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NEST-SITE SELECTION BY EASTERN SCREECH-OWLS IN CENTRAL KENTUCKY[1]

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Abstract. From 1985–1987 we located 15 Eastern Screech-Owl (*Otus asio*) nests in central Kentucky. By comparing used nest sites to randomly chosen unused nest sites, we determined which features of the nest tree/cavity and surrounding vegetation influenced nest-site selection. We employed multivariate statistical techniques and assumed that features contributed to choice if their means differed significantly in the two samples, or if the used sample exhibited significantly reduced variance. Eastern Screech-Owls selected nest sites based on the depth of the cavity and, to a lesser degree, cavity height and entrance size. Neither tree species nor entrance orientation (direction) of the cavity hole were important in nest selection. Similarly, nest-site vegetation parameters appeared to play little role in nest-site selection. If suitable cavities are limited in supply, and cavities with nonoptimal characteristics reduce protection from predators and decrease reproductive success, then the availability of suitable cavities may limit Eastern Screech-Owl populations.

Key words: Eastern Screech-Owl; Otus asio; *nest-site selection; secondary cavity nester; nest cavity; cavity dimensions; multivariate habitat analysis; central Kentucky.*

INTRODUCTION

Eastern Screech-Owls (*Otus asio*) are small, nocturnal owls found throughout much of the eastern United States. Like other secondary cavity-nesting species, they cannot excavate their own cavities and are limited to either natural tree cavities or old woodpecker holes. The abundance of such cavities may limit populations of secondary cavity-nesting birds (von Haartman 1957, Thomas et al. 1979, Brush 1983, Cody 1985, Brawn and Balda 1988), including owls (Lundberg and Westman 1984). Despite the obvious importance of cavities, limited information is available concerning those features that make them suitable for particular species. Peterson and Gauthier (1985) suggested that volume and, to a lesser extent, entrance area were important in determining which species used a cavity. Cavity dimensions and height may also be important features (Stauffer and Best 1982, van Balen et al. 1982), and both are known to influence reproductive success (Karlsson and Nilsson 1977, Nilsson 1984, Korpimäki 1985, Rendell and Robertson 1989). Tree species diversity and density (Swallow et al. 1986) and the vegetation surrounding the cavity (McCallum and Gehlbach 1988) may also influence the suitability of cavities. By comparing the characteristics of used cavities to those of unused cavities, we sought to determine which of these features, if any, were important in nest-site selection by Eastern Screech-Owls in central Kentucky.

METHODS

From 1985–1987 we located Eastern Screech-Owl nest sites in Madison County, Kentucky within the 680-ha Central Kentucky Wildlife Management Area (CKWMA), located 17 km southeast of Richmond. This area consists of small deciduous woodlots (1 to 15 ha in size) and thickets interspersed with cultivated fields and old fields. Areas surrounding the CKWMA are mainly agricultural, although extensively wooded and mountainous areas are nearby.

We located screech-owl nests by following radio-tagged adults to nest cavities and by systematically inspecting tree cavities within the study area. We captured owls from roost cavities during winter, or with mist nets while playing recordings of bounce songs on owl territories during concurrent telemetry studies (Cavanagh and Ritchison 1987; Ritchison et al. 1988; Belthoff and Ritchison 1989, 1990). Young at each nest were banded with U.S. Fish and Wildlife Service

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aluminum bands, and two young were removed from each of three nests for other experiments. We defined used sites as those in which screech-owls laid eggs; young owls successfully fledged from 12 (80.0%) of these nests. Ten nests represented independent nesting pairs. Two other pairs of owls used the remaining five sites (three different nests and two different nests, respectively). Members of these pairs changed nest cavities each year that they were monitored (one pair used one of the cavities in successive years prior to this study). For each nest we recorded tree species, cavity height (m), tree height (m), and tree diameter at breast height (dbh, cm). We also measured characteristics of the nest cavity itself (cm), including tree diameter at cavity height, cavity-entrance size (height and width), cavity depth (from top of cavity to bottom), entrance orientation (direction in degrees), and the inside diameter of the cavity (distance from entrance to back wall). These characteristics constituted nest-tree/cavity variables.

