

HISTORY, DISTRIBUTION AND HABITAT REQUIREMENTS FOR  
THREE SPECIES OF THREATENED REPTILES  
IN EASTERN KANSAS

Larry L. Miller  
3635 S.W. Devon Avenue  
Topeka, Kansas 66611

and

Joseph T. Collins  
1502 Medinah Circle  
Lawrence, Kansas 66047

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## INTRODUCTION

This report describes the efforts and results of a survey of known localities and habitats of three species of threatened Kansas reptiles, the Broadhead Skink (*Eumeces laticeps*), the Redbelly Snake (*Storeria occipitomaculata*), and the Smooth Earth Snake (*Virginia valeriae*). All three taxa are residents of the eastern quarter of Kansas, and here two (Broadhead Skink and Smooth Earth Snake) reach the westernmost limits of their ranges in the United States; the Redbelly Snake is known to range in the north as far west as the Black Hills of South Dakota (Conant and Collins, 1991).

This report consists of an introduction (which also contains an explanation of the methods used to gather the information contained herein), three species accounts, a summary of habitat preferences, acknowledgments, an annotated bibliography, and concludes with three appendices, as follows: Appendix I is a list of all known Kansas voucher specimens (with localities and dates of collection) for all three species; Appendix II consists of photographs of Kansas habitat for all three species; and Appendix III is an itinerary of field work during 1992 in search of these three species.

The methods of accumulating data for this report were three. First, an extensive search was made to identify all articles and books that mentioned or contained information about the three species in Kansas, and to summarize that information into species accounts in order to provide a general idea of the natural history of these reptiles. Second, a search and query was made of all major research collections throughout the United States to determine known localities for the three species in Kansas. Third, field work was carried out in 1992 to find new localities for these species, to visit previously known localities (if data was specific enough to allow us to locate them), and to photograph and summarize habitat at selected sites.

## SPECIES ACCOUNTS

### BROADHEAD SKINK *Eumeces laticeps* (Schneider)

#### History in Kansas

The first records of this animal from Kansas are based on a juvenile example (KU 719) from Anderson County collected in August 1910 (no specific locality data and collector unknown), and a second juvenile (KU 701) from Franklin County collected in 1911 (also no specific locality data and collector unknown). Sometime prior to 1968, both of these lizards were examined and identified (by Edward H. Taylor?) as *Eumeces laticeps*, but they are poorly preserved, and their condition makes our identification of them uncertain. Smith (1956) did not map either of these records for Kansas. Collins (1974, 1982a, 1993) included them on his Kansas maps because, after examining both specimens, he could not eliminate the possibility that they were *Eumeces laticeps*. Although the locality data for these two specimens is meager (and suspect), good habitat for this lizard is present in the eastern part of both Anderson and Franklin counties, and field work is needed there to corroborate these older records.

The first "modern" report for the Broadhead Skink in Kansas was by Anderson (1950), who recorded two specimens. The initial lizard was collected by Jack E. Joy on 10 May 1949 at Murray's Lake, 3 miles southeast of Fontana,

Miami County. The second example was captured by Anderson on 16 May 1949 at a site 4 miles west of LaCygne, Linn County. Anderson placed both of these specimens in his personal collection (PA 5967 & 6028, respectively), and later donated his entire collection to the Museum of Natural History, University of Kansas. After much checking and searching by us and others, it appears that both specimens were either not sent to KU, or were subsequently misplaced or lost. Because it was the only known voucher (mapped in Collins, 1974, 1982a), and given the extreme difficulty in distinguishing between this species and the Five-lined Skink (*Eumeces fasciatus*), we consider the record for Linn County unverified. In addition, Collins (1993) has eliminated it from his most recent map for *Eumeces laticeps* in Kansas. During 1950 and 1951 other field biologists collected five additional specimens in Miami County, thus substantiating Anderson's (1950) lost record for that county.

Legler (1960) reported the first record of a Broadhead Skink from Cherokee County, Kansas, on the basis of a single specimen (KU 51445) removed from the stomach of an adult Coachwhip (*Masticophis flagellum*) that was collected on 10 May 1958 at a site just east of Five Mile Creek (ca. 3 miles south and 1 mile east of Galena) near the Missouri border. Legler overlooked an earlier example of this lizard (KU 28865) collected on 22 April 1950 at a site 2 miles north of Galena in the same county. More recently (this study), two additional adult females were discovered in the county (see below for details).

The first example (KU 56095) of a Broadhead Skink from Crawford County was taken on 20 April 1960 at a site 6 miles north and 1 mile east of Girard. Three additional vouchers were obtained from that county during the 1980s.

Freeman and Kindscher (1992), in assessing a proposed Southeast Kansas Highway Corridor construction project, considered the records for Cherokee County to be "historical (pre-1960)," but our discoveries during this study indicate that Broadhead Skinks are well established and breeding in that county.

In summary, the Broadhead Skink is verified by vouchers from Anderson, Cherokee, Crawford, Franklin, and Miami counties in Kansas, and available data indicates that it is most abundant in Cherokee, Crawford, and Miami counties.

#### Habitat

The Broadhead Skink is found along the eastern border of Kansas in the Osage Cuestas, Cherokee Plain, and Ozark Plateau. Smith (1956) described its habitat in Kansas as being "restricted to wooded regions, where it is commonly found in logs or piles of brush and in or on standing trees," and further observed that "it is of more arboreal habits than [*Eumeces fasciatus*], but is often found on or near the ground." Cross et al. (1971), during their inventory of the fauna of the Neosho River basin, described the habitat of this lizard as "wooded areas" and "lowland areas which remain damp throughout the year." Collins (1982b) discovered an adult male in Crawford County on the afternoon of 21 May 1981; the lizard was crossing a highway bordered on both sides by heavily forested hills. According to Collins (1974, 1982a, 1993), in Kansas this lizard inhabits forested regions, particularly near aquatic situations. It spends much of its time on the ground around logs and brush piles near standing trees but will ascend trees to escape danger and may use abandoned woodpecker holes as a retreat. It is active annually from April to September at air temperatures of 60°–90°F.

