

## **2020 Final Report**

Eastern Spotted Skunk Distribution and Ecology in Southeast Kansas

Submitted to:

Kansas Department of Wildlife, Parks, and Tourism  
512 SE 25<sup>th</sup> Ave.  
Pratt, KS 67124

Prepared by:

Christine Brodsky

Pittsburg State University  
Department of Biology  
Heckert-Wells Hall 223  
1701 S. Broadway St.  
Pittsburg, KS 66762-7552

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## 2020 Final Project Report

Christine Brodsky, Pittsburg State University, 1701 S. Broadway, Pittsburg, KS 66762  
620-235-4947, [cbrodsky@pittstate.edu](mailto:cbrodsky@pittstate.edu)

### Objectives

1. Determine the distribution and abundance of eastern spotted skunks in southeast Kansas
2. Quantify habitat relationships between spotted skunk presence, mammal diversity, and the habitat's plant composition and structure
3. Determine the distribution and abundance of other priority species identified in Appendix I, and local mammal diversity in mined lands

### Justification

The primary objective of this project is to document spotted skunk presence in southeast Kansas, a threatened species historically found within this region. Spotted skunk occurrences have been recorded in both Cherokee and Crawford counties since 2000, albeit limited in their frequency (Nilz & Finck, 2008). Specifically, a confirmed museum voucher was collected by Dave Jenkins in Cherokee county in November 2004, within the Strip Pits State Wildlife Management Area (Sternberg Museum of Natural History, 2019). Findings from this study will contribute to an updated species distribution map and, if detected, allow us to determine habitat features that best support spotted skunks in this region. Research on spotted skunks has been limited in this region in recent years, thus information collected on this species would be highly valuable. Community data for other mammals would also be valuable in this region due to the shortage of (land) mammal ecology research in southeastern Kansas. Thus, funding this project will provide important data to update the range of a threatened species, all while quantifying mammal diversity in mined land areas.

### Project Status

Date	Proposed Task	Status
January, 2020	Project Initiation; Selection of sampling locations	Complete – selected 20 camera trap locations at seven mined land areas and city-owned property in Pittsburg (Fig. 1 & Appendix I).

February, 2020	Scout potential sampling locations; Hire undergraduate field technicians	Complete – Hired one undergraduate field assistant and recruited volunteers to spearhead field work and collect data with PI
March – May, 2020	Deploy camera traps for Spring season. Check cameras biweekly.	Cameras for group A deployed March 7 – April 4; Group B cameras deployed April 5 – May 2. Cameras checked and rebaited biweekly.
August – October, 2020	Deploy camera traps for Fall season. Check cameras biweekly. Sample vegetation (August).	Cameras for group A deployed August 6 – September 3; Group B cameras deployed September 5 – October 3. Cameras checked and rebaited biweekly.  Vegetation sampled on August 5 <sup>th</sup> for all locations.
December, 2020	Final report to KDWPT	Complete
January, 2021	Present findings at Kansas Natural Resources Conference	Abstract submitted on October 27
December, 2021	Final Publication Completion Date	Planned

## Results

### *Objective 1: Spotted Skunk Detection*

Over 1,111 trap nights, we captured 17 species (Table 1) within 53,238 photographs. No eastern spotted skunks were observed.

### *Objective 2: Habitat Relationships*

Dominant species at the sites included white-tailed deer, Virginia opossum, and raccoons (represented at all sites; Table 1). Rare species included North American river otter, southern flying squirrel, and striped skunk (Table 1 & Fig. 2). We grouped small rodent species

“Unknown Small Rodents” as they could not be identified down to a genus or species from photographs, and treated this group as one species in our species richness analyses. Average species richness per site was 8.5 species, with a maximum of 12 species observed at site MWLA 14a.

