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Front Cover: An adult male Eastern Collared Lizard (*Crotaphytus collaris*) from Harper County, Kansas.
Photograph by MacKenzie K. Wiley

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PRESIDENTIAL ADDRESS

Dear KHS Members,

As my term comes to a close, I would like to thank the membership for giving me the opportunity to serve as your society President for 2006. It was with great pleasure that I followed in the footsteps of many great former presidents to ensure the continued success and development of the nation's premier regional herpetological society. We had a great year, one which I will never forget. I wish to thank our field trip coordinators, Mark, Derek, and Dan, for organizing two excellent field trips. I also want to thank everyone who attended the 33rd annual meeting in Hays and helped make it a huge success.

Perhaps many of you are aware of the conflict currently broiling in Logan County over the state-legislated mandate that requires landowners to eradicate all moles, gophers, and especially prairie dogs on their properties. Recently, the KHS Executive Council met in emergency session and unanimously voted to publish a statement (page 6 of this number) asking for the repeal of these antiquated statutes. Subsequently, I have sent a formal letter to the member of Kansas House Agricultural Committee and many other elected officials reiterating our societal stance. Hopefully, our efforts, coupled with those of other like-minded organizations, will precipitate changes. Regardless, it was the right thing to do to better conserve the native amphibians, reptiles, and turtles in Kansas and for the state's wildlife in general.

I look forward to serving one more year on the Executive Council and would like to welcome our new President-Elect, Dan Carpenter, as I turn the society over to Ginny Weatherman for 2007. The future looks bright! Only a few more months until herping season begins. See you in Seward County!

Curtis J. Schmidt
KHS President

KHS BUSINESS

Kansas Herpetological Society Fall Field Trip Results

One hundred and thirty KHS members, friends, students, and colleagues arrived at Tuttle Creek State Park near Manhattan, Kansas, on the weekend of 6-8 October in search of amphibians, turtles, and reptiles. They found a lot of them. The 2006 event was the annual fall field trip of the Kansas Herpetological Society, and the objective was to catch, identify, and count as many species as possible to determine abundance and diversity in the Tuttle Creek State Park area and surrounding Pottawatomie County. A special thanks this year to Eric Kessler and his students at Blue Valley North High School and Mike McRoberts and his students at Olathe Northwest High School; their participation swelled attendance this year to a record number.

Over the three day event, the assembled group discovered 22 species of amphibians, turtles, and reptiles, counting slightly over 1,200 individual animals. Most were released in the area found, though a few were placed in the research collection at the Sternberg Museum of Natural History, Fort Hays State University, as a documented record of the state's herpetofauna and to provide a repository for DNA tissue samples.

Field research such as this helps scientists, government officials, and land stewards gauge the relative health of the land; amphibians, turtles, and reptiles are vulnerable to environmental changes on the

ground and in the water. Data will be used to refine information used in the next Kansas Field Guide on these creatures, currently being written by Kansas Biological Survey herpetologist Joseph T. Collins and his colleagues.

Participants were: Ted Abel, Karen Abraham, Cathy Acuff, Laura Acuff, Rob Acuff, Lauren Allen, Megha Anunth, Shandi Appier, Mary Kate Baldwin, Laura Baldwin, Lucia Baldwin, Neil Bass, Daniel Baylog, David Bender, Katie Bergman, Tom Brungardt, Catherine Brungardt, Petra Brungardt, Mary Ann Brungardt, Gerard Brungardt, Luke Brungardt, David Brunner, Morgan Butrick, Dan Carpenter, Keith Coleman, Joseph T. Collins, Suzanne L. Collins, Kyle Cook, Juan Damian, Martika Daniels, Turner Day, Chris Day, Kevin Dengel, Mark Denney, Tristan Deschazer, Nick Dorando, Erin Dugan, Andy Durbin, Mark Ellis, Kathy Ellis, Dan Fogell, Leslie Folks, Lexus Folks, Shaun Folks, Mackenzie Folks, Drew Gaddie, Nick Gomez, James Gubanyi, Marla Gubanyi, Julian Gubanyi, Jackson Gubanyi, Lauren Hansen, Jim Hastert, Darrell R. Head, Dave Henderson, Andrea Hinton, Emily Hooser, Deb Horne, Sarah Horton, Dan Johnson, Grace Anne Johnson, Reggie Kapka, Jon Kee, Jennifer Kelly, Sean Kelly, Eric Kessler, Owen Kessler, Chada Klaichang, Ted Leonard, Max LeValley, Emmy Lieser, Dave Lob, Tyler Lob, Lisa Lockhart, Madison Lockhart, Jacob Lockhart, Judy Low, Brandon Low, Steve Marshall, DeAnna Marshall, Joshua Marshall, Nathan Marshall, Stephen Mathis, Andrea May, Brad May, Darwin May, Katie McClung,

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They observed the following:

Woodhouse's Toad	1
Northern Cricket Frog.....	±803
Great Plains Narrowmouth Toad.....	3
Plains Leopard Frog	±87
Bullfrog.....	±35
Northern Painted Turtle	5

Slider.....	1
Great Plains Skink	1
Ground Skink.....	3
Eastern Collared Lizard.....	11
Eastern Racer	17
Common Kingsnake	2
Milk Snake.....	5
Great Plains Rat Snake.....	7
Western Rat Snake	4
Gopher Snake	1
Ringneck Snake	±171
Northern Water Snake.....	6
Brown Snake	2
Common Garter Snake.....	25
Lined Snake.....	10
Massasauga.....	1

22 species ±1201 specimens

Submitted by Derek Schmidt and Dan Murrow
KHS Field Trip Co-Chairpersons



Many of the 130 participants on the KHS 2006 Fall Field Trip to Pottawatomie County. Photograph by Larry L. Miller.

Report on the Kansas Herpetological Society 33rd Annual Meeting

The *Kansas Herpetological Society* held its 33rd Annual Meeting at Alberston Hall, Fort Hays State University, in Hays, Kansas, on 3–5 November 2006. Approximately 120 participants attended scientific paper sessions to listen to 28 talks on amphibians, reptiles, and turtles by scientists and students from across the nation.

During its business meeting, the KHS voted Dan Carpenter (Derby, Kansas) as president-elect, Eric Kessler (Blue Valley North High School) as treasurer, and Mary Kate Baldwin (Topeka Collegiate School) as secretary. Ginny Weatherman (University of Kansas) currently is president-elect and takes office as president on 1 January 2007. Curtis J. Schmidt (Fort Hays State University) served as president during 2006, and hosted the meeting this year.

Prior to the Society banquet and auction on Saturday night, Daniel D. Fogell (KHS Awards Committee) announced that David Bender of Fort Hays State University was this year's recipient of the *Howard K. Gloyd-Edward H. Taylor Scholarship*. The scholarship of \$100.00 honors the memory of two great herpetologists (and

KHS Distinguished Life Members) with strong ties to Kansas. Gloyd was born in Ottawa, Kansas, and attended both Kansas State University and the University of Kansas, and Taylor graduated from Garnett (Kansas) High School and was a faculty member for decades at the University of Kansas. Next, Fogell awarded the *Alan H. Kamb Grant for Research on Kansas Snakes* to George Pisani, Kansas Biological Survey. The \$100.00 grant honors the memory of longtime KHS member Al Kamb of Lawrence.

Also prior to the start of the Saturday night KHS auction, Henry S. Fitch, University of Kansas, was chosen as the ninth recipient of *The Suzanne L. and Joseph T. Collins Award for Excellence in Kansas Herpetology*. Henry was selected for this honor by the KHS Awards Committee, which judged his paper, *A Field Study of the Timber Rattlesnake in Leavenworth County, Kansas* (published during 2004 in the *Journal of Kansas Herpetology* with co-authors George R. Pisani, Harry W. Greene, Alice F. Echelle, and Michael Zerwekh) to be the best publication on a Kansas amphibian, turtle, or reptile during the period 2004–2005. For his research of excellence, Henry was given a commemorative memento and a check for \$1,000.00 by KHS president

Curtis J. Schmidt. *The Collins Award* is the largest biological award given annually in the state of Kansas, and the largest annual presentation made nationally for research (even-numbered years) or photography (odd-numbered years) of amphibians, reptiles, and turtles. Judges for *The Collins Award* during 2004–2005 were Daniel D. Fogell (University of Nebraska, Omaha), Walter E. Meshaka, Jr. (State Museum of Pennsylvania, Harrisburg), and Travis W. Taggart (Sternberg Museum of Natural History, Fort Hays State University, Hays). Following the presentations, Jerry D. Johnson (University of Texas, El Paso; Figure 6) presented the banquet talk to the assembled participants.

Eugene D. Fleharty was honored as the eighth Distinguished Life Member of the KHS, and was presented with a commemorative plaque by Travis W. Taggart.

Featured speaker at the two-day event was James L. Knight (South Carolina State Museum, Columbia). Jim spoke about the future of KHS. His talk was well received and generated much interest about ideas for future societal fieldwork.