Johnson (1987) described its habitat in Missouri as "in or near trees, stumps, large logs, or dilapidated farm buildings," concluded that the "edges of wood lots and forests seem to be the preferred habitat of this species," and

observed that this lizard "will often take up residence in a large dead tree, utilizing abandoned woodpecker holes or other cavities." Webb (1970) considered this lizard in Oklahoma as "arboreal in forested or savannah regions" and stated the "quality and quantity of wooded areas probably affects the westward dispersal of this species." Also in Oklahoma, Sievert and Sievert (1988) reported this reptile being "frequently found in trees" and noted it "prefers moist, wooded areas and is sometimes observed under loose bark of dead trees or leaf litter."

#### Field Observations Made During This Project

During this study, only two personal observations of this lizard were made by us in Kansas, and these are accounted here.

An adult male Broadhead Skink was observed (by Miller) on the east bank of the Marais des Cygnes River at Miami County State Lake (SW 1/4, Sec. 6, T 19S, R 24E) at about 1200 hours on 11 June 1992. The animal was discovered perched on top of the moss-covered trunk of a fallen tree. The trunk was about 60 cm in diameter and about 3.5 meters long. The lizard was basking in a small patch of sunlight when first observed. It remained motionless for a about 2-3 seconds and then quickly retreated to a small hole in the top of the log. The specimen was a large male that appeared to be at least 22-24 cm in total length. Temperature at the time of the observation was about 26°C with partly cloudy skies and very high humidity. There was no wind. There were numerous live trees in the area, many with diameters of 30-60 cm, and with a few even larger. Poison ivy and other vines were commonly in evidence. The trunks of many old fallen trees were located throughout the area along with several dead standing trees.

Able assisted by a large field party on 17 July 1992, we found two female Broadhead Skinks in Cherokee County; one was discovered with 14 eggs in the early evening under an old railroad tie, and the other was found the same evening under another railroad tie in the same area. The location was NW 1/4, Sec 17, T 33S, R 25E. The railroad ties were on the south side of the railroad tracks about 100 meters east of the bridge across Shawnee Creek. There was standing water in the south ditch near the ties. There were also many tall trees on both sides of the railroad right of way with much understory vegetation.

#### Reproduction

Very little is known of the breeding habits of this species in Kansas. Courtship, mating, and nesting are presumably similar to that of the Five-lined Skink. The number of eggs laid by female Broadhead Skinks cannot be estimated because of a history of confusion of this species with the Five-lined Skink. Apparently, the Broadhead Skink lays more eggs than does the Five-lined Skink.

Whipple and Collins (1990) recorded a clutch of eight eggs from a female (KU 214776) collected in Crawford County. Before capture, the female was observed copulating with a male on 30 May 1989; she laid the clutch on 6 July 1989, a gestation period of 38 days—the eggs did not hatch. As noted above, a female (KU uncat) from Cherokee County was found brooding a clutch of 14 eggs during this study on 17 July 1992.

REDBELLY SNAKE  
*Storeria occipitomaculata* (Storer)

History in Kansas

The first record of the Redbelly Snake from Kansas was reported by Cragin (1881), Yarrow (1883), and Cope (1900), and was based on a single specimen (listed variously as USNM 4651 or 4657) obtained by US Army Captain J. H. Simpson on 16 July 1859. No other data accompanied the specimen; the county of origin is unknown. Cragin (1881) also mentioned an example of this species from Douglas County (attributed to F. H. Snow, University of Kansas), but no voucher was listed. Branson (1904) stated that he had "examined specimens from Bourbon, Riley and Douglas counties," but listed no vouchers to verify these records.

A Redbelly Snake (AMNH 3380) was collected from Long Island, Phillips County, by W. Granger on 25 September 1884, and was the first specimen from Kansas with specific locality data. Another Kansas record (KU 2355) was obtained in June 1902 from Hamilton County, but was lacking specific locality data and the name of the collector. These two records (Phillips and Hamilton counties) were mapped for Kansas by Smith (1950, 1956), who considered them questionable and in need of verification. They were not mapped for Kansas by Brumwell (1933) and were rejected by Collins (1974, 1982a, 1993) as well as Conant (1958, 1975) and Conant and Collins (1991). Both Lynch (1985), based on an isolated record from southcentral Nebraska, and Peyton (1989), based on a colony of these snakes recently discovered along the Platte River in the same area, speculated that the "western records" rejected by Collins might be valid. Presumably, they both were referring to the specimens from Phillips and Hamilton counties, Kansas. Collins rejected (then and now) those records for the following reasons: 1) the Phillips County record is over a century old, has never been corroborated, and visits to the locality (by both of us) did not reveal any forest habitat suitable for this species; 2) the Hamilton County record is over 90 years old, has no specific locality data, and is so far southwest of the main range of this species that it lacks credence.

The first reliable "modern" voucher records for the Redbelly Snake from Kansas were based on two specimens (FMNH 18135 and UMMZ 66981); both were collected on 3 May 1925 in Franklin County, but lacked specific locality data. Four additional specimens were taken in Franklin County during 1926 and 1927, but no vouchers have been received since then.

The first verified record for Douglas County was based on a specimen (KU 3581) collected 7.5 miles southwest of Lawrence on 27 May 1927. Since then, six additional vouchers have been obtained from the county, the most recent (KU 155397) from a site ca. 2 miles south and 1 mile east of Stull on 9 July 1974.

A single Redbelly Snake (KU 3582) was collected 4 miles south of Garnett in Anderson County on 25 June 1927.

The first record (KU 8431) of *Storeria occipitomaculata* for Jefferson County was discovered during the spring of 1928, but no specific locality was associated with the specimen. Since then, four additional vouchers have been obtained, the most recent (KU 179038) from Camp Jayhawk in July 1978.

Two records exist for Miami County, the oldest a specimen (CHAS 5277) taken by Howard K. Gloyd on 24 March 1928 along the north shore of Pigeon Lake, and the latest (KU 28750) a Redbelly Snake from the Murray Lake area in 1950.

For Cherokee County, the first known voucher specimen (KU 23690) was collected on 24 April 1948 at a locality 5.5 miles east of Baxter Springs. Since then, five more specimens have been preserved, the most recent of which (KU 192184) was caught in the northern half of Section 1, T35S, R25E, on 22 May 1982.