We conducted one vegetation survey at each camera trap location to assess the plant community and structure (Table 2). The most common tree species found were hackberry (*Celtis occidentalis*), pin oak (*Quercus palustris*), and eastern cottonwood (*Populus deltoides*). The dominant shrub across most sites was Amur honeysuckle (*Lonicera maackii*) and blackberry (*Rubus* spp.). We also documented the following exotic plants at the camera trap locations: sericea lespedeza (*Lespedeza cuneata*), wintercreeper (*Euonymus fortunei*), multiflora rose (*Rosa multiflora*), and Japanese (*Lonicera japonica*) and Amur (*Lonicera maackii*) honeysuckle. The only habitat variable that predicted mammalian species richness was tree abundance ( $r^2 = 0.31$ ,  $P = 0.006$ ; Fig. 3).

### Objective 3: SWAP Species Detection

We did not observe any Tier 1 (i.e. Eastern Spotted Skunk) or Tier 2 (i.e. Gray Fox, Swamp Rabbit) SWAP species. There seems to be no discernable spatial pattern in mammalian species richness (Fig. 1). Species richness did not differ across season (paired t-test:  $t = 1.46$ ,  $P = 0.15$ ; Table 3).

**Table 1.** Mammal species observed in the 2020 field season.

Species		% Sites Observed
Armadillo	<i>Dasypus novemcinctus</i>	95
Bobcat	<i>Lynx rufus</i>	35
Coyote	<i>Canis latrans</i>	65
Domestic Cat	<i>Felis catus</i>	15
Domestic Dog	<i>Canis lupus familiaris</i>	30
Eastern Cottontail	<i>Sylvilagus floridanus</i>	65
Eastern Fox Squirrel	<i>Sciurus niger</i>	90
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	30
Eastern Woodrat	<i>Neotoma floridana</i>	35
North American River Otter	<i>Lontra canadensis</i>	5
Raccoon	<i>Procyon lotor</i>	100
Southern Flying Squirrel	<i>Glaucomys volans</i>	5
Striped Skunk	<i>Mephitis mephitis</i>	10
Unknown Small Rodent	.	55
Virginia Opossum	<i>Didelphis virginiana</i>	100
White-tailed Deer	<i>Odocoileus virginianus</i>	100
Woodchuck	<i>Marmota monax</i>	15

**Table 2.** Camera trap site coordinates and vegetation features.

Site	Lat	Long	Ground Cover (%)				
			Bare	Leaf Litter	Woody Plants	Herbaceous Plants	Dead Wood
End Street	37.4179993	-94.7220001	9	53	14	4	20
Industrial Park 1 (IP1; Northeast)	37.4329987	-94.6733017	0	93	4	1	2
Industrial Park 2 (IP2; West)	37.4313011	-94.6753998	1	35	0	64	0
Industrial Park 3 (IP3; South)	37.4296989	-94.6725998	18	56	7	10	7
MLWA12a	37.2549019	-94.8145981	26	33	5	28	8
MLWA12b	37.2532005	-94.8182983	19	11	2	60	6
MLWA14a	37.2509003	-94.8187027	3	31	6	53	7
MLWA14b	37.2505989	-94.8237991	0	72	3	18	9
MLWA18a	37.2801018	-94.919899	10	70	6	4	10
MLWA18b	37.2731018	-94.9056015	1	83	7.4	0	8.6
MLWA20a_north	37.2448006	-94.9810028	10	32	25	21	6
MLWA20a_south	37.2386017	-94.9925995	2.6	39	2.6	52	1.8
MLWA20b_north	37.2509003	-94.9776001	5	54	5	32	4
MLWA20b_south	37.2392998	-94.9837036	2	54	13	29	2
MLWA21a	37.2473984	-94.9606018	1	76	13	4	6
MLWA22a	37.2346992	-94.983902	20	41	34	0	5
MLWA23b_north	37.2369995	-94.9692001	16	6	1	77	0
MLWA23b_south	37.2293015	-94.9742966	2	57.6	0	28.4	12
Railroad	37.4085999	-94.6955032	16	22	11	47	4
Rouse	37.4319992	-94.683403	29	38	12	5	17