The Saturday evening KHS auction garnered \$2,392.00

for the Society treasury, spurred in part by the extraordinary offerings of original artwork by Eva Horne and Ted Leonard, excellent donations of herpetological publications by Suzanne L. Collins (CNAH) and Eric Thiss (Serpents Tale Books), and also by the hard work of auction assistants Robin Oldham, Kendra Phelps, Laura Acuff, and Grace Ann Johnson, who so ably assisted KHS auctioneer Joe Collins.

Meeting Chairperson and KHS President Curtis Schmidt deserves the thanks and appreciation of the entire KHS membership for putting together a great meeting. Curtis was aided in his task by a local committee consisting of Travis W. Taggart, Jerry Choate, William Stark, David Bender, Michael Rochford, Chad Whitney, Mike Taylor, and Joseph T. Collins. To them all we owe our enthusiastic cheers. And, of course, we must recognize the stalwart and sterling efforts of Mary Kate Baldwin (KHS Secretary) and Eric Kessler (KHS Treasurer); both kept us financially frugal and fulfilled through their fiscal work. Finally, our thanks to the local meeting committee. Their dedication to making this a great meeting went far beyond the needed effort.

KHS 33rd Annual Meeting and Auction Photos

by Larry L. Miller, Kansas Heritage Photography, Wakarusa, Kansas.





KHS 2007 Spring Field Trip Site Set

The KHS 2007 spring field trip will be to Arkalon Park northeast of Liberal in Seward County, Kansas. Arkalon Park consists of three lakes and a marsh surrounded by sandsage prairie.

Several nature trails wind through the marsh area. Particularly interesting herps found in the area include the Eastern Glossy Snake, Longnose Snake, Texas phase Common Garter Snakes, and Eastern Hognose Snakes. Bullsnares and Coachwhips are especially plentiful.

For information as it is posted, be sure to check the KHS web site regularly at:

<http://www.cnah.org/khs/FieldTripSpringInfo.html>

For immediate information, contact:

Derek Schmidt or Dan Murrow
KHS Field Trip Chairpersons
(see inside front cover of this issue)

KHS Auctions Over the Past 29 years

A list of KHS Annual Meeting auctions since 1978, in which Joseph T. Collins has served as auctioneer. Joe is to be commended for his tireless work in helping keep the Society solvent monetarily as well as structurally.

Year	Location	Amount (\$)
1978	Caldwell	254.00
1979	Topeka	181.00
1980	Lawrence	250.00
1981	Wichita	386.00
1982	Lawrence	275.00
1983	Lawrence	264.00
1984	Fredonia	300.00
1985	Topeka	405.00
1986	Lawrence	824.00
1987	Emporia	465.00
1988	Lawrence	435.00
1989	Wichita	780.00
1990	Lawrence	1,505.00
1991	Pratt	560.00
1992	Newton	832.00
1993	Emporia	1,356.00
1994	Wichita	859.00
1995	Lawrence	1,192.00
1996	Lawrence	775.00
1997	Wichita	1,073.00
1998	Lawrence	3,213.00
1999	Pratt	888.00
2000	KCMO	847.00
2001	Wakarusa	1,702.00
2002	Lawrence	1,268.00
2003	Emporia	1,537.00
2004	Manhattan	1,760.00
2005	Pittsburg	1,580.00
2006	Hays	2,392.00

Grand Total (1978 to 2006) = \$28,167.00

Open Letter to the House Agriculture Committee and Other Elected Officials

I am writing on behalf of the Kansas Herpetological Society (KHS), an organization with approximately 250 members, in support of House Bill 2783 and other similar efforts, (the repeal of K.S.A. 80-1201 through 80-1208 and revision of K.S.A. 80-1201: 1901-1923). The current mandates requiring Kansas landowners to destroy prairie dogs (and moles and gophers) on their properties are far outdated, practice poor wildlife management, and seem unconstitutional. Landowners should have the right to manage these animals on their property as they choose; furthermore, such a mandate has led to the near extinction of the Black-footed Ferret throughout it's range, and will cause the eventual extinction of the Black-tailed Prairie Dog in Kansas. Prairie dogs are a keystone species, which means that prairie dogs essentially create a unique "ecosystem" on which several species depend. The presence and livelihood of many species depend directly on the presence of prairie dogs. If there are no changes in the current laws concerning prairie dogs, the species is likely to become extirpated from Kansas, which will no doubt have a negative impact on several species, including many herps. The Kansas Herpetological Society encourages the conservation of wildlife in general and of amphibians, turtles, and reptiles in Kansas. In recognizing the Black-tailed Prairie Dog as a keystone species, the KHS supports the repeal of K.S.A. 80-1201 through 80-1208. We also support the repatriation of the Black-footed Ferret into the state.

Sincerely, Curtis Schmidt
President – Kansas Herpetological Society

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FHSU, Department of Biological Sciences

Pay Your 2007 Dues

If you have not already done so, send your calendar 2007 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 delivery of the *Journal of Kansas Herpetology* will be uninterrupted.

FIELD NOTES

Raccoon Predation as a Potential Limiting Factor in the Success of the Green Iguana in Southern Florida

The Green Iguana, *Iguana iguana*, is a well established, large-bodied, exotic species in Florida (Meshaka et al. 2004a. The Exotic Amphibians and Reptiles of Florida, Krieger Publishing Company, Malabar, Florida. 155 pp.; Meshaka et al. 2004b. *Iguana* 11:154-161). Limiting factors of populations and causes of Green Iguana mortality in Florida are poorly understood and the only documented predators are the domestic dog (*Canus familiaris*) (Meshaka et al. 2004a), Yellow-crowned Night-heron (*Nyctanassa violacea*) (Engeman et al. 2005. *Herpetol. Rev.* 36: 320), Florida Burrowing Owl (*Athene cunicularia floridana*) (McKie et al. 2005. *Florida Field Nat.* 33:125-127), and an unidentified species of hawk (HTS pers. obs.). Here, we report the first documented predation of a juvenile Green Iguana by a Raccoon (*Procyon lotor*) in a southern Florida state park. Additionally, we provide strong evidence of Green Iguana population density and recruitment suppression by Raccoons.

Hugh Taylor Birch State Park (HTBSP) is a small, urban park located in Broward County, Florida, USA, within the City of Ft. Lauderdale. It consists of 56.7 ha of uplands and 14.2 ha of freshwater and tidal wetlands for a combined total of 70.9 ha. HTBSP is completely encapsulated by urban infrastructure, and the Intracoastal Waterway (a large bulkheaded canal) truncates the entire western boundary.

At ca. 1130 h on 16 October 2006, a sunny day, temperature ca. 85°F, HTBSP Park Rangers SMC and MEF observed a Raccoon chase a ca. 20 cm SVL Green Iguana out of maritime hammock on to one of the park roads. The iguana cut back across the road surface apparently trying to reach the safety of trees/woodland cover, and the Raccoon then caught it in its jaws and carried it back into the hammock. SMC estimated the entire sequence of events to cover less than 15 seconds. This observation brings the list of known predators of invasive Green Iguana in Florida to five. Likewise, this predation observation provides additional support for our hypothesis that an inverted trophic pyramid dominated by artificially high mid-level predator biomass of the Raccoon exerted almost complete population suppression on an invasive, large-bodied, lower trophic level reptile for at least six years. In subsequent observation, nearly one month later, a large male Green Iguana basking at 1535 h on 9 November 2006 at HTBSP was first circled by a young Raccoon and then attacked. Its response (Figure 1) and follow-up behavior suggest that even large adults are susceptible to attack by Raccoons, and at least during the day, can be successfully fended off (Figure 1).

Raccoon population densities in the park have always been artificially high as a direct result of unlawful feeding by humans. Estimates of Raccoons in

HTBSP during the 1990s ranged from ca. 75 to 125 animals (Smith and Engeman 2002. *Canadian Field-Nat.* 116:636-639). The threats of epizootic disease transmission (particularly rabies) to other wildlife, bites to humans, and vehicular traffic hazards, resulted in a control program in November 2000 to reduce these threats. The HTBSP trap and removal program documented an absolute minimum density of 238 raccoons/km² [= 169 raccoons/175 acres] (Smith and Engeman 2002. *Canadian Field-Nat.* 116:636-639), which is the third highest Raccoon density ever reported in North America, 4-200 times greater than the other reported rural densities of 0.9-55.6 Raccoons/km² (Smith and Engeman 2002. *op cit.*).

During the years of this extraordinary mid-level predator density, few ground-dwelling reptiles were observed in the park and virtually all mast was stripped from trees annually (HTS pers. obs.). The Green Iguana was first opportunistically observed by HTS in the park maritime hammock in 1994 and the date of their initial introduction is unknown; however, the very rare individuals encountered in subsequent years were always large adults and in arboreal situations. During frequent visits from 1994 to 2000 for various projects, no evidence of Green Iguana recruitment was found in HTBSP. Since 2001, and after Raccoon removal, new hatchlings have been observed annually and as of 2006, the Green Iguana has saturated the park in mixed size-classes in all ground, arboreal, and ruderal habitats (HTS and WEM pers. obs.).