We measured woody vegetation surrounding each nest tree following James and Shugart (1970). We recorded the species, dbh, and height of all trees greater than 8 cm located within a 0.04-ha circular plot centered on the nest tree. To calculate shrub density, we made two perpendicular transects (north boundary to south boundary and east to west) and counted and measured the diameter of all woody stems less than 8 cm within our reach. We estimated percent canopy, understory, and ground cover by sampling 10 points along transects in each of four cardinal directions from the nest tree (i.e., total of 40 points for each category) using an ocular tube. We determined canopy height by calculating the mean of five randomly located measurements taken to the top of the canopy within the circular plot and used Shannon's diversity index (H') to estimate species diversity (calculated as $-\Sigma\ p_i \log p_i$, where p_i is the proportion of total number of individuals occurring in species i or n_i/N). These measures constituted surrounding vegetation variables. Because we obtained surrounding vegetation measurements after the young fledged, we assumed that values approximated those at the time owls selected nest cavities. We also recorded the distance from nest trees to the nearest forest opening or edge, to permanent water, and to the nearest tree containing a cavity; distances greater than 500 m were estimated from aerial photographs of the study area.

We obtained similar data (both nest tree/cavity and surrounding vegetation/distance) from 15 cavity trees that screech-owls did not nest in during the study period. We conducted random line transects through eight woodlots known to contain nesting pairs of screech-owls and chose 15 cavity trees lying within 10 m of the transect, choosing the first cavity we encountered on each transect. By using cavities located on known owl territories we increased the likelihood that unused sites represented those selected against, rather than those unoccupied because habitat was not saturated with screech-owls (McCallum and Gehlbach 1988). Because dense canopy vegetation presumably obscured our view of some cavities, our sample may represent more exposed sites than the true population of unused sites. Nevertheless, tree cavities must have appeared large enough for screech-owl use (i.e., an opening greater than about 8 cm in height or 8 cm in width) to be included. Red-bellied Woodpeckers (*Melanerpes carolinus*), Pileated Woodpeckers (*Dryocopus pileatus*), and Northern Flickers (*Colaptes auratus*) formed many of the cavities on the area, and these were often enlarged by eastern gray squirrels (*Sciurus carolinensis*); naturally occurring (i.e., those that were not excavated) tree cavities were also present. We did not test for possible preference of natural cavities vs. old woodpecker holes because the history of some cavities was ambiguous.

DATA ANALYSIS

We followed procedures outlined by McCallum and Gehlbach (1988) in their analysis of Flammulated Owl (*Otus flammeolus*) nest sites, but several of the variables we measured differed from theirs. They noted that to demonstrate that individuals choose nest sites nonrandomly from the available pool of tree cavities used and unused sites must differ in variance and/or mean along at least one dimension of habitat (McCallum and Gehlbach 1988; p. 654).

For analysis of nest-tree/cavity data, we divided analyses into tests of variance, a means test, and a test of cavity entrance direction; cavity entrance orientation was considered separately because it required circular statistical procedures. To reduce the probability of Type I error (i.e., α), we arbitrarily allocated 0.025% of alpha to variance, 0.02 to means, and 0.005 to cavity bearing, totaling 0.05 for all analyses. For surrounding vegetation analyses, we allocated 0.03

TABLE 1. Tree species of Eastern Screech-Owl nest sites (used) and randomly selected unused sites.

Tree species	Frequency (%) Used	Unused
Plantanus occidentalis	5 (33.3)	3 (20.0)
Quercus shumardii	2 (13.3)	1 (6.7)
Liquidambar styraciflua	2 (13.3)	4 (26.7)
Quercus rubra	1 (6.7)	0 (0.0)
Quercus falcata	1 (6.7)	0 (0.0)
Ulmus americana	1 (6.7)	0 (0.0)
Robinia pseudoacacia	1 (6.7)	0 (0.0)
Juglans nigra	1 (6.7)	0 (0.0)
Catalpa speciosa	1 (6.7)	0 (0.0)
Prunus serotina	0 (0.0)	1 (6.7)
Quercus velutina	0 (0.0)	1 (6.7)
Sassafras albidum	0 (0.0)	1 (6.7)
Carya laciniosa	0 (0.0)	1 (6.7)
Unidentified snag	0 (0.0)	3 (20.0)

