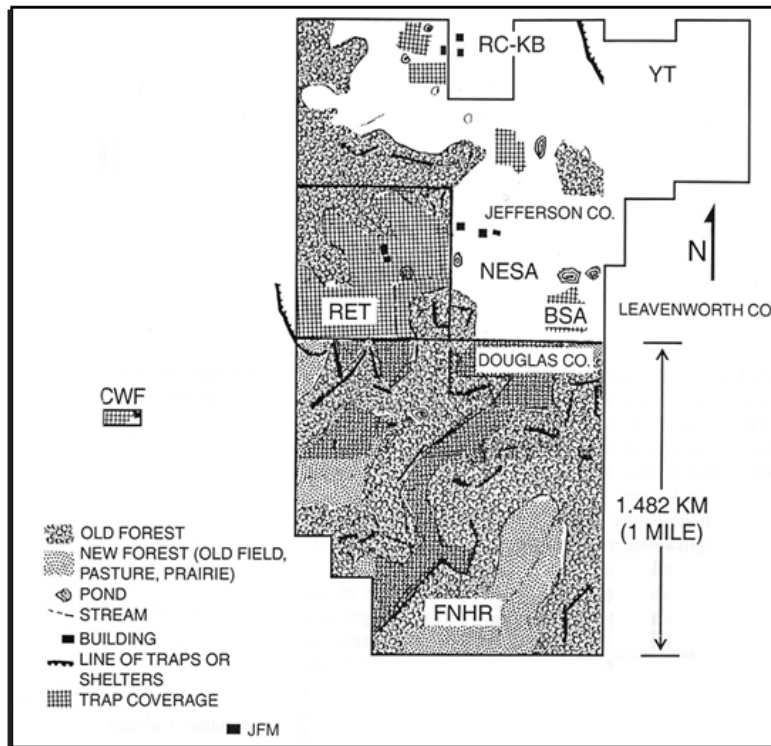


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Front Cover: Map of the most ecologically studied site on earth. The tracts comprise the KU Ecological Reserves, where Henry S. Fitch has conducted unprecedented mark-and-recapture studies from 1948 to the present. Reprinted from *A Kansas Snake Community: Composition and Change over 50 Years*, by Henry S. Fitch and published by Krieger Publishing Company, Malabar, Florida (1999).

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KHS BUSINESS

FALL 2003 KHS FIELD TRIP SCHEDULED FOR LEAVENWORTH COUNTY

The fall 2003 KHS field trip will be at Leavenworth County State Lake located in Leavenworth County in northeastern Kansas. The dates of the field trip will be 11–12 October 2003. Although many participants will arrive the afternoon and evening of Friday, 10 October (look for the big KHS sign at the lake), the first organized foray will begin at 9:00 am on Saturday, 11 October. The second organized event will begin at 2:00 pm on Saturday, 11 October. The final organized survey will take place at 9:00 am on Sunday, 12 October. The meeting place for the field trips will be Leavenworth County State Lake, which is located approximately one mile north and three miles west of Tonganoxie. Please contact Jay Kirk, KHS Field Trip Chairperson (see inside front cover) for information about the availability of motels in Tonganoxie, as well as camping, restrooms, showers, and electrical hookups, and whether open campfires are permitted. This information will be posted on the KHS web site as it becomes available.

As with all KHS field trips, FRS channel 4 will be monitored. The Leavenworth County field trip will be the only official fall KHS field trip for 2003. There is a strong possibility that we will have access to the Fort Leavenworth Military Reservation on the morning of 11 October. Start making plans now to attend this exciting Society event.

RESULTS OF THE 2003 KHS SPRING FIELD TRIP TO WILSON COUNTY

On 25–27 April 2003, KHS members traveled to Wilson County, Kansas, to search for amphibians, turtles, and reptiles found in southeastern Kansas. Many participants gathered and made numerous observations at Wilson County State Lake on Friday night, and at 9:00 am on Saturday morning a stunning 90 participants (Figure 1) were present for the herpetofaunal count.

With the help of gracious land-owners and residents in the area (particularly Pat Porter, Michael Washburne, and John Fraser), we spent three great days collecting a record number of species.

The count for 25–27 April 2003 was as follows:

Kansas: Wilson Co: Wilson County State Lake & Environs
 N37.69243°, W95.67398° (lake campsite)
 25 April 2003 noon–midnight

American Toad (chorusing)	±115
Northern Cricket Frog	2
Gray Treefrog (chorusing)	±50
Western Chorus Frog (chorusing)	±500
Plains Leopard Frog (chorusing)	±10
Southern Leopard Frog (chorusing)	±35
Great Plains Narrowmouth Toad	7
Common Snapping Turtle	1
River Cooter	1
Eastern Collared Lizard	±35
Five-lined Skink	2

Great Plains Skink	±50
Ground Skink	±10
Six-lined Racerunner	±25
Ringneck Snake	±30
Flathead Snake	±20
Eastern Racer	2
Great Plains Rat Snake	1
Western Rat Snake	1
Common Kingsnake	1
Coachwhip	1
Plainbelly Water Snake (Figure 2)	1
Northern Water Snake	1

Total

23 species ±901 specimens

Kansas: Wilson Co: Wilson County State Lake & environs (& road-cruising county-wide)
 26 April 2003 (all day long and into the evening)

American Toad	24
Northern Cricket Frog	84
Gray Treefrog (Figure 3)	9
Western Chorus Frog	13
Bullfrog	±30
Plains Leopard Frog	4
Southern Leopard Frog	9
Great Plains Narrowmouth Toad	17
Common Snapping Turtle	4



Figure 1. Some of the ±90 participants in the KHS spring field trip to Wilson County, Kansas, on 25–27 April 2003. Photograph by Suzanne L. Collins.

Common Musk Turtle	8	Lined Snake	1
Painted Turtle	6	Copperhead	4
River Cooter	5	Massasauga	1
Eastern Box Turtle	7		
Ornate Box Turtle	7		
Slider	6		
Eastern Collared Lizard	15		
Five-lined Skink	13		
Great Plains Skink	88		
Northern Prairie Skink	3		
Ground Skink	16		
Western Slender Glass Lizard	2		
Six-lined Racerunner	61		
Ringneck Snake	226		
Flathead Snake	38		
Eastern Racer	13		
Great Plains Rat Snake	6		
Western Rat Snake	13		
Prairie Kingsnake	3		
Common Kingsnake	6		
Milk Snake	1		
Coachwhip	1		
Rough Green Snake	1		
Gopher Snake	2		
Plainbelly Water Snake	2		
Diamondback Water Snake	2		
Northern Water Snake	1		
Graham's Crayfish Snake	2		
Western Ribbon Snake	3		
Common Garter Snake	3		
		<i>Total</i>	
		42 species	±760 specimens
		<i>Kansas: Wilson Co: at Pat Porter's Ranch</i>	
		N37.44358°, W95.77444°	
		27 April 2003 (dawn–1:00 pm)	
		American Toad	5
		Northern Cricket Frog	17
		Bullfrog	1
		Plains Leopard Frog	3
		Great Plains Narrowmouth Toad	27
		Eastern Box Turtle	7
		Ornate Box Turtle	1
		Slider	6
		Eastern Collared Lizard	18
		Great Plains Skink	28
		Ground Skink	11
		Western Slender Glass Lizard	5
		Six-lined Racerunner	28
		Western Worm Snake	14
		Ringneck Snake	66
		Flathead Snake	70
		Eastern Racer	3
		Great Plains Rat Snake	1



Figure 2. Plainbelly Water Snakes were encountered on the KHS spring field trip to Wilson County, Kansas. Photograph by Travis W. Taggart.

Common Kingsnake	6
Coachwhip	1
Ground Snake	2
Brown Snake	1
Western Ribbon Snake	5
Lined Snake	3

Totals

24 species ±333 specimens

Grand Total

44 species ±1994 specimens

Participants were: Cathy Acuff, Laura Acuff, Robert Acuff, Robert L. Acuff III, Lucia Baldwin, Mary Kate Baldwin, Daniel Becker, Rose Benefiel, Traci Bennett, Mitch Bennett, Calley Burr, Andy Burr, Cassie Carter, Joseph T. Collins, Suzanne L. Collins, Cory Cowger, Cress, Cindy Cummings, Monte Davis, Nate Davis, Katlynn DeVader, Elisabeth DeVader, Erin Dugan, Kathy Ellis, Mark Ellis, John Fraser, Jeff Garfinkle,



Figure 3. Preoccupied Gray Treefrogs were in abundance on the KHS spring field trip to Wilson County, Kansas. Photograph by Travis W. Taggart.



Figure 4. Elizabeth Smith lifted many rocks on the KHS spring field trip to Wilson County, Kansas. Photograph by Larry L. Miller.

Nicholas Gomez, Harry Grange, Alan Gravenstein, Tanner Gravenstein, James E. Gubanyi, Michael Hogan, Megan Hughes, David Humenczuk, Charles Janssen, Greg Jarren, Olin Karch, Eric Kessler, Maura Kessler, Rebecca Kessler, Patrick Kimes, Eden Kirk, Jamie Kirk, Jay Kirk, Michelle Kozubek, Chrissy Kutz, Adrienne Kutz, Brett Lemker, Colby Lane, Will Lane, Cami Liggett, Jill Lokke, John Lokke, Ian McCloud, Scott McCloud, Ross McNearney, Larry L. Miller, Suzanne L. Miller, Michael Morgan, Daniel Murrow, David Oldham, Jackson Oldham, Robin Oldham, Tag Oldham, Cindy Palmer, Weston Palmer, Erica Peterson, Dale Randall, Emily Reimer, James Reimer, Mike Rochford, Dean Rothlisberger, Sharen Rothlisberger, Curtis Schmidt, Bryce Smith, Liz Smith, Andy Sindorf, Charles Spellman, Eddie Stegall, Savilla Stegall, John Stoklosa, Travis W. Taggart, Jacob Tollefson, John Tollefson, Julie Tollefson, Derek Turner, Mark VanDoren, Michael Washburne, Ginny Weatherman, Eric Wenzl, Roy Wenzl, Chad Whitney, and Amy Zavala

The participants at this spring excursion owe a great deal of thanks to KHS Field Trip Chairperson Jay Kirk for his dedicated efforts, which made this the most successful field trip in the Society's history.