**Table 2.** Continued.

<b>Site</b>	<b>Canopy Cover (%)</b>	<b>Total Shrub Stems</b>	<b>Tree Abundance</b>	<b>Average DBH (cm)</b>
End Street	97.92	38	23	16.4
Industrial Park 1 (IP1; Northeast)	98.96	3	28	18.82
Industrial Park 2 (IP2; West)	56.77	5	22	12.48
Industrial Park 3 (IP3; South)	100	78	11	17.41
MLWA12a	97.92	23	11	20.86
MLWA12b	90.63	67	10	23.26
MLWA14a	96.35	36	26	11.71
MLWA14b	97.92	0	10	30.2
MLWA18a	95.83	26	8	20.45
MLWA18b	98.96	65	15	27.21
MLWA20a_north	55.21	89	20	24.4
MLWA20a_south	92.19	9	3	40.83
MLWA20b_north	91.67	7	14	14.52
MLWA20b_south	92.71	50	10	32.8
MLWA21a	96.88	57	12	17.3
MLWA22a	83.33	60	14	30.19
MLWA23_north	63.54	19	15	16.67
MLWA23_south	64.06	76	18	20.02
Railroad	82.29	59	14	14.61
Rouse	91.67	108	35	13.75

**Table 3.** Mammal species observed (dark cells) at camera trap locations during the spring (S) and fall (F) sampling.

Species		Armadillo	Bobcat	Coyote	Domestic Cat	Domestic Dog	Eastern Cottontail	Eastern Fox Squirrel	Eastern Gray Squirrel	Eastern Woodrat	North American River Otter	Raccoon	Southern Flying Squirrel	Striped Skunk	Unknown Small Rodent	Virginia Opossum	White-tailed Deer	Woodchuck	
End Street	S	■		■				■				■		■		■	■		
	F								■								■		
IP1	S			■	■			■									■		
	F	■											■				■		
IP2	S	■						■									■		
	F																■		
IP3	S	■						■									■		
	F																■		
MLWA12a	S	■		■	■			■									■		
	F	■							■								■		
MLWA12b	S	■				■		■									■		
	F									■							■		
MLWA14a	S	■		■				■									■		
	F		■							■							■		
MLWA14b	S	■						■									■		
	F																■		
MLWA18a	S	■						■									■		
	F			■		■											■		
MLWA18b	S	■						■									■		
	F								■								■		
MLWA20a_north	S	■		■				■									■		
	F		■							■							■		





## **Publications and Presentations**

### *Publications*

Currently drafting a manuscript for submission to the *Transactions of the Kansas Academy of Science*.

### *Conference Presentations*

Brodsky, C. C., & Durbin, C. J. *Accepted*. The search for the spotted skunk in southeast Kansas. Kansas Natural Resources Conference (2021). Virtual (Poster).

### *News Articles*

Pittsburg State University News, Sept 30, 2020. "[Biology students, teacher once again chosen for Smithsonian project.](#)"

## **People Reached with Project**

Pittsburg State University Students Involved in 2020:

