# Missouri Herpetological Association

# Newsletter

**Number 38**

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# MISSOURI HERPETOLOGICAL ASSOCIATION NEWSLETTER NO. 38

## Contents



**Cover**: Albino Western Wormsnake (*Carphophis vermis*) collected in Cole County, 10 June 2025 by Bob Krager . Photo by Jeff Brigger.

# INTRODUCTION

The Thirty-eight annual meeting of the **Missouri Herpetological Association** was held on 27-28 September 2025 at the **Ozark Education Center** in Taney, County.

This organization is designed to provide herpetologists in Missouri and surrounding states with an opportunity to meet and exchange ideas regarding current efforts in research and other professional activities. High on the list of priorities is to provide students, involved in research at either the graduate or undergraduate level, (1) the chance to interact with senior herpetologists, and (2) an outlet to present, in a semi-formal setting, the results of their labors.

This newsletter is the result of a decision made at the 1988 inaugural meeting to provide a means of publicly acknowledging papers presented at this and subsequent annual meetings. Further, the newsletter will inform the herpetological community of new distribution records of Missouri's herpetofauna, additions to the bibliography dealing with the state herpetofauna and provide an outlet for the publication of short notes dealing with the natural history of Missouri amphibians and reptiles.

# ANNOUNCEMENTS

## 39th Annual Meeting of the Missouri Herpetological Association

The Thirty-nineth annual meeting of the Missouri Herpetological Association will be held on 26-27 September 2026, location TBD. A "call for papers" will be sent electronically in mid-August. For more information, please contact **Jeff Briggler** at:

Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102-0180
(573) 751-4115 X3201
E-mail: jeff.briggler@mdc.mo.gov

# Abstracts of Papers Presented at the 38th Annual Meeting of the Missouri Herpetological Association

## Ozark Education Center
## 27-28 September 2025

### MONTHLY DIFFERENCES IN TURTLE CAPTURE EFFICACY IN A DIVERSE TEMPERATE TURTLE COMMUNITY

**Derek L. Bateman, Kevin B. Babbitt, Alexander Edmond, Day B. Ligon**
Department of Biology, Missouri State University, Springfield, Missouri

Turtle communities are of increasing interest for assessing conditions in aquatic ecosystems and surveys are of especially great value at sites where historical data are available for assessing trends and shifts in community structure. Such surveys are often executed over short time intervals at similar times of year (think academic calendar), yet results are presumed to accurately reflect size distributions, sex ratios, and species composition of a community. However, because of the limited distribution of survey efforts, biases in capture rates due to season and climatic conditions may skew conclusions. To test this, we trapped throughout the year to determine whether variation in season or water temperature influenced results. We conducted monthly trapping surveys in two species-rich tributaries (9 species of turtle detected in both systems) of the Neosho River in northeastern Oklahoma. Each trapping session typically spanned 2–3 nights of trapping and totaled 30–100 trap-nights of survey effort (there were exceptions in December and January when large portions of the creeks were frozen, limiting us to just 23 and 14 net nights, respectively). We used 0.9-m and 1.2-m diameter hoop nets hung with 2.5-cm mesh and baited with thawed fish (invasive carp and Striped Bass obtained from another study) or sardines and occasionally supplemented with smaller diameter spring traps to survey shallower waters. Surveys were conducted monthly from February 2024 through January 2025; however, water temperatures were <10 °C November–February and turtle capture rates were at or near zero (range = 0–2) and therefore we removed those months from further analyses. (Although we did the work to document it, we also assume that it is self-evident that wintertime trapping isn't appropriate for surveys of temperate turtles.) We captured 1600 turtles in 475 net nights in the eight months analyzed, and the results were clear: species and sexes were not equally detectable across months. Red-eared Sliders (*Trachemys scripta elegans*) dominated captures, with peaks in March and fall (though males and females disagreed on which fall month was best). Other species—including Ouachita Map Turtles (*Graptemys ouachitensis*), Alligator Snapping Turtles (*Macrochelys temminckii*), Common Snapping Turtles (*Chelydra serpentina*), and Spiny Softshells (*Apalone spinifera*)—also showed seasonal shifts, though with less consistent or less obvious patterns, especially when sample sizes were limited. Subsequent analyses separating sexes within species highlighted further differences, with males of all species and females of a subset of species exhibiting temporal patterns in detectability. These results indicate that assumptions regarding capture rates and analysis of turtle communities may be violated unless care is taken to survey across the entire active season. These biases should be noted in future turtle surveys to ensure that survey efforts are temporally distributed to ensure even detections across species and sexes.

