 m north of the 1991 Barred Owl nest. Even though Barred Owls are known for their nest site tenacity (Bent, *op. cit.*, pp. 183–185), and despite the fact that their old nest cavity was still in good condition, they did not use it again. Instead, they relocated approximately 350 m to the south (450 m away from the Great Horned Owl nest), where they nested successfully in the hollow of another cottonwood tree. During February and March, both species of owls continued to interact vocally at night..

By 2 February, the Red-shouldered Hawks had begun to assemble their nest 12 m above ground in the main fork of a 16 m pecan tree. This nest was 200 m northwest of the previous year's, and some 110 m west of the Great Horned Owl nest. On 7 February the nest was virtually complete. The hawks spent most of February displaying, screaming, and soaring above the nest, occasionally adding fresh redcedar twigs to the lining.

I noticed a single downy owlet in the Great Horned Owl nest on 11 March. By then, the hawks had started incubation, which proceeded without incident until 20 March when, near their nest, I saw two Red-shouldered Hawk primary feathers caught on the bark of the nest tree. Although I checked this nest and the surrounding area throughout the day, I was unable to see both hawks simultaneously. Scanning the nest regularly with a spotting scope, I determined that, by 25 March, normal incubation was no longer taking place, even though one bird attempted to sit on the nest from time to time, and the territory was still being actively defended. Closer inspection of the area below the hawk nest revealed several Red-shouldered Hawk primary and secondary wing feathers. I walked to the Great Horned Owl nest. On the ground below it lay 15 Red-shouldered Hawk wing feathers and 30 or 40 breast and belly feathers. In the nest, next to the young owl, were more. One of the adult Red-shouldered Hawks apparently had been taken from its nest by the larger owls and fed to their young, an occurrence that has been reported before (see Craighead and Craighead, *op. cit.*).

During the next two weeks, the remaining Red-shouldered Hawk continued to call and display above and around its nest. On 5 April I saw two Red-tailed Hawks and three Red-shouldered Hawks circling high above the latter's territory. On 9 April, I observed what I presumed to be the remaining bird copulating with a new mate near the nest tree. Because the new hawk was an immature female, I assumed that the one killed earlier had also been a female.

The Red-shouldered Hawks established a new territory approximately 300 m north of the Great Horned Owl nest, but were inconspicuous until 26 May, when they began to call once more. However, each time I approached the Great Horned Owl nest, even after the owlet had fledged (on or about 22 April), the hawks quick-

ly appeared and mobbed the owls. The Great Horned Owls were neither seen nor heard during July and August, but the Barred Owls and Red-shouldered Hawks continued to be both visible and vocal. By the first week of August, an immature Red-shouldered Hawk, often accompanied by an adult, hunted in an orchard near the original nest tree.

Thus, all three species eventually fledged young, even though the Great Horned Owls apparently displaced the Barred Owls from their breeding territory and killed a nesting Red-shouldered Hawk. This, in turn, forced the remaining hawk to renest, thereby investing more time and energy than normal into reproduction. As local breeding habitat becomes more open and fragmented, I predict that the larger, more adaptable Great Horned Owl will exert an increasingly negative effect on the nesting success of the other two raptors. — Victoria J. Byre, *Oklahoma Museum of Natural History, University of Oklahoma, Norman, Oklahoma 73019, 23 September 1992.*

Short-eared Owls nest unsuccessfully in northeast Oklahoma. — According to the American Ornithologists' Union (1983), the Short-eared Owl (*Asio flammeus*) breeds throughout arctic and subarctic North America "south to . . . northeastern Colorado, Kansas, [and] Missouri . . ." In the spring of 1990, I found two Short-eared Owl nests with eggs 4 miles west and 1 mile south of Collinsville in Tulsa County, Oklahoma. There is only one other breeding record for Oklahoma, a nest in Woods County mentioned by Nice (1931). In a letter to G.M. Sutton dated 1 November 1956, T.C. Carter described this nest that he discovered among short bluestem (*Andropogon* sp.) and buffalograss (*Buchloë dactyloides*) 2 or 3 miles east of Freedom in Woods County, northwestern Oklahoma, "many years ago" (Sutton 1967, pp. 264–265).

