

A Study of the Habitat of the Reptiles and Amphibians¹ of Ellis County, Kansas

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Ellis county is only a short distance west and north of the center of Kansas. It lies between the 99th and 100th meridians at the eastern margin of the High Plains. The surface of the county is of the same character as that of most of Western Kansas, one vast stretch of plains, almost completely destitute of trees, excepting for a narrow portion along the principal streams, and here and there near a farm house. The surface of the county, however, is very far from being uniform. Some portions, especially the southeastern, are quite level; the central portion is very high and uneven; while in the western and northern portions, especially in the vicinity of the Saline river, there are a number of bluffs.

The county is drained by the Saline river, which runs from west to east along the northern boundary of the county, and the Smoky Hill river which runs in the same direction close to the southern boundary. Big creek traverses the county diagonally, midway between the Saline and the Smoky Hill rivers.

The rocks exposed in Ellis county are of the Cretaceous system, excepting the sands and gravels along the rivers, which are of a much later period (Pleistocene). The two great divisions of the Cretaceous, the Benton and the Niobrara group, cover the whole area.

The upper member of the Niobrara group, the Smoky Hill chalk, does not cover much area in Ellis county. The Fort Hays limestone covers approximately the western half of the county, being exposed on the hills. The rock is a yellowish limestone, which is easily dressed and has been used locally as building stone. Just below the Fort Hays limestone are shales of great thickness, which contain large calcareous concretions.

The upper Benton portions are called the Blue Hill shales and are exposed in the hills west and northeast of Hays. The lower Benton group contains more limestone than the upper division. It is exposed in the eastern part of the county and is known as the Benton limestone, locally called "fence post."

The soils of Ellis county have been formed from limestone, sandstone, and shale, with limestone predominating in most of the area. The soil along the streams of the region is predominately sandy and sand pockets are found along the streams throughout the county.

The plant life of Ellis county is characterized as a mixed prairie association. It is a combination of tall and short grass areas.

DESCRIPTION OF HABITATS

Ellis county affords a choice of several habitats for the animals found in it. For the purpose of logical consideration of the amphibian and reptilian fauna, the habitats of this region will be discussed under two main headings:

I. Terrestrial:

1. Mixed prairie
2. Flat Rock Hillside
3. Rocky Hillside

1. Brennan, L. A. A check list of Reptiles and Amphibians of Ellis county, Kansas. *Transactions of Kansas Academy of Science* 37:189-191, 1934.

II. Aquatic:

1. Stream
2. Swamp
3. Permanent Mixed Prairie Pond
4. Temporary Mixed Prairie Pond

There is variation among the species as to their habitat distribution, some being exclusive to one while others are scattered.

The biota of most areas is constantly undergoing change. Environment plays a large part in the general distribution of animals, and if the physiography of the present area changes, the fauna that it supports will very probably undergo modification and redistribution.

1. MIXED PRAIRIE HABITAT

Under natural conditions the tops and slopes of the hills of Ellis county support a climax association of thick prairie vegetation. Only a few spots remain which show the original conditions. The fact that the open, rolling country affords excellent opportunities for farming, has caused the greater portion of the area to be put under cultivation. At their best grasses and sedges cover the ground and grow to a height of almost a foot. Among the important species of grasses in this mixed prairie habitat are: the short grasses; buffalo (*Buchloe dactyloides*), and grama (*Bouteloua gracilis*); the tall grasses: big bluestem (*Andropogon furcatus*), and little bluestem (*Andropogon scoparius*), the latter being dominant. The hills and the outcroppings of limestone make it difficult to cultivate the rougher parts, and here there is still an abundant growth of prairie grasses.

2. FLAT-ROCK HILLSIDE HABITAT

The slopes of hills in this habitat are covered with flat rocks of various shapes and sizes, most of which vary from three to eight inches in thickness. These rocks are outcroppings of Benton limestone. Many are large, eight or ten feet across, sometimes imbedded in the ground. These flat stones make an excellent shelter for animals. The dominant plant in this habitat is the little bluestem.

3. ROCKY HILLSIDE HABITAT

This habitat consists of an outcropping of Fort Hays limestone. The rocks are sometimes very large and they may be as much as ten feet thick. This is in contrast to the flat rocks of the Benton formation. Fort Hays limestone tends to disintegrate much faster than Benton limestone, so the ground is often covered with small portions of these rocks.