## BODY COMPOSITION OF FREE-RANGING WILD AND HEAD-STARTED JUVENILE ALLIGATOR SNAPPING TURTLES (*Macrochelys temminckii*)

**Derek L. Bateman, Kevin B. Babbitt, Riley L. Austin, Day B. Ligon**
Department of Biology, Missouri State University, Springfield, Missouri

Alligator Snapping Turtles (*Macrochelys temminckii*) have declined in the Mississippi River and its tributaries, and in response a captive propagation and reintroduction program was established at Tishomingo National Fish Hatchery in 1999 with the goal of reestablishing extirpated populations and augmenting those that were unlikely to recover without intervention. Head-started juveniles were released at a site in northeastern Oklahoma to augment an existing but depleted population in 2020 and 2021, and recent survey efforts (2023–2025) have demonstrated that both wild and introduced juveniles are present. The cooccurrence of both groups and their significant overlap in body size presented the opportunity to compare the body composition of the released and wild juvenile turtles to assess the potential for long-term effects of captivity. In 2025 we captured both wild and head-started juvenile Alligator Snapping Turtles, which we then scanned using a dual-energy X-ray absorptiometer (DEXA) to nondestructively estimate lean-tissue mass, fat mass, bone density, and bone-mineral mass. The turtles were then returned to their home river and released at the point of capture. While wild ($n = 3$) and head-started ($n = 10$) turtles exhibited comparable fat mass and lean-tissue mass, head-started turtles appeared to have proportionally more bone mass ($F_{1,10} = 11.69$, $P < 0.01$) overall as well as marginally higher bone density ($t_{11} = 2.07$, $P = 0.062$, 95% CI [-0.01, 0.23]) than their wild counterparts, a pattern that is consistent with results of a previous study that compared captive to released individuals and that may reflect differences in growth rate during early development. The persistence of differences in body composition between wild and head-started juvenile turtles after 4–5 years of occupying the same aquatic system was surprising and suggests that at least subtle effects of captivity may be quite persistent, though the ecological ramifications of the observed differences remain to be determined.

## WHAT HAVE WE LEARNED AFTER TRAPPING TURTLES FOR 17 YEARS ON A COLLEGE CAMPUS?

**Mark S. Mills, Claudia Cartaya, Angel Justus, Jared Kelly, Tadyn Shaffer, and Emily Sweet**
Department of Biology - Missouri Western State University, St. Joseph, MO

My students and I marked the very first turtles in the nine ponds on the campus of Missouri Western State University (MWSU) in St. Joseph, MO, in September 2008. Since that time, we

sampled every pond every year at least twice, and in most years 3 or more times. We also sampled four ponds off campus. Based on 1041 total captures of 353 marked turtles, we can state the following: 1) 47 students have been on the “turtle team” and hundreds more have participated in turtle trapping through various classes, 2) every pond has snapping turtles, 2) we have three common and two uncommon species, and three non-native subspecies, 3) one of the smallest ponds on campus has the most marked turtles, 4) some turtles regularly move among the ponds, others seem to never move, 5) we captured one female Red-eared Slider 58 times since 2009, 6) sex ratio is not significantly different from 1:1 in any of the three common species, 7) turtles move off and on to campus. We will present the highlights of this long-term study of an urban metapopulation of turtles.

## USING ADULT MALE ALLIGATOR BELLOWS AS AUDITORY STIMULI TO STUDY THE STRESS PATHWAY IN JUVENILE AMERICAN ALLIGATORS (*Alligator mississippiensis*)

**J. Finger and M. Kelley**
Department of Biology, Missouri State University, Springfield, Missouri

It is well-known that juvenile alligators are social, staying together in cohorts during early life stages. This social behavior allows the advantages of protective parental care via maternal interactions and/or sibling alarm calls, warning of predators, such as adult male alligators that may cannibalize and consume juvenile alligators. In this study, we co-opted the use of adult male alligator bellows to determine if these ecological sensory cues stimulate a stress response or to what extent a stress response can be elicited through the sound of a potential predator. After presentation of adult male alligator bellows, blood samples of each individual were immediately taken and then again at 24 -hours for analysis of stress hormones (e.g., mainly corticosterone), white blood cell differentials, heat shock proteins and antioxidants, and inflammatory genes and metabolites. Acute stress responses can be beneficial to individual survival through the mobilization of energy stores to minimize predation risk. However, pro-longed stimulation can be detrimental through immune suppression. This study will add to our understanding of how sensory stimuli can influence stress physiology in a long-lived, top trophic carnivore.