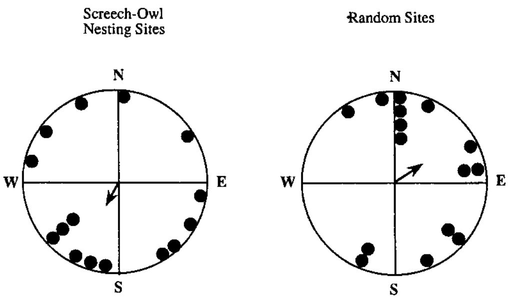

FIGURE 1. Cavity-entrance orientation for Eastern Screech-Owl nesting sites and randomly chosen unused sites. Arrows represent mean direction for each distribution; their lengths correspond to relative dispersion (i.e., r) of observations. Means and their angular deviation for used and unused sites are 204.5 ± 94.99 (r = 0.253) and 48.5 ± 82.46 (r = 0.356) degrees, respectively.

and 0.02 to tests of variance and means, respectively. Using contingency analysis (Zar 1974) to compare the relative frequency of used vs. unused cavity trees, we also evaluated the null hypothesis that cavity use was independent of tree species. For this test, we pooled tree species with $n < 2$.

We calculated mean cavity-entrance orientation ($\bar{a}$ ± angular deviation) and its dispersion (r) for both used and unused sites and used Rayleigh's test to determine if a significant mean population direction existed in either sample (Zar 1974). We examined differences in mean directions of entrance holes between used and unused cavities using the nonparametric Watson's test (Zar 1974).

We compared mean values of used and unused sites using multivariate analysis of variance (MANOVA) and performed separate principal component analyses (PCA) on nest-tree/cavity and surrounding vegetation data. To examine the equal variance hypothesis we compared variances of PC scores for used and unused sites along the first three principal components using one-tailed F-tests (Type I error probability for each test was set at 0.015). We transformed all percentages using the arcsine transformation (Zar 1974) and all other measures by taking natural logarithms prior to analyses.

RESULTS

Fifteen Eastern Screech-Owl nests were in nine species of trees (Table 1); the 15 randomly selected cavities were in seven species of trees, plus three unidentified snags. These distributions did not differ significantly (χ^2 = 4.90, df = 4, p >

TABLE 2. Mean (±SE) characteristics and coefficient of variation (CV) of screech-owl nest trees/cavities and random, unused sites (n = 15 for both used and unused).

Character	Nest sites $\bar{x}$ ± SE	Nest sites CV	Unused sites $\bar{x}$ ± SE	Unused sites CV
Nest tree				
Cavity height (m)	6.5 ± 0.44	26.16	7.6 ± 0.92	46.43
Tree height (m)	20.8 ± 1.97	36.58	21.6 ± 1.78	32.04
Tree dbh (cm)	44.2 ± 2.05	17.96	49.0 ± 3.88	30.65
Nest cavity				
Tree diameter at cavity (cm)	34.3 ± 2.02	22.04	34.9 ± 3.16	35.04
Entrance height (cm)	12.4 ± 0.82	25.54	11.0 ± 1.05	36.81
Entrance width (cm)	11.0 ± 0.72	25.28	9.2 ± 0.60	25.00
Cavity depth (cm)	30.6 ± 3.69	45.09	82.7 ± 23.12	108.34
Inside diameter (cm)	24.5 ± 1.28	19.51	21.1 ± 1.53	28.03

TABLE 3. Mean (±SE) characteristics and coefficient of variation (CV) of vegetation surrounding used and unused cavity trees and distance variables (n = 15 for both used and unused).