4. STREAM HABITAT

The streams of Ellis county, namely, Big creek, Smoky Hill river, and the Saline river have been grouped together and classified as a stream habitat. Big creek crosses the county in a southeasterly direction about midway between the Smoky Hill and Saline rivers. This stream is fed by springs, and dams are being built at various places. The Smoky Hill river, which flows from west to east in the southern portion of the county, has a sandy bed that is rarely more than a few hundred feet in width. The Saline river flows in the same direction as the Smoky Hill river, but is located in the northern portion of the county. It is a narrow and shallow river, with occasional pools,

rarely more than five feet deep. All through Ellis county it is situated between rocky bluffs sometimes sixty feet in height.

These streams are all sandy, though Big creek has less sandy areas than the two rivers. The two rivers are very likely to go dry during a very dry season, but Big creek, due to springs, always manages to hold its own. Big creek went out of its banks in Ellis county in 1932 and caused considerable damage to property in the city of Hays. All of these streams are well lined with trees, among them the American elm, boxelder, hackberry, cottonwood, honey locust, ash, mulberry, willows, and cedars, the cedars being prominent along portions of the Saline river. Intermingled with the trees are such shrubs as the sumac, the wild plum, the wild grape and the wild cherry.

5. SWAMP HABITAT

The soil of the swamp is supersaturated with moisture throughout the year. Here half disintegrated plant fragments accumulate and continue for a longer or shorter time unchanged. These decompose to form a black, oozy, odoriferous muck. Algae of many kinds are found here. The "blanket algae," whose dense felt mats may smother many submerged animals, is common. The arrowhead and the water plantain are also very common here.

6. PERMANENT MIXED PRAIRIE POND HABITAT

Many artificial ponds have been built in both the prairie and hilly pasture areas. The permanent ponds are fed by springs. These ponds are bordered by the characteristic short grasses, namely, buffalo and grama, while the water is often covered with algae.

7. TEMPORARY MIXED PRAIRIE POND HABITAT

The temporary prairie ponds are generally slight depressions in the surface of the short grass pasture land or in gullies and draws. These ponds are fed by flood waters and often go dry in periods of drought.

RELATIONSHIP BETWEEN SPECIES AND HABITAT

1. *Mixed Prairie Habitat*

Of the thirty-nine species of amphibians and reptiles reported here, twenty-one are found in this habitat, namely, four amphibians, four lizards, one turtle and twelve snakes. Eleven species reach their maximum abundance here: box tortoise, race-runner, common horned lizard, Woodhouse's toad, western toad, spadefoot, bull snake, blue racer, rattlesnake, hog-nosed snakes (light and dark). The hog-nosed snakes are exclusive to this area and there are more species of amphibians and reptiles found here than in any other habitat.

2. *Flat-Rock Hillside Habitat*

Fifteen species are found in this habitat: one amphibian, five lizards, and nine snakes. Eight species of reptiles reach their maximum abundance here. They are: collared lizard, Sonoran skink, rat snake, prairie spiny lizard, earless spotted lizard, ring-necked snake and Say's kingsnake. Three reptiles are exclusive to this habitat: collared lizard, Sonoran skink and the rat snake, and lizards are more numerous here than in any other. That flat rocks of the Benton formation afford more shelter than the rocks of the Fort Hays lime-

stone is evidenced by the greater number of individuals collected in the flat-rock areas.

3. Rocky Hillside Habitat

Thirteen species are found in this habitat: two amphibians, three lizards, seven snakes and one turtle. Two reach their maximum abundance here, the narrow-mouthed toad and the lined snake. The narrow-mouthed toad is also exclusive to this habitat.

4. Stream Habitat

Thirteen species occur here, being divided as follows: four amphibians, five snakes and four turtles. There are more amphibians in the stream habitat than in any other. This is natural for the amphibians must have water in which to deposit their eggs. Four amphibians were not observed in the stream habitat (narrow-mouthed toad, western toad, Woodhouse's toad, and the spadefoot), probably due to the vicissitudes of collecting. One snake (ribbon snake) and one turtle (soft-shelled) reached their maximum abundance here.

5. Swamp Habitat

Comparatively, this semiaquatic habitat harbors the smallest number of species. Seven are found as follows: two turtles, two snakes and three amphibians. None reach their maximum abundance in nor are exclusive to this habitat.