## CIRCADIAN RHYTHM’S INFLUENCE ON BEHAVIORAL AND PHYSIOLOGICAL PERFORMANCE OF *Agkistrodon piscivorus*

**Bryce Jarrett, Olivia Hoffner, Sam Walker-Schaefer**
Department of Biology, Missouri State University, Springfield, Missouri

Many animals exhibit distinct diel activity patterns that are often generalized as diurnal, nocturnal, or crepuscular, reflecting conditions under which hormonal and sensory systems are optimized. While some snake species display discrete diel patterns, others exhibit more labile activity schedules that allow both daytime and nighttime activity. We used a repeated measures design to evaluate the influence of time of day on behavioral (latency to feed) and physiological (swimming

speed) traits in juvenile Northern Cottonmouths (*Agkistrodon piscivorus*), a species that appears to shift activity schedules seasonally. Latencies to emerge from shelter were less variable during nighttime feeding trials, although means for daytime and nighttime trials were not significantly different. After emerging from shelters, the distribution of responses for striking at prey were very similar for both testing times. Swimming speed increased significantly with increasing temperature, but snakes swam at equal mean velocities day and night at each temperature. Unlike some snake species that exhibit performance dichotomies that reflect their preferred activity period, our results suggest that *A. piscivorus* is a cathemeral species. However, because we standardized illumination levels across time periods, the difference in emergence times in feeding trials suggests a nocturnal bias in diel activity. Our results suggest that time of day may have differential effects on separate types of response variables, and that performance measures alone may not be an accurate indicator of preferred activity times.

## VARIABLE PREY HANDLING BEHAVIORS AND THE EFFECTS OF BODY TEMPERATURE VARIATION ON STRIKE-INDUCED CHEMOSENSORY SEARCHING IN NORTHERN COTTONMOUTH SNAKES (*Agkistrodon piscivorus*)

**Bryce F. Jarrett and Brian Greene**
Department of Biology, Missouri State University, Springfield, Missouri

The foraging strategy of vipers is typically characterized by a sequence of behaviors known as strike-induced chemosensory searching (SICS), where prey are struck and envenomed, released, trailed, and consumed. An increase in the post-strike tongue flicking rate (TFR) of vipers facilitates the location and trailing of prey chemical cues. Although snakes typically release envenomed rodents – presumably to avoid retaliatory injuries – harmless prey (e.g. frogs and small lizards), or those that may not deposit a scent trail (e.g. birds) are likely to be held post-strike. Additionally, while it is known that body temperature greatly impacts the performance of reptiles, no studies examining the accuracy of post-strike scent trailing in relation to body temperature have been performed. I conducted two foraging experiments on northern cottonmouth snakes (*Agkistrodon piscivorus*) to determine if prey capture behavior varied across three ecologically relevant live prey types: fish (*Pimephales* spp.), frogs (*Acris blanchardi*), and mice (*Mus musculus*). I measured whether prey was held post-strike, pre- and post-strike tongue flick rates, and whether prey were consumed alive or dead. I also conducted an experiment in which I measured the post-strike scent trailing accuracy of seven cottonmouth snakes after striking mice at three different ecologically relevant body temperatures. Harmless and un-trailable prey types were held post-strike and consumed alive while mice tended to be released post-strike and were consumed dead. Post-strike TFRs were lower at lower body temperatures, but body temperature did not significantly impact trailing accuracy during SICS. Snakes exhibited significantly more exploratory behavior at lower body temperatures and significantly less exploratory behavior at higher body temperatures during SICS. These findings provide insight into the dynamic foraging behaviors of pit vipers and offer a greater understanding about how thermal conditions impact their foraging ecology.