Two voucher specimens are known from Atchison County, the first (KU 129470) taken on 27 April 1968 at a site 9 miles south of Atchison, and most recent (KU 179037) collected within the Atchison city limits on 28 April 1978.

In summary, the Redbelly Snake is verified by vouchers from Anderson, Atchison, Cherokee, Douglas, Franklin, Jefferson, and Miami counties in Kansas, and available vouchers indicate that it is most abundant in Cherokee, Douglas, Franklin, and Jefferson counties.

### Habitat

This secretive reptile is restricted to the extreme eastern border of Kansas in the Glaciated Region, Osage Cuestas, Cherokee Plain, and Ozark Plateau. Gloyd (1928) characterized its habitat in Franklin County as "sandstone woods" where it was "found under rotten logs, among leaves and under boards." Later, Gloyd (1932) reported two specimens in Miami County, a small one "among leaves on moist ground in heavily wooded region near the [Marais des Cygnes] river" and an adult "beneath a board in the vicinity of an old cabin on the north shore of [Pigeon] lake." Burt and Hoyle (1934) discovered a specimen in Cherokee County; it was found "under a stone in a deeply wooded area near [the] Spring river." Smith (1951, 1956) described this snake's habitat in Kansas as being "restricted to moist areas, where it is found under boards, stones, logs and other surface debris." Cross et al. (1971), during their inventory of the fauna of the Neosho River basin, described the habitat of this snake as "moist woodlands" and "lowland areas which remain damp throughout the year." Collins (1974, 1982a) found it "beneath rocks on wooded hillsides in Douglas and Jefferson counties," and Collins (1982b) found four of these snakes in Cherokee County; two were beneath logs at forest edge. According to Collins (1974, 1982a, 1993), in Kansas the Redbelly Snake inhabits woodlands with dense leaf litter.

Peyton (1989) discovered an isolated colony of these reptiles in central Nebraska at "a drainage ditch bank along the Platte River." Johnson (1987) described its habitat in Missouri as "moist woodlands where there is ample shelter such as rocks, logs and leaf litter." In Oklahoma, Dundee (1948) found a single specimen by day "crawling over the pine needles and dead leaves carpeting the steep northeast slope of a limestone hill," and Sievert and Sievert (1988) reported the habitat of this reptile in that state as "woodlands and moist areas under protective cover." Trapido (1944), in his monograph of this genus, described the Redbelly Snake's habitat as "under logs and leaf mold in wooded areas, as well as under stones and boards in open fields."

### Field Observations Made During This Project

On 7 October 1992 an adult Redbelly Snake was observed active by day at 1530 hours in leaf litter on sandstone substrate in thick (white oak) forest in Douglas County. The snake was in a protected refuge area, and was not collected.

## Reproduction

Mating occurs both in spring and fall. When fall matings occur, the sperm are retained by the female through the winter. Courtship is unknown. Each female gives birth to young during late July, August, or early September. The number of young per litter ranges from one to eighteen, with an average of eight.

Collins (1982b) discovered a gravid female beneath a log at forest edge in Cherokee County on 10 April 1982. Eric M. Rundquist (pers. comm., 1989) recorded a litter of eighteen young born on 7 July 1989 by a female from northeastern Kansas.

## SMOOTH EARTH SNAKE *Virginia valeriae* Baird and Girard

### History in Kansas

Taylor (1929) stated that "the first specimen of [*Virginia valeriae*] to be taken in [Kansas] was collected by me in Anderson County, in August, 1910. H. K. Gloyd collected two specimens in Franklin County in 1926. Students in my class in herpetology obtained four specimens of this snake in Jefferson County in the spring of 1929." In addition, Taylor mentioned that it occurred in Douglas County. Brumwell (1933) mapped all four counties (probably based on Taylor's article), but did not list any vouchers. Unfortunately, none of Taylor's reports of this species from Anderson or Franklin counties is substantiated by voucher specimens, and only one (KU 8406) of the four from Jefferson County can be located. No specimen has ever been found in Anderson County to back up Taylor's assertion, but more recent (1985) collections corroborate his records for Franklin County.

Thus, the first documented record of the Smooth Earth Snake from Kansas is based on a specimen (KU 8406) found north of Lawrence in Jefferson County during May 1929 by students of Edward H. Taylor. Since that initial find, sixteen additional examples of this serpent have been obtained in Jefferson County, the most recent (KU 218779) in Section 26, T10S, R17E, on 6 April 1991.

The first example (KU 7663) of this species collected in Douglas County was taken on 1 April 1930 at a site northwest of Lawrence. Since then, five more vouchers have been secured, the most recent (KU 177018) on 4 May 1965 at a locality ca. 1.6 kilometers east-northeast of Baldwin.

Three Smooth Earth Snakes are documented from Leavenworth County. Two (KU 7344, 7345) were found on 23 April 1930 at a site 20 miles north of Lawrence. The most recent (KU uncat) was taken during this study on 10 May 1992 in the northwest one-quarter of Section 10, T10S, R21E.

This snake was first collected in Wyandotte County in May 1956 when a specimen (KU 188984) was obtained from a locality 4.8 kilometers northeast of Bonner Springs. Since then, two more examples have come to light, the most recent (KU 207060) on 24 June 1987 on the east edge of Bonner Springs.

A single Smooth Earth Snake has been verified from Atchison County. The specimen (KU 189272) was found in April 1981 inside the city limits of Atchison.

During a field trip conducted by the Kansas Herpetological Society on 8 May 1982, two (KU 192254, 192255) of these reptiles were discovered in Linn County, both at Linn County Park near Lake LaCygne.

This animal was first recorded from Shawnee County on 9 May 1982 when a single specimen (KU 192256) was collected in Section 9, T11S, R16E. The only other voucher (KU uncat) from this county was taken during our study on 14 October 1992 in Section 11, T11S, R16E.

Two specimens (KU 203989, 203990) have been found in Franklin County, both discovered on 21 September 1985 in Section 32, T17S, R20E.