6. Permanent Mixed Prairie Pond Habitat

Ten species are found here: three amphibians, three snakes and four turtles. Turtles are represented here by more species than in any other habitat, for only permanent ponds furnish the aquatic types a home throughout the year. Six species reach their maximum abundance here. They are as follows: mud turtle, Bell's terrapin, snapping turtle, leopard frog, cricket frog and the bullfrog. The bullfrog (*Rana catesbeiana*) was found in the permanent ponds and not in the temporary ponds. Evidently it requires a habitat that contains water all the year around. The mud turtle is found in the Smoky Hill river in the southern part of the county. A specimen is reported from the Saline river by L. D. Wooster. None has been observed in Big Creek.

7. Temporary Mixed Prairie Pond Habitat

Eight species are found here: four snakes, one turtle and three amphibians. The tiger salamander reaches its maximum abundance in this habitat. Many larvae are found in the ponds of this terrain.

TABLE I
HABITAT DISTRIBUTION OF AMPHIBIA

NAME.	Mixed prairie.	Temporary mixed prairie pond.	Permanent mixed prairie pond.	Stream.	Swamp.	Flat rock hillside.	Rocky hillside.
Leopard frog.....	24	391	1,450	462	45		10
Cricket frog.....		12	1,543	165	120		
Bullfrog.....			241	42	1		
Salamander.....		20		2			
Narrow-mouth toad.....						1	2
Woodhouse's toad.....	150						
Western toad.....	2						
Spadefoot.....	1						

HABITAT DISTRIBUTION OF SNAKES

Bull snake.....	20	1	1	1		3	7
Lined snake.....						1	2
Ribbon snake.....		1		2			
Garter snake.....	1	10	20	6	6		
Water snake.....		12	30	18	4		
Coachwhip.....	1						1
Blue racer.....	16			1		3	1
Ring-necked.....						14	
Hog-nosed (light).....	2						
Hog-nosed (dark).....	1						
Rattlesnake.....	10					2	2
Rat snake.....	5					48	
Salt and pepper snake.....	1					3	1
Banded king snake.....	1					3	
Mitre snake.....	1					6	1

HABITAT DISTRIBUTION OF LIZARDS

Collared lizard.....						49	
Skink (Sonoran).....						26	
Prairie spiny lizard.....	10					63	5
Earless Spotted lizard.....	6					8	
Six-lined lizard.....	40					3	7
Horned lizard.....	9						1

HABITAT DISTRIBUTION OF TURTLES

Mud turtle.....			11		4		
Box tortoise.....	32		3	30			2
Bell's terrapin.....			118	4			
Snapping turtle.....			68	37			
Soft-shelled turtle.....				8			

NUMBER OF SPECIES FOUND IN EACH HABITAT

The figures after the names in the following lists of species of amphibians and reptiles indicate the numbers of individuals collected or positively identified in the different habitats during 1931-1933.

1. The Mixed Prairie Habitat :

<i>Rana pipiens</i> . Leopard frog.....	24
<i>Bufo cognatus</i> . Western toad.....	2
<i>Bufo woodhousii</i> . Woodhouse's toad.....	150
<i>Pituophis sayi sayi</i> . Bull snake.....	20
<i>Tantilla gracilis nigriceps</i> . Mitre snake.....	1
<i>Thamnophis radix radix</i> . Garter snake.....	1
<i>Crotalus viridis viridis</i> . Rattlesnake.....	10
<i>Coluber constrictor flaviventris</i> . Blue racer.....	16
<i>Heterodon nasicus</i> . Hog-nosed snake.....	1
<i>Lampropeltis triangulum gentilis</i> . Banded king snake.....	1
<i>Lampropeltis getulus holbrookia</i> . Salt and pepper snake.....	1
<i>Masticophis flagellum flagellum</i> . Coachwhip snake.....	1
<i>Terrapene ornata</i> . Box tortoise.....	32
<i>Cnemidophorus sexlineatus sexlineatus</i> . Race runner.....	40
<i>Holbrookia maculata maculata</i> . Earless spotted lizard.....	6
<i>Sceloporus undulatus consobrinus</i> . Prairie spiny lizard.....	10
<i>Phrynosoma cornutum</i> . Common horned lizard.....	9

