Occupancy of Allegheny Woodrats (*Neotoma magister*) and Small Mammals at Rocky Outcrops in Lilley Cornett Woods

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Introduction

Rocky outcrop habitat features provide shelter for a variety of animals, particularly small mammals[1]. These features act as biogeographic islands whose flora and fauna can differ greatly from the surrounding habitat. The main types of rocky outcrops that were observed in this study are boulders and cliff lines, the latter of which tend to be located at higher elevations.

The Allegheny woodrat (*Neotoma magister*) is a species of packrat found in the eastern U.S. Allegheny woodrats exist in a metapopulation dynamic, with individual subpopulations remaining mainly separate despite being spatially close to one another[2]. Populations in several states across the woodrat's historic range have experienced declines, many to the point of extirpation[3]. Although there are many potential causes of this decline, such as raccoon roundworm (*Baylisascaris procyonis)* infection, decline in hard mast production, habitat fragmentation, and habitat loss[4], it is unclear which of these factors has the greatest detriment to woodrat populations.

The objectives of this study were as follows: identify rocky outcrop use by woodrats and other small mammals, determine the occupancy status of Allegheny woodrats, and assess potential of disturbance at rocky outcrops in Lilley Cornett Woods. The hypotheses for this study were as follows: woodrat detections would be greater at higher elevations, woodrat and small mammal detection rates will decrease as frequency of disturbance increases, and connectivity will decrease as distance between rocky outcrops increases.

Methods

This study was conducted over a four-week period from June 15-July 14, 2021. Our study area was Lilley Cornett Woods (LCW) in Letcher County, Kentucky, which is an area operated by the EKU Division of Natural Areas (Fig.1). LCW is a 223-ha mixed mesophytic forest, and of this, over ¼ consists of old growth forest (60 ha)[5].

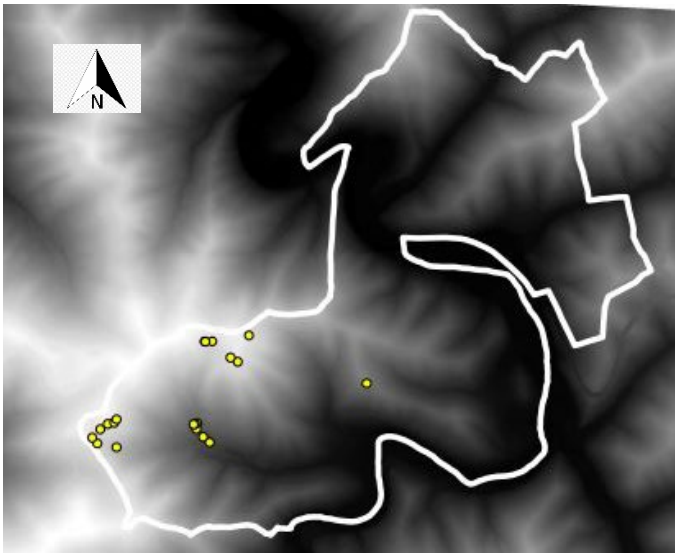

Figure 1. *Elevation map (black areas show low elevation, white areas show high elevation) and camera trap locations (yellow points) at Lilley Cornett Woods Ecological Area, Letcher County, KY. White polygon shows property boundary line.*

A total of 20 camera traps were placed facing suitable areas for woodrat habitation along cliff lines, inside of caves, and along boulder edges. Methods followed K. Powers (Radford Univ., pers. comm.). Over a two-day deployment period, 15 Browning Strikeforce trail cameras were deployed and baited with sweet feed for livestock. After two weeks, the cameras were collected and 5 were redeployed in different locations within LCW for a total of 20 locations spanning 280 trap-nights.

For this study, the response variables were detection rates of woodrats, raccoons, and total small mammals, as well as species richness. Camera data were uploaded to Wild.ID v9.28, and the program assigned metadata to each image. Using ArcGIS, we extracted the following data for

each camera location: elevation, aspect, distance to boundary, distance to walking trail, distance to ridgetop, average vegetation height, and mean distance between each camera location.

Results and Discussion

Trapping efforts resulted in 18 camera locations (data from 2 cameras were omitted due to malfunction) for a total of 236 trap nights. Out of the 9584 images analyzed, 4742 captured Allegheny woodrats, and woodrats were detected on 11 of the 18 total cameras (61% of locations).