The post-Raccoon removal spike in Green Iguana presence at HTBSP and the depredation of a ca. 60 cm TL Green Iguana suggest to us the effectiveness of the Raccoon as a potentially severely limiting factor of Green Iguana abundance in southern Florida. In this connection, we propose that predation of the nest, as well, is a mechanism for suppression of the Green Iguana by the Raccoon. The case for nest predation and its effects on the Green Iguana remain to be tested but seem logical in light of the Raccoon's keen ability to find and destroy nests, up to 95% of Sea Turtle nests in Florida and down to 9.4% after Raccoon re-



Figure 1. A male Green Iguana (*Iguana iguana*) fends off a Raccoon (*Procyon lotor*) at Hugh Taylor Birch State Park in Broward County, Florida on 9 November 2006.

moval (Stancyk 1982. In Bjorndal, K.A. [ed.], *Biology and Conservation of Sea Turtles*, pp. 139-152, Smithsonian Institution Press, Washington, DC; Engeman et al. 2002. *Ecological Economics* 42: 469-478; Engeman et al. 2005. *Oryx* 39: 318-326).

Ironically, even as the targeted management benefits of removal of Raccoons were completely achieved at HTBSP beyond expectations, the release from predation pressure of the Green Iguana may well have resulted in the unexpected ecological consequence of a biotic burst of an exotic species in this urban park.

Henry T. Smith

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New Record Length for the Black Kingsnake (*Lampropeltis getula nigra*)

The largest specimen previously recorded for *Lampropeltis getula nigra* was found in New Albany, Indiana prior to 1958 by Anthony Wilson and measured 58 inches (Conant and Collins 1998. *Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Edition Expanded.* Houghton Mifflin Co., Boston. xviii + 616 pp.) On 18 September 2006, a large example of this subspecies was discovered by Phil Peak and William Bird in Hopkins County, Kentucky, under a large sheet of metal. The snake was taken to the Louisville Zoo where the veterinarian staff administered isoflurane to it and it was measured in a relaxed state. Caution was taken to ensure that the snake was not stretched in any way. A measurement of 148.6 centimeters (58.5 inches) was confirmed by lead reptile keeper Gary Johnson, reptile keeper William Bird, veterinarian Dr. Zoltan Gyimesi, and Vet Tech Elizabeth Hayden. This is a new maximum length for this subspecies. The specimen weighed 392.3 grams. It was photographed and released at the site of capture.

We wish to thank the kind and generous people of rural Kentucky for their permission to search for reptiles, amphibians, and turtles on their private proper-

ties. We are also indebted to the Louisville Zoo AHC staff for their expertise in immobilization. We also take pleasure in thanking our wives, whose immense patience allows us to continue our efforts.

William Bird

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Ninth Annual Running of the Lizards

On 10 September 2006, the Washburn University Herpetology Class Field Trip, led by instructor Joseph T. Collins, participated in his Ninth Annual Running of the Lizards at 21st Street and Gage Boulevard in Topeka, Shawnee County, Kansas. WU student participants were April Barker, Andrew Hare, Jon Kee, Dominique Loreg, Andrea May, John L. Petterson, Jeremiah J. Teller, and Brad Tobyre, accompanied by non-students Brandon Low, Judy Low, Larry L. Miller, James Gubanyi, Brad May, Darwin May, Dan Murrow, Chad Whitney and many others. We chased Italian Wall Lizards (*Podarcis sicula*) from noon until 2:00 pm, observing about 75 specimens and catching about 25 of them (the lizards always win more races than the people). Also observed but not caught was a single Western Green Lacerta (*Lacerta bilineata*). One Lined Snake (*Tropidoclonion lineatum*) was found dead in the parking lot on the southwestern corner of the intersection.

Joseph T. Collins and Suzanne L. Collins

The Center for North American Herpetology
1502 Medinah Circle
Lawrence, Kansas 66047



The chase is on as participants in the Ninth Annual Running of the Lizards corner one of the swift reptiles on the northwestern corner of 21st Street and Gage Boulevard in Topeka, Shawnee County, Kansas. Photograph by Larry L. Miller, Wakarusa, Kansas.

An Addition to the Herpetofauna of Cheyenne Bottoms, Barton County, Kansas

There currently are twelve species of snakes known to occur at Cheyenne Bottoms in Barton County, Kansas (Collins and Collins 2006. Amphibians, Turtles, and Reptiles of Cheyenne Bottoms, Second Revised Edition. Publ. Sternberg Mus. Nat. Hist., Fort Hays St. Univ., Hays, Kansas. viii + 76 pp.). On 3 September 2006 at 17:59, I captured an additional species, an adult Brown Snake (*Storeria dekayi*), that was basking on a limestone road on the north side of the bottoms. Canals were present on both sides of the road, with water abutting piles of limestone rock directly adjacent to the road. Recent, heavy rains had filled the basin, which had been completely dry a few weeks prior. At the time of collection, the only surfaces that were above water in the immediate area were the roads and roadside dikes. This species prefers moist environments, and likely is a common inhabitant of Cheyenne Bottoms. This also was the first individual of this species to be recorded from Barton County and constitutes a new county record (Collins and Collins, 1993, Amphibians and Reptiles in Kansas, Third Edition, Univ. Press Kansas, Lawrence. xx + 397 pp.).

Curtis J. Schmidt
Sternberg Museum of Natural History
Fort Hays State University
Hays, Kansas 67601

Brown Anole (*Anolis sagrei*) found in De Soto, Kansas

On 14 September 2006, a single juvenile specimen of *Anolis sagrei* (Brown Anole) was discovered and captured on the northeast side of the DeSoto High School building. Initial reports from students of numerous sightings made the possibility of multiple individuals seem plausible, but as of 26 September 2006, the specimen (below) is the only one collected or seen. I thank Walter E. Meshaka, Jr. (curator at the State Museum of Pennsylvania) for identifying the lizard.

Scott L. Sharp
De Soto High School
De Soto, Kansas



A juvenile specimen of the Brown Anole (*Anolis sagrei*) found on the Desoto High School building. Photograph by Scott Sharp.

Washburn University Herpetology Class Field Trip

On 24 September 2006, the Washburn University Herpetology Class Field Trip was led by instructor Joseph T. Collins to Franklin and Linn counties, Kansas. Student participants were April Barker, Andrew Hare, Dominique Loreg, Andrea May, John L. Petterson, Jeremiah J. Teller, and Brad Tobyre, accompanied by non-students Suzanne L. Collins, Courtney Gauerth, Brandon Low, Judy Low, Brad May, Darwin May, Dan Murrow, and Chad Whitney. The group observed the following:

Kansas: Linn Co: Marais des Cygnes WMA at KDWP Unit G

Smallmouth Salamander.....	1
Eastern Newt	12
Northern Cricket Frog.....	16
Bullfrog	1
Southern Leopard Frog.....	2
Eastern Racer.....	1
Plainbelly Water Snake	1
Diamondback Water Snake.....	1
Western Ribbon Snake.....	2

Kansas: Linn Co: Marais des Cygnes National Wildlife Refuge

Ground Skink	1
Eastern Racer.....	2
Common Kingsnake	1
Milk Snake	1
Western Rat Snake.....	±17
Ringneck Snake.....	±40
Brown Snake.....	1

Kansas: Franklin Co: at Miami County line on Rt. 68

Ground Skink	1
Milk Snake	1
Ringneck Snake.....	2
Timber Rattlesnake	4

Totals
16 species ±108 specimens

Joseph T. Collins and Suzanne L. Collins
The Center for North American Herpetology
1502 Medinah Circle
Lawrence, Kansas 66047

County Record Milk Snake from Kiowa County

Lampropeltis triangulum (Milk Snake). KANSAS: KIOWA CO: 37.38818°N, 99.47304°W. 21 April 2006. Derek Schmidt & Brett Schmidt. MHP 12867. Verified by Curtis J. Schmidt. New county record (Collins & Collins, 1993, Amphibians and Reptiles in Kansas. Third Edition. Univ. Press Kansas, Lawrence. xx + 397 pp.).

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ARTICLES

A Herpetofaunal Survey of Southwestern South Dakota with an Emphasis on Species of Conservation Concern

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Species inventories of particular regions provide essential data sets for conservation and resource management (Tuberville et al., 2005), and acquiring baseline data on the distribution and status of even common species is important (Dodd and Franz, 1993; Gibbons et al., 1997). Furthermore, knowledge of distribution and abundance patterns is fundamental to understanding community and ecosystem dynamics (Andrewartha and Birch, 1954). However, accurate determination of the distribution and demographic status for most species in the United States has yet to be achieved (Gibbons et al., 1997), and faunal inventories of the Northern Great Plains have lagged behind those of other regions (Hossack et al., 2005). In particular, the herpetofauna of South Dakota has received relatively little attention (Chiszar et al., 1994; Ballinger et al., 2000; Platt et al., 2005a). Ballinger et al. (2000) recently reviewed and summarized specimen-based distribution records for amphibians and reptiles in South Dakota and concluded that knowledge of the regional herpetofauna is incomplete and additional surveys are warranted. Likewise, according to Chiszar et al. (1994) there is a notable paucity of information on the herpetofauna of Indian Reservations in western South Dakota, in part due to the difficulty of obtaining access to tribal lands.