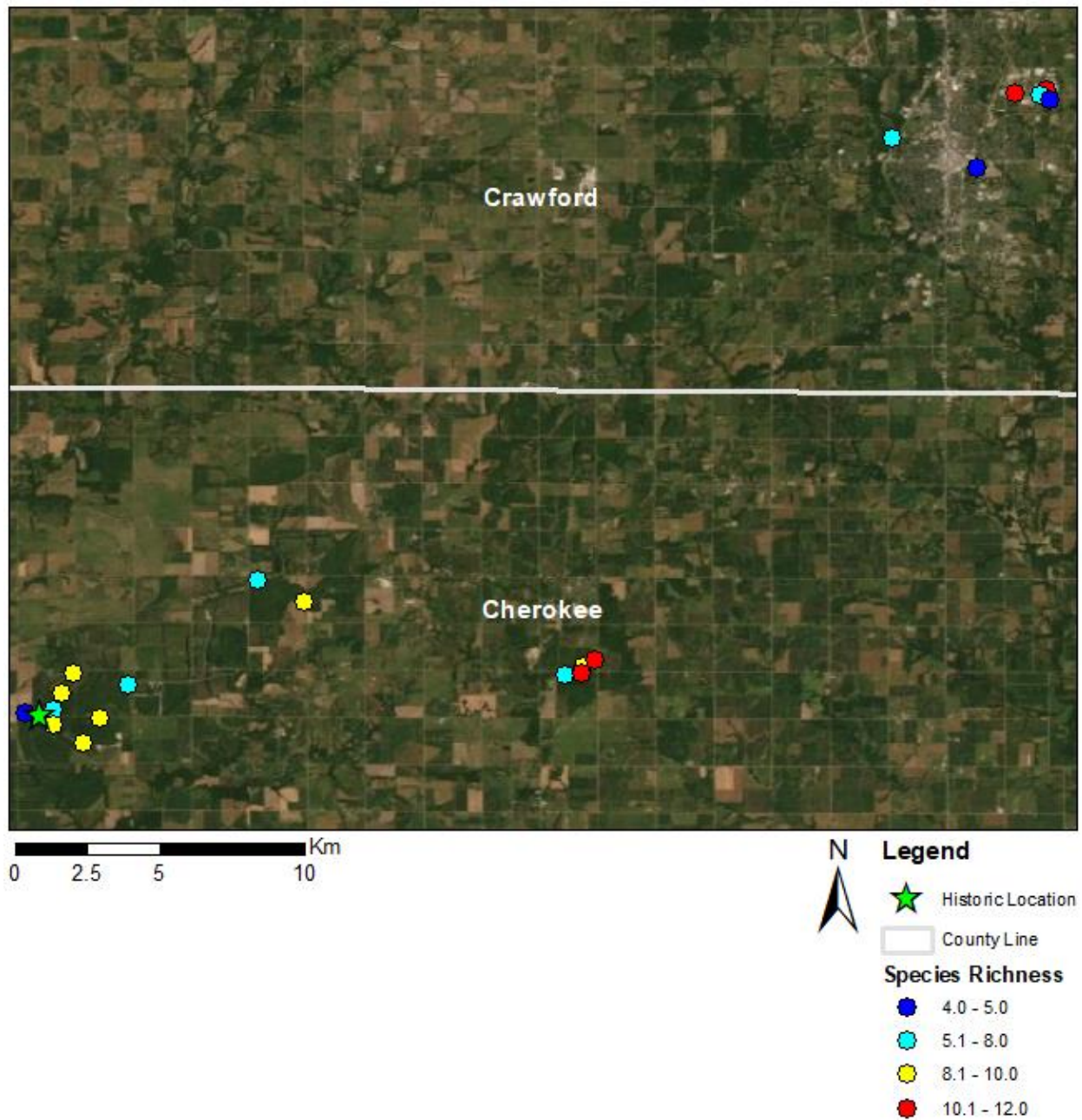
*Part-time undergraduate researcher:* Caleb Durbin

*Student volunteer field assistants:* Ryan McGinty, Maggie Murray, Peyton Witham, Ximena Bogarin, Lindsey Williams, Brady Taylor

Attendees of the following conferences:

Kansas Natural Resource Conference (2021 – Abstract submitted)

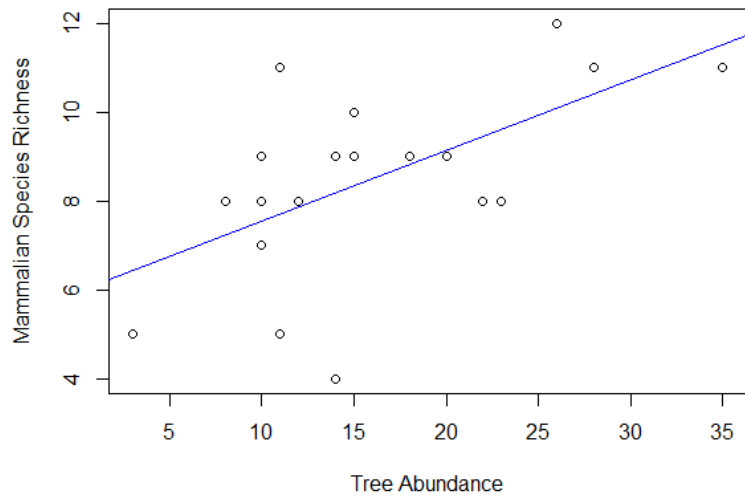
Pittsburg State University Research Colloquium (Planned, 2021)



**Figure 1.** Twenty study sites in Crawford and Cherokee counties. Sites included Mined Land Wildlife Areas (MLWA; KDWPT) 12, 14, 18, 20, 21, 23; and land owned by the City of Pittsburg. Historic spotted skunk location provided by Dave Jenkins. Colors indicate species richness observed at each camera trap location across both seasons. Detailed maps for each camera trap sampling location are provided in Appendix I.



