MISSOURI CONSERVATIONIST

VOLUME 80, ISSUE 10, OCTOBER 2019
SERVING NATURE & YOU

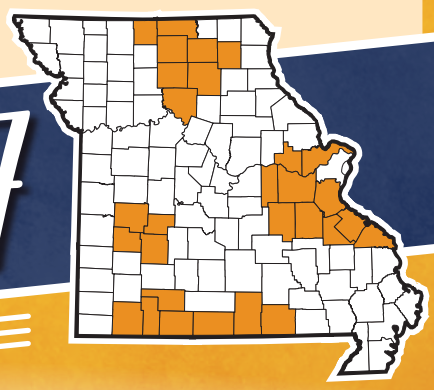
HUNTERS, HELP US!

MANDATORY CWD SAMPLING OF DEER OPENING FIREARMS WEEKEND IN 29 COUNTIES

Bring your deer to a sampling station near you.

The 29 mandatory CWD sampling counties are:

Adair, Barry, Cedar, Chariton, Christian, Crawford, Franklin, Gasconade, Hickory, Howell, Jefferson, Knox, Linn, Macon, Mercer, Oregon, Ozark, Perry, Polk, Putnam, St. Charles, St. Clair, St. Francois, Ste. Genevieve, Stone, Sullivan, Taney, Warren, and Washington.



NOVEMBER 16-17

Get information on chronic wasting disease and sampling locations at MDC.MO.GOV/CWD, or in the *2019 Fall Deer & Turkey Hunting Regulations and Information* booklet available where permits are sold.

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MISSOURI CONSERVATIONIST

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Nikon Coolpix S7000
f/3.4, 1/250 sec, ISO 125

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Inbox

Letters to the Editor
Submissions reflect readers' opinions and may be edited for length and clarity. Email Magazine@mdc.mo.gov or write to us:
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PO BOX 180
JEFFERSON CITY, MO 65102

OPOSSUMS

I found this article [*Awesome Opossums*, August, Page 22] one of the best I have read in the *Missouri Conservationist*. I have been a reader for more than 40 years.

Steve Anderson
via email

MORE AWESOME OPOSSUMS

My husband and I love this magazine, and we learn so much from the wonderful articles. I was pleasantly surprised to learn about our native opossums, and will never again think of them as vermin. They really are amazing creatures.

Andrea Mockridge Higginsville

The article was probably the best I have ever read in the *Conservationist*, and you have put out some good ones. How little I knew about this mammal. I may not love them yet, but I sure like them a whole lot better. I'm sure I will grow to love them now that I have this new respect for them.

Terry Thompson via email

Thanks for the awesome magazines that come in the mail each month. I always enjoy the articles I read, especially the *Awesome Opossums* that came in the August issue. It was eye-opening to see how useful opossums are to a neighborhood, and why they are called opossums as well. Many people I know don't even like looking at them, so thank you for publishing this article to teach them how much every part of nature matters, even the ugly parts. As a Boy Scout, I love nature, and the *Missouri Conservationist* helps support that every month.

Alexander Ficken Maplewood

HOORAY FOR MAGAZINES

Thank you for producing a wonderfully informative and interesting magazine! My kids enjoy the magazine so much that they often steal my copy and compete to be the first to read the kids version of the magazine [*Xplor*]. The *Missouri Conservationist* has made me more aware of all the programs that the department offers. Keep up the great work and keep the print issues coming!


Opossum

There is simply no replacement for print magazines. I love having my kids on either side of me while we read and look at pictures. When I'm done with the magazine, I leave it in public places so others can read about the great things that the department is doing.

Dan Grzina St. Charles

THANKS FOR THE MEMORIES

Your August cover immediately took me back to my childhood in the 1950s. Between the ages of 8–12, my dad and I would walk a path just like the cover to fish in the Lamine River at Otterville. A distant relative of my dad's lived in an old log cabin back in the woods above the river. He kept an old rowboat tied up and we were allowed to come and use it. How I loved going fishing with my dad then. On the same land, we would follow a similar path to mushroom hunt. I felt like Daniel Boone in those days.

Between ages 10–12, you would find my friends and I on our bikes, lunches packed, and off to a place where we would hike deep into the woods like your cover. The trail would lead us to a high ledge with a small cave. It was called Sunshine Rock. We would sit on that rock, eat our lunch, look out across the tops of trees and think we were on top of the world.

Thank you for bringing those long ago years back to me just from looking at the August cover.

Ramona Allen Sedalia

OPOSSUM: DAVID CAPPAERT, MICHIGAN STATE UNIVERSITY, BUGWOOD.ORG

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Have a Question for a Commissioner?
Send a note using our online contact form at mdc.mo.gov/commissioners.

Want to see your photos in the Missouri Conservationist?

Share your photos on Flickr at flickr.com/groups/mdcreaderphotos–2019, email Readerphoto@mdc.mo.gov, or include the hashtag #mdcdiscovernature on your Instagram photos.

1

1 | Wood duck by Garrett Derr, via Instagram

2 | Emery fishing by Marshall Basham, via email

3 | Tall thistle by William Allen, via Flickr

2

3

LLOYD GROTJAN OF FULL SPECTRUM PHOTO

Up Front

with Sara Parker Pauley

I recently read a letter a dear friend wrote to his young grandchildren. It was a literary masterpiece. If my grandparents had penned something similar, I would treasure it beyond measure. It was a charge to take the long view — and included an indictment of the world today with its frequent focus on temporary gain regardless of future cost. He opined on their obligation to care for nature in all its forms, to steward our resources wisely as our lives depend upon their safekeeping.

One of the challenges of my job is to remember that the mission I am charged to uphold requires taking the long view, despite the immediate demands of the day. Yes, the mission includes providing ample opportunities to use and enjoy our resources today, but not at the expense of their long-term health and sustainability. And every day I am privileged to witness MDC staff and our partners applying their expertise and talents to ensure we deliver on that mission for the long-term. (Read about new tools State Ornithologist Sarah Kendrick is using to track migratory birds on Page 22.)