In this paper we present the results of herpetofaunal surveys conducted in southwestern South Dakota during April-October 2004. Additional noteworthy observations from 2003 and 2005 are also reported herein. Our efforts focused primarily on Fall River, eastern Custer, Jackson, and Shannon counties, but limited surveys were also conducted in Bennett, Mellette, and eastern Pennington counties (Figure 1). Shannon, Jackson, and parts of Bennett counties are included in the Pine Ridge Indian Reservation (PRIR), an area comprising approximately 670,000 ha. We restricted our surveys in the Black Hills to the Hogback and Red Valley of Fall River and Custer counties; the herpetofauna of the central and northern hills has been previously described by others (Chace, 1971; Peterson, 1974; Collins et al., 2005).

Study Area and Methods

Southwestern South Dakota falls within the unglaciated Missouri Plateau Physiographic Province (Hudson, 2002). The region is characterized by rolling topography drained by the Cheyenne and White Rivers. Significant areas of highly eroded Badlands are found along the White River. Mixed grass prairie (*sensu* Johnson and Larson, 1999a) is the dominant vegetation except in broken terrain where stands of Ponderosa pine (*Pinus ponderosa*) predominate. Riparian forest consisting of cottonwood (*Populus deltoides*), ash (*Fraxinus* sp.), elm (*Ulmus* sp.), and willow (*Salix* sp.) occur along most drainages, along with occasionally extensive cattail (*Typha* sp.) wetlands. Extensions of the sandhill ecoregion that characterizes much of western Nebraska (Hudson, 2002) occur in southern Bennett and Shannon counties (Radeke, 1971; Kalvels, 1982). The Hogback, a sandstone ridge rising to over 1300 m in some places, forms the outer rim of the Black Hills and encloses the Red Valley in Fall River and Custer counties. Ponderosa pine forest covers much of the Hogback, while the Red Valley is primarily grassland. The region experiences a semi-arid continental climate with hot, dry summers and cold

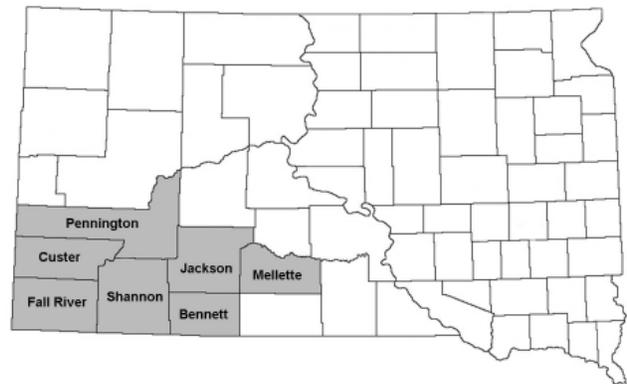


Figure 1. Map of South Dakota showing counties (shaded) where herpetological surveys were conducted during 2003-2005.

Table 1. Amphibians and reptiles recorded during surveys of southwestern South Dakota (2003-2005). Asterisks denote species of conservation concern (Stukel and Backlund, 1997; South Dakota Department of Game, Fish, and Parks, 2003).

Common name	Scientific name
Amphibians	
Caudata (salamanders)	
Barred Tiger Salamander	<i>Ambystoma mavortium</i>
Anura (frogs)	
Great Plains Toad	<i>Bufo cognatus</i>
Woodhouse's Toad	<i>Bufo woodhousii</i>
Western Chorus Frog	<i>Pseudacris triseriata</i>
Bullfrog	<i>Rana catesbeiana</i>
Northern Leopard Frog	<i>Rana pipiens</i>
Plains Spadefoot	<i>Spea bombifrons</i>
Reptiles	
Testudines (turtles)	
Spiny Softshell*	<i>Apalone spinifera</i>
Common Snapping Turtle	<i>Chelydra serpentina</i>
Northern Painted Turtle	<i>Chrysemys picta</i>
Ornate Box Turtle*	<i>Terrapene ornata</i>
Squamata (lizards and snakes)	
Lacertilia (lizards)	
Six-lined Racerunner*	<i>Cnemidophorus sexlineatus</i>
Many-lined Skink*	<i>Eumeces multivirgatus</i>
Lesser earless Lizard*	<i>Holbrookia maculata</i>
Mountain Short-horned Lizard*	<i>Phrynosoma hernandesi</i>
Prairie Lizard*	<i>Sceloporus undulatus</i>
Serpentes (snakes)	
Eastern Racer	<i>Coluber constrictor</i>
Prairie Rattlesnake	<i>Crotalus viridis</i>
Western Hognose Snake	<i>Heterodon nasicus</i>
Milk Snake	<i>Lampropeltis triangulum</i>
Smooth Green Snake	<i>Liochlorophis vernalis</i>
Gopher Snake	<i>Pituophis catenifer</i>
Plains Garter Snake	<i>Thamnophis radix</i>
Common Garter Snake	<i>Thamnophis sirtalis</i>

winters. Annual precipitation averages 400-450 mm, 75% of which falls during April-September. Detailed descriptions of vegetation, soils, topography, and climate are provided elsewhere (Radeke, 1971; Kalvels, 1982; Raventon, 1994; Johnson and Larson, 1999a; Johnson and Larson, 1999b; Hudson, 2002).

We employed a variety of standard methodologies during this survey, including road-cruising and collection of dead-on-road (DOR) and alive-on-road (AOR) specimens, visual encounter surveys, anuran calling surveys, coverboards, and baited minnow traps (Cooperrider et al., 1986; Karns, 1986; Corn and Bury, 1990). Specialized turtle trapping techniques (e.g., basking traps, trammel nets, hoop nets) were not employed during this survey. Instead we used 7 × 35 binoculars to identify basking turtles and made hand-captures on numerous occasions. As in many herpetofaunal surveys (e.g., Gillespie et al., 2005), opportunistic encounters were an extremely important source of records throughout our survey. Detailed field

notes, including a description of routes followed while road cruising are archived in the Campbell Museum (CUSC), Clemson University, Clemson, South Carolina. Voucher specimens and photographs of most, but not all species encountered during this survey are also deposited in the Campbell Museum. Geographic coordinates were determined with a Garmin® GPS 12. Place names are in accordance with topographical maps issued by the United States Geological Survey. For locations not labeled on topographical maps, place names given are those in common local usage. We present maps for uncommon species and those monitored by the Natural Heritage Program of the South Dakota Department of Game, Fish and Parks (Stukel and Backlund, 1997; South Dakota Department of Game, Fish, and Parks, 2003). Our nomenclature follows Collins and Taggart (2002).

Results

We recorded seven species of amphibians and 16

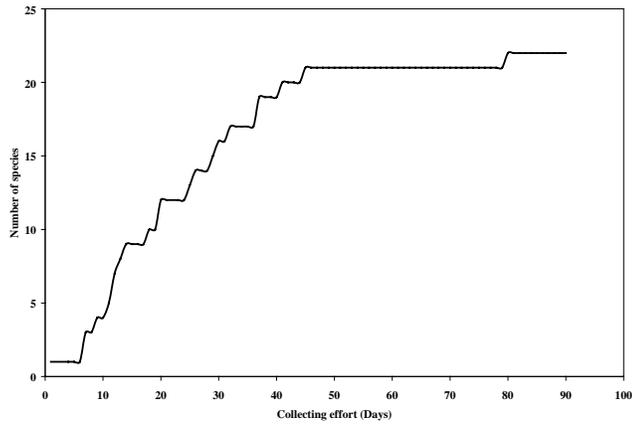


Figure 2. Cumulative number of amphibian and reptile species recorded during surveys of southwestern South Dakota from mid-April to mid-October 2004.

species of reptiles during this survey (Table 1). A species accumulation curve for fieldwork conducted during 2004 is provided in Figure 2. Accounts (arranged alphabetically by Order and Suborder) for each species are provided below. Additionally, we include among these accounts a single record for the smooth green snake (*Liochlorophis vernalis*) provided by a colleague; however, this species was not encountered during our survey.

Amphibians

Salamanders (Order Caudata)

Barred Tiger Salamander (*Ambystoma mavortium*)

Ambystoma mavortium is the only salamander occurring in western South Dakota (Fischer et al., 1999; Ballinger et al., 2000). A single well-developed larval *A. mavortium* was captured in a minnow trap set in a wetland along the Cheyenne River at Maverick Junction (Fall River County) during May 2004 (Figure 3). This wetland was much reduced by drought during May and completely dry by mid-summer. Minnow traps deployed from June through mid-August in cattail wetlands along the White River at Oglala and White Clay Lake (Shannon County), and beaver ponds on Horsehead Creek Game Production Area (Fall River County) yielded no specimens. Many potential breeding sites examined during preliminary fieldwork in 2003 contained no water in 2004 owing to the effects of a prolonged regional drought.