Figure 5. A KHS participant adds another first to his photographic collection during the KHS spring field trip to Wilson County, Kansas. The Common Snapping Turtle was uncommon during the field trip. Photograph by Suzanne L. Collins.



Figure 6. Erin Dugan examines the Common Musk Turtles she found around the margin of Wilson County State Lake on the KHS spring field trip. These creatures were but one of the 44 taxa observed or heard during the event. Photograph by Larry L. Miller.



Figure 7. Mark & Kathy Ellis got a big surprise on the KHS spring field trip to Wilson County, Kansas. On Saturday night, the participants gave them with a wedding cake and card (compliments of Suzanne Collins & Robin Oldham), and serenaded them in celebration of their recent marriage. This was undoubtedly a KHS first. Photograph by Larry L. Miller.

KHS ANNUAL MEETING CALL FOR PAPERS

The program for the KHS 30th Annual Meeting will be held at ESU Science Building, *Emporia State University*, Emporia, Kansas, on 8–9 November 2003. Lodging arrangements will not be made by the KHS; program and motels will soon be listed on the KHS web site. An auction will be held at the *Ross Natural History Reservation* on Saturday night. Participants wishing to present a talk should contact Greg Sievert with their title, institutional address, and abstract at sievertg@emporia.edu no later than 1 October 2003. Copies of the title and institutional address should also be sent to Joe Collins for posting on the KHS web site meeting program. Individuals using US mail should send this information to both Sievert and Collins (see inside front cover). Presenters wishing to be considered for *The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology* should so indicate with their submission.

KHS 2003 HERPETOFAUNAL COUNTS

KHS members are reminded to send their spring 2003 herp counts to the associate editor (see inside front cover) as soon as possible. All such counts will be published in the September issue of the *Journal of Kansas Herpetology*. Counts must have been conducted during April and May of 2003, and must list locality, date, participants, and complete address of the verifier. Additional data such as time span and weather should be submitted, and will be included as space permits.

KHS SCHOLARSHIP & GRANT DEADLINES

Individuals are reminded that the deadline is 15 September 2003 for submission of applications for the *Howard K. Gloyd-Edward H. Taylor Scholarship* and the *Alan H. Kamb Grant for Research on Kansas Snakes*. Self-nominations for the *Gloyd-Taylor Scholarship* are encouraged. Submissions for both the scholarship and grant should be sent to the Chairperson of the KHS Awards Committee (see inside front cover).

KHS ON THE TRAVEL CHANNEL

On 20 April 2003 about 10:30 pm, the *Travel Channel* had a program called *Honeymoon Hotspots* that focused on the Grand Canyon. Although the show was tourist oriented, it did have a short piece on venomous snakes. The snake segment featured KHS member Andy Holycross (Arizona State University) wearing the KHS 25th Anniversary T-shirt. The state outline and Barred Tiger Salamander stood out clearly, although you couldn't make out the KHS logo. (*The editor thanks KHS past president Chris Mammoliti for bringing this information to our attention.*)

PAY YOUR 2003 DUES

Send your calendar 2003 dues (\$15.00 regular, \$20.00 contributing) to:

Mary Kate Baldwin
KHS Secretary
5438 SW 12th Terrace Apt. 4
Topeka, Kansas 66604

Your attention to this matter will ensure that the delivery of your *Journal of Kansas Herpetology* will be renewed, and will support the KHS and its many fine programs. Also, you will be eligible for KHS awards, grants, and scholarships.

RESEARCH SPECIMENS NEEDED

I am a doctoral candidate in the Department of Biology at Saint Louis University. My doctoral research is a comparative phylogeographic study of the Brown Snake (*Storeria dekayi*), Redbelly Snake (*Storeria occipitomaculata*), Rough Earth Snake (*Virginia striatula*), and Smooth Earth Snake (*Virginia valeriae*). I will also be conducting a project on the Ground Skink (*Scincella lateralis*). For both projects, I will be analyzing mtDNA as well as morphological data.

I will be traveling throughout the eastern U. S. during 2003–2004 collecting specimens. I was wondering if anyone could suggest specific areas where I might find these species, other people to contact, or if anyone could collect some of these taxa for me during their own fieldwork? I will obtain scientific collecting permits for my own work, and any specimens sent to me should be accompanied by a proper scientific collecting permit. Any assistance would be appreciated.

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Many thanks to our 2003 Donors
Howard K. Gloyd-Edward H. Taylor Scholarship
Steve Adams
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*Alan H. Kamb Grant
for Research on Kansas Snakes*
Steve Adams
George W. Roycroft, Jr.

(as of May 2003)

OF INTEREST

KENTUCKY HERPETOFAUNAL COUNT

On 17 April 2003, we observed amphibians and reptiles from 8:00 pm to 10:45 pm on both sides of the Nada Tunnel in the Red River Gorge area, Powell County, Kentucky. It had rained continuously since early morning, and continued to rain as we road-cruised Ky. Rt. 77 from Nada up through the narrow mountain tunnel and down to the Red River and back. We drove this route twice during the time shown above, and observed or heard the following (many observed were alive on the road):

Spotted Salamander	2
Eastern Newts (eft-stage)	4
Southern Two-lined Salamander	1
Spring Salamander	3
Four-toed Salamander	1
Red Salamander	6
American Toad (choring)	±50
Mountain Chorus Frog (choring)	±500
Spring Peeper (choring)	±500
Bullfrog	1
Green Frog	1
Pickerel Frog	2
Wood Frog	2
Northern Water Snake (both DOR)	2
14 species	±1075 specimens

Submitted by **SUZANNE L. COLLINS**, *The Center for North American Herpetology*, 1502 Medinah Circle, Lawrence, Kansas 66047 & **JOSEPH T. COLLINS**, Adjunct Herpetologist, *Kansas Biological Survey*, 2101 Constant Avenue, Lawrence, Kansas 66047.

DWIGHT PLATT ON VOICE OF AMERICA

For the last three years, *KHS Distinguished Life Member* Dwight R. Platt and his colleagues have been taking a group out to the sandhills in Harvey County, Kansas, to listen for frogs on April nights. This year Sam Hendren from a local public radio station came along and recorded some of the frogs heard. Later, Hendren interviewed Dwight and then did a short radio story on the event, which was broadcast on the local station. This program was picked up by *Voice of America* and was broadcast on one of their programs on May 24 of this year. KHS members can hear it on their website if they have RealPlayer. The website for the VOA is <http://www.voanews.com>. On the scrollable list of programs, click on *Our World*. The frog story is one segment of the May 24 program.

U. S. BLIND SNAKES REVISED

Dixon, James R. & Kathryn Vaughan [2003 *The Status of Mexican and Southwestern United States Blind Snakes allied with *Leptotyphlops dulcis* (Serpentes: Leptotyphlopidae)*. *Texas Journal of Science* 55(1): 3–24], using external morphological data, recognized the subspecies *Leptotyphlops dulcis dissectus* as a distinct species, *Leptotyphlops dissectus*. Standard common name becomes New Mexico Blind Snake, the same as it was for the subspecies. The name Blind Snake has been used consistently for this genus for nearly 75 years, a usage that continues with the recent third edition of the Peterson Field Guide to the western U.S. by Robert C. Stebbins.

CROTALUS HORRIDUS

Clark, Moler, Possardt, Savitzky, Brown, & Bowen [2003 *Journal of Herpetology* 37(1): 145–154], using mtDNA, concluded that no subspecies could be defined within the species *Crotalus horridus*. Their results corroborate the conclusion arrived at three decades ago (using a different data set) by Pisani, Collins, & Edwards (1973 *Transactions of the Kansas Academy of Science* 75: 255–263).

AN ARBOREAL TIMBER RATTLESNAKE

A subadult Timber Rattlesnake (*Crotalus horridus*) was found *in situ* on a limb in Atchison County, Kansas, during a KHS field trip in 1998.

Submitted by **SUZANNE L. COLLINS**, *The Center for North American Herpetology*, 1502 Medinah Circle, Lawrence, Kansas 66047.



GEOGRAPHIC DISTRIBUTION

The *Journal of Kansas Herpetology* publishes brief notes of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important in that they document the range of a species, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a *standard format* only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, STANDARD COMMON NAME, LOCALITY, DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author), COLLECTION WHERE SPECIMEN IS DEPOSITED and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

This geographic distribution section does not publish *observation* records. Records submitted should be based on preserved specimens which have been placed in a research collection. A good quality color slide may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record.

Please submit any geographic distribution records in the *standard format only* to the editor (see the inside front cover of this issue).

Recommended citation for new distribution records appearing in the *Journal of Kansas Herpetology* is: Schmidt, Curtis J. and Travis W. Taggart. 2002. Geographic Distribution. *Gastrophryne olivacea*. *Journal of Kansas Herpetology* 2: 10.

BUFO WOODHOUSII (Woodhouse's Toad). KANSAS: ELK Co: within Elk Falls city limits, Sec. 10, T31S, R11E. 25 April 2003. Mike Washburne. MHP 7615. Verified by Curtis Schmidt.

Submitted by **JEREMY WASHBURNE & MICHAEL WASHBURNE**, P. O. Box 58, Elk Falls, Kansas 67345.

RANA AREOLATA (Crawfish Frog). KANSAS: COFFEY Co: DOR on Rt. 57, 1.5 miles E Rt. 75, Sec. 36, T22S, R15E. 30 April 2003. Andy Burr. MHP 7721. Verified by Travis W. Taggart.

Submitted by **ANDY BURR & CALLEY BURR**, 902 South 7th Street, Burlington, Kansas 66839.

EUMECES SEPTENTRIONALIS (Northern Prairie Skink). KANSAS: ELK Co: 1 mi NW Elk Falls. 29 March 2003. Mike Washburne. MHP 7654. Verified by Travis W. Taggart.

Submitted by **MICHAEL WASHBURNE**, P. O. Box 58, Elk Falls, Kansas 67345.

EUMECES SEPTENTRIONALIS (Northern Prairie Skink). KANSAS: WILSON Co: Wilson County State Lake, SE 1/4 Sec. 17, T27S, R16E. 26 April 2003. Tanner Gravenstein. MHP 7645. Verified by Joseph T. Collins.

Submitted by **TANNER GRAVENSTEIN & ALAN GRAVENSTEIN**, 415 North Frontier Court, Meriden, Kansas 66512.

