MAMMAL COMMUNITY COMPOSITION IN FORESTED MINED LAND AREAS IN SOUTHEAST KANSAS

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INTRODUCTION

Mined land reclamation has been ongoing in southeast Kansas, impacting both native animal and plant communities (Holl, 2002; Hummer & Webster, 1991). However, little is known about how mammals respond to recovery efforts, since reclaimed mined areas provide different habitat and microclimate conditions than which existed prior to mining (Larkin et al., 2008).

Most Kansas' coal mining took place in Cherokee, Crawford and Bourbon counties, where hundreds of underground shafts and above-ground strip mines were dug. In 1969, the Kansas Legislature required coal companies to reclaim the land: they must smooth out the ditches, replace the topsoil, and plant grass or crops similar to what was present prior to mining.

Our objective was to determine how mined land vegetation structure impacted mammal community composition and species richness. We utilized data that we collected for the Snapshot USA 2019 project, a survey to examine nationwide trends in mammal community assembly associated with their habitat.

METHODS

MAMMAL SURVEY

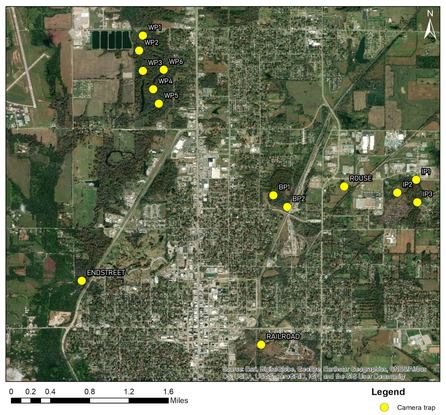
- We established 14 sampling points (located ≥200 m from one another) within forested parks and remnants patches in Crawford county from August – November, 2019 (Fig. 1).
- Each site had one Bushnell Trophy Cam HD Essential E3 trail camera installed at 0.5 m height, facing north, set to take 3 pictures with a 5-second delay between triggers, that were checked biweekly.

VEGETATION SURVEY

We used James & Shugart (1970) methods to assess each site's:
- Canopy cover (spherical densiometer)
- Ground cover composition: bare ground, leaf litter, woody plants, herbaceous plants, and dead wood (Daubenmire frame)
- Tree abundance, composition and diameter at breast height
- Shrub density and composition

DATA ANALYSIS

- We did a manual ID in each photograph and uploaded the data to eMammal; however, these data are not yet available for download.
- We calculated species richness (SR) for each site, except for Bike Park 1 & 2 due to the low number of trap nights.
- Impacts of habitat features on SR were determined by a series of linear regressions, using Akaike Information Criterion (AIC) to rank candidate models (top models ΔAIC < 2).



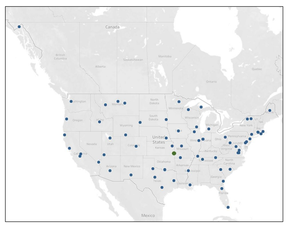


Figure 1. Locations of camera traps in Pittsburg, KS (left). All Snapshot USA sample locations (right).

RESULTS

MAMMAL SURVEY

We collected 8,380 photographs over the 526 trap nights that the cameras were deployed. We observed 16 species in our study areas (Fig. 2); White-tailed deer (*Odocoileus virginanus*) and Fox squirrels (*Sciurus niger*) were two of the most abundant species caught with the cameras. Rare species that we saw were the American beaver (*Castor canadensis*) and Striped skunk (*Mephitis mephitis*; Table 1). No Kansas species of concern were recorded during our survey.

Table 1. Species composition across all sampling locations. Site occurrence indicates the percentage of sites at which each species was observed.

Species		Site Occurence (%)
North American Beaver	*Castor canadensis*	8%
Nine-banded Armadillo	*Dasypus novemcinctus*	83%
Bobcat	*Lynx rufus*	33%
Coyote	*Canis latrans*	50%
Domestic Cat	*Felis catus*	8%
Domestic Dog	*Canis familiaris*	8%
Eastern Cottontail Rabbit	*Sylvilagus floridanus*	17%
Eastern Gray Squirrel	*Sciurus carolinensis*	33%
Fox Squirrel	*Sciurus niger*	100%
Groundhog	*Marmota monax*	25%
Unknown Mouse Species		42%
Raccoon	*Procyon lotor*	92%
Unknown Rat Species		8%
Striped Skunk	*Mephitis mephitis*	8%
Virginia Opossum	*Didelphis virginiana*	67%
White-tailed Deer	*Odocoileus virginianus*	100%

HABITAT FEATURES

The sites were dominated by pin oak (*Quercus palustris*), hickory (*Carya spp.*), and hackberry (*Celtis occidentalis*) in the canopy, while the shrub strata was dominated by exotic Amur honeysuckle (*Lonicera maackii*) and multiflora rose (*Rosa multiflora*). Ground cover was predominantly exotic wintercreeper (*Euonymus fortunei*), Japanese honeysuckle (*Lonicera japonica*), and a variety of grasses.

