



# Mammal communities in Kansas mined lands: Second year of Snapshot USA data collection

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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 over the course of a second year. We utilized data that we collected for the Snapshot USA project, a survey to examine nationwide trends in mammal community assembly associated with their habitat.

## METHODS



MAMMAL SURVEY



VEGETATION SURVEY



DATA ANALYSIS

- We established 10-12 sampling points (located  $\geq 200$  m from one another), within forested parks and remnants patches in Crawford county from August to November, 2019 & 2020 (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. No bait was used.
- We collected the following habitat data centered at the camera in 2019:
  - 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
- We manually identified each photograph and uploaded the data to the eMammal data repository.
- We calculated species richness (SR) for each site.
- 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  $\Delta AIC < 2$ ).



Figure 1. Locations of camera traps in Pittsburg, KS (left). All Snapshot USA 2020 sample locations (right).

## RESULTS

### MAMMAL SURVEY

We collected 27,553 photographs over 1,042 trap nights in 2019 - 2020. We detected 17 species (Fig. 2). The most common species detected across the two years included White-tailed deer (*Odocoileus virginianus*) and Fox squirrels (*Sciurus niger*; Table 1). We detected three new species in 2020: Southern flying squirrel (*Glaucocomys volans*), Eastern woodrat (*Neotoma floridana*), and Red fox (*Vulpes vulpes*). No Kansas Species of Concern were recorded during our survey.

Table 1. Species composition across all sampling locations (n = 12 in 2019, n = 10 in 2020). Species are ordered by their site occurrence.

Species	2019 Site Occurrence (%)	2020 Site Occurrence (%)
Fox Squirrel	100	100
White-tailed Deer	100	100
Raccoon	92	100
Nine-banded Armadillo	83	90
Virginia Opossum	67	100
Coyote	50	60
Unknown Rodent	42	10
Bobcat	33	20
Eastern Gray Squirrel	33	50
Groundhog	25	20
Eastern Cottontail Rabbit	17	40
Striped Skunk	8	20
Domestic Dog	8	10
North American Beaver	8	0
Domestic Cat	8	0
Southern Flying Squirrel	0	10
Eastern Woodrat	0	10
Red Fox	0	10



### HABITAT FEATURES

Camera sites were dominated by pin oak (*Quercus palustris*), hickory (*Carya spp.*), and hackberry (*Celtis occidentalis*) in the canopy, while the shrub strata were 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 greater tree abundance, woody debris, and smaller diameter trees ( $R^2 = 0.82$ ,  $P = 0.002$ ; Fig. 3). All other models resulted in  $\Delta AIC > 2$ .

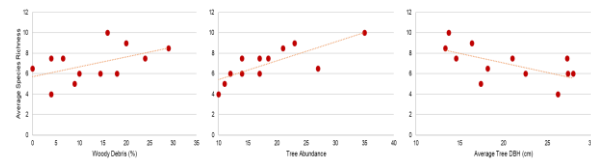


Figure 3. Habitats with greater mammal species richness had more dead wood and trees, but those trees tended to be smaller in diameter.

## CONCLUSIONS

The second year of this study has solidified the fact that mined land restoration plays an important role in population growth and habitat development of a multitude of species. In 2020, we were able to detect three new species and we continued to find that woody debris and tree abundance play important roles in supporting diverse mammal communities. Management of the tree community, exotic plant species, and remaining mining impacts (i.e. acidic drainage, soil structure) are a just a few ways that we can continue to sustain suitable habitat. Our continued recommendation is to maintain mined land areas for their mature forest habitat to support mammal diversity in southeast Kansas.

### FUTURE GOALS

Our hope is to continue to explore the impact of mined land restoration on mammal communities, especially in urban settings. We plan to continue participating in Snapshot USA for the foreseeable future 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 (Left to right): Top: Bobcat, Southern Flying Squirrel, Nine-banded Armadillo. Center: White-tailed Deer, Fox Squirrel, Raccoon. Bottom: Eastern Cottontail Rabbit, Virginia Opossum, Coyote.

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