NERODIA ERYTHROGASTER (Plainbelly Water Snake). KANSAS: SALINE Co.; 4.1 mi S Brookville, Smoky Hill Air National Guard Weapons Range, Spring Creek, Sec. 34, T15S, R5W (N38.70755° W97.86795°). 29 May 2003. Curtis J. Schmidt and Richard Hayes. MHP 7727. Verified by Travis W. Taggart.

Submitted by **CURTIS SCHMIDT**, Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas 67601.

REGINA GRAHAMII (Graham's Crayfish Snake). KANSAS: SALINE Co: 4.1 mi S Brookville, Smoky Hill Air National Guard Weapons Range, Spring Creek, Sec. 34, T15S, R5W (N38.70755° W97.86795°). 8 May 2003. Curtis J. Schmidt. MHP 7724. Verified by Travis W. Taggart.

Submitted by **CURTIS SCHMIDT**, Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas 67601.

SISTRURUS CATENATUS (Massasauga). KANSAS: ELK Co: 0.5 mi N & 3 mi W Busby, Sec. 33, T29S, R12E. 26 April 2003. Mike Washburne & Jeremy Washburne. MHP 7621. Verified by Joseph T. Collins.

Submitted by **JEREMY WASHBURNE**, P. O. Box 58, Elk Falls, Kansas 67345.

NOTES

THE RED MILK SNAKE IN NORTHEAST KANSAS

Chad Whitney
12260 Walnut Street
Olathe, Kansas 66061

Brandon DeCavele
8917 North Campbell
Kansas City, Missouri 64155

Red Milk Snakes (*Lampropeltis triangulum sypila*) were observed during 2002 in Anderson, Douglas, Linn, Miami, Franklin, Jefferson, Johnson and Wyandotte counties. Population density, color variation, size, and habitat were factors used in determining the status of the snake in each county. Habitat for this serpent statewide varies, and all surface cover is utilized by Red Milk Snakes including sheet metal, boards, logs, cement, asphalt, and rocks. Methods used for locating this reptile were rock flipping, hiking, and turning all kinds of cover in the field. Sheet metal and boards were placed in selected habitats in the winter of 2001, and produced Milk Snakes in the next spring, demonstrating that these reptiles will find and use any newly-installed surface litter. The following is a description of the habits of *L. t. sypila* in each county. (The numbers in parentheses represent in order the number of *L. t. sypila* found on each hunt at each locality.)

Anderson County

Population Density—undetermined; one *sypila* (1) found in one trip.

Description—Red saddles surrounded by a medium to heavy black border. Background is a light wheat to cream color. Ventral color is white and usual black checkerboard pattern.

Habitat—*L. t. sypila* utilized rocky woodland edge and rock cuts along a country road in this county.

Douglas County

Population Density—Extremely high, 35 (2, 4, 1, 2, 2, 9, 10, 1, 2, 2) found in ten trips.

Description—Wide red saddles, bordered in thin pinstriped black, pure white background color (Figure 1). Ventral color is white with usual black checkerboard pattern.

Habitat—*L. t. sypila* habitat in this county ranges from rocky valleys to rock-crested treeless hills.

Franklin County

Population Density—High, 8 (2, 1, 1, 4) found in four trips.

Description—Bright with deep red bands, and slim to heavy deep black saddles. In some specimens, the red saddles had a white tinge to them. Cream background color.

Habitat—*L. t. sypila* habitat in this county ranges from rock cuts along country roads, to open rocky valleys.

Jefferson County

Population Density—Very high, 22 (1, 10, 1, 7, 2) found in five trips.

Description—Red saddles bordered in thick black, red side blotches. Usual checkerboard ventral pattern.

Habitat—*L. t. sypila* habitat in this county is rocky woodland edge and open rocky glades atop wooded hills.

Johnson County

Population Density—Medium, 9 (1, 1, 1, 2, 1, 1, 2, 0) found in eight trips.

Description—Dark red saddles bordered by very thick black bands, dark wheat background color.

Habitat—Ranges from rock cuts along country roads and railroad tracks, to rocky valleys and cedar glades (Figure 2).

Linn County

Population Density—Low, 1 (1, 0, 0) found in three trips.

Description—Light red saddles bordered in pinstripe black.

Habitat—Rock cuts, rocky valleys, and rocky hillsides are all habitat for *L. t. sypila* in this county.

Miami County

Population Density—Undermined, 3 (0, 3, 0) found in three trips.

Description—Thin red blotches, with a thick black border. Red side blotches. Usual checkerboard ventral pattern.

Habitat—Rock cuts along county roads; semi-wooded rocky hillsides.

Wyandotte County

Population Density—High, 13 (1, 1, 4, 2, 1, 1, 1, 1, 1) found in nine trips.

Description—Pure white background color, vivid red saddles bordered in thin black bands (Figure 3).

Habitat—*L. t. sypila* habitat in this county ranges from open glades atop heavily wooded hillsides to semi-wooded rock valleys.

Roughly four hours a day were spent in the field during the months of April and May 2002 searching for *Lampropeltis t. sypila* in northeastern Kansas; a total of 92 *L. t. sypila* were found in 43 trips to eight counties by us. The most populous county in Kansas for *L. t. sypila*, according to our numbers, was Douglas County. The most popular habitat for this snake in Kansas, according to the number of snakes found, was open rocky hills adjacent to thick rocky wooded hillsides. Prairie Ringneck Snakes (*Diadophis punctatus arnyi*) were the most common snakes encountered in the habitat described, followed by Red Milk Snakes, and Osage Copperheads (*Agkistrodon contortrix phaeogaster*).

Acknowledgements: We thank the following for their assistance in the field, and in all other aspects of this paper; Larry and Jennifer Johnson, Mike Chambers, John Fraser, Robert Acuff. Finally, we thank all of the kind Kansas land owners for allowing us to tread across their pastures and lay out junk on their land.

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Figure 1. An adult Red Milk Snake from Douglas County, Kansas. Photograph by Chad Whitney.



Figure 2. Habitat for Red Milk Snakes in Johnson County, Kansas. Photograph by Chad Whitney.



Figure 3. An adult Red Milk Snake from Wyandotte County, Kansas. Photograph by Chad Whitney.

KHS CONDUCTS FIRST SYSTEMATIC ROAD SURVEY

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During the spring 2003 field trip, a new herpetological inventory program was undertaken by many interested volunteers. On Saturday afternoon (26 April 2003), groups of field trip participants were each given a KDOT county map (similar to Figure 1) with a predetermined route highlighted. Each route ran north-south the entire length of the county. Participants drove their respective routes and identified and collected road-killed specimens, collected at rock outcrops, listened for chorusing frogs at aquatic situations, and gained permission from land owners to explore adjacent areas.

The survey yielded thirty species and forty-five new locality observations for the Wilson County herpetofauna. Additionally, many valuable specimens were taken dead on the road (DOR), and have been cataloged in the Sternberg Museum of Natural History. The observations and collections made during this Survey serve as an important resource in establishing baseline data on the Wilson County herpetofauna (Table 1). Surveys during future KHS trips will ultimately result in a clearer picture of the distribution of amphibians, reptiles, and turtles throughout Kansas.

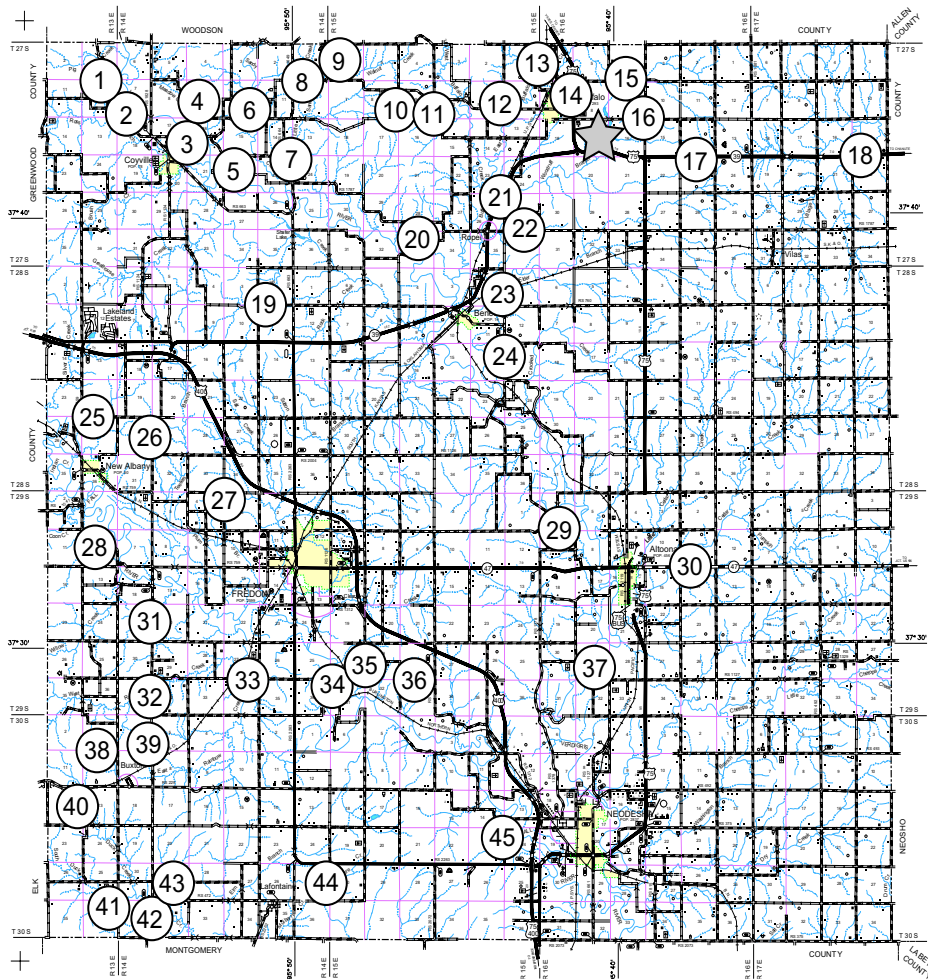


Figure 1. A KDOT map of Wilson County, Kansas, showing the numbered localities where new herpetofaunal observations were made on the systematic road survey during the KHS spring field trip on 26 April 2003.

Table 1. Collections and observations made during the first KHS Systematic Road Survey are listed below. The number(s) listed after each species correspond to a numbered locality on the map.