Another famous grandfather gave a similar charge to the public, though generations ago. Teddy Roosevelt said, "Here is your country. Cherish these natural wonders, cherish the natural resources, cherish the history and romance as a sacred heritage, for your children and your children's children. Do not let selfish men or greedy interests skin your country of its beauty, its riches or its romance."

Sara Parker Pauley

SARA PARKER PAULEY, DIRECTOR
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Nature LAB

by Bonnie Chasteen

Each month, we highlight research MDC uses to improve fish, forest, and wildlife management.

A technician uses a receiver and antenna to locate previously tagged wild turkey.

WILDLIFE MANAGEMENT

Turkey Trapping

For the past five years, MDC biologists have been working with researchers at the University of Missouri, University of Montana, and University of Washington to study the survival and reproduction of wild turkeys in four north Missouri counties.

"We conducted the research almost exclusively on private lands, and it would not have been possible without the graciousness of hundreds of Missouri landowners who allowed us access to their properties," said Jason Isabelle, MDC's cervid program supervisor.

After capturing wild turkeys during the winter, banding them, and fitting them with radio-transmitters, researchers monitored the birds to determine how successful they were at nesting and rearing young. Fieldwork ended in spring 2019, and now the team is analyzing data and preparing reports.

Although nesting success was reasonably good during most years, Isabelle said, poult survival was poor in all but one year of the study. "We're not exactly sure what was causing such low survival rates for those young turkeys," he said. "This is certainly something that needs further investigation and research."

Study yields survival and reproductive rates to help shape future harvest regulations and population monitoring

Isabelle said that the percentage of banded turkey harvested during the hunting seasons was relatively low. "On average, about one in four banded adult gobblers was harvested during the spring hunting season — harvest rates were considerably lower for jakes." Preliminary data indicates that less than 1 percent of the hens banded during the project were harvested during the fall hunting season.

Researchers will use the study's data to build population models. "These models will become the primary way that we estimate turkey numbers and monitor trends in their population," Isabelle said.

Turkey Numbers at a Glance

11 Average number of eggs in a wild turkey nest

28 Approximate number of days hen turkeys spend incubating their eggs

390,000 Estimated wild turkey population size in Missouri

1954 Year turkey restoration in Missouri began

1960 Year Missouri's modern spring turkey hunting season started

Project Funding

Federal Aid in Wildlife Restoration Funds and grants from the Missouri State Chapter of the National Wild Turkey Federation helped fund the project.

DAVID STONNER

Browse more research topics at **research.mdc.mo.gov**

In Brief

News and updates from MDC

JIM RATHERT

CHANGING REQUIREMENTS FOR LANDOWNER PERMITS

HIGHLIGHTED CHANGES INCLUDE INCREASED ACREAGE, DISCOUNTED PERMITS, AND A LANDOWNER REGISTRY

→ Starting in 2020, MDC will increase the minimum acreage requirement from five to 20 acres for resident landowners and members of their immediate households to receive free permits for deer and turkey hunting. Resident landowners with five or more acres and members of their immediate households can still hunt small game, fish on waters of the state, and trap on their qualifying properties without a permit.

Also starting in 2020, MDC will offer discounted deer and turkey hunting permits for nonresident landowners with 75 acres or more in a contiguous tract. Many nonresident landowners provide wildlife habitat work on their properties and those efforts can provide significant benefits to state wildlife resources.

MDC will also implement a landowner registry starting in 2020 for resident landowners to obtain free deer and turkey permits and for nonresident landowners to obtain discounted landowner permits. The registry is needed to help eliminate misuse of landowner permits and privileges. Conservation agents around the state find several hundred related violations each year. Learn more at **short.mdc.mo.gov/ZMh**.

NONRESIDENT HUNTING AND FISHING PERMITS GOING UP

MDC will increase the prices for some nonresident hunting and fishing permits starting in 2020. Permit prices have not been raised in over a decade and adjustments are needed to help keep up with increasing costs of providing conservation work and services around the state. Learn more at **short.mdc.mo.gov/ZMn**.

USE AUTO-RENEWAL FOR ONLINE PERMITS

Renewing Missouri hunting, fishing, and trapping permits is now easier and more convenient through our new online permit auto-renewal service. It allows online permit buyers to automatically renew their permits prior to the start of the next season or permit year so they never have an expired permit when they need it most.

Participation in auto-renewal is voluntary, and the service can only be activated by the permit buyer. Enrollment in auto-renewal can be done during an online permit purchase or by using the "Manage Your Account" feature. There are no additional fees for the service. Auto-renewal will automatically charge permit buyers for their enrolled permits. Learn more at **short.mdc.mo.gov/ZMs**.

TROUT PERMITS AND TAGS GOING UP, AND WE'RE TRYING SOMETHING NEW

After 20 years, MDC will raise the prices of annual trout permits and daily trout tags starting in 2020 to better cover costs of running trout hatcheries and providing more than a million trout each year for public fishing.

Starting in 2020, the cost of an annual trout permit will go from $7 to $10 for anglers 16 years of age and older and from $3.50 to $5 for anglers ages 15 and younger. Also starting in 2020, the cost of a daily trout tag to fish at three of Missouri's four trout parks — Bennett Spring State Park, Montauk State Park, and Roaring River State Park — will go from $3 to $4 for adults and from $2 to $3 for those 15 years of age and younger.

MDC will begin a pilot program at Maramec Spring Park next year where the daily limit will be raised from four to five trout and the cost of a daily trout tag will go from $3 to $5 for adult anglers and from $2 to $3 for those 15 years of age and younger. Learn more at **short.mdc.mo.gov/ZM7**.