Character	Nest sites		Unused sites	
	$\bar{x}$ ± SE	CV	$\bar{x}$ ± SE	CV
Surrounding vegetation				
Species diversity (H')	0.82 ± 0.044	20.85	0.79 ± 0.042	20.50
Shrub density/ha	1,379.7 ± 207.92	58.37	2,106.7 ± 172.76	31.76
Tree density/ha	483.3 ± 52.70	42.23	508.3 ± 45.03	34.31
Basal area (m^2/ha)	102.4 ± 11.94	45.15	109.9 ± 7.38	26.00
Canopy cover (%)	79.5 ± 3.18	15.50	84.5 ± 2.71	12.42
Shrub cover (%)	53.5 ± 4.71	34.10	57.5 ± 3.48	23.41
Ground cover (%)	62.3 ± 4.99	31.01	59.3 ± 3.94	25.75
Canopy height (m)	13.9 ± 0.71	19.63	14.5 ± 0.64	17.17
Distance variables[1]				
Distance to water (m)	110.0 ± 25.61	90.18	98.9 ± 17.59	68.85
Distance to opening (m)	33.6 ± 5.43	62.68	31.6 ± 4.40	54.01
Distance to nearest cavity tree (m)	23.6 ± 3.71	60.80	23.0 ± 2.54	42.88

[1] Distance variables excluded from multivariate analyses.

0.25), thus, use of cavities was independent of tree species.

Mean entrance orientation (direction) for screech-owl nest cavities and random cavities was 204.5 ± 94.99 degrees (r = 0.253) and 48.5 ± 82.46 degrees (r = 0.356), respectively (Fig. 1). Neither population exhibited significant directionality (Rayleigh's z-test; used: $Z = 0.960$, $P > 0.20$; unused: $Z = 1.897$, $P > 0.10$). Similarly, there was no significant difference in mean entrance orientation between used and unused sites (Watson's test; $U^2 = 0.129$, $P > 0.10$).

Nest-tree/cavity means for used and unused sites did not differ significantly (Wilk's lambda = 0.696, $F = 1.15$, $P > 0.374$) (Table 2). Similarly, there was no significant difference between used and unused sites in surrounding vegetation (Wilk's lambda = 1.80, $F = 1.32$, $P > 0.28$; Table 3). The assumption of equal variances among treatment groups was not fulfilled for either of these tests, however (Bartlett's test: $F = 1.572$, $P < 0.017$ for nest tree/cavity; $F = 1.542$, $P < 0.007$ for surrounding vegetation). Variation was reduced in used sites for six of eight nest-tree/cavity features (Table 2; CV) but greater in used sites for all surrounding vegetation measures (Table 3; CV). Although there was no overall difference (i.e., multivariate) between the groups, shrub density (stems/ha) was significantly greater on unused sites (one-way ANOVA; $F = 8.99$, $P < 0.006$).

PCA for nest-tree/cavity variables suggested PC I is a gradient of increasing cavity depth (Table 4), explaining approximately 68% of variation among sites. Although explaining much less of the overall variation (12%), PC II is a gradient of increasing tree size (height and diameter). PC III indicates that cavity height and the size of cavity entrances also explain a small percentage (6.7%) of overall variation among sites. We plotted used and unused sites along the first two principal components in Figure 2a, along with cavity depth vs. an index of tree size ([tree height × tree dbh]/10) from raw data (Fig. 2b). We noted significant variance reduction in PC scores among used sites for both PC I (cavity depth; $F = 9.334$, $P < 0.001$) and PC III (cavity height and cavity entrance size [height]; $F = 5.891$, $P < 0.003$). Variance of scores for used and unused sites did not differ along PC II ($F = 1.424$, $P > 0.25$).

For surrounding vegetation (Table 5), principal component I is a gradient of increasing canopy cover, while PC II represents increasing ground cover. The third PC is a gradient of increasing shrub cover. Variance of scores was greater in used sites for each PC examined (Fig. 3).

DISCUSSION

Eastern Screech-Owls in the present study exhibited no apparent preferences for tree species containing nesting cavities. Similarly, Bent (1938) reported seven screech-owl nest cavities in four different tree species. In contrast, Ligon (1968) found that 26 of 32 (81%) Elf Owl (*Micrathene whitneyi*) nest cavities were located in syca-

