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The Influence of Microhabitat on Nest Tree Selection of Southern Flying Squirrels

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Southern Flying Squirrels (SFS) are small, gliding mammals that nest in the eastern half of the United States. They tend to nest in cavities in trees, especially if it is in a hardwood (Taulman 1999). SFS den in areas with plenty of understory cover for foraging and large trees with big cavities to nest in (Bendel et al. 1987). Along with nuts, SFS also eat truffles which are often associated with decaying woody debris (Braun 1988; Merritt et al. 2001). In the winter time, SFS will often huddle together in one den tree to keep warm (Merrit et al. 2001). Little else is known about SFS winter nesting behavior, so I wanted to determine what microhabitat variables affected SFS winter den selection.

This study took place in the ravines on Grand Valley State University's (GVSU) campus. The squirrels were radio-collared in October and the den trees were found through radio telemetry between October and January. Measurements for the den trees and random trees were taken between February and April. These measurements included diameter at breast height (dbh), basal area (BA), number of saplings around the trees, number of small to large trees around the test tree, the amount of coarse woody debris (CWD), the elevation, whether the tree was a snag (dead) or not, and the species of the tree in question. Many of these habitat variables I obtained from Gilmore et al. 1985, Bendel et al. 1987, and Taulman et al. 1999. I wanted to make sure that biases for certain trees were due to preference, not availability, so for each den tree I picked a random tree (over 23 cm DBH and at least 10m away) using random compass bearings I obtained from a random number generator.

My hypothesis was that dbh, BA, and CWD measurements would be significantly different between the random trees (for a general overview of the forest) and the den trees. Squirrels nest in trees that are large enough to house themselves and have accessible cavities in them (Bendel et al. 1987). The basal area would also likely be significant because it would be easier for flying squirrels to glide from tree to tree if there were plenty in the area (Bendel et al. 1987). CWD came mostly from the idea that SFS forage for fungus, especially truffles, as a food source (Merritt et al. 2001); high levels of decaying wood would make an excellent habitat for the fungi.

To measure differences between each group (den vs. random for each variable), I used 2-tailed t-tests to see if any of the variables were significant. I used a 2-tailed t-test because my data was not normal, there were not enough data points and I was comparing data between two different groups. I found that the number of saplings around a tree was significantly different between the two groups of trees, and that the BA of trees in the area was almost significant. The p-value of the BA (Fig. 1) was 0.0831 (df=1, chi-square=3.2396), which was close to but not under 0.05. The difference between the number of saplings (Fig. 2) around the den or random trees were significant with a p-value of 0.0307 (df=1, chi-square=4.7507). All of the other values were either not significant, or I had insufficient data to compare the two groups. The analysis of dbh gave a p-value of 0.2196 (df=1, chi-square=1.6022), elevation had a p-value of 0.7807 (df=1, chi-square=0.0883). CWD had one of the least significant p-values with 0.9199 (df=1, chi-square=0.0140), along with the number of small (above 5cm dbh) trees, which had a p-value of 1 (df=1, chi-square=0.0003). There was not sufficient data with the species of trees to run any statistical analysis. I was not able to run a 2-tailed t-test on the alive or dead tree data.

Squirrels likely nested in trees surrounded by many saplings because there was more cover near the ground to avoid predation while foraging (Bendel et al. 1987, Braun 1988). Den trees generally had a higher density of large trees around them; that is to say that their basal area measurements were larger. The higher density of trees made it easier to move from place to place, gave more den tree options, and likely had fewer disturbances (Bendel et al. 1987, Holloway et al. 2007). The dbh of the trees were most likely not significant because I only measured trees large enough to house squirrels (Bendel et al. 1987). The reason I did this was so that all trees measured could be potential den trees. I was surprised that CWD and the amount of small trees in the immediate vicinity did not have a statistically significant effect on were squirrels were nesting. Maybe the squirrels in this area don't utilize fungi as much for food. The small trees possibly weren't large enough to be used for gliding and they weren't close enough to the ground to shelter the squirrels from predators.