WILD WEBCAST ON ELK, ELK HUNTING

Join us Oct. 9 from noon to 1 p.m. for a Wild Webcast on elk and elk hunting in Missouri. Get information on seeing wild elk in Missouri and on our upcoming elk hunting season, possibly starting in 2020. Our experts will share information, and participants can post questions throughout the webcast. Register at **short.mdc.mo.gov/ZMb**.

Ask **MDC**

Got a Question for Ask MDC?
Send it to AskMDC@mdc.mo.gov
or call 573-522-4115, ext. 3848.

Q: We found this mushroom on our property. Could you help us identify it?

→ This appears to be a young puffball in the genus *Calvatia*, possibly *Calvatia craniiformis*.

Craniiformis are medium to large puffballs that often develop distinctive, skull-like shapes as they mature. When sliced open, this mushroom's flesh is initially white but changes to olive-yellow as it matures.

This species is also thought to be a choice edible when immature. Use caution when ingesting them because other types of white mushrooms — such as the poisonous destroying angel (*Amanita bisporigera*) — have stages in which they could be mistaken for a puffball. Be sure to cut through any puffball from top to bottom to confirm it is pure white inside, like a marshmallow, with no sign of a cap or stem.

Craniiformis are saprobic, meaning they live in and derive their nourishment from dead, organic matter, and are usually found growing singly. Look for them on the ground in grassy areas or in open woods.


Puffball

MUSHROOM: EVAN PRESTI; TARANTULA: DAVID GRAHAM

Q: Where and when should you put up a wood duck nest box in Missouri?

→ Since natural cavities can be scarce, wood ducks readily use nest boxes. Sites near wetlands, rivers, and lakes are preferred. Boxes can be installed on posts in the water, at least 3 feet above the high-water mark, facing south or west. If installing

GIGGERS GET 15 MORE DAYS

MDC extended the fish gigging season by 15 days. This year's season will run Sept. 15 through Feb. 15, 2020. The move to lengthen the season was based on feedback we received through an online survey conducted last year.

Gigging is a type of spearfishing where participants use a long forklike spear, or gig. Fish harvested by gigging are known generally as "suckers." It is primarily a nighttime activity and is most effective in shallow, clear water. For more information, visit **short.mdc.mo.gov/Z4f**.

on land, choose a site within 100 feet from the water with no branches around the entrance hole and point the nest box toward the water. Predator guards should be installed.

Wood ducks pair up in January. It's a good idea to put nest boxes up well before the launch of breeding season, which starts in early April and continues through August.

Building a wood duck nesting box is sure be a rewarding experience. Featuring brightly hued plumage, male wood ducks are one of Missouri's most-beautiful breeding residents. Females' feathers are more subdued, but a distinguishing characteristic is the white eye ring that tapers to a point behind the eye.

For building plans, visit **short.mdc.mo.gov/ZMJ**.

Q: I found this tarantula dead in late September, perfectly intact. What might have killed it?

This tarantula (*Aphonopelma hentzi*) is a male, and it probably died while wandering in search of a mate.

Texas brown tarantula

As mature tarantulas approach the end of their lives, often in the autumn of their seventh year, they leave their home territories in search of females. By this time of their lives, the urge to procreate is so strong that even when presented with food, they rarely take the opportunity to eat.

After a few weeks of wandering, the males have either found mates or have exhausted themselves trying.

These spiders prefer dry, rocky glades where they live in silk-lined burrows in natural cavities such as rodent or reptile burrows. Shy and unaggressive, they prefer quiet and peaceful settings far away from people. But in late summer, they are commonly seen crossing roads in southern Missouri.

What IS it?

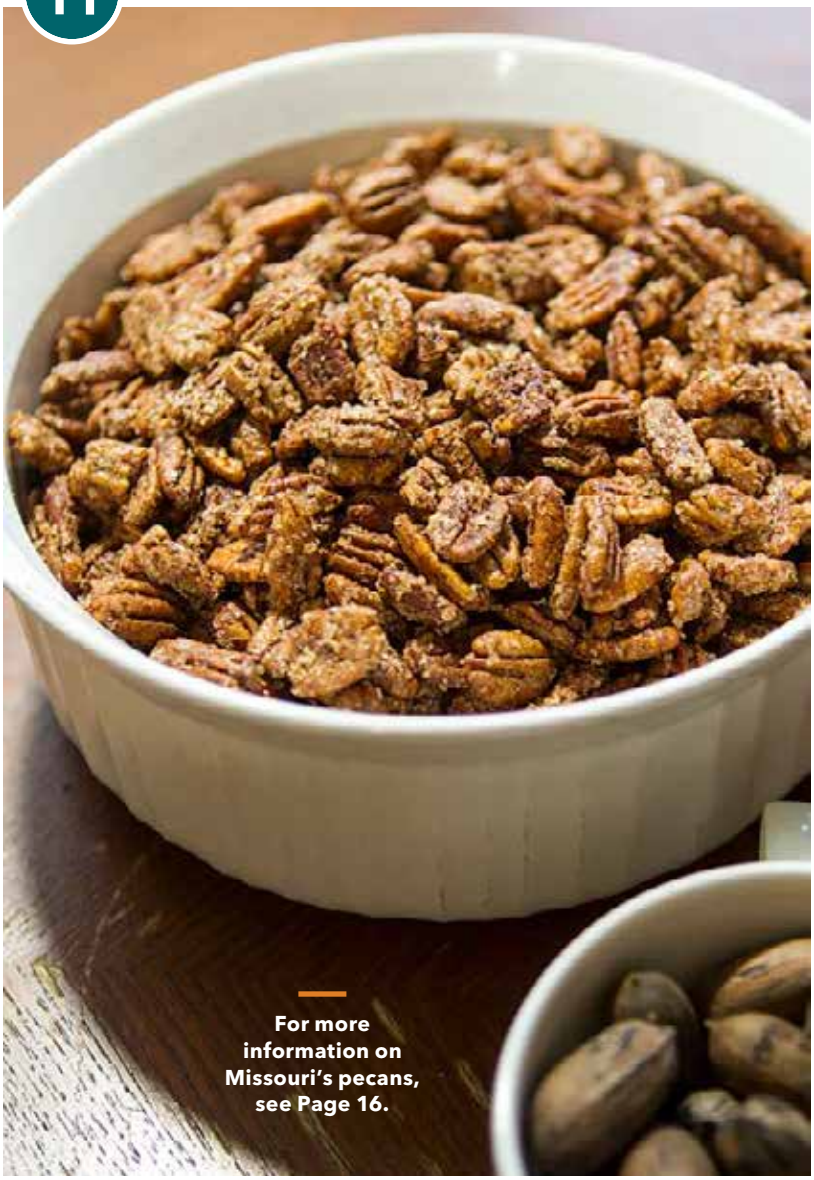
Can you guess this month's natural wonder?