Frogs and toads (Order Anura)

We conducted anuran calling surveys at 42 wetlands in Bennett (5), eastern Custer (5), Fall River (9), Jackson (5), Mellette (6), eastern Pennington (6), and Shannon (6) counties during 2004. Drought conditions seriously hampered anuran surveys, and locating suitable survey sites proved difficult. Many potential sites identified during preliminary fieldwork in 2003 were completely dry or nearly so in 2004. Furthermore, except for large choruses of *Pseudacris triseriata* during mid- to late April, few vocalizing anurans were noted during call surveys, probably due to the scant rainfall. Species that depend on rainfall events to initiate breeding activities (e.g., *Bufo cognatus*, *Spea bombi-*

frons) proved especially difficult to find.

Great Plains Toad (*Bufo cognatus*)

The Great Plains toad has been sparingly collected from most counties within the study area (Ballinger et al., 2000). We recorded *B. cognatus* at only 2 (4.7%) of 42 wetlands where amphibian calling surveys were conducted in 2004. Adult toads were encountered at Horsehead Creek Game Production Area, and in sagebrush habitats near Edgemont (Fall River County), and in a drying stockpond in eastern Pennington County.

Woodhouse's Toad (*Bufo woodhousii*)

Woodhouse's toad has been recorded throughout the study area (Ballinger et al., 2000) and is reportedly common in mesic habitats where insects are abundant (Fischer et al., 1999). We encountered *B. woodhousii* at 5 (11.9%) of 42 wetlands surveyed in Bennett (1) and Shannon (4) counties during 2004. We also observed *Bufo woodhousii* at several wetlands in Fall River, Custer, and eastern Pennington counties during preliminary surveys in 2003, but toads were not found at these sites in 2004, most likely due to prevailing dry conditions.

Western Chorus Frog (*Pseudacris triseriata*)

The western chorus frog is abundant in permanent and ephemeral wetlands of western South Dakota (Fischer et al., 1999). We recorded *P. triseriata* at 8 (19.0%) of 42 wetlands surveyed in Fall River (3), eastern Pennington (1), and Shannon (4) counties in 2004. Particularly large choruses were noted in the extensive cattail wetlands bordering the White River from Oglala south to Pine Ridge and adjacent to BIA (Bureau of Indian Affairs) Hwy 41 north of Oglala, as well as along Wounded Knee Creek from Wounded Knee north to Sharps Corner (Shannon County). Western chorus frogs were abundant at the wastewater treatment facility near Maverick Junction (Fall River County). In late August 2004 we found numerous chorus frogs concealed among moist cracks in drying mud at a small pond in eastern Pennington County. During preliminary fieldwork from mid-April to early June of 2003 we found abundant *P. triseriata* vocalizing in wet pastures and rain-filled ditches in Minnekahta Valley west of Hot Springs (Fall River County); however, chorus frogs were not recorded in this area in 2004 presumably as a result of drought conditions.



Figure 3. Map of southwestern South Dakota showing locations where a barred tiger salamander (large dark circle) and plains spadefoots (stars) were observed in 2004.

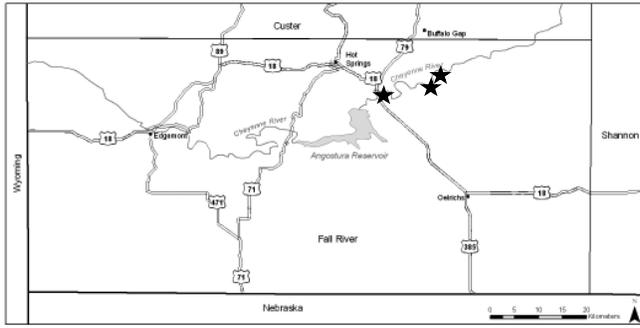


Figure 4. Map of Fall River County, South Dakota showing locations (stars) where spiny softshells were observed along the Cheyenne River in 2003 and 2004.

Although vocalization generally peaks from mid-April to mid-May (Fischer et al., 1999), we recorded vocalizing chorus frogs as late as 21 October 2004.

Bullfrog (*Rana catesbeiana*)

Rana catesbeiana is confined to the southernmost tier of counties in western South Dakota (Smith et al., 1966; Fischer et al., 1999; Ballinger et al., 2000). During 2004 we recorded bullfrogs at 15 (35.7%) of 42 wetlands surveyed in Bennett (3), Fall River (2), Custer (1), Jackson (3), Mellette (4), and Shannon (2) counties. Bullfrogs were particularly abundant in two beaver impoundments on Long Creek near Wamblee (Jackson County) where 46 adults were tallied on the night of 17 June 2004. Bullfrogs were also common in a small pond within the town limits of Kadoka (Jackson County). *Rana catesbeiana* has not previously been reported from Jackson County (Ballinger et al., 2000), and our observations constitute a distribution record.

Northern Leopard Frog (*Rana pipiens*)

The northern leopard frog occurs throughout western South Dakota and has previously been reported from every county within the study area (Fischer et al., 1999; Ballinger et al., 2000). During 2004 we recorded *R. pipiens* at 20 (47.6%) of the 42 wetlands surveyed in Bennett (3), eastern Custer (1), Fall River (5), Jackson (3), Mellette (1), eastern Pennington (5), and Shannon (2) counties. Our observations suggest that leopard frogs prefer wetland margins of dense grass and sedges and were generally absent from sites lacking stands of such cover, often as a result of intensive grazing and trampling by cattle.

Plains Spadefoot (*Spea bombifrons*)

The plains spadefoot is an explosive breeder that gathers in temporary pools following heavy rainstorms (Hammerson, 1999). We verified the occurrence of *S. bombifrons* in Shannon, Fall River, and Bennett counties (Figure 3). A breeding aggregation of *S. bombifrons* was found near Denby (Shannon County) several hours after a torrential downpour on 11 June 2004. Many vocalizing males and amplexing pairs were observed in a small (ca. 3 m × 3 m) rain-filled pool. On 14 June 2004 another chorus was recorded in grasslands at the base of Cuny Table (Shannon County). At the time, numerous temporary pools were

present as a result of recent heavy rains. Scattered individuals were also heard calling at the Hot Springs Wastewater Treatment Facility (Fall River County) on 23 June 2004. Finally, two *S. bombifrons* were found while road-cruising in an agricultural area of Bennett County during a violent thunderstorm on the night of 30 June 2004.

Reptiles

Turtles (Order Testudines)

Spiny Softshell (*Apalone spinifera*)

While *A. spinifera* is known to occur in the Missouri River of South Dakota, its distribution in the western part of the state remains ill-defined and museum specimens from this region are lacking (Ballinger et al., 2000). We observed nine basking softshell turtles on 23 May 2003 during a canoe trip down the Cheyenne River (Oral to BIA Hwy 2), and a single turtle on 17 September 2004 in a beaver impoundment along the Cheyenne River at Maverick Junction (Fall River County) (Figure 4). Collectively these observations confirm the presence of *A. spinifera* in the Cheyenne River downstream from Angostura Reservoir, although whether the species occurs in the latter has not been determined. During a pedestrian reconnaissance of the Cheyenne River upstream from Angostura Reservoir in July 2004 we found virtually no water in the riverbed; thus it is unlikely that viable populations of this highly aquatic turtle occur in upper reaches of the river.

Common Snapping Turtle (*Chelydra serpentina*)

Although *C. serpentina* likely occurs in wetlands throughout western South Dakota, few records are available from the region (Ballinger et al., 2000). Because snapping turtles rarely bask (Ernst et al., 1994) and we did not use sampling methodologies that specifically target aquatic turtles (e.g., baited hoop nets), *C. serpentina* likely escaped detection at many of the sites that we surveyed. Despite these caveats, we recorded snapping turtles in Fall River, Bennett, and Shannon counties. These records include a hatchling

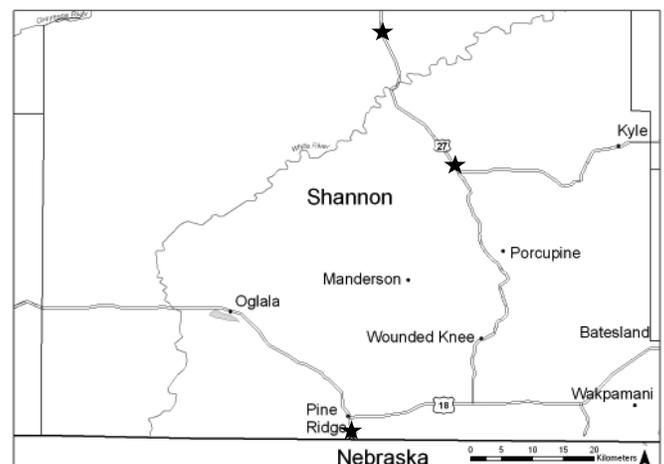


Figure 5. Map of Shannon County, South Dakota showing locations (stars) where ornate box turtles were found in 2003 and 2005.