The top model indicated more mammal species were observed at sites with more leaf and dead wood cover, and greater tree abundance (R^2=0.80, $P < 0.001$; Fig. 3). All other models had Δ AIC > 2.

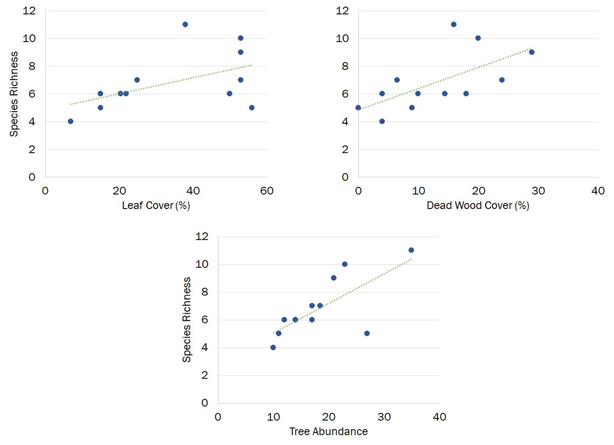


Figure 3. Habitats with greater mammal species richness had more leaf cover, dead wood, and higher tree abundance. Dead wood and tree abundance were significant predictors of species richness ($P < 0.05$), while leaf cover was not ($P = 0.18$).

CONCLUSIONS

Reclaimed strip mines are suitable habitats for a variety of different mammal species. We have found with this study that the mammal communities in Crawford county are more rich in areas that have high tree canopy cover, dead wood cover, and leaf cover. We would recommend maintaining mined land areas for their mature forest habitat to continue support mammal diversity in southeast Kansas.

This study highlights the importance of mined land restoration. We can see that the vegetation that has established after the restoration of the mined land has brought about many species into the forested habitat, even though many species are non-native. The management of these exotic plants and remaining mining impacts (i.e. acidic drainage, soil structure) is crucial to the health of the mammal community.

FUTURE GOALS

Our hope is to bring the knowledge of restored mined lands and their impact on mammal communities to the towns and cities that have not yet taken action with their strip mines. We hope to use camera traps again to continue to monitor the land and its impact on the mammal communities. We will observe annual differences in richness and try to evaluate the factors that influence these trends.

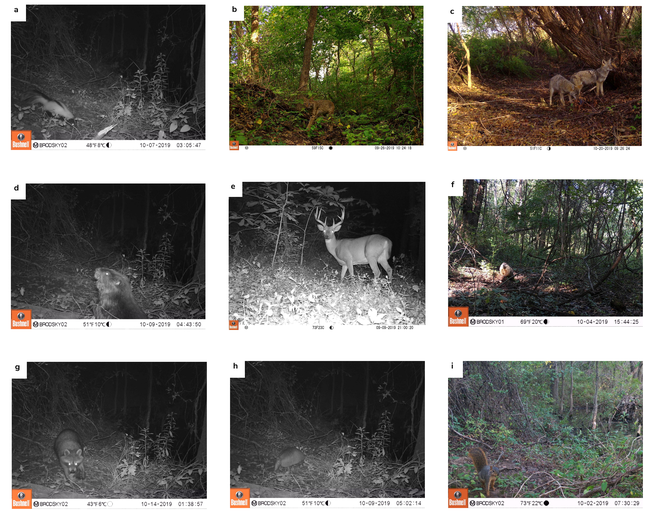


Figure 2. Species recorded (right): a) **Striped skunk** (*Mephitis mephitis*), b) **Bobcat** (*Lynx rufus*), c) **Coyote** (*Canis latrans*), d) **North American beaver** (*Castor canadensis*), e) **White-tailed deer** (*Odocoileus virginianus*), f) **Groundhog** (*Marmota monax*), g) **Raccoon** (*Procyon lotor*), h) **Nine-banded Armadillo** (*Dasypus novemcinctus*), i) **Fox Squirrel** (*Sciurus niger*).

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Snapshot USA - eMammal

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