The answer is on Page 8.

Mark Skelton
BUTLER COUNTY CONSERVATION AGENT
offers this month's

AGENT ADVICE

Early season for Canada geese and brant opens statewide Oct. 5. Get out early and scout the birds prior to hunting. Visit the agriculture fields they tend to frequent and get a sense of their behavior patterns. Birds can see color, so camouflage is key during this season. Blinds are useful, but natural cover works just as well. To hunt Canada geese and brant, you will need a Small Game Hunting Permit, a Migratory Bird Hunting Permit, and a Federal Duck Stamp. For more information on the early season for Canada geese and brant, check out Page 16 of the *Migratory Bird and Waterfowl Hunting Digest 2019–2020.*



For more information on Missouri's pecans, see Page 16.

HOMEMADE CANDIED PECANS

Missouri pecans are smaller than southern varieties, but don't let their size fool you. Most pecan enthusiasts find Missouri pecans rival others in sweetness and flavor. And due to a higher oil content, Missouri pecans are perfect for ice cream and candy making. Try this simple pecan recipe. It's perfect for a last-minute gathering or just a go-to snack.

4 cups (1 pound) pecan halves
1 large egg white
1 tablespoon water
1 cup granulated sugar
2 teaspoons ground cinnamon
½ teaspoon salt

PLACE pecans into a large bowl. In a separate bowl, whisk together egg white and water. Pour mixture onto the pecans and stir until the pecans are fully coated. Set aside.

In another bowl, **WHISK** together sugar, cinnamon, and salt. Pour the cinnamon sugar mixture over the pecans and stir until completely coated.

SPREAD them onto a parchment paper-lined baking sheet in an even layer.

BAKE for about 45 minutes at 300 degrees. To ensure they bake evenly, stir every 15 minutes. Once you take them out of the oven, let them cool completely.

Recipe courtesy ***livewellbakeoften.com***

WHAT IS IT? SNOW FUNGUS

Snow fungus (*Tremella fuciformis*), also known as white jelly mushroom, is part of a group of jelly fungus that grows mostly on dead deciduous trees. Its irregular shape is composed of firm, gelatinous lobes. The translucent white fungus can reach up to 7 cm across and 4 cm high. Common in tropical and subtropical climates, it can also be found in Missouri, Indiana, and Kansas.

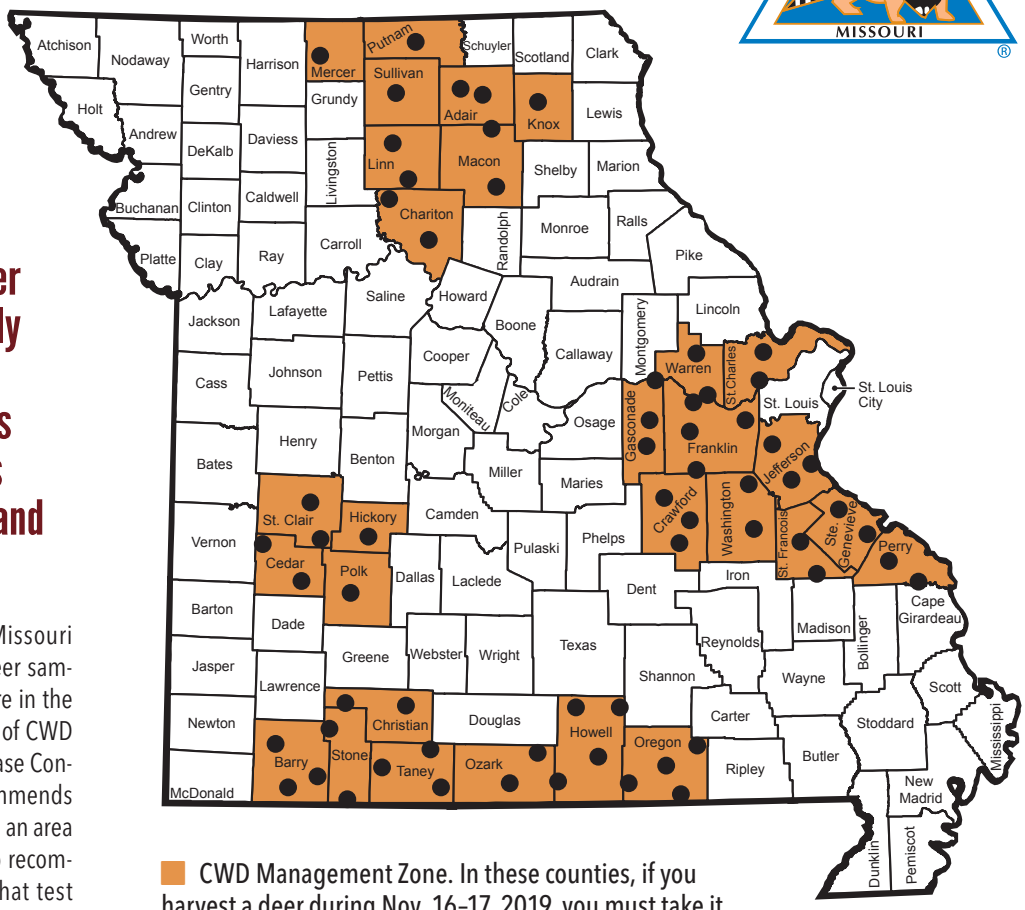
CANDIED PECANS, MUSHROOM: DAVID STONNER

CWD: Info to Know for the 2019–2020 Deer Season

Chronic wasting disease (CWD) is a deadly, infectious disease in white-tailed deer and other members of the deer family that eventually kills all animals it infects. There is no vaccine or cure. CWD is spread from deer to deer and through the environment.