**Figure 2.** Striped skunk and North American river otter at a city-owned parcel in Pittsburg (37.4319992, -94.683403).



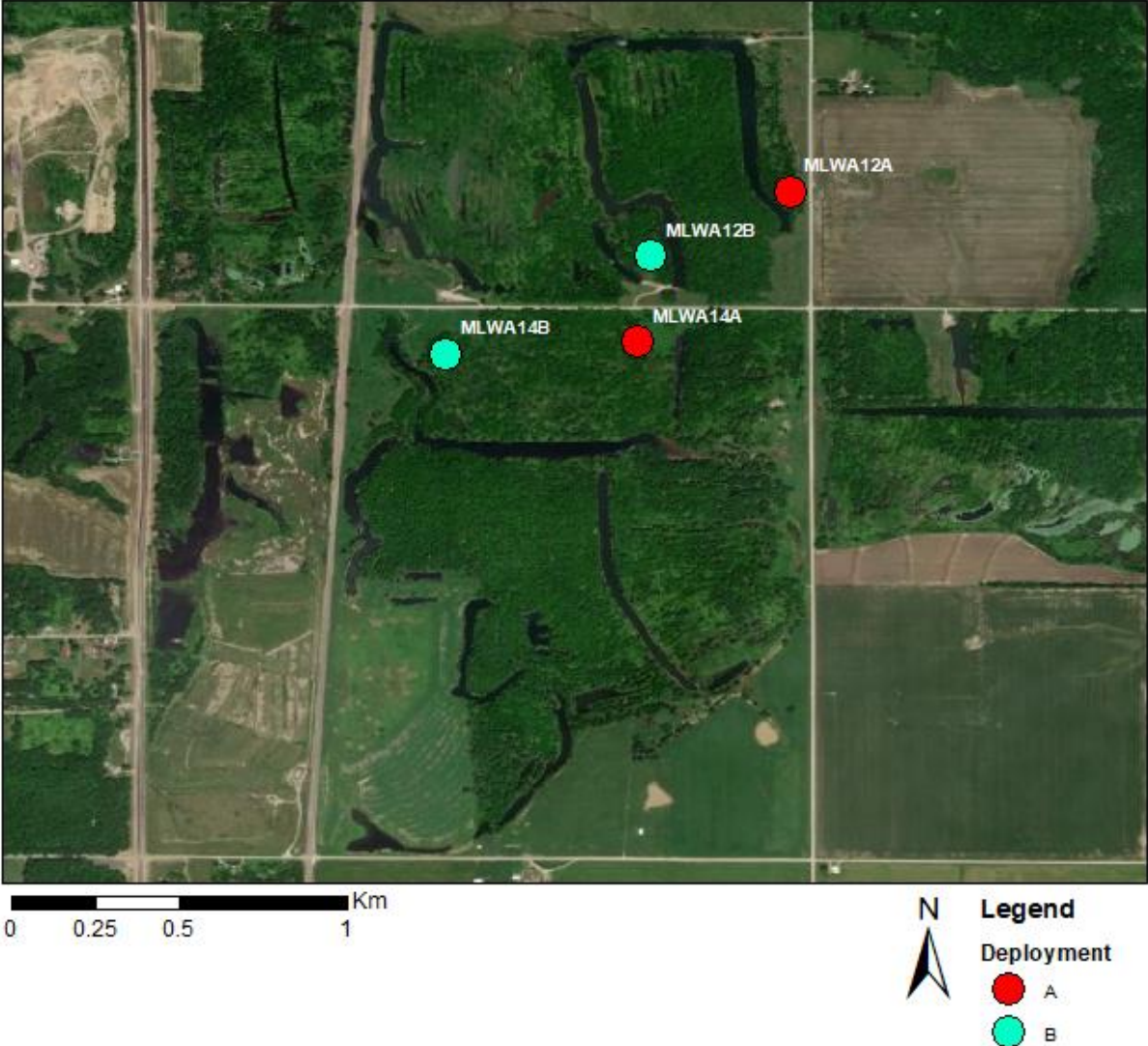
**Figure 3.** Relationship between mammalian species richness and tree abundance.