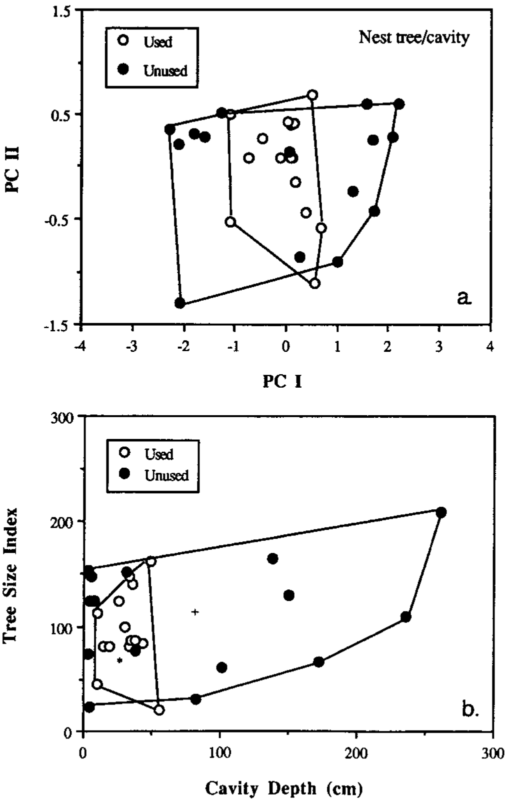

FIGURE 2. Plot of first two principal components of nest-tree/cavity data from Eastern Screech-Owl nest sites and randomly chosen cavities (a). PC I and PC II represent gradients of relative cavity depth and tree size, respectively. The dimensional space occupied by PC scores for used and unused sites is bounded by respective lines. Raw data for cavity height and tree size index (i.e., [tree height × dbh]/10) are plotted in (b). Mean values for used and unused sites are shown as (*) and (+), respectively.

mores. This apparent preference for sycamores by Elf Owls probably reflects the fact that woodpeckers prefer this tree species (because of its fairly soft wood or smooth bark that may be difficult for snakes to climb) and Elf Owls are dependent on woodpeckers for nest cavities (Ligon 1968). McCallum and Gehlbach (1988) found 15 of 17 Flammulated Owl nest cavities in either ponderosa pine (*Pinus ponderosa*) or pinyon pine (*P. edulis*). Thus, owls in some areas may exhibit preferences for certain tree species, but such preferences, as in Elf Owls (Ligon 1968, Goad and Mannan 1987), probably result from preferences of primary cavity nesters (woodpeckers) in that particular area. Moreover, species richness in these habitats (i.e., Sonoran desert and pinyon pine forest) is lower than in deciduous forests in central Kentucky, limiting the number of alternate tree species.

Although the direction a cavity entrance hole faces may affect the microclimate within the cavity, our results suggest that entrance orientation is of little importance to screech-owls in Kentucky. Duley (1979) found that six screech-owl nest cavities in Tennessee were oriented in five different directions and suggested that factors other than orientation of the entrance must be important in nest-site selection. Similar results were reported for Flammulated Owls (McCallum and Gehlbach 1988), Barred Owls (*Strix varia*; Johnson 1987), Elf Owls (Goad and Mannan 1987), and Spotted Owls (*S. occidentalis*; Forsman et al. 1984). Nonrandom orientation of cavity entrances has been reported in other cavity-nesting species and has sometimes been attributed to thermal constraints (McEllin 1979,

TABLE 4. Principal components analysis (first three principal components reported) of nest-tree/cavity data from used and unused cavity trees.

Principal component	Eigenvalue	Variation explained (%)	Cumulative %
I	1.584	68.01	68.01
II	0.289	12.42	80.43
III	0.154	6.59	87.02

Variable	Eigenvectors (loadings) PC I	PC II	PC III
Cavity height	0.077690	0.341660	0.638581
Tree height	0.018731	0.753080	−0.112914
Tree dbh	0.014248	0.225241	−0.089550
Diameter at cavity height	−0.014909	0.375060	−0.223365
Entrance height	−0.033638	0.167951	0.588457
Entrance width	−0.047512	0.172305	−0.225616
Cavity depth	0.994730	−0.029114	−0.034468
Inside diameter	0.017634	0.256887	−0.350971

Inouye et al. 1981). American Kestrels (*Falco sparverius*) use cavities facing east more often than expected based on availability of nest cavities (Balgooyen 1976, Raphael 1985). Kestrels prefer open habitats (Bird 1988) and often locate their nests within such habitat; therefore, thermoregulatory advantages associated with non-random selection of cavities may be available. Because Eastern Screech-Owls nest in forest habitats where exposure to solar radiation and prevailing winds is reduced, thermoregulatory benefits resulting from nest-hole orientation may be limited.