MDC has found 116 cases of CWD in Missouri since 2012 out of more than 100,000 deer sampled, so the disease remains relatively rare in the state. There have been no reported cases of CWD infecting people, but the Centers for Disease Control and Prevention (CDC) strongly recommends having deer tested for CWD if harvested in an area known to have the disease. The CDC also recommends not eating meat from animals that test positive for CWD. For more information on CWD, visit **mdc.mo.gov/cwd**.

MDC is continuing its efforts to limit the spread of CWD in Missouri by finding new cases and slowing its spread to more deer and more areas.



CWD Management Zone. In these counties, if you harvest a deer during Nov. 16–17, 2019, you must take it (or the head with at least 6 inches of neck attached) on the day of harvest to a designated CWD sampling station.

Sampling station location

CWD Management Zone

MDC's CWD Management Zone consists of counties in or near where CWD has been found. The 29 counties in the CWD Management Zone for this season are: Adair, Barry, Cedar, Chariton, Christian, Crawford, Franklin, Gasconade, Hickory, Howell, Jefferson, Knox, Linn, Macon, Mercer, Oregon, Ozark, Perry, Polk, Putnam, St. Charles, St. Clair, St. Francois, Ste. Genevieve, Stone, Sullivan, Taney, Warren, and Washington.

Mandatory CWD Sampling Nov. 16 and 17

Hunters who harvest deer in any counties in the CWD Management Zone during opening weekend of the November portion of fall firearms deer season (Nov. 16 and 17) are required to take their harvested deer (or the head with at least 6 inches of neck attached) on the day of harvest to one of MDC's numerous CWD sampling stations throughout the zone. Sampling and test results are free. Hunters who harvest deer in counties no longer part of the zone are not required to participate in sampling.

Learn more at **mdc.mo.gov/cwd** under *Mandatory CWD Sampling*, or from MDC's *2019 Fall Deer & Turkey Hunting Regulations and Information* booklet, available where permits are sold and online at **short.mdc.mo.gov/ZMP**.

Voluntary CWD Sampling All Season Statewide

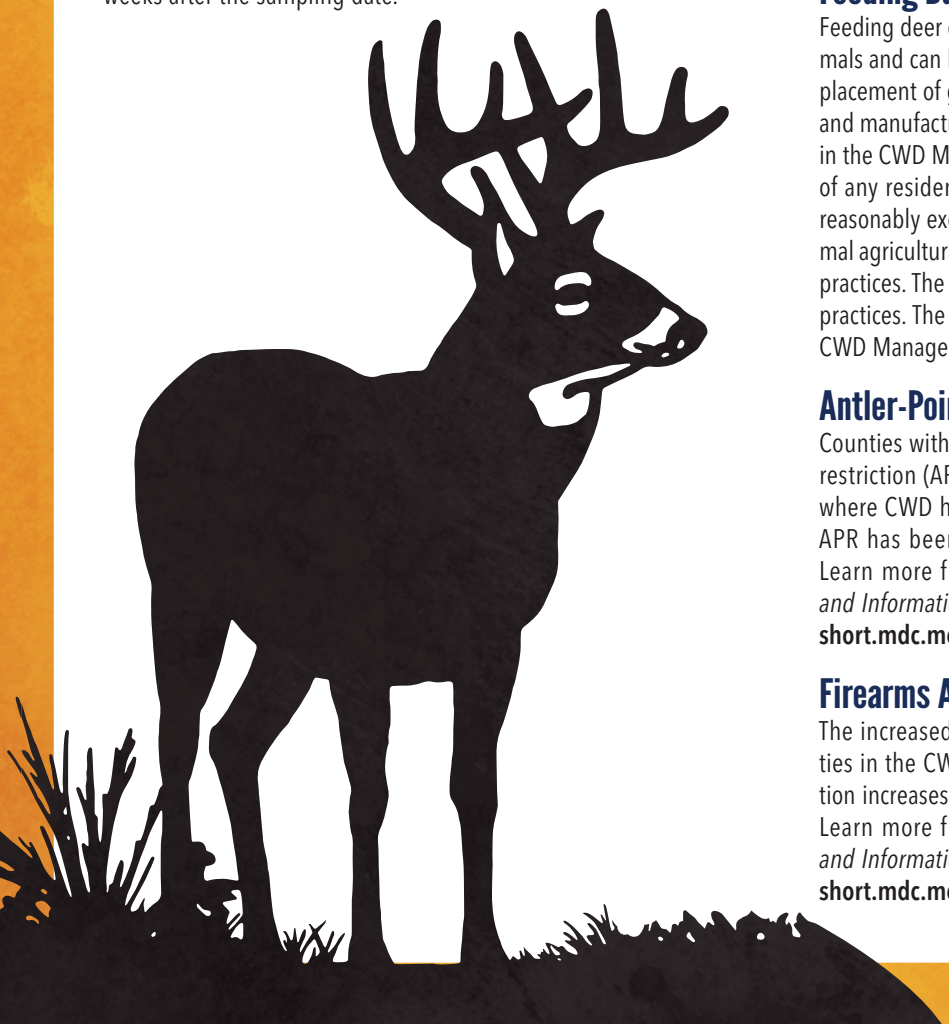
MDC is offering free voluntary CWD sampling and testing of deer harvested anywhere in Missouri throughout the entire deer hunting season (Sept. 15 through Jan. 15, 2020) at all MDC regional offices during regular business hours and through participating taxidermists and meat processors within the CWD Management Zone. Get locations and more information at **mdc.mo.gov/cwd** under *Voluntary Sampling*.