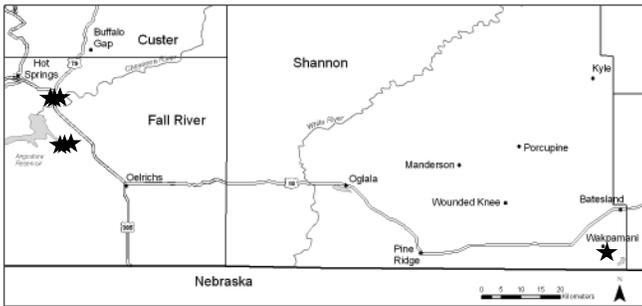


Figure 6. Map of Fall River and Shannon counties, South Dakota showing locations (stars) where six-lined racerunners were found in 2004.

captured at Yellow Bear Dam (Bennett County), a DOR adult found at the Cheyenne River Bridge near Maverick Junction and a small adult captured in Fall River (Fall River County), and an adult that was frequently observed basking in a small wetland at Sharps Corner (Shannon County). Additionally, many large adult snapping turtles were observed foraging in shallow waterfowl impoundments at Lacreek National Wildlife Refuge (Bennett County). The demographic attributes of this population were described by Hammer (1969). Additionally, snapping turtle nests unearthed by predators (probably striped skunks, *Mephitis mephitis*) were found along Horsehead Creek and an irrigation ditch that traverses the Oral Game Production Area (Fall River County). Residents of PRIR occasionally harvest snapping turtles for food, but this practice does not appear to be widespread (Fast Horse, unpubl. manuscript).

Northern Painted Turtle (*Chrysemys picta*)

Western painted turtles are abundant in wetlands of southwestern South Dakota, and basking turtles were observed in rivers, creeks, marshes, beaver impoundments and livestock ponds in every county that we surveyed. Additionally, turtles were occasionally found moving overland several kilometers from any known waterbody. We noted a large winterkill of *C. picta* at Limestone Butte Lake near Oelrichs (Fall River County) where 84 dead turtles were found in the dry lakebed during two visits in May and August 2004. The turtles are thought to have perished while hibernating when drought conditions exposed them to lethally low ambient temperatures during the winter of 2003-04. Five nesting female *C. picta* were encountered late in the evening on 7 June 2004 at White Clay Reservoir (Shannon County). Additionally, we observed a badger (*Taxidea taxus*) excavating a painted turtle nest in Bennett County at dusk on 30 June 2004. This nest contained four intact eggs and the shells of two others consumed by the badger. Mucous covering the intact eggs indicated the clutch had been deposited only a short while before.

Ornate Box Turtle (*Terrapene ornata*)

Although apparently quite rare and represented by only a few museum specimens, *T. ornata* has previously been reported from Bennett, Jackson, and Todd counties in western South Dakota (reviewed by Platt et al., 2005b). We found three *T. ornata* in Shannon

County during 2003 and 2005 (Figure 5); a turtle crossing BIA Hwy 2, approximately 7.2 km north of Sharps Corner (11 June 2003), another crossing Hwy 407, approximately 1.6 km south of Pine Ridge (5 June 2005), and a badly damaged DOR on BIA Hwy 27, 17.6 km south of Scenic (14 June 2005). These turtles all occurred in grassland subject to light-moderate cattle grazing, and characterized by *Stipa comata*, *Stipa viridula*, *Pascopyrum smithii*, *Schizachyrium scoparium*, and *Bouteloua gracilis*. Little habitat information accompanies earlier records from South Dakota (Platt et al., 2005b), but according to Over (1923), *T. ornata* is restricted to the sandhill region, and Malaret (1977) found two specimens in sandhills of Bennett County. Moreover, locality data from other Bennett County records suggest that these turtles were found in sandhill habitat or close to it (Platt et al., 2005b). However, the ornate box turtles that we found in Shannon County occurred in mixed grass prairie north of the sandhill region, indicating that *T. ornata* is not confined to the latter habitat in western South Dakota.

Lizards and snakes (Order Squamata)

Lizards (Suborder Lacertilia)

Six-lined Racerunner (*Cnemidophorus sexlineatus*)

We observed numerous six-lined racerunners in the undulating, sagebrush-covered sandy hills near Angostura Reservoir and on steep bluffs above the Cheyenne River (Fall River County) during May, June, and September 2004 (Figure 6). The former habitat is characterized by abundant big sagebrush (*Artemisia tridentata*) growing on well drained sandy and loamy soils (Kalvels, 1982). Racerunners along the Cheyenne River were only found on south-facing slopes of the north bank; searches of north-facing slopes on the opposite side of the river proved unproductive. We also observed racerunners around abutments of the New and Old Hwy 79 bridges over the Cheyenne River. We encountered a single racerunner in sandhill habitat approximately 3 km east of Wapakamani (Shannon County). This was the only racerunner that we observed in Shannon County, although several lizards that fled before we could make a positive identification may well have been racerunners. Malaret (1977) reported *C. sexlineatus* from sandhills in adjacent Bennett County. We observed several racerunners

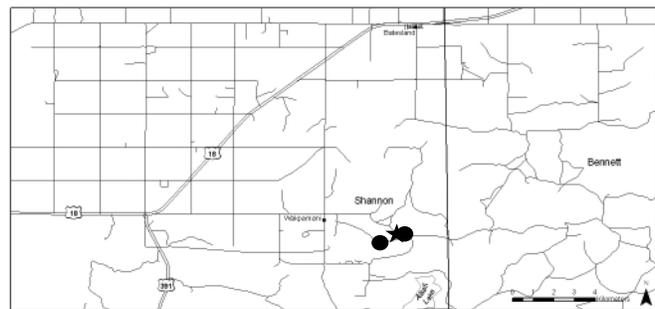


Figure 7. Map of eastern Shannon and western Bennett counties, South Dakota showing locations where lesser earless lizards (large dark circles) and a many-lined skink (star) were found in 2004.

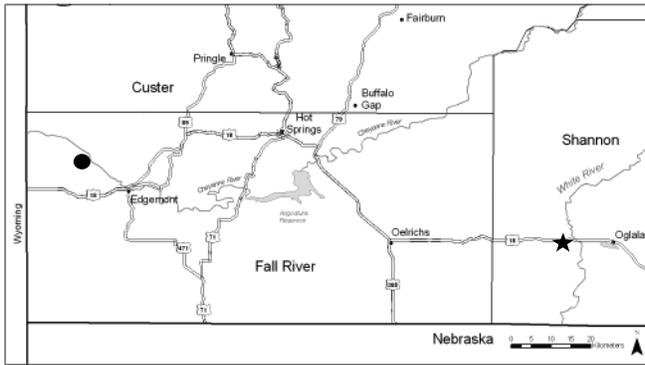


Figure 8. Map of Fall River and Shannon counties, South Dakota showing location (large dark circle) where a short-horned lizard was collected in 2004. The star indicates a reliable report (see text), although we were unable to verify the occurrence of horned lizards at this site.

basking at the entrance of abandoned mammal burrows and others sought refuge in mammal burrows when pursued. Similarly, Vaughan (1961) noted racerunners among the fauna inhabiting pocket gopher (*Geomys* sp.) burrows in Colorado.

Many-lined Skink (*Eumeces multivirgatus*)

We collected a single *E. multivirgatus* from beneath a clump of dried cattle dung in sandhill habitat approximately 3 km east of Wakpamani (Shannon County) on 15 June 2004 (Figure 7). *Eumeces multivirgatus* was previously reported from only Tripp and Bennett counties in South Dakota (Ballinger et al., 2000). Considerable search effort was required and we found the skink only after overturning several hundred clumps of cattle dung. Likewise, others (Taylor, 1935; Hammerson, 1999) reported finding *E. multivirgatus* under dried cattle dung. Hammerson (1999) noted that this small, secretive lizard is hard to detect without labor-intensive pitfall trapping, a technique not employed in our survey. During a study in Colorado, over 300 *E. multivirgatus* were taken in pitfalls, more than all other amphibians and reptiles combined (Hammerson, 1999).

Lesser Earless Lizard (*Holbrookia maculata*)

Lesser earless lizards are closely associated with sandhill habitats in South Dakota (Malaret, 1977; Ballinger et al., 2000). We captured two *H. maculata* in sandhills 3 to 4 km east of Wakpamani (Shannon County) on 11 and 15 June 2004 (Figure 7). Both specimens were found among grass clumps near sand "blowouts". *Sceloporus undulatus* also occur in this area and it proved difficult to distinguish the two species without capturing specimens for identification. Because a number of lizards eluded capture, *H. maculata* is probably more common in this area than suggested by our two captures. *Holbrookia maculata* has not been previously reported from Shannon County (Ballinger et al., 2000), but is known to occur in sandhills of adjacent Bennett County (Malaret, 1977). According to Davis and Theimer (2003) *H. maculata* are common inhabitants of Gunnison's prairie dog (*Cynomys gunnisoni*) towns in Arizona. Therefore we searched structurally similar black-tailed prairie dog (*C. ludoviciana*)

colonies in Shannon County north of the sandhills, but detected no *H. maculata* at these sites.