Elevation and the number of dead trees nested in also were not significant. First, the elevation in the ravines tended to be within about 50 ft of each other throughout the study area. Some of the trees were on the sides of the ravines, and some were in the bottoms of the ravines. There were just about as many snags picked for dens as there were snags that were not used. This leads me to conclude that there was no benefit to nesting in a living tree during winter in the ravines; however, I would need more data to support this claim.

I would have liked to analyze the difference between the types of trees that were den trees and the random trees that I chose. Because it was winter, I was unable to identify several of the random trees; I was also unable to get in contact with the botany professor. Another factor in my research was the relatively small numbers of den trees and random trees I had to work with. I only had one semester in which to do the research, data from 12 radio-collared squirrels for one season, and only one study site. If I were to do further research, I would have multiple sites, multiple field seasons, and I would do kernel estimates of the squirrels' home ranges. I would like to see the broader scope of SFS microhabitat.

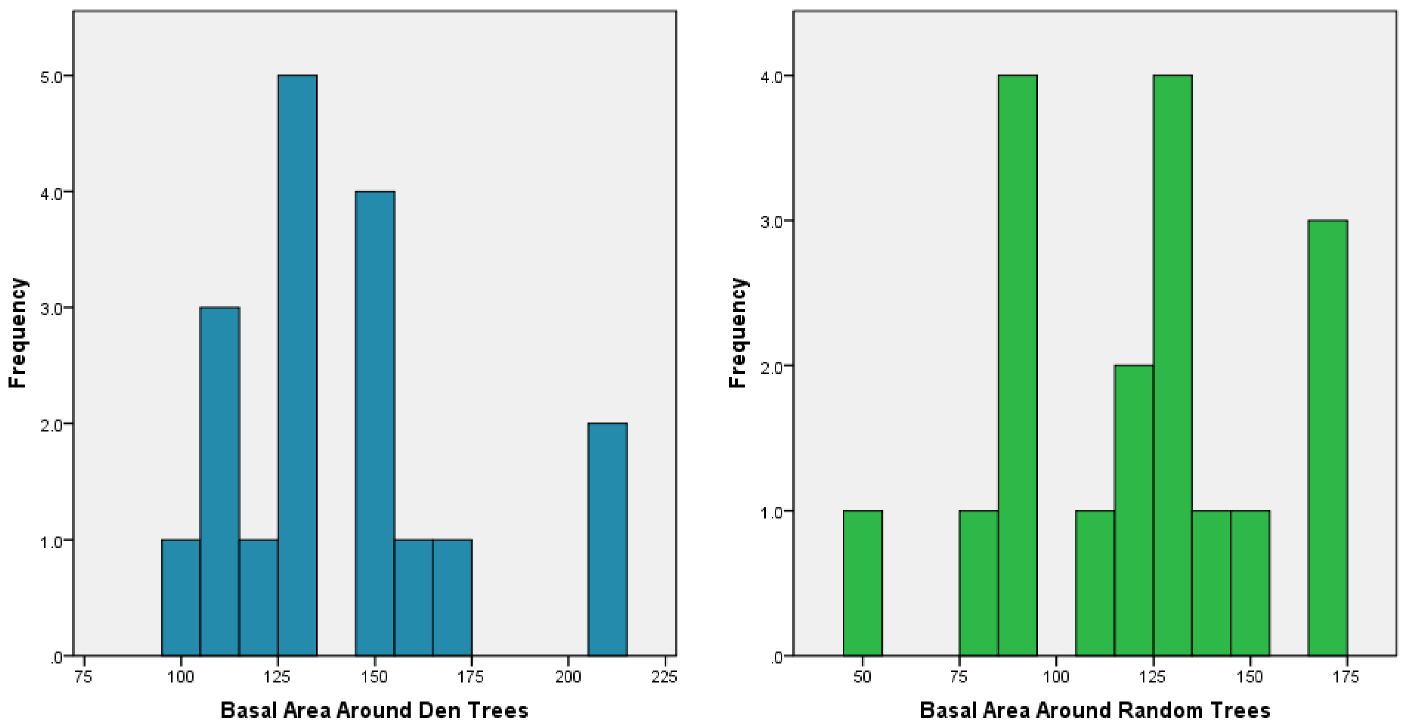

Figure 1. Distribution of the basal areas of each tree
More SFS denned in trees with higher densities of trees around them. The difference between the general forest composition and the den trees were almost statistically significant after 2-tailed t-test**;** p-value: 0.0831, df: 1, chi-square: 3.2396.