The Short-eared Owl is a winter visitor in Oklahoma that has been recorded from 29 September to 3 May, exceptionally to 30 May (Sutton *op. cit.*). While in Oklahoma, these owls normally inhabit undisturbed grasslands where they roost colonially on the ground. Winter population size may be correlated with density of prey, primarily mice of the genus *Microtus* (Eckert 1974), or with the area of suitable hunting habitat near a roost (Clark 1975). I have observed up to 34 owls at one roost site. Other observers (Delap 1977; McMahon 1989) have described groups of from 40 to 200 Short-eared Owls at other roosts in the state.

Short-eared Owls are relatively quiet on the wintering grounds. When disturbed, however, they usually emit one to five (generally three) harsh, barking calls. My observations of Oklahoma birds indicate that these "wak" calls are used to alert other owls in the vicinity.

On 16 February 1990, while studying a roost of Short-eared Owls in Tulsa County, I heard not only the normal barking call, but also a series of 10 to 14 rapid sequential "hoots," given within six or eight seconds. These sounds were coming from a group of Short-eared Owls on the ground. The hooting or "toot" call is described in Bent (1938:169) as part of the courtship behavior: the "toots" are "repeated fifteen to twenty times, at the rate of four toots per second . . ." On 23 February 1990, I heard the hooting sequence from a bird in flight. On most visits, 22 to 26 owls were counted in the roost area but on 1 March there were 28.

Nests are difficult to pinpoint because the incubating bird sits tightly until

approached to within about 10 m. Other individuals flush from the roost when an intruder is within perhaps 40 m. Roosts and nests that I have studied in Oklahoma are usually located in grazed, unimproved fields where three-awn (*Aristida* spp.) and broomsedge bluestem (*Andropogon virginicus*) grasses predominate.

I discovered the first nest on 9 March. Located on the west slope of a hill, it contained two eggs. The nest was a depression in a large clump of broomsedge bluestem which contained many stems pressed down, keeping the eggs off the ground, and measured only about 15 by 25 cm. When the female was incubating, the nest was perfectly camouflaged. On 10 March there were three eggs, four on the 12th. The nest held six eggs on the 15th, and the two owls near the nest gave the rapid hooting sequence five times during my visit. They also "wing clapped" (four to nine claps each series) eight different times. According to Bent (*loc. cit.*, p. 170), the clapping display, a courtship activity, is caused as the owl dives and brings "his wings together beneath him, stretching them back posteriorly and striking them rapidly together with short clapping strokes." As I walked to the nest, the owls nearby responded to my presence with the barking call.

On 19 March the nest contained eight eggs and I heard the rapid hooting series (of 12 each) five different times. At least two and possibly three nearby Short-eared Owls conducted several wing clapping displays, two of them directly overhead. These displays produced four to six "popping" sounds in rapid succession, as the owl lost 15 to 20 m in altitude.

The owl was incubating all eight eggs when I next checked the nest on 27 March. That day, I counted 19 Short-eared Owls in the area. Only one of the monotone hooting series was heard. Three barking, or "wak" calls were uttered by an owl as it flew into the roost area.

I saw 12 Short-eared Owls in the colony on 3 April. One of these was on the nest, another on the "sentry station" in a clump of grass about 60 m uphill toward the ENE, and 10 more at the roost, about 120 m to the northeast (I have observed that the non-incubating member of the pair, usually the male, positions himself where he can view the nest, i.e., at the "sentry station;" from this site, he may lead intruders away from the nest, but if unsuccessful, can return to defend it). Upon examining the nest, I found some of the eight eggs discolored from whitish to tan. One was cracked. By this time, incubation of the first eggs should have been completed or nearly so, as Bent (*loc. cit.*, p. 172) stated that the incubation period is about three weeks.

The nest had been abandoned when I next checked it on 8 April. Only two eggs remained and several shell fragments lay scattered about. No owls were observed in the nest vicinity. In the field to the south remained 14 of the 28 roosting birds I had counted on 1 March (the "southern group"). Periodically during winter, the roost site had changed locations slightly. I located the sentry station of the southern group and shortly thereafter found the second nest. It was similar to the first except that its exit faced east, not north, and it was situated on an eastward slope rather than a west-facing one. Although it contained six eggs, I had no way of telling how far incubation had proceeded. Clutch size normally varies from four to seven eggs, with as many as 14 having been reported (Terres 1980).