American Toad	5, 20, 45	Ground Skink	25, 33
Northern Cricket Frog	4, 15, 18, 23, 26, 31, 35, 37, 42	Six-lined Racerunner	10, 14, 19
Gray Tree Frog complex	1, 28, 37, 45	Ringneck Snake	
Western Chorus Frog	2, 11, 12, 45	5, 8, 9, 10, 19, 20, 23, 32, 33, 34, 36, 40, 42, 45
Bullfrog	23	Flathead Snake	16, 23
Southern Leopard Frog	7, 20, 35, 37	Racer	6, 7, 8, 19, 20, 21, 24
Great Plains Narrowmouth Toad	14, 19, 34, 38, 42	Great Plains Rat Snake	36
Common Snapping Turtle	9, 30	Western Rat Snake	6, 8, 19, 20, 22, 39, 44, 45
Eastern Box Turtle	12, 40	Prairie Kingsnake	13, 17, 27
Ornate Box Turtle	16, 35	Common Kingsnake	9, 36
Painted Turtle	14, 23	Rough Green Snake	6
Slider	8, 29, 41	Gopher Snake	38
Five-lined Skink	6, 7	Plainbelly Water Snake	37, 43
Great Plains Skink	3, 6, 7, 8, 9, 23, 33, 34, 41, 42	Diamondback Water Snake	15, 22
Northern Prairie Skink	14, 40	Common Garter Snake	26
		Copperhead	34



PREDATION BY A RINGNECK SNAKE

I was out near my survey area in Cowley County, Kansas, on May 22, 2003 doing herpetofaunal counts, and observed an interesting event.

Shortly after its capture, a 13-inch Ringneck Snake (*Diadophis punctatus*) opened its mouth, revealing the head of a small snake. It then proceeded to regurgitate a 7-inch Brown Snake (*Storeria dekayi*). Two inches of the Brown Snake's posterior showed evidence of the effects of digestion.

This was only the second Brown Snake versus hundreds of Ringneck Snakes that I have encountered in the 15 years that I have been surveying in the area.

Submitted by **ALLAN W. VOLKMANN**, 1650 Melrose Lane, Wichita, Kansas 67212.

WESTERN GREEN LACERTA LONGEVITY

On 2 August 1996, I obtained an adult specimen of the Western Green Lacerta (*Lacerta bilineata*) from an introduced colony in southern Topeka, Kansas. The lizard was captured at 24th Street and Burnett Road, and was maintained in captivity by me until its death on 16 April 2003, a span of six years, eight months, and 20 days. The specimen has been deposited at the Sternberg Museum of Natural History, Fort Hays State University (MHP 7772).

Submitted by **JAMES E. GUBANYI**, 2501 Burnett Avenue, Topeka, Kansas 66614.

ARTICLES

LIZARDS AND SNAKES (ORDER SQUAMATA) OF HARVEY COUNTY, KANSAS

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Abstract—Harvey County is a small county on the western edge of the potential tallgrass prairie in southcentral Kansas containing four habitat regions for reptiles. This paper summarizes data on habitat distribution, population size and trends and individual size of adults for the six species of lizards and seventeen species of snakes that have been documented for the county. It is based on data collected in eighteen years of trapping studies on three sites, on less intensive observations in other parts of the county, on information on county reptiles from other competent Harvey County residents, and on Harvey County specimens in herpetological collections. Population changes are related to environmental changes in the county over the last forty years.

Introduction

Harvey County is on the western edge of the potential tallgrass prairie in southcentral Kansas (Küchler 1974). It is a small county containing only 15 townships, but it includes four habitat regions for reptiles: the McPherson Valley, Arkansas River Valley, Sandhills and Flint Hills regions (Figure 1).

Central Harvey County is part of the McPherson Valley in the Wellington-McPherson Lowlands, an old filled river valley. The soils are silt loams, silty clay loams and silty clays of the Crete-Ladysmith and Ladysmith-Goessel soil associations (Hoffman and Dowd 1974). This region is drained by the Little Arkansas River and its tributaries (Figure 1). Most of the land in this region is cultivated, mainly with annual grain crops - wheat, sorghum, soybeans and corn (before the mid-1980s small acreages of oats, barley and rye). Some perennial hay crops, especially alfalfa and brome grass, are also cultivated. Other habitats in this region important for lizards and snakes are uncultivated fencerows, riparian woodland, small pastures, and the residential land and parks of urban areas and farmyards.

The southwest corner of the county includes a part of the Arkansas River Valley (Figure 1). The soils are loams and sandy loams of the Farnum-Slickspots-Naron association (Hoffman and Dowd 1974). This region lacks a well-defined drainage system and has a number of wetlands. Like the McPherson Valley, this valley is mostly cultivated land. This region has been little searched for reptiles.

North of the town of Burrton and south and west of the Little Arkansas River are Sandhills. There is

another small area of Sandhills east of Halstead (Figure 1). The soils are fine sands and loamy fine sands of the Dillwyn-Tivoli and Carwile-Pratt associations (Hoffman and Dowd 1974). This region is almost entirely poorly drained hummocky native grassland with many ephemeral wetlands. Some of the mile roads are undeveloped. Most of this region is used for pasture although there is a small amount of unpastured grassland. The area mapped on Figure 1 includes only the land that is mostly grassland and does not include the cultivated and riparian areas on the edges of this region.

The eastern part of the county is in the western transitional edge of the Flint Hills (Figure 1). It is a mosaic of native grassland on rocky soil and cultivated land. The region demarcated on the map is that area with half or more of the land in native grass. However small native grasslands and shale breaks can be found west almost to Newton. The soils are silty clay loams and silty clays of the Irwin-Rosehill-Clime association (Hoffman and Dowd 1974). The southern part of the Flint Hills region in Harvey County has been less surveyed for reptiles. It has most of the limestone breaks in the county. These are small and isolated. The eastern part of the county is drained by tributaries of the Walnut River.

There are few records of reptiles from Harvey County before the 1930s. In 1932, Charles A. Smith, an amateur naturalist living in Halstead, sent a small collection of amphibians and reptiles from Harvey County to the U. S. National Museum. In 1937, Rufus Thompson, a botanist from the University of Kansas, made a small collection of lizards from "Burrton" in Harvey County. These specimens are now in the

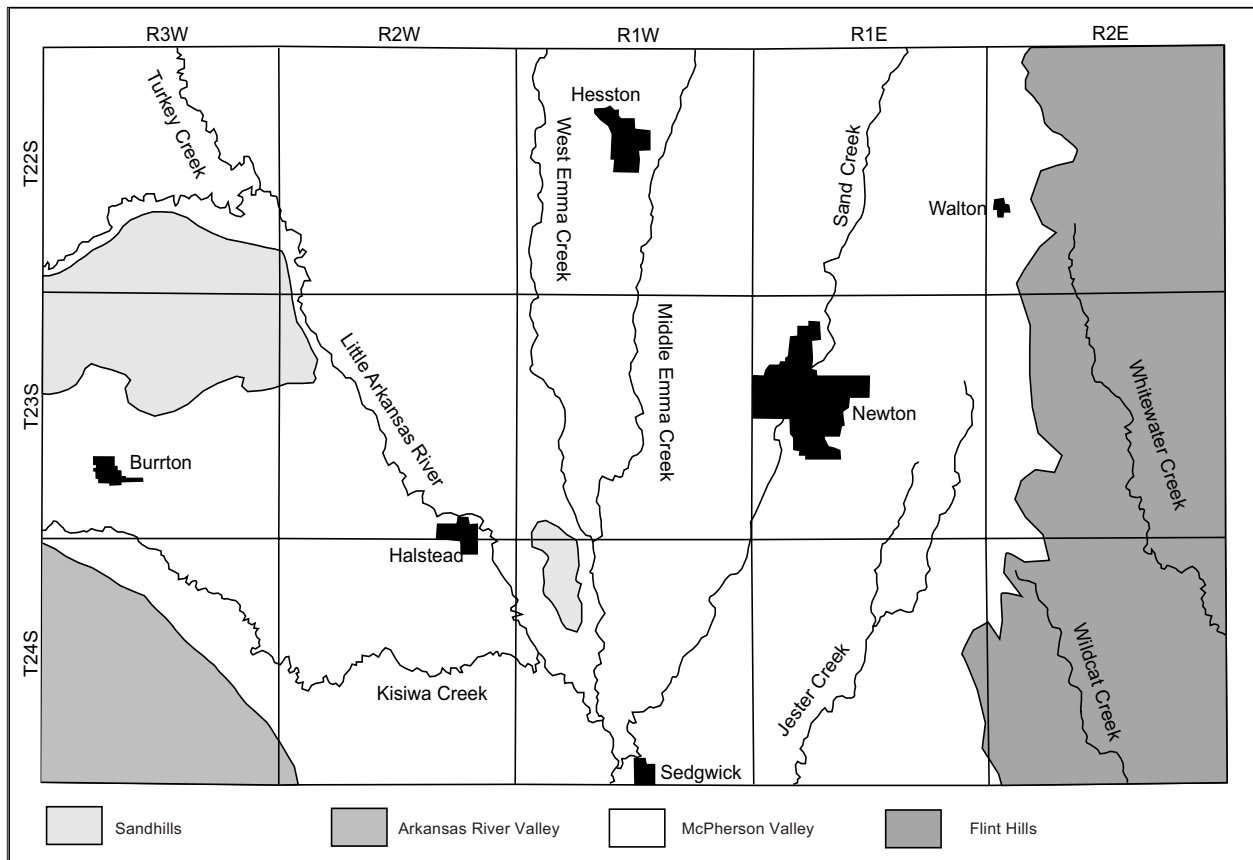


Figure 1. The habitat regions of Harvey County, Kansas.

Field Museum and the University of Illinois Museum. I made a collection of amphibians and reptiles in Harvey County in 1952 many of which are in a small collection at Bethel College in North Newton. Brad Anderson sent specimens of reptiles from Harvey County to the Kansas University Museum of Natural History in 1979.

From 1959 to 1963, 1966 to 1974, 1984 to 1985 and 1997 to 1998 inclusive, I conducted a population study of snakes and lizards by drift-fence trapping in Harvey County. These eighteen years of study resulted in data from more than 4,000 lizard captures and more than 10,000 snake captures. Most of the trapping was done on study sites in the Sandhills region of the county, but in 1984–85 and 1997–98 trapping was also done on study sites in the McPherson Valley near Sand Creek east of North Newton and in the Flint Hills region. This paper is based on data collected in these studies, on less intensive observations in other parts of the county, on information on county reptiles from other competent Harvey County residents, and on Harvey County specimens in herpetological collections. Some questions on the abundance and distribution of lizards and snakes in the county still

remain unanswered, not only because most of the data summarized in this paper is from a limited part of the county, but also because trapping methods were inefficient in sampling some populations, particularly those of Water Snakes and very small snakes.