Mountain Short-horned Lizard (*Phrynosoma hernandesi*)

We found a single *P. hernandesi* in Buffalo Gap National Grassland, 9.6 km northwest of Edgemont (Fall River County) on 28 May 2004 (Figure 8). The lizard was found in lightly grazed grassland at the base of a large butte. This site was sparsely vegetated with scattered clumps of grass and big sagebrush and had a considerable area of loose, dark-colored, bare, sandy soil. We also received a reliable locality record from Mr. Dustin Twiss (*pers. comm.*), a student at Oglala Lakota College who reportedly encounters "about five" horned lizards each summer while searching for fossils among eroded clay bluffs and exposed gravel beds along Blacktail Creek, approximately 3 km west of Oglala on Hwy 18. We searched this area in June 2005, but encountered no lizards.

Prairie Lizard (*Sceloporus undulatus*)

We encountered numerous *S. undulatus* in sandhill habitat near Wakpamani (Shannon County) and Scotchman's Lake (Bennett County) during June 2004 and 2005, respectively (Figure 9). Within the sandhills we found *S. undulatus* in areas of sparse grass cover, basking on fenceposts, and concealed beneath yucca clumps. Malaret (1977) stated that *S. undulatus* "was the most frequently observed lizard in the sandhills" of adjacent Bennett County. Additionally, we collected a fence lizard from a southwards-facing bluff along BIA Hwy 27, approximately 2.6 km south of the PRIR boundary (Shannon County) on 16 June 2003. This lizard was found among scattered *Juniperus* on a steep slope above eroded, sparsely vegetated badlands. To our knowledge, this record represents the northernmost occurrence of *S. undulatus* in South Dakota, and extends the distribution approximately 77 km northwards from a previous record in southern Shannon County at the Nebraska state line (Ballinger et al., 2000).

Snakes (Suborder Serpentes)

Eastern Racer (*Coluber constrictor*)

The eastern racer is widely distributed and common throughout western South Dakota (Ballinger et al.,

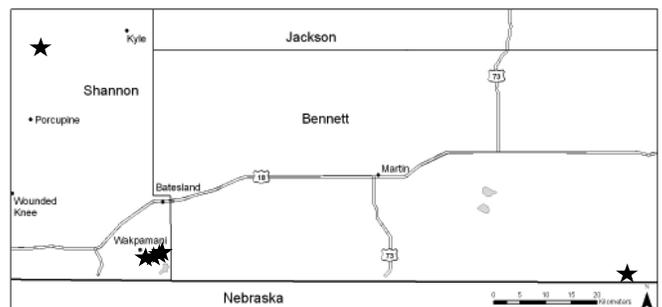


Figure 9. Map of Bennett and Shannon counties, South Dakota showing locations (stars) where eastern fence lizards were observed in 2003-2005.

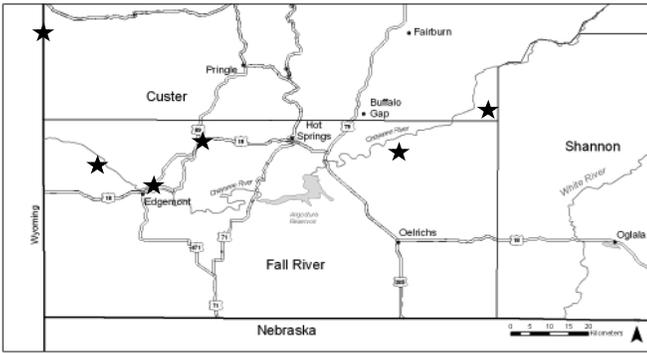


Figure 10. Map of Fall River and Custer counties, South Dakota showing locations (stars) where western hognose snakes were encountered in 2004-2005.

2000), and was the second-most frequently encountered snake during our survey. We encountered 28 *C. constrictor* in Bennett, Custer, Fall River, Shannon, and Pennington counties during 2004. This total included 19 (67.8%) observed during visual encounter surveys and 9 (32.1%) found while road-cruising. Eastern racers occurred most frequently in open grasslands and three were noted in association with black-tailed prairie dog (*C. ludoviciana*) colonies. Others were found in sandhills, open Ponderosa pine forest, along wetland margins, and basking on rocky slopes. A fresh DOR specimen found on 28 October was the last eastern racer we recorded in 2004.

Prairie Rattlesnake (*Crotalus viridis*)

With the exception of Perkins County, *C. viridis* has been recorded from every county in South Dakota west of the Missouri River (Ballinger et al., 2000), and was the third-most frequently encountered snake in this study. We recorded 20 *C. viridis* from Fall River, Shannon, Custer, and Jones counties in 2004, including 15 (75.0%) observed during visual encounter surveys and 5 (25.0%) found while road-cruising. Most observations occurred in rocky habitats of the southern Black Hills and the surrounding grasslands. Historically Dodge (1876) noted that prairie rattlesnakes occurred "in considerable numbers" in the Red Valley and grasslands surrounding the Black Hills.

We found two denning areas on steep, boulder strewn south-southwest-facing slopes in Battle Mountain Game Production Area near Hot Springs (Fall River County). Repeated observations of basking snakes were made at one den site near the summit of Battle Mountain (elevation = 1280 to 1310 m asl [above sea level]). The other den site was located on a steep slope (elevation = 1200 m asl) burned by an intense wildfire in the late 1980s. Both denning areas lacked significant tree cover and were exposed to full sunlight for much of the day. A fresh DOR specimen found on 28 October was the last *C. viridis* encountered in 2004.

Western Hognose Snake (*Heterodon nasicus*)

The western hognose snake is uncommon in western South Dakota, and rarely observed owing to its largely fossorial habits (Chace, 1971; Hammerson, 1999). We recorded five and two *H. nasicus* during 2004 and

2005, respectively from Fall River and Custer counties (Figure 10). This total included three DOR and four living snakes. The first DOR was found on BIA Hwy 2 east of Buffalo Gap (Custer County) in an intensively grazed pasture. Two additional DOR specimens were found on consecutive days at the same site in Buffalo Gap National Gap Grassland near Edgemont (Fall River County). The surrounding habitat is characterized by highly eroded buttes surrounded by sparsely vegetated grassland with scattered big sagebrush. Two living *H. nasicus* were recorded along the Mickelson Bike Trail (Fall River County); one was found on the edge of a cultivated hay field and the other in sandy soil among big sagebrush. A third living *H. nasicus* was found basking on a sandy, southeast-facing slope covered in grass and cactus at the Oral Game Production Area (Fall River County). Finally, a living *H. nasicus* was found in Custer County near the summit of Elk Mountain (elevation = 1592 m) in Ponderosa pine forest with a grass understory.

Milk Snake (*Lampropeltis triangulum*)

Although *L. triangulum* occurs widely in western South Dakota, there are few records from this region (Ballinger et al., 2000), most likely due to the reclusive nature and fossorial habits of this snake (Werner et al., 2004). We recorded five *L. triangulum* during this survey, including three from Buffalo Gap National Grassland west of Edgemont (Fall River County), and two at widely separated sites on PRIR (Shannon County) (Figure 11). Milk snakes have not been previously reported from either of these counties (Ballinger et al., 2000). Milk snakes in Buffalo Gap National Grassland were found by over-turning rocks on south and southwest facing slopes above steep-sided but shallow canyons from 22 to 25 June 2004. The surrounding habitat is arid grassland with a significant component of big sagebrush; soils are silt and clay (Kalvels, 1982). One snake was found coiled in a rodent tunnel beneath a large slab of rock. Trapping data indicate that deer mice (*Peromyscus maniculatus*) are abundant in this area (Platt et al., unpubl. data) and probably constitute an important food source for *L. triangulum*. We recorded two DOR *L. triangulum* in Shannon County; one was found along BIA Hwy 2 in rolling grassland (23 June 2003) and another in a vacant lot within the urban limits of Pine Ridge (27 July 2004).



Figure 11. Map of Fall River and Shannon counties, South Dakota showing locations (stars) where milk snakes were encountered in 2003-2004.

Smooth Green Snake (*Liochlorophis vernalis*)

The smooth green snake has an unusual distribution in South Dakota that is difficult to explain (Ballinger et al., 2000). *Liochlorophis vernalis* has been reported from the extreme northeastern portion of the state, there is a single record from Clay County in southeastern South Dakota, and the species is common at higher elevations in the central and northern Black Hills (Smith, 1963; Ballinger et al., 2000; Williams and Platt, 2004; Collins et al., 2005); however, the occurrence of *L. vernalis* in the southern Black Hills is poorly documented (Robbins, 1952; Smith, 1963; Ballinger et al., 2000). Although we failed to record *L. vernalis* during our survey, in July 2001 Dr. Kent Jensen (South Dakota State University; pers. comm.) found a DOR specimen on 7-11 Road, approximately 1.5 km east of Hwy 385 at an elevation of 1175 m. To our knowledge this is the southernmost and lowest elevational record for *L. vernalis* in the Black Hills.