## EVIDENCE FOR RISK EXTRAPOLATION IN DECISION MAKING BY TADPOLES

**Adam Crane and Maud Ferrari**
School of Mathematical and Natural Sciences, University of Arkansas at Monticello, Monticello, AR,

Through time, the activity patterns, morphology, and development of both predators and prey change, which in turn alter the relative vulnerability of prey to their coexisting predators. Recognizing these changes can thus allow prey to make optimal decisions by projecting risk trends into the future. We used tadpoles (*Lithobates sylvaticus*) to test the hypothesis that tadpoles can extrapolate information about predation risk from past information. We exposed tadpoles to an odor that represented either a temporally consistent risk or an increasing risk. When tested for their response to the odor, the initial antipredator behavior of tadpoles did not differ, appearing to approach the limit of their maximum response, but exposure to increasing risk induced longer retention of these responses. When repeating the experiment using lower risk levels, heightened responses occurred for tadpoles exposed to increasing risk, and the strongest responses were exhibited by those that received an abrupt increase compared to a steady increase. Our results indicate that tadpoles can assess risk trends through time and adjust their antipredator responses in a way consistent with an extrapolated trend. This is a sophisticated method for prey to avoid threats that are becoming more (or less) dangerous over part of their lifespan.

## STATUS OF THE NORTHERN CRAWFISH FROG (*Lithobates areolatus*) IN MISSOURI

**Jeffrey T. Briggler**
Missouri Department of Conservation, Jefferson City, MO

No abstract submitted

# NEW AND PREVIOUSLY UNREPORTED HERPETOLOGICAL DISTRIBUTION RECORDS FOR MISSOURI IN 2025

**Richard E. Daniel[1], Brian S. Edmond[2] and Jeffrey T. Briggler[3]**
[1]Division of Biological Sciences (ret.), University of Missouri, Columbia, MO 65211
[2]Computer Services, Missouri State University, Springfield, MO 65897
[3]Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102

The following list represents new county records accumulated or brought to our attention since the publication of Briggler and Johnson (2021) and Daniel and Edmond (2024). Publication of these records extends our knowledge of the amphibians and reptiles found within the state of Missouri. In addition, recipients of this list have an opportunity to update checklists and distribution maps. Finally, the publication of this list allows us to acknowledge the contributions of the many individuals who have contributed information or specimens.

The records listed below represent the first report of the species within a given county and are based on catalogued voucher specimens or photographs deposited in a public institution. Distribution records are presented in the standardized format of Collins (1989): common and scientific name, county, specific locality (unless withheld for species of special concern), legal description of locality, date of collection, collector(s), catalogue number and institution where the specimen is deposited. Beginning in 2020 the published legal description of the locality was restricted to township and range. Nomenclature and common names follow Nicholson (2025) and updates from the *SSAR North American Species Names Database*.

Specimens reported in this note have been deposited in the Dean E. Metter Memorial Collection, University of Missouri, Columbia, MO (UMC). Unless otherwise indicated, all distribution records are documented by post-metamorphic/hatchling fluid preserved specimens.

We would like to extend our appreciation to H. Al Harash, N. Bass, and L. San Diego for contributing photographs that were used in this note.

**AMPHIBIA: CAUDATA (SALAMANDERS)**
EASTERN NEWT
*Notophthalmus viridescens*
**Chariton Co.:** ~3.0 km N Mendon (T55N R20W); 15 March 2025; J. Folkerts (digital image, UMC 5283P)

**AMPHIBIA: ANURA (FROGS)**
WOODHOUSE'S TOAD
*Anaxyrus woodhousii*
**St. Louis Co.:** Earth City (T46N R5E); 24 April 2025; H.H. Al Harash (digital image, UMC 5281P).

**TESTUDINES (TURTLES)**
SPINY SOFTSHELL
*Apalone spinifera*
**Henry Co.:** Haysler Poague Conservation Area (T43N R27W); 31 August 2025; N. Bass (digital image, UMC 5287P).

**Literature Cited**

Briggler, J.T. and T.R. Johnson. 2021. *The amphibians and reptiles of Missouri* (3rd ed.). Missouri Department of Conservation, Jefferson City, Missouri.

Collins, J.T. 1989. New records of amphibians and reptiles in Kansas for 1989. *Kansas Herpetological Society Newsletter* (78): 16-21.

Daniel, R.E. and B.S. Edmond. 2024. *Atlas of Missouri Amphibians and Reptiles for 2023.* <http://atlas.moherp.org/pubs/atlas23.pdf>

Nicholson, K. E. (ed.). 2025. *Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding.* Ninth Edition. Society for the Study of Amphibians and Reptiles. 87pp.

**ADDITIONS TO THE BIBLIOGRAPHY OF HERPETOFAUNAL REFERENCES FOR MISSOURI**

Compiled by
**Richard E. Daniel**
Division of Biological Sciences (ret.), University of Missouri, Columbia, MO 65211

The following is a list of publications dealing with the biology of amphibians and reptiles from Missouri that have been brought to the attention of the author since the publication of Daniel (2024). Readers are requested to notify the author of any additional references that should be included in future compilations.