Capture rates of snakes and lizards in drift-fence traps are a measure of activity of a species which is a rough measure of abundance. Capture rates are expressed in this paper as the numbers of individuals caught per 600 trap station days (600tsd) in the period mid-May through mid-July. (A trap station day is the operation of one trap station, consisting of one drift fence with a funnel trap on both ends, for a 24-hour period). Capture rates in 1997–98 are used as a measure of current abundance for those species with sufficient captures (Tables 1 and 2). Comparison of 1997–98 capture rates in the Sandhills region with those in other years of the study gives a measure of variability and trends in abundance. The median capture rate is used when summarizing the capture rates for more than two years. Lengths of snakes are expressed as snout–vent or body length (SVL) and total length (TL). Adults were identified by age (more than one year), color pattern (in some species) and/

or reproductive maturity (sperm production in males and enlarged ova in females).

The documented lizard fauna of Harvey County consists of six species, one of which is no longer present in the county. The snake fauna consists of seventeen species. Voucher specimens for the county are listed at the end of each species account. BC refers to a small collection at Bethel College in North Newton, Kansas.

Species Accounts

LIZARDS (SUBORDER LACERTILIA)

Western Slender Glass Lizard (*Ophisaurus a. attenuatus*). The glass lizard is an uncommon resident of the Sandhills region, but has not been found in other habitat regions of the county (Table 1). Capture rates have varied from 0.2 to 2.3/600tsd for the years of the study. The population of this species has remained rather stable and the highest capture rates were in 1997–98. The lizards captured (N = 48) varied in length from 143 to 230 mm SVL. The largest was a male (KU 182243), 230 mm SVL (685 mm TL).

Lesser Earless Lizard (*Holbrookia maculata*). The Lesser Earless Lizard is a resident of the Sandhills region, but is not found in other habitat regions. It was rarely caught in traps, but was seen uncommonly in open sandy areas. The population may be declining since one seen in 1985 was the only record during field work in 1984–85 and 1997–98 (USNM 88772–85; FMNH 106487–9; UIMNH 20367–8).

Texas Horned Lizard (*Phrynosoma cornutum*). Two specimens collected in 1937 in "Burrton," Harvey County, and one observed in Athletic Park in the City of Newton, are the only records of Horned Lizards for the county. I have never observed the Horned Lizard in Harvey County and neither have others who have collected and observed reptiles in the county. The lizard observed in Newton was almost certainly a released individual. The two specimens could also have been brought into the county. However, if these

specimens were collected in western Harvey County near Burrton (there is no evidence to suggest otherwise), there may have been a small population in the Sandhills until the late 1930s or 1940s, as the this area appears to be good habitat for the species. The Horned Lizard is not present in the county today (UIMNH 20422; FMNH 115799).

Fence Lizard (*Sceloporus undulatus*). The Fence Lizard is a common to uncommon resident of the Sandhills region, but has not been found in other habitat regions (Table 1). The capture rate varied from 13.8/600tsd in 1966 to 0 in 1998. It is probably declining in abundance. Eighty-seven per cent of the adult lizards captured (N = 236) were between 43 and 60 mm SVL. The largest was a female gravid with six eggs, 70 mm SVL (147 mm TL) (USNM 88787; UIMNH 21915; KU 21347).

Great Plains Skink (*Eumeces obsoletus*). The Great Plains Skink is locally common at some sites in the McPherson Valley and Flint Hills regions and was caught in both 1984–85 and 1997–98 (Table 1). The difference in capture rates in the two regions may be due to the localized nature of populations rather than to differences in the skink population in the two regions. The species was found in riparian woodland, grassland and fencerows between cultivated fields. It was caught twice in the Sandhills region in 1962, but was not found there before or since. Eighty-nine per cent of the lizards captured (N = 19) were between 74 and 112 mm SVL (KU 182242).

Prairie Racerunner (*Aspidoscelis sexlineata viridis*). The Racerunner is an abundant resident of the Sandhills region, but has not been found in other habitat regions in our study (Table 1). However, both Brad Anderson and John Torline (pers. comm.) reported having observed these lizards along the railroad track in Newton until the early 1960s. There may have been local populations in other parts of the county in open habitats at one time. The populations in the Sandhills may be declining since the capture rates in 1997 and 1998 were some of the lowest. The highest capture rate was 121.1/600tsd in 1966. Ninety

Table 1. Mean capture rates of lizards at the Sandhills, McPherson Valley, and Flint Hills study sites in Harvey County, Kansas from mid-May to mid-July in 1997 and 1998. Capture rates are expressed as the number of individual captures per 600 trap station days.

Species	Sandhills	McPherson Valley	Flint Hills
Western Slender Glass Lizard	1.9	0.0	0.0
Fence Lizard	0.1	0.0	0.0
Great Plains Skink	0.0	3.6	0.4
Prairie Racerunner	8.4	0.0	0.0

per cent of the adult lizards captured (N = 1614) were between 60 and 81 mm SVL. The largest was a male, 85 mm SVL (239 mm TL) (USNM 88786; FMNH 106821–2; AMNH).

SNAKES (SUBORDER SERPENTES)

Kansas Glossy Snake (*Arizona e. elegans*). The Glossy Snake is an uncommon to rare resident of the Sandhills region and has not been found in other regions of the county (Table 2). The capture rate in the Sandhills declined in 1970 and has remained low ever since. The median capture rate in the nine years prior to 1970 was 1.0/600tsd and the maximum was 1.5. In the nine years of the study since 1969 the median capture rate was 0.2 and the maximum was 0.4. Ninety-five per cent of the adult Glossy Snakes captured (N = 83) were between 550 and 950 mm SVL. The longest was 1000 mm SVL (1165 mm TL) (BC 36).

Yellowbelly Racer (*Coluber constrictor flaviventris*). The Racer is an abundant to common species in all habitat regions in Harvey County (Table 2). It was caught most commonly in grassland, especially pastures, and in fencerows between cultivated fields, and less commonly in riparian woodland. The population is subject to large fluctuations in size. In the Sandhills region in the seven years prior to 1968, the median capture rate was 10.0/600tsd and the maximum was 17.4. In the seven years from 1968 to 1974, the median capture rate was 3.4 and the maximum was 6.3. In 1984–85, the average capture rate was 33.4. Ninety-six per cent of the adult Racers captured (N = 1472) were between 550 and 950 mm SVL. The longest was a female, 1102 mm SVL (1395 mm TL) (USNM 88791; KU 21339–40, 192442, 216156; BC 59, 93).

Western Rat Snake (*Elaphe obsoleta*). The Western Rat Snake is a common species in the county. It is increasing in numbers and increasing its range, and is now found in all regions of the county (Table 2). It was uncommon in most of the county prior to 1970. Prior to 1997, it had not been trapped in the Sandhills region, although Smith had collected a specimen in 1932 from 10 miles northwest of Halstead, in the vicinity of the Sandhills, but possibly along the Little Arkansas River (specimen in the U. S. National Museum). The Western Rat Snake is particularly common in riparian woodland, but is also caught in grassland and in fencerows. It is also common in urban areas. The adult snakes captured (N = 14) were between 850 and 1500 mm SVL. The longest was a male, 1500 mm SVL (1795 mm TL) (USNM 88797; KU 216158).

Prairie Kingsnake (*Lampropeltis c. calligaster*). The Prairie Kingsnake is a common to uncommon resident of all the habitat regions in the county (see Table 2). In the 18 years of study in the Sandhills region, capture rates varied from 0 to 2.6/600tsd. The highest capture rate (3.2) occurred in the two eastern study sites in 1984–85. In the Sandhills region, it was caught more commonly in unpastured grassland than in pastures. In the McPherson Valley and Flint Hills regions, it was caught commonly in riparian woodland, fencerows, and grassland, especially unpastured grassland. Ninety per cent of the adult Prairie Kingsnakes captured (N = 138) were between 550 and 900 mm SVL. The longest was a male, 1105 mm SVL (1277 mm TL) (BC 26).

Speckled Kingsnake (*Lampropeltis getula holbrooki*). The Speckled Kingsnake is rare in Harvey County and may be no longer present. There are three records, two in the Sandhills region and one in the McPherson Valley region. The last record was in 1979 (KU182245).

Table 2. Mean capture rates of snakes at the Sandhills, McPherson Valley and Flint Hills study sites in Harvey County, Kansas from mid-May to mid-July in 1997 and 1998. Capture rates are expressed as the number of individual captures per 600 trap station days.

Species	Sandhills	McPherson Valley	Flint Hills
Kansas Glossy Snake	0.2	0.0	0.0
Yellowbelly Racer	15.3	3.5	6.2
Western Rat Snake	0.6	2.5	2.7
Prairie Kingsnake	1.2	1.0	1.0
Bullsnake	2.8	0.0	0.0
Plains Garter Snake	6.8	0.0	0.0
Red-sided Garter Snake	10.5	6.0	14.2
Plains Hognose Snake	0.8	0.0	0.0
Eastern Hognose Snake	0.5	0.0	0.0

Bullsnake (*Pituophis catenifer sayi*). The Bullsnake is common in the Sandhills region (Table 2). The population has been relatively stable. The median capture rate for the 18 years of study was 2.7/600tsd. Capture rates were unusually high in 1967 and 1968, 7.3 and 6.7 respectively, when small mammal populations were high. The lowest capture rate was 1.1 in 1962. No Bullsnares were trapped in the McPherson Valley region. However, I have seven records from this region, mostly DORs, the last one being in 1962. Brad Anderson (pers. comm.) had two records in the 1990s within the Newton city limits. Although never common in this region, the species has declined in numbers in the last forty years. No Bullsnares were trapped in the Flint Hills region, but one was found 0.5 miles south of our trapping site in 1997. John Torline (pers. comm.), who lives in this region, reports that he sees one or two every year. Eighty-two per cent of the adult Bullsnares captured (N = 274) were between 850 and 1250 mm SVL. The longest was a female, 1565 mm SVL (1696 mm TL). The shortest one-year old snake was 660 mm SVL (753 mm TL) (USNM 88790; BC 105).