### Photos of Completed Phases



Students assisting with Spring camera trap deployment.

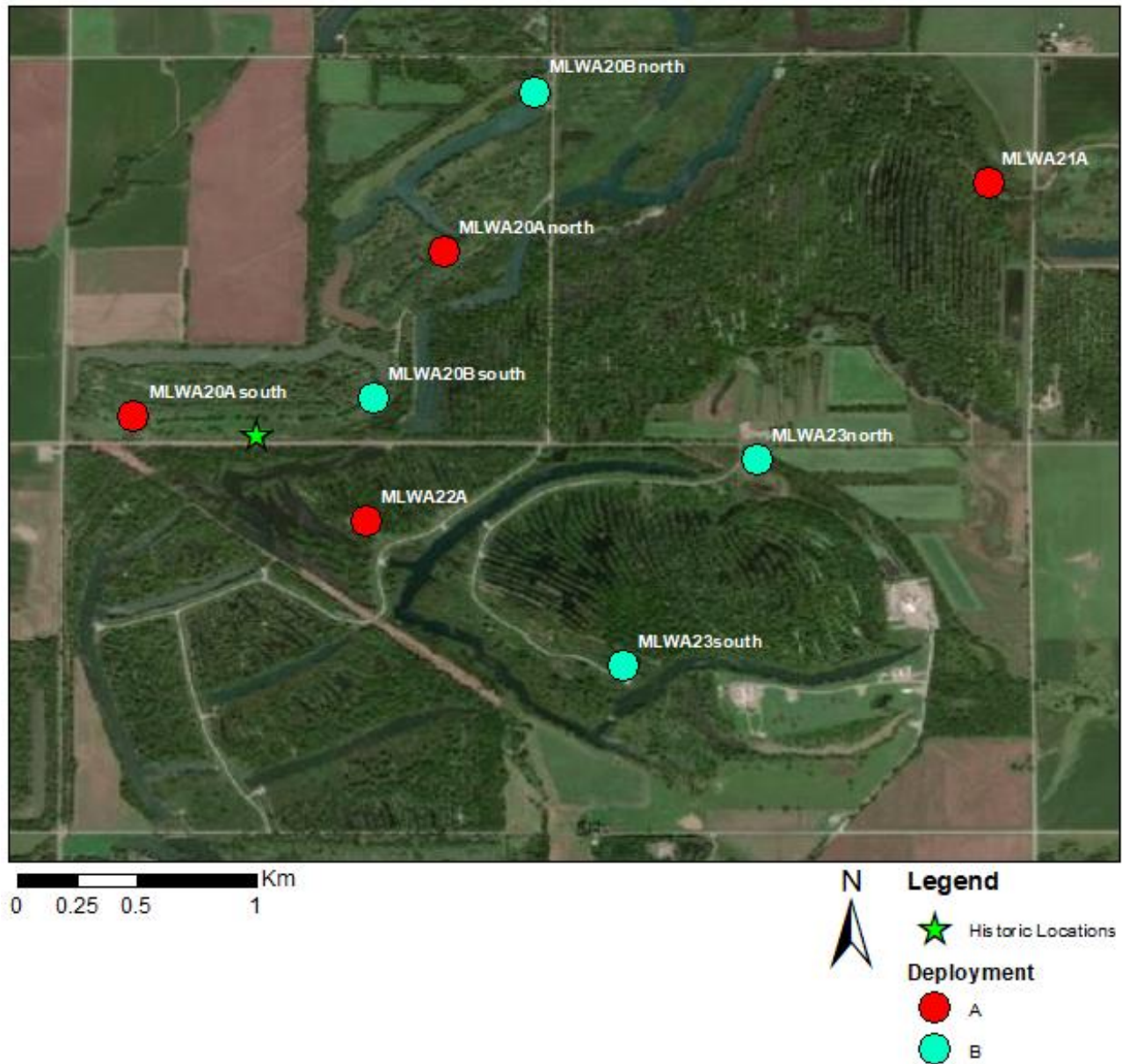
**Appendix I.** Deployment locations across MLWAs and Pittsburg sites.