Before Having Deer Sampled

- Field dress and Telecheck deer before arrival at a sampling station.
- Bring the carcass or just the head with at least 6 inches of the neck attached.
- Capes may be removed in preparation for taxidermy before going to a sampling station.
- The person who harvested the deer must be present.
- The hunter's conservation number will be required, along with specific location of harvest.
- If using a paper permit, have it detached from the deer for easy access.
- If using the MO Hunting app, have permit and Telecheck information available.
- Position deer in vehicles with head and neck easily accessible.

CWD Test Results

Get test results for CWD-sampled deer online at **mdc.mo.gov/CWDTestResults**. Results are free and will be available within four weeks after the sampling date.



Carcass Disposal

Carcasses or remains of CWD-infected deer can expose other deer to the disease. Process deer as close as possible to their harvest location. Place remaining carcass parts in trash bags and properly dispose of them in the trash or a landfill. If necessary, bury or leave remains at the harvest site. Learn more at **mdc.mo.gov/cwd** under *Carcass Disposal*. New regulations on carcass movement and disposal will go into effect in 2020. Learn more at **short.mdc.mo.gov/ZM8**.

Share the Harvest

Missouri's Share the Harvest program helps deer hunters donate venison to those in need. To participate, take harvested deer to an approved meat processor and let the processor know how much venison is to be donated. Learn more and find participating processors at **mdc.mo.gov/share**.

Deer harvested within the CWD Management Zone may only be donated to approved processors in the Share the Harvest CWD Testing Program located within or directly adjacent to the CWD Management Zone. Processors not participating in the Share the Harvest CWD Testing Program cannot accept deer from CWD Management Zone counties. Deer harvested outside of the CWD Management Zone may be donated to any Share the Harvest processor.

For deer sampled for CWD before being taken to an approved processor for donation, present the CWD barcode number provided at the sampling station to the processor as proof of sampling. If a sample has not been collected before donation, the processor will collect the sample or remove the head and submit it to MDC for sampling. Learn more at **mdc.mo.gov/cwd** under *Share the Harvest*.

Feeding Ban in CWD Management Zone

Feeding deer or placing minerals for deer unnaturally concentrates the animals and can help spread CWD. The *Wildlife Code of Missouri* prohibits the placement of grain, salt products, minerals, and other consumable natural and manufactured products used to attract deer year-round within counties in the CWD Management Zone. Exceptions are feed placed within 100 feet of any residence or occupied building, feed placed in such a manner to reasonably exclude access by deer, and feed and minerals present for normal agricultural or forest management, or crop and wildlife food production practices. The feeding ban does not apply to food plots or other agricultural practices. The feeding ban no longer applies to counties removed from the CWD Management Zone.

Antler-Point Restriction

Counties within the CWD Management Zone do not have an antler-point restriction (APR). Protecting young bucks from being harvested in areas where CWD has been found can increase the spread of the disease. The APR has been reinstated for some counties removed from the zone. Learn more from MDC's *2019 Fall Deer & Turkey Hunting Regulations and Information* booklet, available where permits are sold and online at **short.mdc.mo.gov/ZMP**.

Firearms Antlerless Permits

The increased availability of firearms antlerless permits for some counties in the CWD Management Zone can help prevent undesired population increases in local deer numbers around where CWD has been found. Learn more from MDC's *2019 Fall Deer & Turkey Hunting Regulations and Information* booklet, available where permits are sold and online at **short.mdc.mo.gov/ZMP**.

Little Wolves OF MISSOURI

WOLF SPIDERS ARE DISTINCTIVE, DIVERSE, AND BENEFICIAL

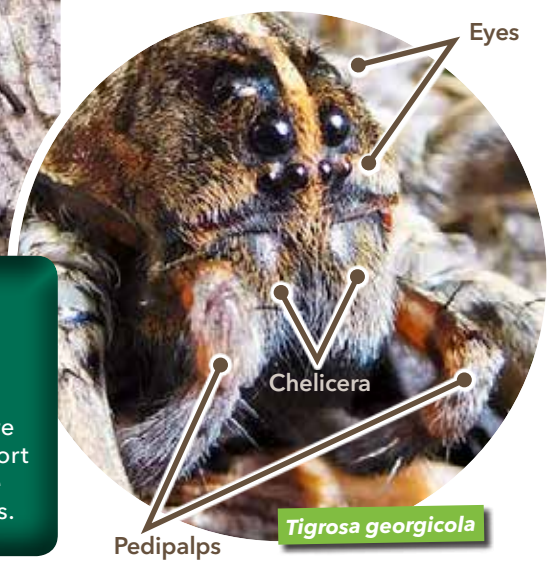
story and photographs by David Bruns

Look closely to see the young of this dotted wolf spider hitching a ride on her back.

In the tree-dappled moonlight not far from your home, a predator is hunting. It moves quietly among the leaves and plants of the undergrowth. Spotting prey nearby, it waits — then leaps, grasping the insect in its jaws. A little wolf spider enjoys her meal.

Rabid wolf spider

Four larger eyes forming a box above a row of four smaller eyes is distinctive to the wolf spider family. While the two back eyes can watch for predators, the other two large eyes are oriented forward for hunting.



Tigrosa georgicola

HARMLESS TO HUMANS

Bites from wolf spiders are extremely rare. The venom of wolf spiders is not medically significant, resulting in no more than a few minutes of discomfort at the site of the bite. They are essentially harmless to humans.