Yellowbelly Water Snake (*Nerodia erythrogaster flavigaster*). I have 31 records of this Water Snake from both the Sandhills and McPherson Valley regions (KU182383).

Diamondback Water Snake (*Nerodia rhombifer*). I have 24 records of this species from the Sandhills, McPherson Valley and Flint Hills regions of the county (BC 39).

Northern Water Snake (*Nerodia sipedon sipedon*). I have 25 records of the Northern Water Snake from both the Sandhills and McPherson Valley regions. Both Brad Anderson and John Torline (pers. comm.) have observed them in the Flint Hills region (BC 8, 58).

Graham's Crayfish Snake (*Regina grahamii*). I have six records of the Crayfish Snake from the Sandhills and McPherson Valley regions. The last record was in 1963, and they may no longer be present (USNM 88792).

Plains Garter Snake (*Thamnophis radix*). The Plains Garter Snake is an abundant resident of the Sandhills region (Table 2). However, the capture rate fluctuated greatly from year to year depending upon the amount of water and therefore the amount of frog activity on the study sites. The highest capture rate was 28.7/600tsd in 1973 and the lowest was 1.5 in 1968. No Plains Garter Snakes were trapped in the McPherson Valley or Flint Hills regions. I have observed them in the McPherson Valley region within two miles of the Sandhills in years when the population in the Sandhills region was large. A specimen was collected near Halstead in 1922, but this is also near a Sandhills area. An individual observed by John Torline (pers. comm.) six miles east of North Newton in the late 1990s is the only record away from the Sandhills. Brad Anderson (pers. comm.) has not seen this species outside the Sandhills region in Harvey County, although he has seen it further east in the Flint Hills in Butler County. The species may be rare in regions with a high proportion of cultivated ground. Ninety-eight per cent of the adult Plains Garter Snakes captured (N = 2161) were between 400 and 700 mm SVL. The longest was a female, 841 mm SVL (947 mm TL but it had an incomplete tail). Another female was 835 mm SVL (1045 mm TL). The smallest reproductively mature male was 402 mm SVL and the smallest mature female was 497 mm SVL (KU 2041, 216160; BC 28, 29, 60).

Red-sided Garter Snake (*Thamnophis sirtalis parietalis*). This Garter Snake is an abundant species in most habitats throughout the county (Table 2). Population fluctuations on the Sand Prairie study sites were similar to those of the Plains Garter Snake with low capture rates of 1.7/600tsd in 1967 and 1968 and highest capture rates in 1960 and 1973 of 22.1 and 21.9 respectively. Although this snake was trapped most commonly near wetlands, it was caught in all habitats sampled. It was also commonly observed in residential areas. Ninety per cent of the adults captured in the Sandhills (N = 1838) were between 400 and 700

Table 3. Median number of acres of annual grain crops planted each year and percentage of acreage in cool season grain crops, of hay fields harvested each year and of pasture for each decade from 1960 to 1999 in Harvey County, Kansas. Total land area in Harvey County is approximately 345,600 acres.

Decade	Grain Planted	% Cool Season	Hay Harvested	Pasture
1960s	203,650	64%	23,550	78,838
1970s	225,900	57%	18,540	67,500
1980s	222,050	60%	16,950	45,900
1990s	249,850	52%	19,230	44,267

Data from USDA National Agricultural Statistics Service, 1961–2000 and Kansas State Board of Agriculture, 1961–1998.

mm SVL. The longest was a female, 991 mm SVL (1240 mm TL). The smallest reproductively mature male was 339 mm SVL, but all others were more than 400 mm SVL. The smallest reproductively mature female was 470 mm SVL, but all others were more than 520 mm SVL. Snakes in the Flint Hills region may grow more slowly. The sample of Red-sided Garter Snakes from the Flint Hills (N = 85) included 33 reproductively mature females with 11 less than 500 mm SVL. The sample from the McPherson Valley was smaller (N = 43) and only included five reproductively active females, all more than 500 mm SVL (KU 216161; BC 54–7, 70, 94).

Lined Snake (*Tropidoclonion lineatum*). The Lined Snake was not trapped in any of our studies and it has not been observed in the Sandhills region. It is locally common in the McPherson Valley and Flint Hills regions. It is often found in urban areas (KU 182248).

Western Massasauga (*Sistrurus catenatus tergeminus*). The Massasauga is a rare snake in Harvey County. It was caught in the Sandhills region five times in the 18 years of trapping, the last capture in 1971. Brad Anderson (pers. comm.) can usually find at least one per year in the Sandhills region. In the McPherson Valley region, a Western Massasauga was killed in the fall of 1993 two miles west of Newton and Brad Anderson (pers. comm.) received one that had been caught in a native grassland four miles east of Newton. Wedel (1954) described two experiences with “rattlesnakes” in the 1890s on the Bethel College campus in North Newton, and suggested that such experiences were not uncommon at that time. Massasaugas may have been more common then. However the identification of the snakes mentioned by Wedel is uncertain. There is no record as yet for this species in the Flint Hills region (KU 216164).

Prairie Ringneck Snake (*Diadophis punctatus arnyi*). The Prairie Ringneck Snake was not trapped in any of our studies and it has not been observed in the Sandhills region. In the McPherson Valley region, one was collected from under concrete at the old Newton city dump in 1979 and one was collected from under grass mulch in a residential yard near North Newton in 1999. Brad Anderson (pers. comm.) found one in a rocky area in the Flint Hills region. John Torline (pers. comm.) has seen a few DOR in this region (KU 182244).

Plains Hognose Snake (*Heterodon n. nasicus*). The Plains Hognose Snake is a common to uncommon resident of the Sandhills region, but is not found in the other habitat regions of the county (Table 2). Capture rates were higher on pastures than on ungrazed grassland. Capture rates declined in 1968 and have been low since. The median capture rate in the seven

years of study prior to 1968 was 8.5/600tsd with a maximum of 12.3 and a minimum of 4.5. In the eleven years after 1967, the median capture rate was 1.3 with a maximum of 1.9 and a minimum of 0.6. Ninety-three per cent of the adult Plains Hognose Snakes captured (N = 592) were between 300 and 550 mm SVL. The largest snake was a female, 707 mm SVL (800 mm TL). The smallest reproductively mature male was 246 mm SVL (293 mm TL) (BC 67, 92, 104, 110–2, 114).

Eastern Hognose Snake (*Heterodon platirhinos*). The Eastern Hognose Snake is an uncommon to rare species in the Sandhills region and has not been found in other habitat regions (Table 2). Capture rates were higher on pastures. Capture rates of this species declined in 1967 and have been low since. The median capture rate in the six years of the study prior to 1967 was 2.8/600tsd with a maximum of 5.7 and a minimum of 1.6. In the twelve years after 1966, the median capture rate was 0.4 with a maximum of 0.8 and a minimum of 0. Eighty per cent of the adult Eastern Hognose Snakes captured (N = 92) were between 450 and 650 mm SVL. The largest was a female, 750 mm SVL (870 mm TL) (USNM 88794–6; BC 68–9).

Species of Questionable Occurrence

Eastern Collared Lizard (*Crotaphytus collaris*). Brad Anderson (pers. comm.) observed an Eastern Collared Lizard twenty years ago in a rocky area which he remembers as being in southeastern Harvey County. Eastern Collared Lizards possibly exist in a few of the small rocky areas in the southern part of the Flint Hills region, but there is no specimen from Harvey County and no recent observation.

Rough Green Snake (*Opheodrys aestivus*). Robert Dester (pers. comm.) reported seeing a green snake in a tree on his property in the Flint Hills region in the early 1990s. There are no other records of this species in Harvey County.

Discussion

The Sandhills of Harvey County have a much greater diversity and abundance of snakes and lizards than the other regions of the county. In the Sandhills region, five species of lizards (four today) and fifteen species of snakes (possibly reduced to thirteen today) have been found. In the McPherson Valley region, only two species of lizard (one today) and thirteen species of snakes (possibly reduced to eight today) and in the Flint Hills region one species of lizard and nine species of snakes have been found. This is only

partly due to the more intensive study in the Sandhills. In the 1980s and 1990s, we caught snakes in traps on the Sandhills site at an average rate of 55.0/600 tsd while on the Flint Hills site they were caught at an average rate of 23.0 and on the McPherson Valley site at 14.0. Soil type and prey abundance are important factors in these differences in reptile abundance and diversity. They are especially important for those species, like the Kansas Glossy Snake, Hognose Snakes, and Lesser Earless Lizard, that are only found in the Sandhills. The sandy soil may be more favorable for burrowing species. The large number of wetlands in the Sandhills, with high populations of amphibians in many years, may be important for maintaining the abundance of those serpents, like Hognose Snakes and Garter Snakes, that feed on amphibians.

Degradation of reptile habitat is also a very important factor in limiting the abundance of snakes and lizards, and has occurred to a much greater degree outside the Sandhills, especially in the McPherson Valley region where most of the land is in annually cultivated grain crops. Approximately 60% of the acreage of grain is in cool season grains (Table 3), mainly winter wheat, which is fallow and therefore provides poor habitat for reptiles during much of their active season. Fencerows may be important avenues for travel and important escape cover in these degraded habitats, but few snakes use these narrow habitats continuously. There may be small populations of Great Plains Skinks that occupy fencerows and adjacent fields.

Snakes and lizards may be injured and killed by operations involved in crop production and by the greater road traffic outside the Sandhills. Some agricultural chemicals applied to crops in the McPherson Valley and Flint Hills regions may affect reptile reproduction and/or mortality. Only 2% of the Red-sided Garter Snakes caught in the Sandhills showed obvious injury or scarring while there was 10% injury or scarring at the other sites. For Racers, the injury rate was 10% in the Sandhills and 19% at the other sites.

Changes in abundance of snakes and lizards over the last 45 years are best documented in the Sandhills, where we have a long history of study. However, lesser amounts of evidence document changes in the other two regions as well. Three species, the two Garter Snakes and the Yellow-bellied Racer, have had very large fluctuations in population size on the study sites in the Sandhills, the Garter Snakes often making large changes from year to year in response to changes in amphibian availability. The Racers have undergone longer term fluctuations with no obvious cause. The Red-sided Garter Snake and

Yellow-bellied Racer populations also seem to behave similarly in the other regions, although they never become as abundant.

