

Effects of Human Presence on Mesopredators in Central Appalachia



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Introduction

As a biodiversity hotspot, the central Appalachians are used heavily for ecotourism. Many mammal species in this region have grown in abundance, most notably mesopredators, and with this population growth the interactions between humans and wildlife are likely to increase.^{1,2} Reducing conflicts with wildlife is a priority for land managers.¹ Knowledge of wildlife population ranges and their proximities to human development can aid in responsible and preventative management.¹ Further, this information could make visiting a Natural Area a more enriching experience; knowing where species could lead to more safe sightings.

Mammals species have a significant impact on the ecosystems around them and are known indicators of community health.³ Mesopredators, organisms that are largely carnivores, and are important due to their mid-trophic level and high numbers.⁴ The interactions and numbers of mesopredators have been known to disrupt herbivore populations and provide a concern in urban areas, due to their adaptability.^{2,5}

Trail cameras are an effective surveillance tool for modern mammal surveys and, more specifically, mesopredators. A minimally invasive method, camera-trapping can collect information such as time, date, location. The raw data provides the presence and activity of various species. Overall, trail cameras provide large amounts of data for relatively low cost, effort, and time.³

The aim of this study was to assess mesopredator species presence across several Natural Areas in Eastern Kentucky. Further, the propensity for on-trail versus off-trail usage by a species was assessed at each site, and was compared between sites. Initial hypotheses were that species with smaller home ranges and more general diets were to be more active closer to

urban environments. Species that require larger home ranges were proposed to be less tolerant of human developments and habitat fragmentation, and therefore, would not be detected in high abundance near urban areas.

Methods

Camera Deployment. A total of nine trail cameras (Browning, Model BTC-5) were deployed across three study sites: Taylor Fork Ecological Area, Maywoods, and Lilley Cornett Woods.⁶ These EKU Natural Areas represent a gradient of human presence, decreasing respectively, moving toward from the western edge of the Appalachian mountain range.⁶ There was a total sampling effort of 302 trap nights. All camera locations were georeferenced, and all images were tagged with the date, time, camera name, moon phase, and temperature. Cameras were set to collect images in bursts of four with a 1-minute trigger delay between trigger events.

Placements. Cameras were deployed in triplicate at each site. A baited camera was deployed,⁵ and two additional cameras were deployed within 0.75 km (on-trail and off-trail). The distance off-trail was related to the location and vegetation density, with a mean \pm SE placement of 47.0 ± 3.4 m off trail. The baited camera was repositioned every two weeks,⁵ while the other two unbaited cameras were repositioned weekly, to allow for spatial greater replication.

Statistical Analysis. Survey data were standardized to trap-night, and species presence was assessed per triggered event. Means and standard errors were determined for each species across the sites, on-trail, and off-trail. Final response variables for analyses included total mesopredator detections for each trap night, excluding baited camera detections. The statistical

effects of site (Taylor Fork, Maywoods, and Lilley Cornett Woods) and trail usage (trail-associated, off-trail) were assessed for response variables using a generalized linear model fitting a negative binomial distribution. Multiple comparisons of means were run between all factors.

Results and Discussion

The statistical model of mesopredator activity (# detection events per trap-night) was found to be significant across all factors, including an interaction ($p < 0.01$).

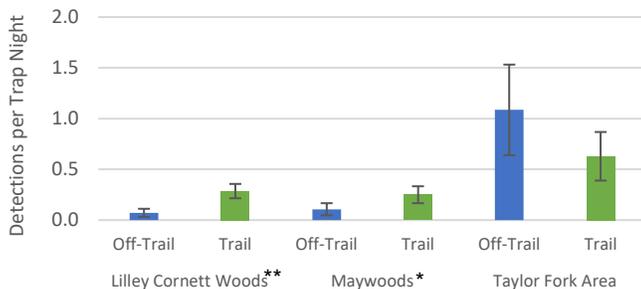


Figure 1. Mean \pm SE mesopredator activity recorded by on-trail and off-trail camera traps at EKU Natural Areas during the summer of 2017. Significance codes: $p < 0.001$ (***) $p < 0.01$ (**).

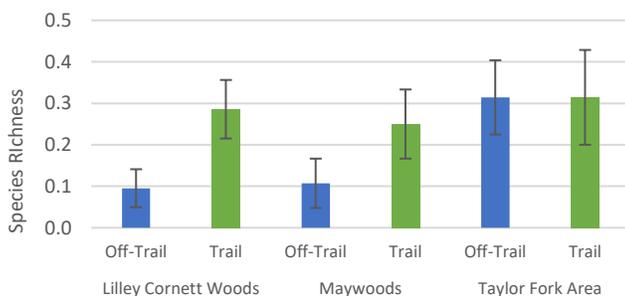


Figure 2. Mean \pm SE mesopredator richness recorded by on-trail and off-trail cameras at EKU Natural Areas during the summer of 2017.

As seen in Figure 1 and Figure 2, the most disturbed site (Taylor Fork) had greater activity and richness. This observation aligns with the mesopredator release hypothesis, which results from the absence of apex predators.² Further, mesopredator species have historically been more adaptable to urban environments due to their broad diets and relatively small home ranges, which may allow them to tolerate fragmented landscapes.

Additionally, detections at Taylor Fork showed no significant preference for trail usage, and had similar species richness on and off-trails. In general, Taylor Fork's greater mesopredator activity could be detrimental on the herbivorous prey species already threatened by human development and is a cause for further research.

Maywoods had, on average, the lowest detection of mesopredators, with a trend toward trail use ($p < 0.05$), as shown in Figure 1. The species richness for Maywoods was also lower, with more richness on-trail (Figure 2). This was unexpected since it is the largest of the three Natural Areas.

Finally, the least disturbed area (Lilley Cornett Woods) exhibited intermediate activity and richness (Figure 1, Figure 2), with a trend for on-trail activity ($p < 0.01$). This result was not surprising, as many species detected are known to have larger home ranges, such as the bobcat, and would be sparser across the landscape.³

Conclusions

Taylor Fork, the most urban of the natural areas, had the greatest amount of mesopredator activity, and detections occurred more off-trail. In contrast, both Lilley Cornett and Maywoods showed a trend towards greater on-trail activity.

References

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