Two specimens (UIMNH 32948 and FMNH 98565) are known from Johnson County, both taken at a site 3 miles west of Shawnee; date of collection is not known for either snake.

In summary, the Smooth Earth Snake is verified by vouchers from Atchison, Douglas, Franklin, Jefferson, Johnson, Leavenworth, Linn, Shawnee, and Wyandotte counties in Kansas, and available vouchers indicate that it is most abundant and widespread in Douglas and Jefferson counties.

### Habitat

The Smooth Earth Snake is restricted to the forested portions of the Osage Cuestas and the Glaciated Region in the northeastern part of Kansas. Gloyd (1928) found two examples of this species in "heavily timbered sandstone woods" in Franklin County; they were discovered "by raking through thick piles of dead leaves." Smith (1951, 1956) described the habitat of this serpent in Kansas as being "wooded areas where they hide beneath stones, logs and other surface cover." Fitch (1956) obtained two examples of the Smooth Earth Snake in Jefferson County; both were beneath flat rocks. Later, Fitch (1958) described this snake's general habitat as "chiefly in deciduous forest," and noted that in Jefferson County it "seems to prefer open woodland with rocks and brush but not a continuous leaf canopy." In Franklin County, Errol D. Hooper, Jr., (pers. comm., 1985) found a male and female Smooth Earth Snake beneath the same rock. According to Collins (1974, 1982a, 1993), this reptile lives on rocky hillsides in moist woodlands and woodland edge situations.

Johnson (1987) described this creature's habitat in Missouri as "on rocky, wooded hillsides and in moist woods," noted that it was "most often encountered under rocks, in leaf litter or under other objects," and observed that it was "likely to be active at night during warm, humid weather." In Oklahoma, Webb (1970) reported a single specimen found "in a pile of leaves on a rocky, wooded hillside." Sievert and Sievert (1988) reported the habitat of this reptile in that state as "moist woodlands, wooded urban areas and abandoned fields."

### Field Observations Made During This Project

A single road-killed Smooth Earth Snake was found in Leavenworth County on 10 May 1992. Adjacent habitat consisted of sloping open pasture with some flat rocks, low bushes, and shrubs; woodland was less than 200 feet distant along a small stream.

On 14 October 1992 an adult Smooth Earth Snake was found under pile of wood chips in Shawnee County.

### Reproduction

The Smooth Earth Snake mates in the spring after emergence from winter inactivity; it also may mate in the fall. After eleven to fourteen weeks, females give birth, the number of young per litter ranging from two to fourteen, with an



average of six or seven. Birth generally occurs during August or September. No Kansas broods have ever been recorded.

### SUMMARY

Each species summary below begins with a paragraph summarizing the known habitat based on previously published reports. A second paragraph compares that with the observations made during this study.

#### BROADHEAD SKINK

Based on published reports, Broadhead Skinks inhabit the edges of wood lots, open savannah forests, damp wooded lowlands, deciduous forests, and heavily forested hills, usually near water bordered by dead trees either standing or fallen. When arboreal they retreat up living or dead trees, sometimes hiding in abandoned woodpecker holes; when on the ground they seek shelter (often near water) beneath old slabs of wood, lumber, large logs, stumps, piles of brush, loose bark, leaf litter, and debris around dilapidated farm buildings. The quality and quantity of Kansas deciduous woodlands, particularly those near water, is apparently very important in order for the Broadhead Skink to survive.

Our observations during this study corroborate the above summary. A male Broadhead Skink was observed on the east bank of the Marais des Cygnes River in Miami County on 11 June 1992. The animal was basking in a small patch of sunlight atop the moss-covered trunk of a fallen tree. The area was forested, with an undergrowth of Poison Ivy and other vines. Trunks of many old fallen trees were scattered throughout the area, interspersed with several dead standing trees. Two female Broadhead Skinks were discovered in Cherokee County on 17 July 1992; both were found beneath ties along the south side of the tracks of an abandoned railway line about 100 meters east of a bridge; standing water was present in the south ditch near the ties. Tall trees with much undergrowth lined both sides of the former railroad right of way.

#### REDBELLY SNAKE

Based on published reports, Redbelly Snakes seem to prefer deeply wooded regions near rivers and lakes, sandstone woods, wooded hillsides, hillsides near streams, steep slopes of forested hills, moist areas, moist woodlands, woodlands with dense leaf litter, lowlands, forest edge, open fields, the vicinity of old dilapidated farm buildings, and woodlands which remain damp throughout the year. They are usually discovered on damp ground beneath leaf litter, leaf mold, or pine needles mixed with dead leaves; equally as often they are found under flat rocks, logs, rotten logs, boards, and other surface debris. In Nebraska, an isolated colony was found at a drainage ditch bank along a river.

The single observation made during this study corroborates the above summary. A Redbelly Snake was seen in Douglas County on 7 October 1992 by Kevin R. Toal, and his data turned over to us. He observed an adult of this species active by day at 1530 hours in leaf litter on sandstone substrate in thick (white oak) forest. The area is a protected refuge, and contains an extensive stand of old growth forest.

## SMOOTH EARTH SNAKE

Based on published reports, Smooth Earth Snakes seem to prefer heavily timbered sandstone woods, rocky hillsides in moist woodlands, deciduous forests, wooded urban areas, woodland edge situations, open brushy woodlands without a continuous leaf canopy, and abandoned fields. They are frequently found in thick piles of dead leaves, or beneath leaf litter, flat rocks, logs, and other surface debris.

Our observations during this study corroborate the above summary. A single Smooth Earth Snake was found dead in Leavenworth County on 10 May 1992. Adjacent habitat consisted of sloping open pasture with some flat rocks, low bushes, and shrubs; woodland was less than 200 feet distant along a small stream. On 14 October 1992, an adult Smooth Earth Snake was found under pile of wood chips in an urban, open woodland area in Shawnee County.