Wolf spiders are among the most familiar type of spider in Missouri. They are distinctive, abundant, and important wildlife elements in Missouri's ecosystems.

DISTINCTIVE

The comparison of some types of spiders to little wolves dates back to descriptions of certain spiders made by the Greek philosopher, Aristotle, more than 2,000 years ago. Rather than spinning webs to catch their prey, wolf spiders are active hunters that stalk and pounce. Although these spiders do not move in a coordinated pack as wolves do, their grayish color, furry appearance, hunting behavior, and nocturnal habits also seem wolflike. Wolf spiders make up the Lycosidae family, which gets its name from lycos, the Greek word for wolf.

Spiders have two main body parts — the head, which is known as the cephalothorax, and the abdomen. They have eight legs, which are attached at the base of the cephalothorax. Wolf spiders can be distinguished from other types of spiders by their unique eye arrangement. All wolf spiders have eight eyes. Four large eyes form the corners of a box-shape as seen from above. Below there is a row of four more smaller eyes.

Wolf spider mouth parts, called chelicera, include two stout, basal segments that make up a prominent feature of the spider's face below the eye rows. Tiny fangs are rarely seen since they are nested in grooves until the spider needs them to capture its prey. As with other spiders, small, jointed, leglike appendages known as pedipalps extend in front of the chelicera. The spider's mouth is located behind the chelicera at the base of the pedipalps.

DIVERSE

More than 40 species of wolf spider have been documented in Missouri. At first glance, they all appear to be brown, tan, and gray. This cryptic coloration helps them hide from predators and avoid

Tiger wolf spider

Gladicosa pulchra

Tigrosa georgicola

Allocosa funerea

NOT A WOLF SPIDER: The dark fishing spider is frequently mistaken for a large wolf spider. Unlike wolf spiders, fishing spiders have all eight eyes nearly equal in size.

This lance wolf spider is producing "draglines" as it climbs on a plant. Lance wolf spiders can be found in prairies and savannas as well as fields and lawns.

Lance wolf spider

detection by all but the most observant people. The hairs seen on spiders are known as setae. Upon closer examination, wolf spiders can also have a wide variety of stripes, bands, and spots of orange, black, and white on their head, abdomen, and legs. Different wolf spider species also vary in size. Pirate wolf spiders are tiny, less than ⅛ inch measured from the front of the head to the back tip of the abdomen (not including legs). Large wolf spiders, such as tiger wolf spiders, may be more than ¾ inch long, while their legs cause them to appear even larger. Size and color patterns are helpful for identification and to distinguish between different species.

Some of the larger and more familiar wolf spiders have common names, while most wolf spider species are known only by their scientific names. One reason for this is that distinguishing between wolf spider species can be technical and difficult. Most can be confidently identified only through examining their reproductive structures with a microscope. This aspect of spider study can be a real challenge.

FASCINATING

Even though wolf spiders do not use webs to catch their food as other kinds of spiders do, they can produce silk from a set of six spinnerets positioned at the end of their abdomen. Females of some wolf spiders are known to spin silk "draglines" containing pheromones, special chemical messages for mating purposes that the male can follow. Wolf spiders use other interesting tactics including "singing" and "dancing" to attract a mate. The males of some wolf spiders, including species of brush-legged wolf spiders, stridulate — creating sound vibrations that attract females. Unlike crickets and cicadas, these sounds are barely loud enough for humans to hear without special amplification equipment. The males of other wolf spider species, such as the shore spider, can be observed waving their front legs and palps to attract a female.

Brush-legged wolf spider

Varacosa avara

Pirate wolf spider

Trochosa sepulchralis

Shore spider with egg sac

Tigrosa georgicola with young

Left, a shore spider's egg sac attaches to her spinnerets, allowing this wolf spider to protect her eggs while continuing to hunt. Above, a wolf spider's recently hatched spiderlings cling to her abdomen for protection.

After mating occurs, female wolf spiders lay eggs, wrapping them in silk, and creating a round egg sac. In a behavior distinctive to wolf spiders, the females then protect their egg sac, carrying it attached to the spinnerets. This enables them to guard their eggs even while continuing to move and hunt. If the egg sac becomes separated, the female will work to reattach it.

When the eggs hatch, often with the assistance of the mother opening it with her mouth parts, the tiny wolf spiderlings climb onto the upper part of the mother's abdomen. Female wolf spiders have specially shaped hairs there that help the young spiderlings hold on. Spiderlings may climb off and then back onto their mother. While the mother spider does not feed or provide direct care to the young, giving them a ride provides protection from predators, including other spiders. The young disperse after several days.

Wolf spiders are known to live from one to several years. Like other arthropods (insects, for example), wolf spiders molt their exoskeleton in stages, known as instars, as they grow. Spiderlings grow from immature and subadult stages, finally molting into an adult with fully functioning reproductive organs at their final instar. October is a great month to find and observe wolf spiders since they are very active, and most species are at their subadult and adult life stages.

Many wolf spiders, including *Varacosa avara*, are active throughout the winter, particularly during warm spells when the temperature rises above 45 F. When the temperature dips below freezing, they become dormant. Naturally occurring liquid glycols accumulated in the blood act as antifreeze, preventing them from freezing to death. When wolf spiders are not active, they shelter inside a retreat constructed from plant debris held together with silk. Some wolf spiders, including the tiger wolf spiders, are known to dig burrows.

BENEFICIAL

Wolf spiders are important predators. Contrary to the myth that spiders simply suck the juice from their prey, wolf spiders usually consume the entire insect after softening it with digestive saliva. Wolf spiders, in turn, serve as food for birds, small mammals, snakes, lizards, frogs, toads, wasps, and other spiders. It is estimated that spiders eat 10 percent of their body weight of insects and other small arthropods each day, amounting to thousands of insects eaten by each spider per year. Wolf spiders are a particularly abundant family of spiders in Missouri. Their population numbers in the tens of thousands per acre of meadow and in the leaf litter of forested habitats. When this is multiplied by the quantity of insects consumed, the role they play in controlling insect populations is substantial.