If our criteria for indicating choice are reasonable, Eastern Screech-Owls in the present study selected nest cavities on the basis of their depth (PC I) and, to a lesser degree, on cavity height and entrance size (PC III). Most unused cavities were either deeper or shallower than used cavities. Eastern Screech-Owls perhaps avoid deep cavities (i.e., >60 cm in depth) because such cavities may make it more difficult for adults to feed young or for an adult to detect and escape from an approaching predator. Cavities that are too shallow may not provide adequate concealment from potential predators. Moreover, large predators, e.g., raccoons (*Procyon lotor*), that may not be able to enter the cavity could probably reach owls or eggs in a shallow cavity.

Although reduced variance in used sites suggests that nest-tree/cavity characteristics are important for Eastern Screech-Owls when selecting nest sites, several factors may have contributed to our failure to reject the null hypothesis in the test of means. First, statistical significance is influenced by the controls one uses. As McCallum

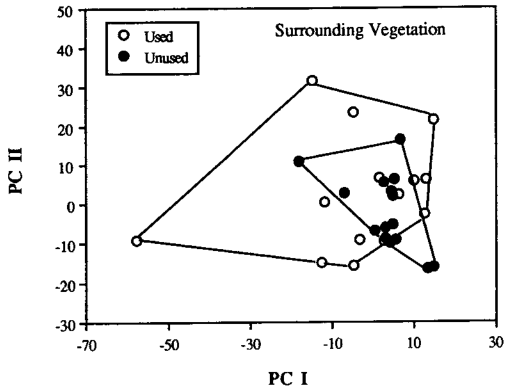

FIGURE 3. Plot of first two principal components for surrounding vegetation. PC I and PC II represent gradients of canopy cover and ground cover, respectively.

and Gehlbach (1988) noted, restricting the null data set to cavities that might reasonably be expected to be used increases the realism of the test but reduces the likelihood of finding significant differences. Similarly, small sample sizes and reduced alpha levels decreased the power of our statistical tests and increased the likelihood of a Type II statistical error. In contrast, it is possible, but we think unlikely, that there are no true differences in used and unused cavities. Certainly, screech-owls exhibit some degree of selectivity in some nest-tree/cavity features in which we found no significant differences. For example, screech-owls require cavities of some minimal size or area (i.e., cavities in trees of some minimal dbh) to accommodate a brood of three to five young (the normal brood size; VanCamp and

TABLE 5. Principal components analysis (first three principal components reported) of surrounding vegetation variables from used and unused cavity trees.

Principal component	Eigenvalue	Variation explained (%)	Cumulative %
I	193.717	48.9	48.9
II	146.845	37.0	85.9
III	55.237	13.9	99.8

Variable	Eigenvectors (loadings) PC I	PC II	PC III
Shrub density	−0.004011	−0.018793	0.034096
Tree density	0.005868	−0.009359	0.011595
Basal area	0.002630	−0.012344	0.008850
H′	0.002542	0.002587	−0.011006
Canopy height	−0.000870	−0.003540	−0.003082
Canopy cover	0.948880	−0.112555	0.294521
Understory cover	−0.311502	−0.482997	0.817187
Ground cover	−0.050289	0.868005	0.493920

Henny 1975). Western Screech-Owls (*Otus kennicottii*) only used cavities in trees with a minimum dbh of 30.5 cm (Thomas et al. 1979, cited in DeGraff and Rudis 1986). Eastern Screech-Owls also require cavity entrances of some minimal size to permit their entry. Because cavities with smaller entrances will exclude some potential nest predators (Sonerud 1985), screech-owls may also avoid cavities with entrances much larger than necessary. Gehlbach (1986) suggested the safest nest cavities for Eastern Screech-Owls in central Texas had entrances small enough to exclude potential predators such as opossums (*Didelphis virginiana*), raccoons, and ringtails (*Bassariscus astutus*).