Returning to the area on 16 April, I flushed five Short-eared Owls from the roost and one from the sentry post, which was WSW of the nest. I did not disturb the incu-

bating owl. On 19 April an owl was incubating the six eggs, and there were five other birds nearby. When the incubating owl was flushed, it hovered about 50 m away at an altitude of 25-35 m, and regurgitated a pellet containing the remains of a plains harvest mouse (*Reithrodontomys montanus*). On 24 April there were only two Short-eared Owls in the area, one incubating, the other at the sentry station. The nest now held only four eggs. By 28 April no owls were to be seen and three eggs and one shell were in the nest. Therefore, apparently no chicks hatched at either nest.

The earliest nesting date listed in Bent (*loc. cit.*, p. 182) was 20 March (northern Great Plains states), with most nesting occurring from about late April to early June. For Nebraska, Kansas and Illinois, dates extend from 8 April to 17 May (Johnsgard 1979). Thus the 9 March record above appears to be a new early nesting date for this species.

In Kansas, Johnston (1965) listed nesting records from Marshall, Bourbon, Republic and Woodson counties. Presently, "Its actual breeding status in much of Kansas is still uncertain" (Thompson and Ely 1989). Seltman (1990) found a nest with young on 1 July 1990, 4 miles north and 1 west of Rozel in Pawnee County; on 28 July he saw a juvenile bird near the nest site.

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—Paul W. Wilson, *10004 E. 156th St. N., Collinsville, Oklahoma 74021, 25 November 1990.*

A Short-eared Owl nest in Osage County, Oklahoma.—On 13 April 1993, while laying out plots for a study of nesting birds on The Nature Conservancy's Tallgrass Prairie Preserve about 20 km north of Pawhuska, Osage County, Oklahoma, we (Blaha, Nelson and Stewart) flushed an adult Short-eared Owl (*Asio flammeus*) from the ground about 3 m ahead of us at 1500 CST. When we reached the flush site we

found that the bird had been brooding four downy owlets about 8 to 10 cm long in a nest sparsely lined with grass and a few feathers (Fig. 3). It contained an unidentified dead mouse. Buckbrush (*Symphoricarpos orbiculatus*) grew at the southeast edge of the nest, providing a bit of concealment and shading, but the nest was otherwise exposed in the adult's absence. Dominant vegetation in the area consisted of big bluestem (*Andropogon gerardi*), switchgrass (*Panicum virgatum*) and Indian grass (*Sorghastrum nutans*).

We returned to the nest at 1335 on 15 April and flushed an adult Short-eared Owl while still about 80 m from the nest; a second owl flew from the nest when we were 5 m away. Besides the four downy chicks which were now beginning to turn brownish-buff, the nest held two dead mice that we were unable to identify. We collected eight owl pellets from the base of a post 8 m from the nest. Their contents included four prairie voles (*Microtus ochrogaster*), one harvest mouse (*Reithrodontomys* sp.), a least shrew (*Cryptotis parva*), one Horned Lark (*Eremophila alpestris*), an unidentified bird and the heads of five large beetles (Carabidae or Tenebrionidae).

When we next visited the site at 1030 on 19 April, no adult owl was seen and the nest, though intact, was empty. The still limp, freshly bloodied and partially-eaten remains of two owlets lay nearby. We surmised that they had been killed earlier that morning or late the previous night. On 20 April the carcasses were gone, but we did find two carnivore scats (species unknown) nearby.

The incubation period for Short-eared Owls is about 24-28 days, with eggs laid at 2-day intervals (Harrison 1978); based on descriptions in Holt and Leasure (1993), we estimated that the owlets had been about five days old when the nest was discovered. Therefore, the first egg had probably been laid during the first or second week in March. The nest and nest site, as well as the variety of prey items recovered from the pellets, were all typical for Short-eared Owls (Clark 1975; Holt and Leasure 1993). Photographs of the nest and owlets have been placed in the Prairie Bird Nest Records File at the Sutton Avian Research Center in Bartlesville and with the Oklahoma Bird Records Committee.

In Oklahoma, Short-eared Owls are considered transients or winter residents (Baumgartner and Baumgartner 1992; Sutton 1967, 1974) and the state is south of their normal breeding range (Holt and Leasure 1993). There are only three nesting records known for Oklahoma. Many years ago, a nest was found by T.C. Carter near Freedom in Woods County (Nice 1931; Sutton 1967), but no details are available. More recently, Paul Wilson found two nests in Tulsa County in 1990, the first in early March, the second in early April (see previous note). Both nests were apparently abandoned before the eggs hatched. Our nest is the fourth recorded for Oklahoma; so far, all have been situated in grassland habitats in the north central part of the state.

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