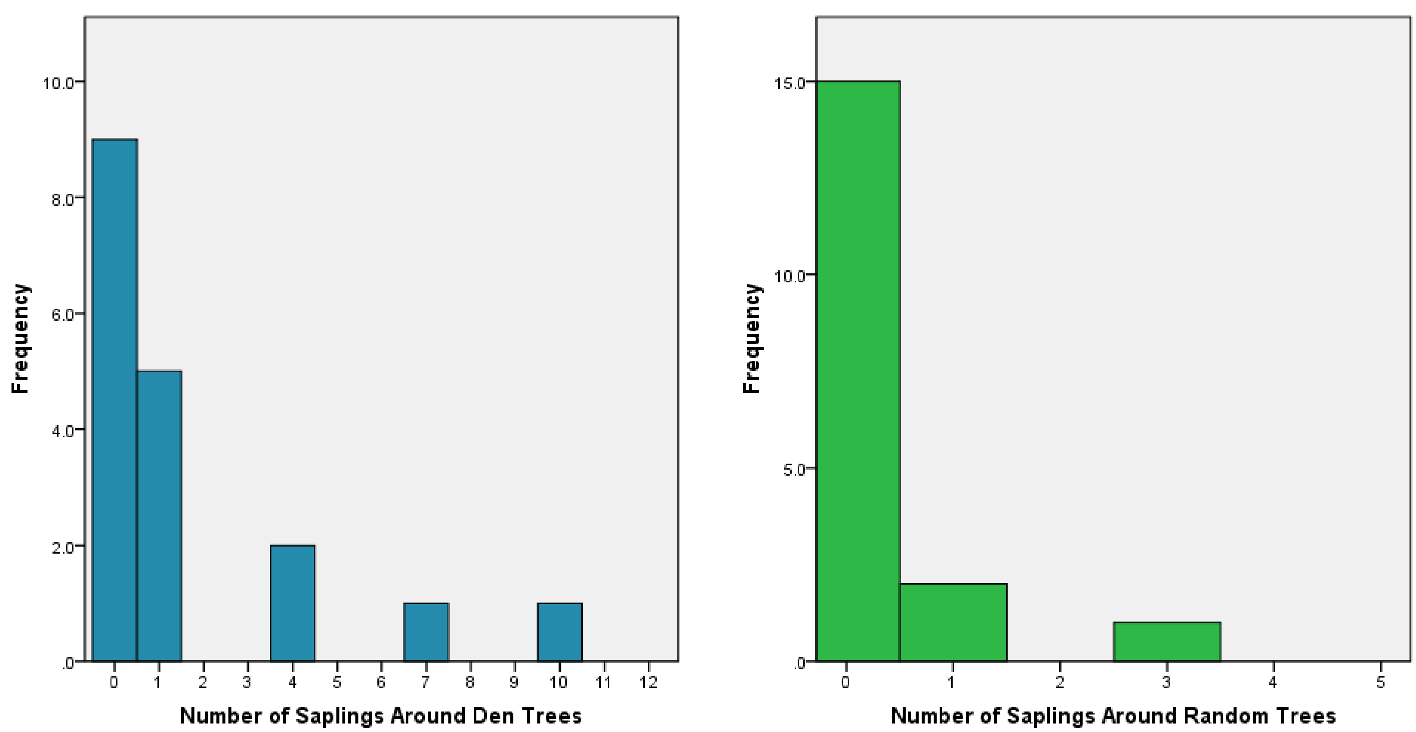

Figure 2. The spread of the number of saplings per tree
(Green- Random Trees, Blue- Den Trees) More squirrels significantly nested in trees that were surrounded by more saplings. Statistically significant variable (p-value <.05) after two-tailed t-test: p-value: .0307, df: 1, chi-square: 4.7507

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