Conley, A.K. J.L. Neuwald and A.R. Templeton. 2021. Network analyses of the impact of visual habitat structure on behavior, demography, genetic diversity, and gene flow in a metapopulation of collared lizards (*Crotophytus collaris collaris*). In New Horizons in Evolution; Wasser, S.P., Frenkel-Morgenstern, M., Eds.; Academic Press: Oxford, UK, 2021; pp. 131–160.

Gittemeier, L., K. Kapral, B. Schuette and R. Edwards. 2024. Climbing Behavior in adult Ringed Salamanders (*Ambystoma annulatum). Missouri Herpetological Association Newsletter*. (37): 13-16.

Heeb, A.B., C. Light, W.F. Hanson-Regan, G.L. Buelow, J.D. Heeb, B.R. Wolhuter, A. F. Ellison, D.R. Ellison, D.S. Whitney, J.A. Gibson, D.E. Carpenter, M.R. Smith, S.K. Schiffelbein, T. P. Bentz, B. S. Lister, E.N. Melgren, V.N. Vester, A. J. Bartels, H. L. Clark, C.M. Vermillion, E.O. Jones, L.C. Priest, E.I. Houchin, K.L. Weston, L.M. Prowant, and H.L. Lacke. 2024. Turtle Races: A Threat to Wild Turtle Populations? *Herpetological Review* 55(1): 11-18.

Neuwald, J.L. and A.R. Templeton. 2013. Genetic restoration in the eastern collared lizard under prescribed woodland burning. *Molecular Ecology* 22: 3666-3679.

Peterson, A.A., K.E. DeMatteo, R.J. Michaelides, S. Braude, A.R. Templeton. 2025. Time Series Analysis of Vegetation Recovery After the Taum Sauk Dam Failure. *Remote Sensing* 17, 1605. https://doi.org/10.3390/rs17091605

Templeton, A.R. and J.L. Neuwald. 2025. If You Burn It, They Will Come: Collared Lizard Colonization of Ozark Mountains Under Prescribed Burns. *Land* 14, 1696. https://doi.org/10.3390/land14081696

Templeton, A.R., J.L. Neuwald and A.K. Conley. 2023. Age structure dynamics in an eastern collared lizard population from founding too demographic stability. *Animal Conservation* 23: 165-173.

Templeton, A.R., J.L. Neuwald and A.K. Conley. 2024. Life history changes in the eastern collared lizard in response to varying demographic phases and management policies. Population Ecology 66: 53-67.

## Literature Cited

Daniel, R.E. 2024. Additions to the bibliography of herpetofaunal references for Missouri. *Missouri Herpetological Association Newsletter*. (37): 17-18.

# Roadkill Observation and Data System

The National Park Service and US Fish and Wildlife Service partnered with the Western Transportation Institute - MSU to develop a standardized WVC data collection system for federal land management agencies.

Now, through a partnership with The Center for Large Landscape Conservation, this system is available for Citizen Science use in Missouri!

## Get the App

1. Go to the App Store or wherever you usually download your apps.
2. Search for the free "Survey 123" app and select "GET" for Apple devices and "Install" on Android.
3. Once the App has downloaded, click "continue without signing in" and allow camera access to scan the QR code.

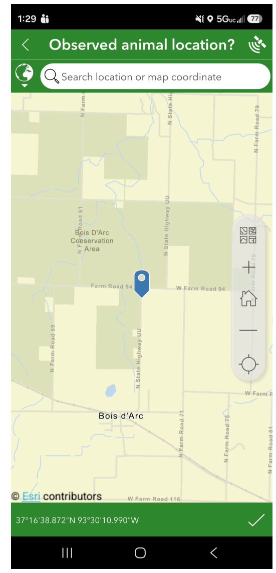
**BE SAFE!**

**Always Use Caution When Collecting Data on Roads!**

**It is best to have a passenger in the Vehicle collect data for vou**

4. Open the form using Survey123. Please Read the training materials for data entry instructions.

5. Now you're ready to start collecting data!



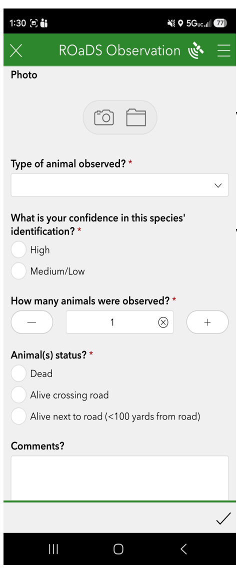

## Collecting Data

Obtain the location:

- Your location should automatically show on the map.
- You can also adjust this manually if necessary.
- To lock in your location, you MUST click the check mark in the bottom right corner.
- Once the location is locked in, it is saved and you can fill in the rest of the form from a safer location if necessary!