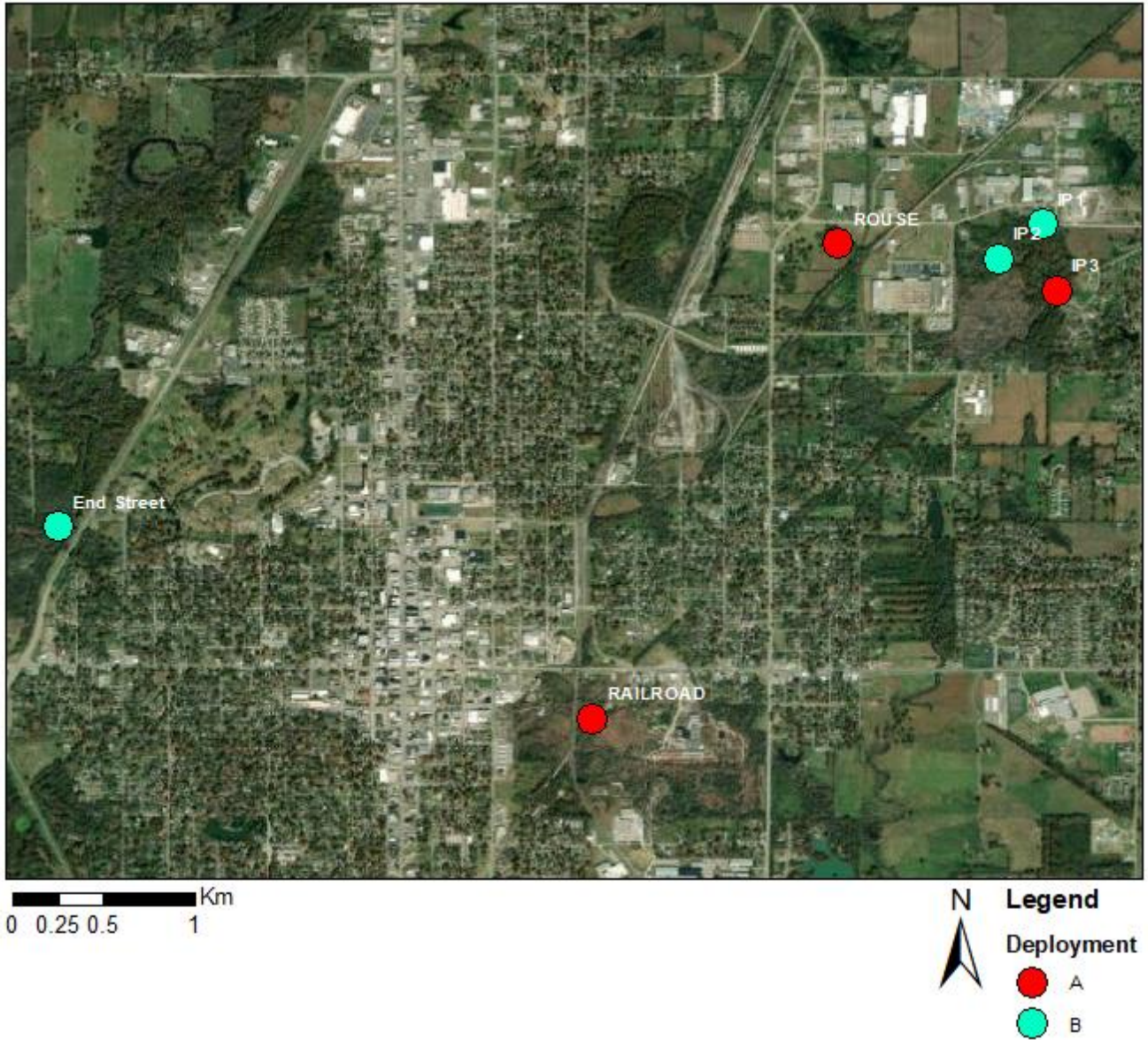
**Fig A1.** MLWA 12 and 14 camera trap locations.