It should be pointed out that all three species of reptiles investigated in this report are extremely difficult to find and observe in their native Kansas habitat. They are small and secretive, and live in the forested eastern regions of the state where undergrowth is thick and vision limited. Searching by both of us for these three taxa by lifting objects such as rocks, logs, and debris (even with many enthusiastic volunteers) has resulted in some discoveries. Roadcruising also has provided some success with all three forms. But in 25 years of field work we have been unable to develop a technique that allowed us to find these reptiles in their native haunt on a regular, sustained basis. We suspect that pitfall traps along drift fences at specific sites would be successful in catching *Storeria occipitomaculata* and *Virginia valeriae* (but not *Eumeces laticeps*), and we recommend that future KDWP projects involving these two snakes require the use of this technique when appropriate.

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## BIBLIOGRAPHY

This bibliography is divided into two parts. The first is NON-KANSAS WORKS, a short list of books or articles cited in the text, but which do not mention the Broadhead Skink, Redbelly Snake, or Smooth Earth Snake in Kansas. The second list is KANSAS WORKS, a complete list of references to those three species in Kansas, many of which are cited in the text.

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## APPENDIX I

This is a summary of all known Kansas voucher specimens for the three species of reptiles addressed in this report. The lists of specimens summarized herein were obtained from a survey by us of 29 institutional collections in the United States. Of the 29 collections surveyed, eight contained specimens relevant to this report. The total number of Kansas voucher specimens (discounting the eggs and young for the Broadhead Skinks) of the three relevant species of reptiles is: *Eumeces laticeps* (14), *Storeria occipitomaculata* (33), and *Virginia valeriae* (38).

Each of the three taxa of reptiles addressed in this report is presented in its own species account. Each account contains the institutional collection abbreviation, collection catalog number, county of collection, specific locality (when available), and date of collection (when available). With regard to the date of collection, "NA" means either date was not available in the materials supplied by the institutional collection or such information was not applicable due to the nature of the record (i.e. eggs, litter, etc.). "Unknown" means no collection date was ever recorded for the specimen. Within each species account, the data is listed in alphabetical order by county, and within each county chronologically. Institutional acronyms are: AMNH = American Museum of Natural History; BYU = Brigham Young University; CHAS = Chicago Academy of Science; FMNH = Field Museum of Natural History, Chicago; KU = Museum of Natural History, University of Kansas; LACM = Los Angeles County Natural History Museum; UIMNH = University of Illinois Museum of Natural History; UMMZ = University of Michigan Museum of Zoology; USNM = U.S. National Museum of Natural History, Washington, D.C.

## VOUCHERS

Broadhead Skink  
*Eumeces laticeps*

KU	719	Anderson Co:	No other data	Aug 1910
KU	701	Franklin Co:	Ottawa	1911
KU	28865	Cherokee Co:	2 mi N Galena	22 Apr 1950
FMNH	69307	Miami Co:	4 mi E Fontana	14 May 1950
KU	30521	Miami Co:	3 mi E & 1 mi S Fontana	26 May 1951
KU	30522	Miami Co:	3 mi E & 1 mi S Fontana	26 May 1951
LACM	99612	Miami Co:	3 mi E & 1 mi S Fontana	26 May 1951
UIMNH	38919	Miami Co:	3 mi E & 1 mi S Fontana	26 May 1951
KU	51445	Cherokee Co:	3 mi S & 1 mi E Galena	10 May 1958
KU	56095	Crawford Co:	6 mi N & 1 mi E Girard	20 Apr 1960
KU	192194	Crawford Co:	NE 1/4 Sec 30, T27S, R25E	21 May 1981
KU	211377	Crawford Co:	Sec. 5, T28S, R24E	8 Apr 1987
KU	214776	Crawford Co:	NW 1/4 Sec 13, T28S, R25E	30 May 1989
KU	214777	Crawford Co:	NW 1/4 Sec 13, T28S, R25E	NA <sup>1</sup>
KU	uncat	Cherokee Co:	NW 1/4 Sec 17, T 33S, R25E	17 Jul 1992
KU	uncat	Cherokee Co:	NW 1/4 Sec 17, T 33S, R25E	NA <sup>2</sup>

<sup>1</sup>Six of eight eggs from KU 214776.

<sup>2</sup>young from KU uncat female collected 17 July 1992.

Redbelly Snake  
*Storeria occipitomaculata*

UIMNH	33069	Cherokee Co:	No other data	Unknown
USNM	4651	"Kansas"	No other data	16 July 1859 <sup>1</sup>
AMNH	3380	Phillips Co:	Long Island	25 Sep 1884
KU	2355	Hamilton Co:	No other data	Jun 1902
FMNH	18135	Franklin Co:	No other data	3 May 1925
UMMZ	66981	Franklin Co:	No other data	3 May 1925
KU	55176	Franklin Co:	No other data	9 May 1926
KU	55177	Franklin Co:	No other data	9 May 1926
KU	55178	Franklin Co:	No other data	9 May 1926
UMMZ	66982	Franklin Co:	No other data	1 May 1927
KU	3581	Douglas Co:	7.5 mi SW Lawrence	27 May 1927
KU	3582	Anderson Co:	4 mi S Garnett	25 Jun 1927
KU	8431	Jefferson Co:	No other data	Spring 1928
CHAS	5277	Miami Co:	N shore Pigeon Lake	24 Mar 1928
KU	7661	Douglas Co:	W of Lawrence	1 Apr 1930
FMNH	11145	Douglas Co:	Lawrence	24 Aug 1930
KU	23690	Cherokee Co:	5.5 mi E Baxter Springs	24 Apr 1948
KU	28750	Miami Co:	Murray Lake	1950
KU	56085	Douglas Co:	1.5 mi NE Baldwin	1 May 1960
KU	88033	Douglas Co:	2 mi N Baldwin	6 Nov 1964
KU	129470	Atchison Co:	9 mi S Atchison	27 Apr 1968
KU	139975	Jefferson Co:	Fitch Nat Hist Reservation	17 Apr 1971
KU	146972	Douglas Co:	Lone Star Lake area	29 Apr 1972
KU	154041	Jefferson Co:	Stoney Crest Camp, W Oskaloosa	5 May 1973
KU	155322	Cherokee Co:	near Galena	16 Mar 1974
KU	155396	Jefferson Co:	5.5 mi N McLouth, Scatter Creek	21 Sep 1974
KU	155397	Douglas Co:	ca 2 mi S & 1 mi E Stull	9 Jul 1974
KU	179037	Atchison Co:	Atchison	28 Apr 1978
KU	179038	Jefferson Co:	Camp Jayhawk	Jul 1978
KU	192181	Cherokee Co:	N 1/2 Sec 1, T35S, R25E	20 Mar 1982
KU	192182	Cherokee Co:	NW 1/4 Sec 36, T33S, R25E	10 Apr 1982
KU	192183	Cherokee Co:	NW 1/4 Sec 36, T33S, R25E	10 Apr 1982
KU	192184	Cherokee Co:	N 1/2 Sec 1, T35S, R25E	22 May 1982

<sup>1</sup>Data sheet received in 1980 by Collins from the U.S. National Museum of Natural History lists the catalog number as USNM 4657, not 4651.