Three species, Western Slender Glass Lizard, Bullsnake and Prairie Kingsnake, have had more stable populations in the Sandhills with smaller fluctuations. The Bullsnake has been greatly reduced, if not extirpated, in the McPherson Valley region and probably reduced in the Flint Hills region. The Prairie Kingsnake has remained uncommon in all three regions. The earlier status of the Western Slender Glass Lizard in the two eastern regions is unknown, but it is probably not present today.

Six species, Prairie Racerunner, Fence Lizard, Lesser Earless Lizard, Eastern and Plains Hognose Snakes and Kansas Glossy Snake, have had substantial declines in the Sandhills. All of these species are now found only in the Sandhills region and most of them were probably never common outside the Sandhills region.

One species, the Western Rat Snake, has increased in abundance and distribution in the county. In the 1950s it was uncommon to rare, but now it is common in the Flint Hills and McPherson Valley regions and has recently moved into the Sandhills.

Habitat changes have occurred in Harvey County in the last 50 years that have probably been important in these changes in reptile populations. In the 1940s and 1950s, there was much open sand and many sand blowouts in the Sandhills region. Better pasture management and wetter years have increased vegetative cover and stabilization of the dunes. This is probably one factor in the population declines of the Prairie Racerunner, Fence Lizard, Lesser Earless Lizard, Kansas Glossy Snake, Plains Hognose Snake and Eastern Hognose Snake, as they depend upon burrowing for foraging and cover and some are heliophilic and need open areas to maintain the high temperatures necessary for activity. Prior to European settlement, these species populations may have been most common in open areas created by grazing, fire, and drought.

In the last 40 years, there has been a decrease in the acreage of pastures in Harvey County and an increase in the acreage of annual grain crops. The acreage of perennial hay crops has not changed substantially (Table 3), and there has been relatively little acreage (3,567 acres currently) devoted to CRP grassland. Pasture and perennial hay and grassland would provide more cover for reptiles. Most of the decreases in pasture acreage have been in the McPherson Valley region. This decrease in perennial cover was probably a factor in the decline of many snake populations in this region, especially the Bullsnake.

In the McPherson Valley region there has been a consolidation of smaller crop fields into larger fields with the loss of many miles of fencerows. This results in a further degradation of habitat for lizards and snakes, and is probably an additional factor causing continued decline in reptiles in this region.

There has been an increase in tree growth in the county, due to the maturation of riparian woodland along streams that were grassland streams before settlement, the spread of trees into pastures in some parts of the Flint Hills and Sandhills regions, the spread of trees and tall shrubs into fencerows and other uncultivated areas, and the development of new residential areas with planted trees. This is an important factor responsible for the increase in abundance and range of the Western Rat Snake. Increase in woodland and competition from Western Rat Snakes may also be factors in the decrease of Bullsnake populations in the McPherson Valley and Flint Hills regions, as both are predators on small mammals and birds. These changes could also result in a decrease in numbers of Bullsnares in the Sandhills region in the future.

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REPRODUCTION IN SNAKES OF THE FITCH NATURAL HISTORY RESERVATION IN NORTHEASTERN KANSAS

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Abstract—Over the past 55 years, life history information has been collected for the assemblage of snake species occurring on the Fitch Natural History Reservation (FNHR). For each species, facts such as sex ratios, the time required for individuals to reach breeding maturity, ratios of non-breeders, usual numbers of young per clutch or litter, and the effects of environmental factors have accumulated. Much of this information was published in my recent book (Fitch, 1999). However, traits such as those mentioned are subject to change in time and space. A reexamination of the data, supplemented by five years of additional records has permitted some extension of the original conclusions. This report includes *Agkistrodon contortrix*, *Carphophis vermis*, *Coluber constrictor*, *Crotalus horridus*, *Diadophis punctatus*, *Elaphe obsoleta*, *Lampropeltis calligaster*, *Lampropeltis triangulum*, *Nerodia sipedon*, *Pituophis catenifer*, *Storeria dekayi*, and *Thamnophis sirtalis*; for each of these new facts are available. *Elaphe emoryi*, *Lampropeltis getula*, *Storeria occipitomaculata*, *Tantilla gracilis*, *Tropidoclonion lineatum* and *Virginia valeriae*, also present on the area, are not included because no new information is available for these species.

Key words: Clutch size, litter size, natural history reservation, non-breeders, and palpation.

METHODS AND MATERIALS

To determine the reproductive potential of each species I undertook to allocate each adult female as a breeder or non-breeder. In early summer breeders could usually be easily recognized by their distended abdomens containing eggs or embryos, and they were likely to have weights much exceeding those of nonspecific males of the same SVL. The females of oviparous species oviposit in early summer. After ovipositing they are noticeably thin and underweight—lighter than conspecific males of the same SVL. In viviparous species also, there is an abrupt reduction in weight, below that of conspecific males of similar SVL, but it takes place in late summer. Non-breeders, not affected by eggs or embryos, usually have weights similar to those of male counterparts of the same SVL, or are somewhat lighter.

DISCUSSION

Agkistrodon contortrix

Individual histories of marked snakes caught several or many times were useful for defining breeding schedules (Fitch, 1960). Some of the snakes checked were from sites in Douglas County other than FNHR (Figure 1), e.g. from property of the late Robert G. Mengel, about 5 miles WSW, and from Clinton State Park about 10 miles SW. Thirteen female Copperheads that produced litters were recaptured in the year following that in which they produced a litter, and none

was gravid. Ten others were recaptured in the third year after reproducing, and none of these was gravid either. In contrast, four females were each known to have been gravid again in the second year after producing a litter, and two were gravid again in the fourth year. Thus, 29 snakes seemed to conform to the pattern of reproduction in alternate years, whereas a single female was gravid at captures three years apart. This individual, living on the University's Biotic Succession Area (BSA, NESAs), with an abundant vole population for food, was much bigger than any other female at its last capture (825 mm SVL, 572 g.) and perhaps was thriving to the extent that she could produce a litter annually. In four other recaptured females, known to have produced litters, reproduction did not occur again in the fifth year (in two), but may have occurred in the sixth, eighth, and tenth year after giving birth. Over the years 1980 to 2002, I found an average of 5.75 ± 0.14 (3–13) in 187 litters, many counted as fetuses in female oviducts.

Carphophis vermis

In Western Worm Snakes, sexual maturity is attained at a much smaller size and earlier age in males than in females (Clark, 1970). The smallest male found to have active sperm was 177 mm in SVL, and typically this size is attained by snakes that are in their second autumn and are about fourteen months old. Most females pass 200 mm SVL early in their third year, and become parents as three-year-olds. Of 44 adult females in spring, 27 were above normal

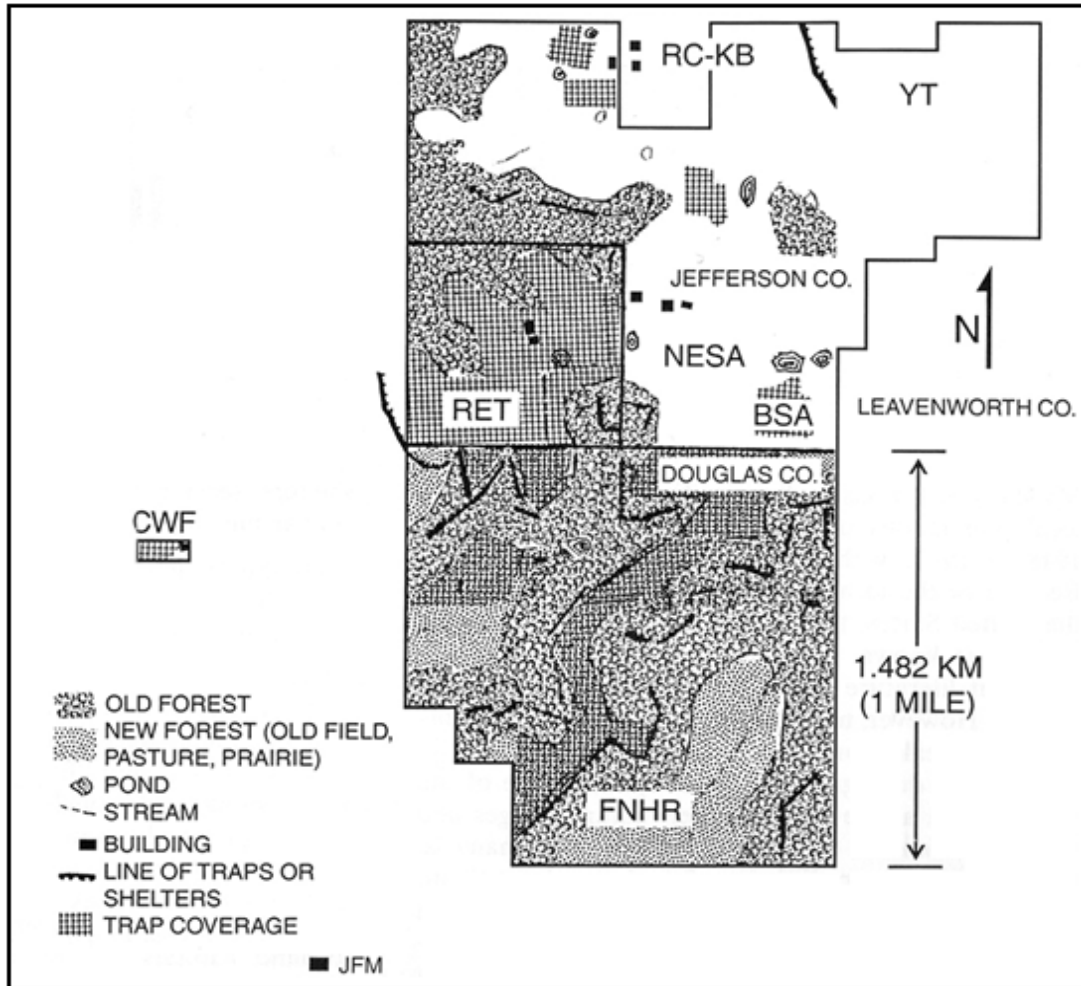


Figure 1. A map showing the location of the Fitch Natural History Reservation (FNHR) in Douglas County, northeastern Kansas.

weight, suggesting that they were gravid, and six others were underweight, suggesting that they had recently laid eggs. These 33 were tentatively allocated as reproductive, whereas eleven others that approximated the normal weight for males of their sizes were considered to be non-breeders. I conclude, tentatively, that about one-fourth of females do not breed in a normal year. Eggs average about 2.5 per clutch.