Gopher Snake (*Pituophis catenifer*)

The gopher snake has been reported from every county within our study area (Ballinger et al., 2000) and was the most frequently encountered snake during our survey. We recorded 42 of these large conspicuous snakes from Bennett, Custer, Fall River, Jones, Mellette, Pennington, and Shannon counties during 2004. This total included 12 (28.5%) snakes found during visual encounter surveys and another 30 (71.4%) snakes observed either alive or dead on roads. The first and last gopher snakes recorded in 2004 were a juvenile and adult found on 7 April and 28 September, respectively. We encountered *P. catenifer* in a variety of habitats, including grasslands, riparian areas, rocky slopes, Ponderosa pine forests, and wetlands. Several *P. catenifer* as well as shed skins were also found in rodent burrows indicating gopher snakes spend considerable periods underground. *Pituophis catenifer* was frequently found by Vaughan (1961) inhabiting pocket gopher burrows in Colorado.

Plains Garter Snake (*Thamnophis radix*)

Thamnophis radix has been previously reported from every county within our study area (Ballinger et al., 2000). We recorded 16 *T. radix* from Bennett, Custer, Fall River, Pennington, and Shannon counties during 2004. This total included 12 (75.0%) snakes found during visual encounter surveys and 4 (25.0%) snakes observed either alive or dead on roads. Enge and Wood (2002) note that small-bodied snakes such as *Thamnophis* are less conspicuous and more likely to be over-looked than larger snakes during road surveys. Most *T. radix* occurred in the vicinity of wetlands; 10 were found on the floor of mesic canyons in the southern and southeastern Hogback in Fall River County. We observed a plains garter snake swallowing a small, badly decomposed unidentified passerine bird in a wetland on the floor of Lindsley Canyon. Similar observations of necrophagy by *T. radix* have been reported by others (Werler and Dixon, 2000; Stebbins, 2003).

Common Garter Snake (*Thamnophis sirtalis*)

Thamnophis sirtalis was recorded only from Bennett County during our survey. We encountered five *T. sirtalis* while searching for anurans in heavily vegetated waterfowl impoundments at Lacreek National Wildlife Refuge and found another in sandhills approximately 10 miles south of Tuthill on 29-30 June 2004. Similarly, Maralet (1977) stated that *T. sirtalis* was "frequently observed along the edges of ponds" at Lacreek National Wildlife Refuge. The distribution of *T. sirtalis* in the counties to the west of Bennett County is unclear. We failed to find *T. sirtalis* in Shannon and Fall River counties, and while Ballinger et al. (2000) reports numerous records from the Black Hills in Custer and Pennington Counties, only a single record is available from western Fall River County. Collectively, these observations suggest that *T. sirtalis* is uncommon in extreme southwestern South Dakota outside of the Black Hills.

Summary

Our survey identified two areas worthy of further investigation: sandhills in southern Shannon County and sagebrush habitats in central and western Fall River County. Sandhill habitat is limited in South Dakota, but contiguous with the sandhill ecoregion that characterizes much of western Nebraska (Hudson, 2002). Four (*Sceloporus undulatus*, *Holbrookia maculata*, *Cnemidphorus sexlineatus*, and *Eumeces multi-virgatus*) of the six species of lizards known to occur in South Dakota (Ballinger et al., 2000) were found in the sandhills of southern Shannon County; notably all are monitored by the Natural Heritage Program of the South Dakota Department of Game, Fish, and Parks (Stukel and Backlund, 1997; South Dakota Department of Game, Fish, and Parks, 2003). Moreover, *Terapene ornata* is common in the Nebraska sandhills, and likely occurs in the sandhills of Shannon County, although our records were obtained north of this region. Sagebrush habitats in Fall River County appear locally unique and yielded few species; these however, were among the least common species encountered during the survey, and included *Phrynosoma hernandesi*, *Cnemidphorus sexlineatus*, *Lampropeltis triangulum*, and *Heterodon nasicus*. Significant tracts of this habitat are protected within Horsehead Creek Game Production Area and Buffalo Gap National Grasslands west of Edgemont.

Acknowledgements

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Rapid Early Growth in Northeastern Kansas Timber Rattlesnakes

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Fitch and Pisani (2006) summarized the rapid early growth and maturation of Timber Rattlesnakes (*Crotalus horridus*) in northeastern Kansas. Snakes make significant gains in length, with concomitant gains in mass, through their 6th shed. Fitch (1999) presented evidence that *C. horridus* females from northeastern Kansas mature generally in their third year, and breed biennially or perhaps even annually—far more frequently than documented for the species in the cooler habitats utilized through the eastern parts of its range. Since the publication of Fitch and Pisani (2006), two additional specimens of *C. horridus* from our study area provide added illustration of this rapid growth.

On 8 September 2006, a young male was killed on property adjacent to the Nelson Environmental Study Area. He measured 775 mm total length and 699 mm SVL, and bore a button plus three rattles, and we estimate his age as 2 years. Our longest male with 3 rattles +button measured 720 mm SVL and total length of 799 mm; the longest female of that age class measured 655 mm SVL and 711 mm total length. Martin (2006, Pers. comm.) indicated

that a typical male Timber Rattlesnake from the central Appalachian populations measuring ca 775 mm total length would be 3-4 years old, and one from the High Allegheny populations would be 4-5 years old.

On 22 September 2006, a mature female from our study population was accidentally killed by field station personnel. She had first been captured on 21 April 2003, newly emergent from hibernation, with just a button; she was 403 mm SVL with a mass of 42 g, and evidently had been born the previous Fall. When killed, she carried 9 + button rattles, measured 890 mm SVL, weighed 616 g, and contained 4 enlarged and well-yolked ovarian follicles averaging 35.5 mm x 24.0 mm. Her stomach contained an unidentified and well-digested rodent and anterior to that an adult Prairie Vole (*Microtus ochrogaster*). Thus, in 41 months (short of four growing seasons) she had more than doubled her length, and increased in mass by a factor of 14.6, and she reached sexual maturity. Two other females from this population (collected 19 September 1990 and 31 March 2006) with comparable

rattle strings (both with 9 segments and button missing) measured 883 mm SVL (mass 370 g) and 880 mm SVL (mass 550 g).

Prairie voles constituted 33% of the identified prey animals taken by *C. horridus* in our study population (Fitch and Pisani 2006), and from May through August of each activity season snakes typically forage in open fields with vegetation consisting of grass (largely brome), mixed grasses/forbs, or the prairie tracts maintained on nearby KBS land. Timber Rattlesnakes in a southern Iowa population utilize similar habitats in summer (Frese, 2006, Pers. comm.). Prairie voles are likely to be the most abundant small mammal species in these habitats (KBS/KSR unpublished data), and density can reach 200/acre in suitable habitat (Bee, et al. 1981; Timm et al. 2002). Populations of *C. horridus* from forested eastern parts of the species' range feed predominantly upon four species of small mammals (Klauber 1972): Chipmunks (*Tamias striatus*), White-footed and Deer Mice (*Peromyscus* sp), and Meadow Voles (*Microtus pennsylvanicus*). Wolff (1996) presented evidence that population densities of chipmunks and mice (*Peromyscus* sp.) in eastern deciduous forest are considerably lower and more variable (depending largely upon annual mast production) than densities cited for northeast Kansas *Microtus*, which are grazers on abundant low-growing grasses. Our study area is not within the range of chipmunks. Eastern *Microtus* populations in favorable habitat do cycle annually (see discussion in Taitt and Krebs 1985), but *Microtus* may not be as large a diet component for montane Timber Rattlesnakes as for northeast Kansas ones. An added factor affecting chipmunk population density involves their home range size, which varies between 0.5-1.0 acre and is actively defended (Elliott, 1978).

Other factors may operate to provide snakes from our study area with a sustained food resource favorable to rapid early growth and maturation. Our study area is a mosaic of small mammal habitats, and overall density of prey may in part be attributable to that. Kirkland (1977) documented increased small mammal abundance and diversity in disturbed (clear-cut) northern Appalachian forests.

Snakes from our study population have a longer activity season than many populations resident in eastern USA montane habitats. Martin (2002) studied montane West Virginia dens having a median activity season of 4.7-5.0 months. Snakes in our study area are active for approximately 174 days per year (typically April 15th – October 6th). However, more study plainly is needed, since Adams (2005) recorded activity seasons for her study dens in West Virginia that are similar to that shown by snakes in ours.

In conclusion, we believe that greater prey abundance, combined with the relatively long foraging season available to Timber Rattlesnakes in Kansas, explain the rapid growth. Early female maturation, and more frequent reproduction observed in snakes from our study population vs. those of east-

ern mountain habitats.

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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 will be selected by the KHS Awards Committee. The award of \$100 is given annually.

The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology

The Award is established in recognition of the scientific and photographic achievements of Suzanne L. Collins and Joseph T. Collins, whose life-long study and conservation of the native amphibians, reptiles, and turtles of Kansas is amply demonstrated in their extensive and excellent writings and photography, both academic and popular, about these animals. The Collins Award shall be presented no more than once each year. 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 native species of Kansas amphibian, reptile, and/or turtle and 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, reptiles, and/or turtles. The Collins Award is minimally \$1,000.00, and is neither a grant nor a scholarship. No nominations or applications can be made for it.

KANSAS HERPETOLOGICAL SOCIETY
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TOPEKA, KANSAS 66604

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