Smooth Earth Snake  
*Virginia valeriae*

UIMNH	32948	Johnson Co:	3 mi W Shawnee	Unknown
FMNH	98565	Johnson Co:	3 mi W Shawnee	Unknown
KU	8406	Jefferson Co:	N of Lawrence	May 1929
KU	7663	Douglas Co:	NW of Lawrence	1 Apr 1930
KU	7550	Douglas Co:	N of Lawrence	5 Apr 1930
KU	7344	Leavenworth Co:	20 mi N Lawrence	23 Apr 1930
KU	7345	Leavenworth Co:	20 mi N Lawrence	23 Apr 1930

FMNH	11141	Douglas Co:	Lawrence	24 Apr 1930
FMNH	11142	Douglas Co:	Lawrence	24 Apr 1930
AMNH	44932	Douglas Co:	5 mi N Lawrence	13 May 1931
LACM	103510	Jefferson Co:	6 mi N & 2 mi E Williamstown	28 Apr 1949
UIMNH	38949	Jefferson Co:	7 1/2 mi N Lawrence	16 Apr 1950
BYU	14026	Jefferson Co:	7 mi N Lawrence	16 Apr 1950
FMNH	69409	Jefferson Co:	No other data	21 Apr 1950
KU	52263	Jefferson Co:	3.5 mi S & 3.5 mi W McLouth	18 Apr 1955
KU	188984	Wyandotte Co:	4.8 km NE Bonner Springs	May 1956
KU	188983	Jefferson Co:	4.8 km SE Ozawkie	4 Aug 1956
KU	188985	Wyandotte Co:	Camp Naish	10 Aug 1959
KU	74700	Jefferson Co:	11 mi WNW Lawrence	30 Mar 1963
KU	177018	Douglas Co:	ca 1.6 km ENE Baldwin	4 May 1965
KU	177023	Jefferson Co:	8.8 km N McLouth, Scatter Cr.	Apr 1968
KU	140294	Jefferson Co:	N Fitch Nat Hist Reservation	17 Apr 1971
KU	148529	Jefferson Co:	1.9 mi N jct Rts 24 & 59	12 Sep 1972
KU	155323	Jefferson Co:	nr Perry Lake on Ks. Rt. 4	20 Apr 1974
KU	155324	Jefferson Co:	nr Perry Lake on Ks. Rt. 4	20 Apr 1974
KU	155402	Jefferson Co:	5.5 mi N McLouth, Scatter Cr.	Sep 1974
KU	189272	Atchison Co:	Atchison	Apr 1981
KU	192253	Jefferson Co:	near Perry Lake dam	30 Apr 1982
KU	192254	Linn Co:	Linn Co. Park nr Lake LaCygne	8 May 1982
KU	192255	Linn Co:	Linn Co. Park nr Lake LaCygne	8 May 1982
KU	192256	Shawnee Co:	Sec 9, T11S, R16E	9 May 1982
KU	203989	Franklin Co:	Sec 32, T17S, R20E	21 Sep 1985
KU	203990	Franklin Co:	Sec 32, T17S, R20E	21 Sep 1985
KU	204790	Jefferson Co:	Sec 22, T10S, R18E	11 Apr 1986
KU	207060	Wyandotte Co:	E edge Bonner Springs	24 Jun 1987
KU	218779	Jefferson Co:	Sec 26, T10S, R17E	6 Apr 1991
KU	Uncat	Leavenworth Co:	NW 1/4 Sec 10, T10S, R21E	10 May 1992
KU	Uncat	Shawnee Co:	Sec 11, T11S, R16E	14 Oct 1992

## APPENDIX 2

### ITINERARY OF 1992 FIELD WORK

This is a brief summary of field work during 1992 by Larry Miller, Joseph T. Collins, and their colleagues and friends who volunteered to assist with the project field work.

#### January

18-19 January 1992: Trip to Cherokee and Crawford County to check on locations of past collections of Redbelly Snakes and Broadhead Skinks. No collecting. Larry Miller and Suzanne Wineland. Total miles driven = 429.

#### February

15 February 1992: Trip to Douglas County to check some past locations where Redbelly Snakes and Smooth Earth Snakes have been collected. Larry Miller. Total miles driven = 122.

#### March

14 March 1992: Trip to Smooth Earth Snakes locations in Shawnee County. Larry Miller. Total miles driven = 67

#### April

12 April 1992: Trip to Lone Star Lake, Douglas County, to check on Redbelly Snake habitat. Larry Miller and Suzanne Wineland. Total miles driven = 134.

26 April 1992: Trip to Lone Star Lake, Douglas County, to photograph habitat and search for Redbelly Snakes and Smooth Earth Snakes. Total miles driven = 148.

#### May

3 May 1992: Trip to Sec. 9, T11S, R16E in Shawnee County to check the location where a Smooth Earth Snake was collected on 9 May 1992. Location was a small park in north Topeka. Larry Miller and Suzanne Wineland. Total miles driven = 11.

4 May 1992: Trip to Lone Star Lake, Douglas County, to search for specimens and observe known Redbelly Snake habitat. Larry Miller and Suzanne Wineland. Miles driven = 70.

9 May 1992: Trip to Franklin County to check known Redbelly Snake and Smooth Earth Snake habitats and look for specimens. Larry Miller and Suzanne Wineland. Total miles driven = 248.