Fill in the rest of the observation information:

- **Photo** - The photo is optional. Please only take a photo if you are in a safe location!

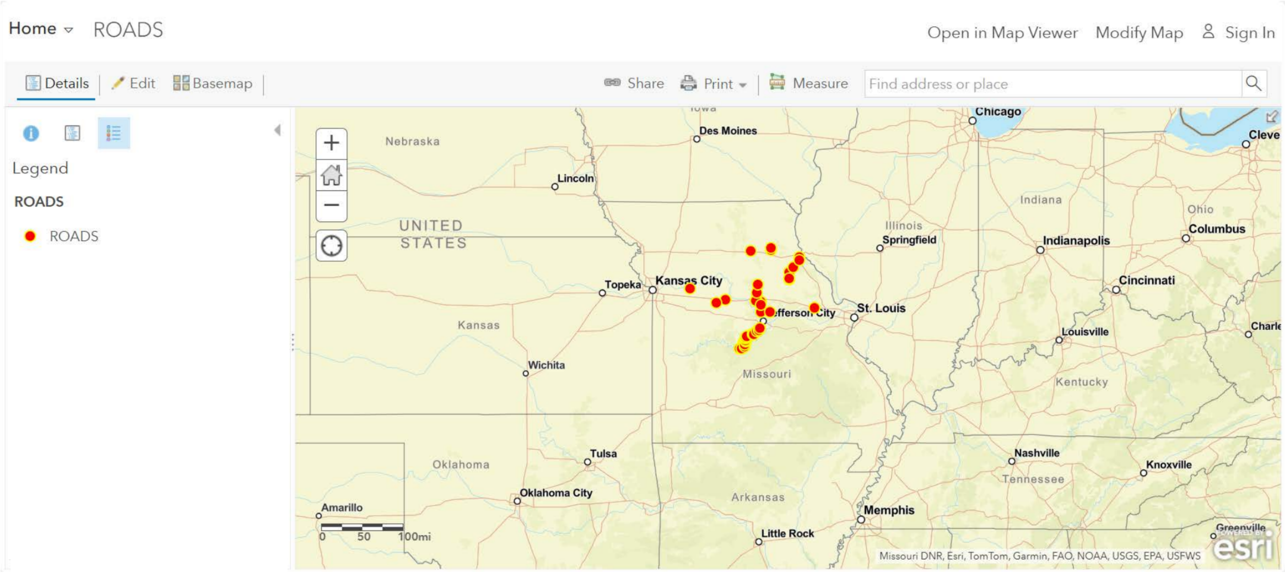



- **Type of Animal Observed** - Choose from the drop-down list of common species. If you don't see the species you are looking for on the list, you can select "Other" and then will be given space to type in the species. Only one type of animal can be entered at once. If two or more species are seen together you will need to make an additional entry for each species. If you are unable to ID the species you observed, please select "Unknown."
- **Confidence Level** - How positive are you that you've correctly identified the species? Sometimes this can be really challenging with roadkill!
- **Number of Animals** - This is just for the one species you are making a record for.
- **Animal Status** - REMEMBER, we want to know where animals are approaching/trying to cross the road as well as where they are getting hit!
- **Comments** - If you are making multiple entries for different species please make a note of that! If you are confident in your identification skills and can accurately identify the animal down to the species level, you can indicate that here as well (Latin or common name is acceptable). Also, please enter your 3 initials in the comment box so that we can track how many different people have contributed to this effort.

***WARNING! NEVER USE THIS APP WHILE DRIVING!*** *Driving requires your full and cautious attention. To make a report on the app, park in a safe location or have a passenger take your phone and ask them to make the report. Parking on a road can be dangerous. When making a report, always be aware of your safety and surroundings, especially approaching vehicles.*

## View Data

Access the online application at: https://moherp.org/roads. All the data collected will be available in real time using our online dashboard! Basic stats and other citizen collections will be visible here.




## Questions?

Please contact Caleb Knerr with any questions at Caleb.Knerr@modot.mo.gov.