Coluber constrictor

All female Eastern Racers captured in the years 1976 to 2000 in June and July were critically examined to define reproduction more thoroughly than was done previously (Fitch 1963a). In the sample of 126 females, 48 were relatively heavy and were thought to have ovarian or oviductal eggs; 65 others, mainly from late June or July, were underweight, and were identified as breeders who had already laid their

clutches. Twelve others had intermediate weights (being neither plump nor lean), and these suspected non-breeders made up 9.5 per cent of the sample. From 1980 through 2002, 69 counts of clutches were obtained; they ranged from 5 to 21 and averaged 12.1 ± 0.41 .

Crotalus horridus

In my long term study of Timber Rattlesnakes, it was determined that males of the local population mature in two years, females in three, and that these intervals represent relatively rapid development compared with the rates prevailing in some other parts of the geographic range. In northern New York, Brown (1991) found that female reproduction usually first occurred in the snakes' ninth or tenth year. In the Appalachians, Martin (1992) found that several years might elapse between births for a female's litters. In

Pennsylvania, Galligan and Dunson (1979) found that females matured in five years and seemed to have a breeding cycle of two or three years.

Thirty-four adult and adolescent females were recorded during the 55 year span of my field work; fourteen of these were known to have been reproductive, including five that produced litters and nine that were palpated and found to contain fetuses, or were salvaged as DORs, dissected, and found to contain embryos. Nine others were judged to be reproductive on the basis of weight – heavier than normal for their SVL's. On the other hand five (11.8%) were near average male weights for their SVL's, and were judged to be non-reproductive. The remaining seven were judged not to be useful for studying reproduction, as they were captured in early spring or fall, or were pre-reproductive. Fourteen litters (born in captivity or palpated as fetuses) averaged 7.5 ± 0.65 (5 to 14), with standard deviation of 2.44.

Diadophis punctatus

Males of the Ringneck Snake may breed in their second autumn at an age of about fourteen months. Females require an additional year to mature and at the earliest breed in fall when they are about 26 months old, or, more likely, breed the following spring at an age of 31 months (Fitch, 1975). Nearly all adult females take part in the annual breeding season. For the six-year period, 1992 through 1997, in June, 106 egg-bearing females were captured, along with three that were not gravid. In 1966, there were 25 egg-bearing females, with just one that was not gravid. For these combined samples the ratio of non-breeders is just under three per cent (2.96). Perhaps the ratio of non-breeders fluctuated around that figure from year to year, under influence of weather and other factors. For 267 clutches of unlaidd eggs (counted by palpation), the average was 3.96, but for fifty clutches that were laid, the mean was 3.36 eggs.

Elaphe obsoleta

Over a 55-year period, 100 adult and adolescent female Western Rat Snakes were examined for reproductive condition in early summer (28 May to 4 August). Forty-eight were relatively heavy, and were tentatively allocated as breeders; twelve others that were underweight were considered to be parturient, whereas the remaining forty had weights within five per cent of those of males of the same length, and were tentatively considered to be non-breeders. Thus, it seems that about 60% of females breed annually and 40% are non-breeders. Twenty-two clutch counts

are available, from unlaidd eggs palpated, clutches laid in captivity, and DOR traffic casualties (Fitch, 1963b). Clutches averaged 10.7 ± 0.98 eggs, ranging from 5 to 27.

Lampropeltis calligaster

Of 49 adult female Prairie Kingsnakes captured in June and July, 33 were heavier than average, and some of these were obviously gravid, containing eggs that could be palpated; eight others, taken late in the season, were below average weight, some appearing emaciated, and were identified as parturient, whereas sixteen (28.1%) weighed approximately the same as male counterparts of the same length, and were tentatively considered non-breeders because they were neither gravid nor parturient. Thus it seemed that to little less than one-fourth were non-breeders (Fitch, 1978). Twelve clutches (laid in captivity, found in the field, or palpated in females before laying) averaged 8.83 ± 0.61 , with range of 6 to 13.

Lampropeltis triangulum

Of 93 adult female Milk Snakes captured, 26 in early summer were substantially heavier than male counterparts of approximately the same size, and were suspected to contain ova that increased their weights. Fourteen others in late summer were substantially lighter than male counterparts and were suspected to have laid recently. Ten (10.8%) in late spring and summer (May through August) weighed about the same as male counterparts, and some or all of them may have been non-breeders.

In this widely ranging species, individuals of tropical populations may produce more than one clutch annually. Tryon and Murphy (1982) mentioned double clutching in captivity in four tropical subspecies, and one snake produced three clutches in the same season (30 May, 19 July, and 4 September). In my study, nineteen clutches laid in captivity or palpated in females' abdomens before laying averaged 6.84 ± 0.51 , with a range of 4 to 13.

Nerodia sipedon

Of eighty adult female Northern Water Snakes examined, 54 (67.6%) were above normal weight for their sizes and were suspected to be gravid; thirteen that were palpated were found to be gravid, whereas 26 (32.4%) were approximately the same weight as males of similar SVL and were suspected to be non-breeders. I tentatively conclude that about one-third of females do not produce litters each year. Seventeen litters averaged 20.8 ± 2.22 (5-36).

Pituophis catenifer

The Bullsnake was moderately common at the outset of my study, but was unfavorably affected by habitat change from short grass to dense ground vegetation and finally to forest. Its numbers dwindled rapidly; only one was captured on FNHR in the fourth decade of fieldwork and none thereafter. A total of 37 adult and adolescent females were captured on FNHR and the adjacent Nelson Experimental Area (where the species still persists). Seventeen of these were caught in late May or June. Two were much above the normal weight for their SVL and four others were somewhat heavier than normal; these six were assumed to be gravid. Seven other females had weights near the average for males of their lengths, and these were tentatively designated as non-breeders. It seemed that about 41.2% of the local population consisted of non-breeders. I recorded five egg clutches, which averaged 11.2 and ranged from 7–12.

Storeria dekayi

Fifty-two adult female Brown Snakes were captured during May and June; 29 that were palpated were found to contain embryos; twenty others were above normal weight and were also thought to be gravid. Only three (5.8%) appeared to be non-gravid. In 42 females, litters averaged 11.8 ± 0.75 , ranging from 4 to 24.

Thamnophis sirtalis

Adult female Common Garter Snakes captured during the six-year period 1990 through 1995 were checked for reproductive status. Of the 191 total, only sixteen (7.8%) were non-reproductive, but the ratio changed from year to year as follows: 12.5% in 1990, 12.1% in 1991, 8.4% in 1992, 4.0% in 1993, and 5.8% in 1994. For 584 litters, the average was 16.8; the mean of 28 annual means was 15.4.

CONCLUSIONS

The snakes of most local species in northeastern Kansas reproduce annually. The copperhead is an exception; most females of this species produce litters in alternate years, but under exceptionally favorable conditions (one of 27 in my sample) may reproduce in consecutive years. In those species that reproduce annually, a small percentage of females may not participate in the annual breeding season, and this minority fluctuates from year to year depending

on environmental factors such as weather, food supply, disease and parasitism. For the following species, the average percentage of abstainers is presented: *Carphophis vermis* 2.5%, *Coluber constrictor* 10.3%, *Crotalus horridus* 11.8%, *Diadophis punctatus* 3.0%, *Elaphe obsoleta* 25.0%, *Lampropeltis calligaster* 28.1%, *Lampropeltis triangulum* 10.8%, *Nerodia sipedon* 32.4%, *Pituophis catenifer* 41.0%, *Storeria dekayi* 5.8%, and *Thamnophis sirtalis* 7.8%.

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Editorial Policy

The *Journal of Kansas Herpetology*, issued quarterly, publishes peer-reviewed manuscripts and notes dealing with the biology of amphibians, turtles and reptiles. Manuscripts should be submitted to the Editor no later than the 10th of the month prior to the month of issuance. All manuscripts become the sole possession of the Society, and will not be returned unless arrangements are made with the Editor. Pen and ink illustrations and photographs are also welcomed. Illustrations and photographs will be returned to the author only upon request. The *Journal of Kansas Herpetology* uses the common names standardized nationwide by Collins & Taggart (2002).

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The Gloyd-Taylor Scholarship is presented annually by the Kansas Herpetological Society to an outstanding herpetology student. Nominations for this award are open to any KHS member enrolled in an accredited educational institution in Kansas or any KHS member enrolled in any accredited educational institution outside of Kansas. The scholarship is \$100.00 and is awarded on the basis of potential for contributing to the science of herpetology. Students from grade school through university are eligible.

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Nominations should include, but are not limited to, academic record, herpetological activities, and future plans in herpetology. Academic record should address schools attended and an indication of academic performance in each (e.g., grade point average, teacher evaluations, courses completed). Herpetological activities should include a brief narrative that details experiences and activities that demonstrate a long-term interest in herpetology, and documents accomplishments in herpetological study. Future plans in herpetology should include a statement, not to exceed one-page, written by the student about his/her future interests and plans.

Applicants may include an optional appendix with photographs, awards, newspaper articles, reports written by the student, or other documents relevant to herpetological activities.

Nominations should be sent to the KHS Awards Committee Chair, and must be postmarked by 15 September. The scholarship winner will be announced at the annual meeting in November. New applications will be accepted after 1 January of the following year.

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KHS members only are eligible to apply for The Alan H. Kamb Grant for Research on Kansas Snakes. The recipient of the grant (minimally \$100.00) will be selected by the KHS Awards Committee. If no qualified proposals are submitted, no award will be made for that year.

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In even-numbered years, the Award is bestowed upon an individual who, in the *preceding* two calendar years, had published a paper of academic excellence on the systematics, ecology, or conservation of a native species of Kansas amphibian, turtle, and/or reptile in the *Journal of Kansas Herpetology*, *Transactions of the Kansas Academy of Science*, *Herpetological Review*, or the *Journal of Herpetology*, and/or presented a lecture of excellence on the systematics, ecology, or conservation of a native species of Kansas amphibian, turtle, and/or reptile at the KHS Annual Meeting. To qualify for the Award, a portion of the field work or observations must have occurred in Kansas, or the systematic data must have been based in part on Kansas specimens. *In odd-numbered years*, the Award is bestowed upon an individual who was chosen the best in a juried competition featuring the art of photography in portraying amphibians, turtles, and/or reptiles, said competition to take place under the auspices and on the occasion of the annual meeting of the *Kansas Herpetological Society*. To qualify for the Award, the art work must portray a species native to Kansas.

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