**Fig A2.** MLWA 18 camera trap locations.



**Fig A3.** MLWA 20, 21, 22, and 23 camera trap locations with the location of the recovered spotted skunk in 2004 (D. Jenkins, personal communication, February 24, 2020).



**Fig A4.** Camera trap locations within Pittsburg city limits.



## **Appendix II. Methods**

### ***Selection of Sampling Locations***

We established 20 camera trap locations across six mined land sites in Crawford and Cherokee Counties (Appendix I). We selected sites characterized by spotted skunk habitat requirements, i.e. those characterized by oak/hickory forest, near a water source, rocky outcrops, and located in areas with fallen logs and brush piles (Nilz & Finck, 2008), and those can be reasonably accessed. All cameras were located at least 200 m from one another to ensure spatial independence.

### ***Spotted Skunk Survey***

We sampled spotted skunks via a camera trap survey in the spring (pre-breeding season) and fall (post-breeding season), avoiding low skunk activity in the winter months. Summer months were also avoided, as those months had the lowest capture rates in a Missouri spotted skunk camera trap study (Hackett et al., 2006). We continued sampling throughout the COVID-19 pandemic, adhering to social distancing policies if we checked the cameras in groups.

All cameras were secured to a tree, set 0.5 m from the ground, and facing north to avoid direct sunlight. This height reduces failed detections, especially for this smaller skunk species. All cameras used for this study were Bushnell Trophy Cam HD, set to a three-photograph, five-second trigger to standardize camera quality and number of captures per trigger. Cameras ran for four weeks at one location (“Deployment A”) and then moved to another nearby location (“Deployment B”; i.e. same MWLA or forest fragment ensuring 200 m separation) to broaden our spatial scope. Camera traps were baited with sardines in soybean oil, set approximately 3 m from the camera, and rebaited every two weeks. Cameras *End Street*, *IP1*, and *IP2* did not receive bait during the Fall deployments due to parallel data collection for the Snapshot USA project.

We downloaded photographs from each camera upon the end of the four-week sampling period and uploaded all photographs to the eMammal (emammal.si.edu) data repository. Each photograph was scanned for any mammal activity and we recorded data on each mammal’s species, sex (if assessable), age (adult vs. juvenile), abundance, and other notable features.

### ***Habitat Assessment***

We sampled vegetation with standard 0.04 ha vegetation plots (11.3 m radius; James and Shugart, 1970) centered at each camera. Within each plot, we assessed the following habitat variables that may contribute to preferred spotted skunk habitats: tree species, abundance, and diameter-at-breast-height; and canopy cover with a spherical densiometer. Shrub density was assessed in four 11.3 m transects in each cardinal direction from the plot’s center. Percent ground cover was assessed in five randomly located quadrats in the vegetation sampling plot with a Daubenmire frame. The following ground cover classes were used to characterize the vegetation: woody vegetation, forbs, grass, litter, bare, rock, and coarse woody debris. A backwards stepwise

regression was used to determine which habitat variables best predicted mammalian species richness at the site.

## References

- Hackett, H. M., Lesmeister, D. B., Desanty-Combes, J., Montague, W. G., Millsbaugh, J. J., & Gompper, M. E. (2006). Detection rates of eastern spotted skunks (*Spilogale putorius*) in Missouri and Arkansas using live-capture and non-invasive techniques. *American Midland Naturalist*, 158, 123-131.
- James, F.C., & Shugart, H.H. (1970). A quantitative method of habitat description. *Audubon Field Notes*, 24, 727-736.
- Nilz, S. K., & Finck, E. J. (2008). Recovery plan for the eastern spotted skunk (*Spilogale putorius*) in Kansas. Kansas Department of Wildlife, Parks and Tourism in cooperation with Fort Hays State University. 51 pp.
- Sternberg Museum of Natural History. (2019). Kansas Mammal Atlas: Eastern spotted skunk (*Spilogale putorius*). Retrieved from <https://webapps.fhsu.edu/ksmammal/account.aspx?o=31&t=164>