NEST BOX USE BY AMERICAN KESTRELS IN THE WESTERN PIEDMONT OF SOUTH CAROLINA

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Captures of banded American Kestrels (*Falco sparverius sparverius*) demonstrate that a migratory population winters in the Piedmont of South Carolina (deMent and deMent 2001). Recent work by Hobson et al. (2009) in this region confirms this conclusion, but also suggests that a few (9.3 $\pm$ 3.5 %) kestrels are residents. Breeding by kestrels in this area of South Carolina has not been confirmed to-date. Kestrels use nest boxes in the Upper Coastal Plain of the state, but apparently not in the lower Piedmont of northern Richland and southern Fairfield Counties (Cely and Sparrow 1988), although observations of breeding kestrels in Newberry County have been reported (Cely 2003). In this study, we used nest boxes to confirm the presence of breeding American Kestrels in the South Carolina Piedmont Region.

Methods

Our study featured 2 15 km^2 sites in the Piedmont of South Carolina. One of the sites was located in rural Abbeville County (34.1º N 82.2º W), where the landscape consisted of non-cultivated pastureland associated with cattle grazing operations (Fig. 1). This site also included vacant lots of an abandoned textile mill. Our second study site was in rural Newberry County (34.1º N 81.4º W), and was comprised of cultivated landscapes associated with large dairy and poultry operations (Fig. 1).

Two local Cub Scout troops volunteered to build 10 nest boxes suitable for kestrels. We placed the 10 nest boxes at locales where both male and female kestrels had been banded during winter months. All nest boxes faced southeast and were separated by at least 1 km². The breeding season for kestrels occurs

from early April through mid June (Clark 1983). Five nest boxes in the Abbeville study site were placed in early March 2002 on steel poles at heights ranging from 3.66 to 4.27 m, and fitted with predator guards. The 5 locales were Dixie Drive, Central Shiloh Road, Pickens Creek Road, Due West, and South Mill. Five nest boxes were also placed in early March 2005 in the Newberry County study site, at the same height range. The boxes used in the latter study site were placed on wooden utility poles and were not protected by predator guards. The locales were Belmont Church Road, Silver Street Road, Belle Ivy Road, Rocky Creek Road, and Floyd Road.

The Abbeville nest boxes were monitored for 9 nesting seasons from 2002 to 2010, and the Newberry County nest boxes were monitored for 6 years from 2005 to 2010. We monitored the nest boxes every 2 weeks from late March until mid June. Nesting activity and sightings of kestrels were recorded at each nest box site during a minimum observation period of 10 minutes. Nestlings were banded, in accordance with a master banding permit, at approximately 25 days post-hatching.

Results

Kestrels nested in 5 of 44 boxes at the Abbeville County study site, and in only 1 box out of 30 at the Newberry County study site (Tables 1 and 2). Overall, only 6 of 74 nest boxes (8%) were occupied by kestrels during the study. Twenty-one kestrels hatched in the nest boxes. Two adult females were trapped and banded. None of the banded fledglings or adult females were recaptured. Two un-hatched eggs were noted, and one nestling died. Clutch size averaged 3.8 ± 0.65 (23 eggs total). Eastern Bluebird (*Sialia sialis*) was the most frequently detected species nesting in the boxes at the Abbeville locations at (17 of 44 opportunities or 39%). European Starling (*Sturnus vulgaris*) was the most common nesting species in the boxes at the Newberry locations (10 of 30 opportunities or 33%), closely followed by Eastern Bluebird at 23%. A Northern Flicker (*Colaptes auratus*) nested in one Abbeville County nest box, and a southern flying squirrel (*Glaucomys volans*) occupied another in the same study area. House Sparrows (*Passer domesticus*) nested in one Newberry County nest box. Paper wasps (*Polistes* spp.) were a problem at one Newberry nest box site, necessitating the relocation of the box to another site in the same field. Twenty-eight of 74 (38%) of the nest boxes were not used by any species during the study.

No nest predation was observed, and no double brooding of kestrels was

noted. No boxes were used by kestrels during the first 2 nesting seasons in the Abbeville study area, and 6 years of the study elapsed before a nest box was occupied by kestrels in the Newberry area. During 2008, a nest box located at Pickens Creek in Abbeville County was removed by a farmer, and could not be re-erected until the nesting season was over.

Discussion

Breeding of American Kestrels in the Piedmont of South Carolina was confirmed. Overall nesting occupancy was 8% for our 2 study areas. This compares to 7.5% for the midlands-sandhills region of South Carolina (Cely and Sparrow 1988), and 3% for Southeast Georgia (Breen and Parrish 1997). The latter study included the smaller southeastern American Kestrel subspecies (*Falco s. paulus*), primarily a Coastal Plain resident which is not known to reside in the South Carolina Piedmont. Interestingly, in a previous study of 28 nest boxes placed in the Piedmont of South Carolina, which included Richland and Fairfield Counties, no breeding kestrels were recorded (Cely and Sparrow 1988).

It is unclear why 6 years elapsed before nesting was first recorded at the Newberry study area. This could be due to a low density of the species in that area compared to the Abbeville area. Sub-optimal nest box placement is also a possible contributing factor, as well as increased human activity related to the busy dairy and poultry operations near the Newberry sites. Although we did not measure habitat parameters at either study site, there clearly was less natural habitat and less structural diversity of habitats at the Newberry sites compared to the Abbeville sites. Thus, the smaller percentage of nest boxes used by kestrels in the Newberry area might be attributable to fewer birds resulting from lesser habitat quality. Competition for nest box use by other species might have also played a role, especially with respect to the boxes at the Newberry sites. European Starlings, an especially aggressive nester, were the predominant nest box occupants in the Newberry area, whereas the more passive Eastern Bluebird was the dominant nesting species in boxes in the Abbeville area. Perhaps the absence of predator guards at the Newberry locations deterred use of the boxes by kestrels, but other bird species readily occupied the nest boxes.