10 May 1992: Trip to Leavenworth County to collect specimens. Single DOR Smooth Earth Snake found adjacent to the NW 1/4 Sec. 10, T10S, R21E. Suzanne L. Collins and Joseph T. Collins. Total miles driven = 141.

11 May 1992: Trip to Clinton Lake area in Douglas County. Spent much time during the late afternoon hours turning rocks and roadcruising around lake. Total miles driven = 73.

16 May 1992: Trip to Linn and Miami counties to search for specimens and check known habitat for all three species. Larry Miller and Mary Kate Baldwin. Total miles driven = 424.

#### June

1 June 1992: Trip to Jefferson County. Cool and very wet. Larry Miller and Mary Kate Baldwin. Total miles driven = 129.

3 June 1992: Trip to Lone Star Lake, Douglas County, to check Redbelly Snake habitat. Total miles driven = 78.

5 June 1992: Trip to Jefferson County to photograph habitat. Larry Miller and Suzanne Wineland. Total miles driven = 246.

9-12 June 1992: Two organized trips with many volunteers. Group One to Linn County and Miami County. Group Two to Jefferson County and Douglas County. A total of 27 people were involved in the two trips. One adult male Broadhead Skink observed. Total miles driven = 750+.

25 June 1992: Trip with volunteers collected north of Stull, Douglas County. Miles not recorded.

#### July

2 July 1992: Trip with volunteers to collect specimens southeast of Topeka in Shawnee County. Mileage not recorded.

17-19 July 1992: Trip to Cherokee County. Participants were Joseph T. Collins, Suzanne L. Collins, Larry Miller, Suzanne Wineland, Shane Eckhardt, Travis W. Taggart, Kevin Parrish, Randall Reiserer, and others. Two adult female Broadhead Skinks found, one on nest of eggs. Total miles driven = 856.

#### October

7 October 1992: Trip to KU Breidenthal Tract (Sec. 28, T14S, R20E), Douglas County. One adult Redbelly Snake observed. Protected area—specimen not collected. Kevin R. Toal. Mileage not recorded.

14 October 1992: Shawnee County (Sec. 11, T11S, R16E). Adult Smooth Earth Snake found by Jeremy Bratcher. Specimen received from Marc Linton by Joseph T. Collins. Mileage not recorded.

## APPENDIX 3

Figure 1. The habitat of Redbelly Snakes near Lone Star Lake in Douglas County, Kansas. Photograph by Larry Miller.

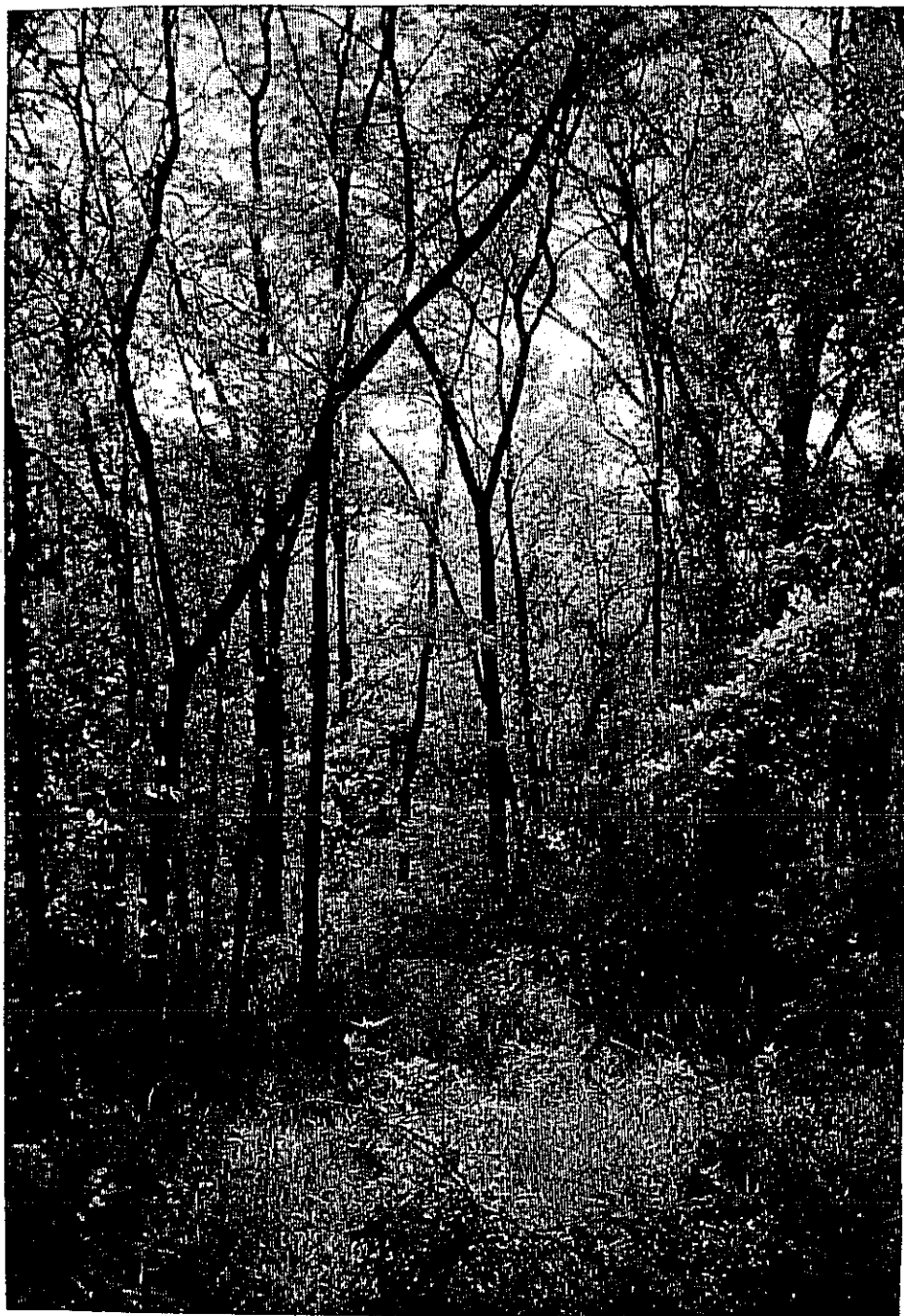


Figure 2. The habitat of Smooth Earth Snakes in Jefferson County, Kansas. Photograph by Larry Miller.