2. The Flat Rock Hillside Habitat :

<i>Microhyla olivacea</i> . Narrow-mouthed toad.....	1
<i>Crotaphytus collaris</i> . Collared lizard.....	49
<i>Eumeces obsoletus</i> . Sonoran skink.....	26
<i>Sceloporus undulatus consobrinus</i> . Prairie spiny lizard.....	63
<i>Holbrookia maculata maculata</i> . Earless spotted lizard.....	8
<i>Cnemidophorus sexlineatus sexlineatus</i> . Race runner.....	3
<i>Phrynosoma cornutum</i> . Horned lizard.....	9
<i>Pituophis sayi sayi</i> . Bull snake.....	3
<i>Tantilla gracilis nigriceps</i> . Mitre snake.....	6
<i>Thamnophis lineatus</i> . Lined snake.....	1
<i>Coluber constrictor flaviventris</i> . Blue racer.....	3
<i>Diadophis punctatus arnyi</i> . Ring-necked snake.....	14
<i>Crotalus viridis viridis</i> . Rattlesnake.....	2
<i>Elaphe laeta</i> . Rat snake.....	48
<i>Lampropeltis getulus holbrookia</i> . Salt and pepper snake.....	3
<i>Lampropeltis triangulum gentilis</i> . Banded king snake.....	3

3. The Rocky Hillside Habitat :

<i>Microhyla olivacea</i> . Narrow-mouthed toad.....	2
<i>Rana pipiens</i> . Leopard frog.....	10
<i>Sceloporus undulatus consobrinus</i> . Prairie spiny lizard.....	5
<i>Cnemidophorus sexlineatus sexlineatus</i> . Race runner.....	7
<i>Phrynosoma cornutum</i> . Horned lizard.....	1
<i>Terrapene ornata</i> . Box tortoise.....	2
<i>Pituophis sayi sayi</i> . Bull snake.....	7
<i>Tantilla gracilis nigriceps</i> . Mitre snake.....	1
<i>Thamnophis lineatus</i> . Lined snake.....	2
<i>Masticophis flagellum flagellum</i> . Coachwhip.....	1
<i>Coluber constrictor flaviventris</i> . Blue racer.....	1
<i>Crotalus viridis viridis</i> . Rattlesnake.....	2
<i>Lampropeltis getulus holbrookii</i> . Salt and pepper snake.....	1

4. The Stream Habitat :

<i>Ambystoma tigrinum</i> . Tiger salamander.....	2
<i>Rana catesbeiana</i> . Bullfrog.....	42
<i>Acris gryllis</i> . Cricket frog.....	165
<i>Rana pipiens</i> . Leopard frog.....	465

<i>Terrapene ornata</i> . Box tortoise.....	30
<i>Chelydra serpentina</i> . Snapping turtle.....	31
<i>Amyda spinifera</i> . Soft-shelled turtle.....	8
<i>Chrysemys bellii bellii</i> . Bell's terrapin.....	4
<i>Pituophis sayi sayi</i> . Bull snake.....	1
<i>Natrix sipedon sipedon</i> . Brown water snake.....	18
<i>Thamnophis radix radix</i> . Garter snake.....	6
<i>Coluber constrictor flaviventris</i> . Blue racer.....	1
5. The Swamp Habitat:	
<i>Thamnophis radix radix</i> . Garter snake.....	6
<i>Natrix sipedon sipedon</i> . Brown water snake.....	4
<i>Chelydra serpentina</i> . Snapping turtle.....	3
<i>Kinosternon flavescens</i> . Mud turtle.....	4
<i>Acris gryllus</i> . Cricket frog.....	120
<i>Rana pipiens</i> . Leopard frog.....	45
<i>Rana catesbeiana</i> . Bullfrog.....	1
6. The Permanent Prairie Pond Habitat:	
<i>Rana pipiens</i> . Leopard frog.....	1,450
<i>Acris gryllus</i> . Cricket frog.....	1,543
<i>Rana catesbeiana</i> . Bullfrog.....	241
<i>Kinosternon flavescens</i> . Mud turtle.....	11
<i>Terrapene ornata</i> . Box tortoise.....	3
<i>Chrysemys bellii bellii</i> . Bell's terrapin.....	118
<i>Chelydra serpentina</i> . Snapping turtle.....	68
<i>Pituophis sayi sayi</i> . Bull snake.....	1
<i>Thamnophis radix radix</i> . Garter snake.....	20
<i>Natrix sipedon sipedon</i> . Brown water snake.....	30
7. Temporary Mixed-Prairie Pond Habitat:	
<i>Rana pipiens</i> . Leopard frog.....	391
<i>Acris gryllus</i> . Cricket frog.....	12
<i>Ambystoma tigrinum</i> . Tiger salamander.....	20
<i>Pituophis sayi sayi</i> . Bull snake.....	1
<i>Thamnophis sauritus proximus</i> . Ribbon snake.....	1
<i>Thamnophis radix radix</i> . Garter snake.....	10
<i>Natrix sipedon sipedon</i> . Brown water snake.....	12
<i>Chrysemys bellii bellii</i> . Bell's terrapin.....	8