Since we did not monitor nest boxes after mid-June, it is possible that some kestrel nests were not detected. Cely and Sparrow (1988) reported that peak nesting by kestrels in the midlands-sandhills (Upper Coastal Plain) region of South Carolina occurred in mid-June. Furthermore, possible double-brooding

by kestrels in our study sites in early summer would have gone undetected; this nesting phenomenon has been observed in kestrels elsewhere in South Carolina and in the Georgia Coastal Plain (Cely and Sparrow 1988, Breen and Parrish 1996).

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Table 1. Species recorded using nest boxes erected for American Kestrels in 5 locations within a 15 km^2 study area in Abbeville County, South Carolina, 2002-2010. Boxes were placed at least 1 km apart.

	LOCATION				
YEAR	**Dixie Dr.**	**Cont. Shiloh**	**Pickens Crk.**	**Due West**	**South Mill**
2002	-----	EABL	EABL	-----	-----
2003	EABL	-----	-----	-----	NOFL
2004	EABL	EUST	AMKE	EUST	EABL
2005	EABL	EUST	EABL[1]	EABL	FLSQ[2]
2006	EABL	EABL	-----[2]	-----	-----[2]
2007	EABL	-----	AMKE	EABL	-----
2008	-----	-----	-----[3]	-----	AMKE
2009	-----	EABL	AMKE	EABL	-----
2010	EABL	EABL	-----[2]	EABL	AMKE

[1]Male and female kestrels sighted near box during breeding season.
[2]Male or female kestrel sighted near box during breeding season.
[3]Nest box removed by farmer; re-erected after nesting period.
Alpha numeric abbreviations: EABL = Eastern Bluebird; AMKE = American Kestrel; EUST = European Starling; NOFL = Northern Flicker; and FLSQ = Flying Squirrel.

Table 2. Species recorded using nest boxes erected for American Kestrels in 5 locations within a 15 km^2 study area in Newberry County, South Carolina, 2005-2010. Boxes were placed at least 1 km apart.

	LOCATION				
YEAR	**Belmont Ch.**	**Silver St.**	**Bell Ivy**	**Rocky Crk.**	**Floyd Rd.**
2005	EABL[1]	EABL	-----	EUST	-----
2006	-----	-----	-----[1]	EABL	EABL
2007	-----	EUST	-----	-----	-----
2008	EABL	EUST	-----	EUST	EUST
2009	EABL	-----	EUST		EUST
2010	EABL	HOSP	AMKE		EUST

[1]Male or female kestrel sighted near nest box during breeding season.
Alpha numeric abbreviations: EABL = Eastern Bluebird; EUST = European Starling; AMKE = American Kestrel; HOSP = House Sparrow.

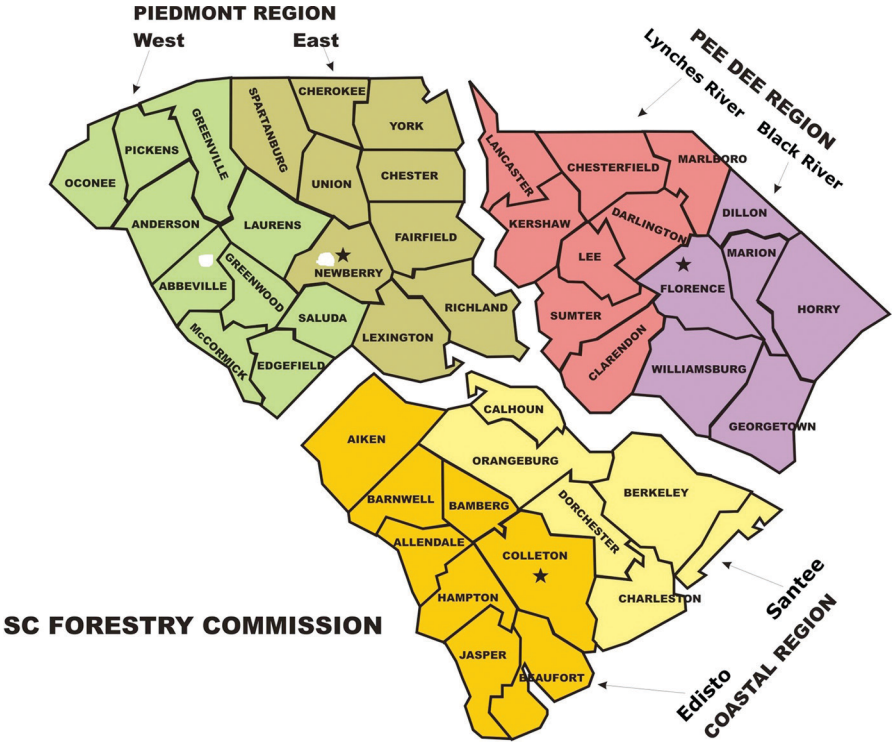

Figure 1. Study sites (white circles) in Abbeville County and Newberry County, South Carolina, where nest boxes were erected for American Kestrels during 2002-2010.