Figure 3. The habitat of Smooth Earth Snakes in Jefferson County, Kansas. Photograph by Larry Miller.





Figure 4. A male Broadhead Skink was observed basking at 1200 hours on this fallen log on 11 June 1992 in Miami County, Kansas. Photograph by Larry Miller.



Figure 5. Dead trees near standing water adjacent to the site where a male Broadhead Skink was observed in Miami County, Kansas, on 11 June 1992. Photograph by Larry Miller.



Figure 6. Railroad right of way in Cherokee County, Kansas, near where two adult female Broadhead Skinks were discovered, one of which was brooding her eggs in a nest beneath a railroad tie. Photograph on 17 July 1992 by Larry Miller.



Figure 7. Ditch with water along south side of railroad right of way in Cherokee County, Kansas, near where female Broadhead Skink was discovered with clutch of eggs on 17 July 1992. Photograph by Larry Miller.



Figure 8. Trees and lowgrowth bordering a water-filled ditch along the south side of a railroad right of way in Cherokee County, Kansas, near where a female Broadhead Skink was discovered with a clutch of eggs on 17 July 1992. Photograph by Larry Miller.



Figure 9. Field crew searching for specimens along railroad right of way in Cherokee County, Kansas, at site where female Broadhead Skink was discovered with clutch of eggs on 17 July 1992. Photograph by Larry Miller.



Figure 10. A female Broadhead Skink brooding her clutch of eggs in Cherokee County, Kansas, on 17 July 1992. Photograph by Larry Miller.

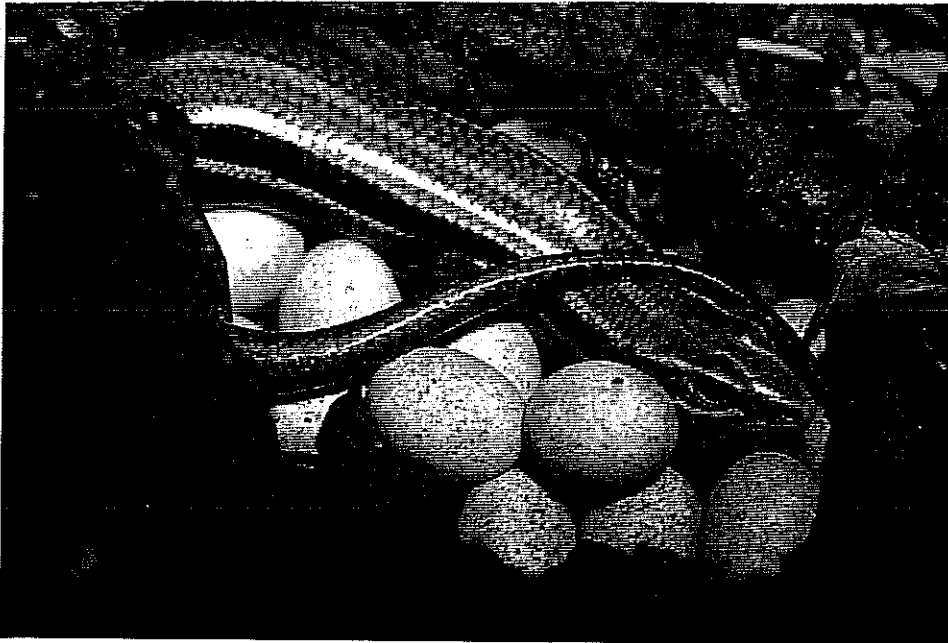


Figure 11. Adult Redbelly Snakes demonstrating two dorsal color variations often encountered in wild-caught Kansas specimens. Photograph by Suzanne L. Collins.

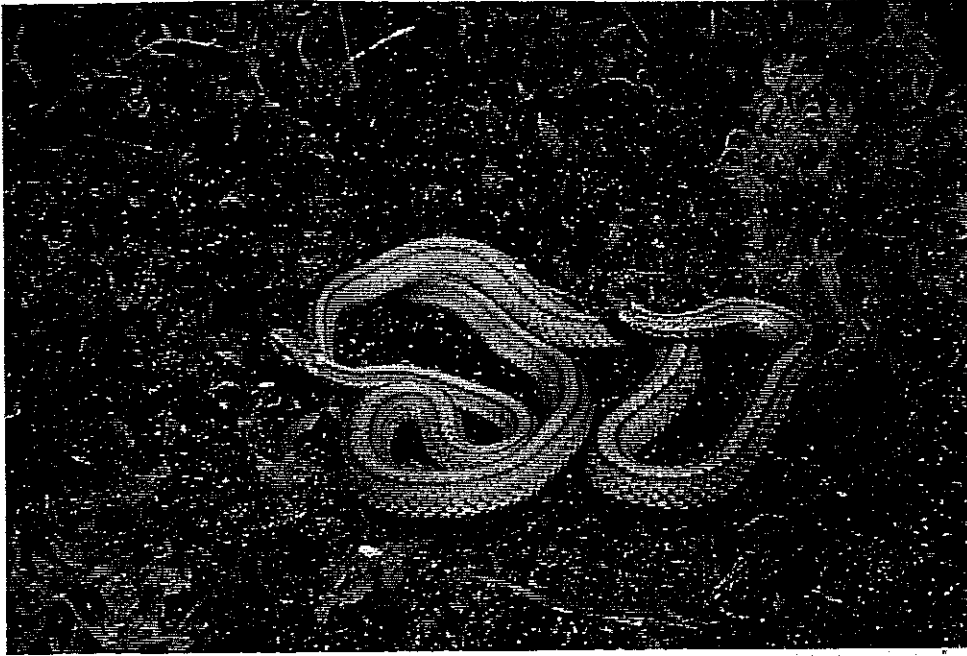


Figure 12. An adult Smooth Earth Snake from Shawnee County, Kansas, collected by Jeremy Bratcher on 14 October 1992. Photograph by Suzanne L. Collins.