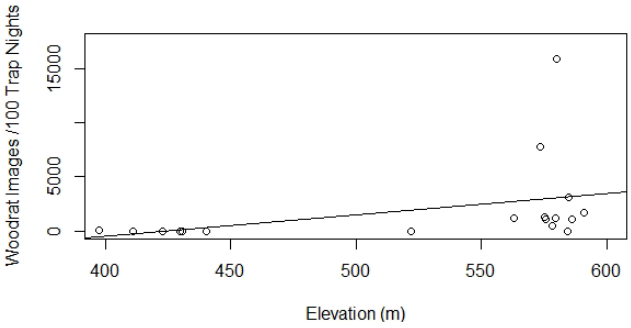

Figure 2. *Woodrat detection rate by elevation (m). Points represent trap locations.*

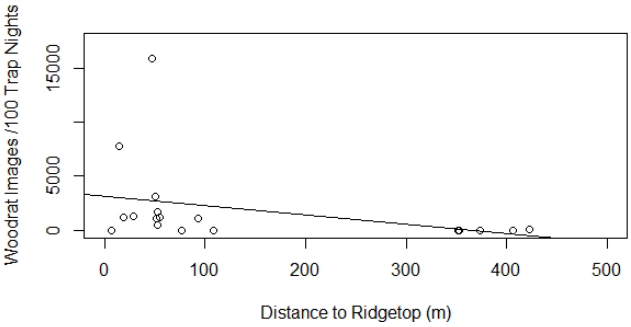

Figure 3. *Woodrat detection rate by distance to ridgetop (m). Points represent trap locations.*

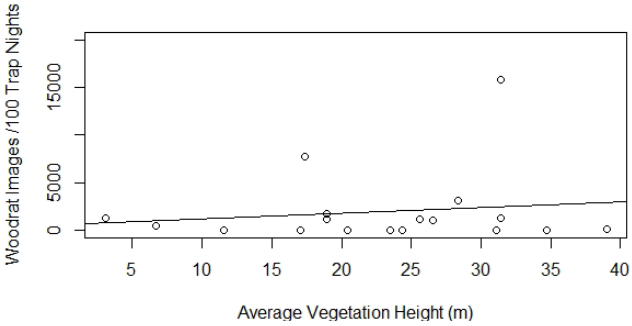

Figure 4. *Woodrat detection rate by mean vegetation height (m). Points represent trap locations.*

Following expectations, Spearman's rank correlation indicated a positive relationship between woodrat detections and elevation ($S = 366.3$, $p < 0.01$, $\rho=0.62$, Fig. 2), and a negative relationship between woodrat detections and distance to ridgetop ($S = 1561.4$, $p < 0.01$, $\rho=-0.61$, Fig. 3). Similarly, Spearman's rank correlation showed a positive relationship between small mammal detections and elevation ($S = 474$, $p < 0.05$, $\rho= 0.51$), however elevation was not as strongly correlated with small mammals as it was with woodrats. Spearman's rank correlation was not significant for small mammal detections and distance to ridgetop ($S = 1164$, $p>0.05$, $\rho= -0.20$). Spearman's rank correlation was not significant for raccoon detections and elevation ($S = 946.2$, $p > 0.5$, $\rho=0.02$), nor was there a difference associated with raccoon detections and distance to ridgetop ($S = 567.5$, $p > 0.05$, $\rho=0.41$). These findings also followed expectations. Contrary to expectations, Spearman's rank correlation showed no statistical significance between vegetation height and woodrats ($S=926.7$, $p>0.05$, $\rho=0.04$, Fig. 4), nor distance to trail and woodrats ($S=603.3$, $p>0.05$, $\rho=0.38$).

Conclusions

1) An Allegheny woodrat population exists at LCW.
2) Woodrats were almost exclusively found at higher elevations, while other small mammals and raccoons were found at all elevations.
3) Neither distance to trail nor vegetation height were correlated with woodrat occupancy at LCW. This suggests that human disturbance and hard mast decline may not be the prominent cause of overall woodrat population declines.

References

1) Lombardi et al. 2018. Wildlife Society Bulletin 42: 667–673.
2) Ford et al. 2006. Ecography 29: 745–754.
3) Mengak. 2002. Report to VDGIF.
4) Smyser et al. 2012. Animal Conservation 15: 205–213.
5) Lilley Cornett Woods Appalachian Ecological Research Station. https://naturalareas.eku.edu/lilley-cornett-woods-appalachian-ecological-research-station.

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