Our results indicate that height of the nest cavity is also important to screech-owls. Because used sites were an average of 3 m higher than unused sites, Devereux and Mosher (1984) suggested that Barred Owls preferred higher nest cavities. Nilsson (1984) found a lower rate of predation on nest cavities located higher in trees for six species of birds (see also Rendell and Robertson 1989). Such data suggest that selective forces of predation may favor screech-owls using nest cavities above some minimum height. In contrast, because high nests may be more exposed to the elements and flying up to higher nests requires more energy (Collias and Collias 1984, Korol and Hutto 1984), Eastern Screech-Owls may also prefer cavities below some maximum height. These opposing selective forces may have contributed to the significantly reduced variance for cavity height (PC III) in sites that nesting owls used.

Eastern Screech-Owls in the present study apparently did not select nest sites on the basis of surrounding vegetation, with used sites exhibiting more variation than unused sites. Although similar results have been reported in other species of owls, e.g., Tawny Owls (*Strix aluco*, Mikkola 1983), vegetation parameters appear to be important in nest-site selection in some species. For example, Flammulated Owls prefer nest sites characterized by low shrub densities and high canopies (McCallum and Gehlbach 1988), and Barred Owls prefer sites with significantly more understory cover and more trees greater than 50 cm dbh than randomly chosen sites (Devereux and Mosher 1984). At least two factors may contribute to this variation in degree of selectivity among species. First, reduced variance is to be expected only when highly preferred sites are abundant (Stephens and Krebs 1986). High selectivity for cavity/nest-site attributes (including vegetation parameters) exhibited by Flammulated Owls in New Mexico may have been possible because the owl population was sparse (McCallum and Gehlbach 1988). With reference to vegetation parameters these authors noted that "an increasing population of owls might exhaust the supply of preferred cavities." Thus, high variability in nest-site vegetation parameters exhibited by screech-owls in our study may indicate high population densities and a corresponding shortage of preferred sites.

Increased variance in nest-site vegetation parameters may also indicate that such parameters are of little importance in nest-site selection by Eastern Screeh-Owls. Previous work has revealed several cavity-nesting species in which nest-site selection appears to be random with respect to habitat features at the nest site. Suitable nest sites (i.e., cavities) were more important than vegetation parameters for Tawny Owls (Mikkola 1983). Similarly, Gutzwiller and Anderson (1987) examined nest-site selection by several cavity-nesting species in riparian habitat and found that habitats at nest sites and at randomly chosen sites were indistinguishable with respect to a variety of vegetation parameters. In such species, features of the surrounding habitat may be more important than specific habitat features in the immediate area of the nest.

Eastern Screech-Owls nest in a variety of habitats, including deciduous woods (pers. observ.), orchards (Bent 1938), rural-agricultural areas (Duley 1979), and urban-suburban areas (Duley 1979, Gehlbach 1986). Examination of nest-site vegetation parameters (or vegetation parameters away from nest sites) in these different habitats would probably reveal much variation. However, recent studies using radiotelemetry have revealed that areas occupied by Eastern Screech-Owls often share certain common features, i.e., open areas and habitat edge (Ellison 1980, Lynch and Smith 1984, Smith and Gilbert 1984, Hegdal and Colvin 1988, Sparks 1990). Such areas may have increased prey populations and greater diversity of prey species (Lynch and Smith 1984). Screech-owls often forage by taking short flights from trees or shrubs (Marshall 1967, pers. observ.), with hunting facilitated by the presence of either open ground or edge. It is possible, therefore, that the availability of suitable habitat for prey, as well as for hunting those prey, is more important for Eastern Screech-Owls than specific nest-site vegetation parameters.

Our results suggest that Eastern Screech-Owls in central Kentucky are selective in their use of nest cavities. Important features include cavity depth and, to a lesser degree, cavity height and entrance size. Nest-site vegetation parameters did not appear to be important. If, as suggested by some authors (Mengel 1965, Bull 1974, Tate 1981), Eastern Screech-Owl populations are declining, a shortage of suitable nest cavities may be one contributing factor. Although the use of nest boxes does not always indicate nest-site limitation (Waters et al. 1990), it often does (e.g., Lundberg and Westman 1984, Brawn and Balda 1988). Thus, the ready acceptance of nest boxes by Eastern Screech-Owls (VanCamp and Henny 1975, Duley 1979, Smith et al. 1987, pers. observ.) suggests that the availability of suitable nest sites may be limiting their populations in some areas.

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