A wolf spider (*Gladicosa gulosa*) sits near its recently shed exoskeleton. Adults of this species can be found from fall to spring in forests and woodlands.

In addition to food crops that humans depend on, wolf spiders protect the overall health of grasslands, trees, and forests through controlling insects. Many biologists include spiders as indicators of the ecological health of natural ecosystems.

Like so many other wildlife species, wolf spider diversity and populations are impacted by habitat loss. For this reason, wolf spiders benefit from thoughtful natural resource stewardship practices. For example, planting trees for birds and native perennials for pollinating insects undoubtedly benefits spiders as well.

FUN TO FIND AND STUDY

In the tree-dappled moonlight, a family wearing bright headlamps walks slowly. "There's one!" a child shouts. The family approaches together, crouching down for a better look at the little wolfie revealed in the light of their headlamps.

Eye-shining for wolf spiders is becoming an increasingly popular evening activity among nature enthusiasts. This activity is still often referred to as "spider sniffing," a term that originated as a prank. A guide would convince inexperienced and astounded followers that the spiders were being located by odor (and the guide's supernatural sense of smell). The trick works because of a well-developed reflective layer inside the wolf spider's eyes known as the tapetum, which aids in night vision. When you use a bright light close to your own eyes, such as with a headlamp, the distinctive, bright, pale-green eyeshine is reflected from the wolf spider's eyes. Often, the wolfie will remain still long enough to be approached, observed, photographed, and possibly collected.

To find wolf spiders during the day, look under stones and woody debris. Another method is to toss leaf litter onto a light-colored sheet where the spiders can be easily located while the leaves are picked through and removed. Pitfall traps are also used by arachnologists to collect these ground-dwelling spiders. Whether found in the day or at night, wolf spiders can be gently collected for observation by coaxing them into the opening of a jar or other small, clear container. Since wolf spiders do not have gripping foot tufts found in other types of spiders, they are not able to climb smooth surfaces and can easily be contained within a jar or bowl.

October is a great month to find and observe wolf spiders since they are very active, and most species are at their subadult and adult life stages.

IT'S EASY TO BE A CITIZEN-SCIENTIST

Many details about wolf spider diversity, populations, range distributions, habitat preferences, seasonality, life history, and ecological impact are still largely unknown. This is actually exciting news for nature enthusiasts with an interest in these "little wolves." Advances in computers and digital technology over the past few decades have expanded our ability to study and document elements of the natural world, including wolf spiders. Even affordable hand-held digital cameras have macro-photography functions and can take high-resolution pictures. The capabilities of cellphone cameras are improving every year. This has resulted in a boom of people participating in citizen-science efforts to document nature.

Citizen-science websites, such as **iNaturalist.org** and **Bugguide.net**, enable people to participate in meaningful science efforts. Each submitted image serves to document an individual organism seen in a certain location at a specific date and time. Frequently, other contributors help with identification and share additional information for photo submissions. These sites provide opportunities, not only to review photo documentation of the richness of life around us, including wolf spiders, but also to contribute valuable information that can be accessed by scientists from around the world.

Powder Valley, Burr Oak Woods, Springfield, and Cape Girardeau nature centers have dedicated projects documenting the biodiversity of these areas on **iNaturalist.org**.

In the tree-dappled moonlight not far from your home, a family like yours collects a little wolf spider — photographically. Within a few minutes, they take several good images with a camera and a smartphone.

"This is a really neat one," says one of the kids.

"OK, it's time to let it go," says a parent.

"I think I see another one!" calls out another young citizen-scientist. ▲

David Bruns studies and photo-documents many types of spiders in Missouri. He also works as an MDC conservation education consultant in the St. Louis area.

THIS NATIVE MISSOURI NUT BENEFITS HUMANS, WILDLIFE, AND THE ECONOMY

by Jan Wiese-Fales
photographs by David Stonner

Long before humans set foot in North America, pecan trees (*Carya illinoinensis*) flourished in Missouri. The tree's presence played a key role in the development of the flood plain forest community in which it took root, an influence that continues today.

Our native nut's early ancestors originally enjoyed widespread distribution in North America, Europe, and Asia. But the pecan as we know it took permanent hold only in the moist, loamy soils of the Mississippi River Valley and its wetlands — from Illinois to Texas and into Mexico.

"There are still native stands of pecans in Missouri," said MDC Natural Areas Coordinator Mike Leahy. "There are stands at Donaldson Point Conservation Area (CA), near New Madrid, and by Brunswick in Chariton County. The Four Rivers Conservation Area in Bates and Vernon counties is also a huge area with native pecans.

"Horton Bottoms Natural Area (NA) in Four Rivers is pretty unique," Leahy said. "Three rivers come together, so there is a pretty large flood plain with the alluvial soils that pecans prefer. Flood plain systems not converted to agriculture are important to native pecan stands."

Adaptation

Sun-loving pecan trees can grow 70 to 100 feet tall and frequently live up to 200 years or longer, out-competing other flood plain species when given enough sun as young trees. Most of the flood-tolerant pecan tree's absorptive roots are within 2 feet of the surface, but the numerous large anchor roots of a mature tree can reach a depth of 20 feet in flood plain soils.

Pecan trees are a wind-pollinated species that produce both male and female flowers. Because the male and female flowers on each tree bloom at different times, pecans rely on their neighbors for pollination and nut production. Because of this adaptation, native pecan seedlings benefit from genes from both parent trees and typically are well-adapted to changing local conditions. Such diversity aids in disease and insect resistance.

Pecan nuts are encased in a thin husk, called a shuck. When ripe, the shuck splits open in four sections, exposing the smooth, brown and black-shelled nuts. Pecans float, which means they are more likely to be carried away from parent trees by floodwaters.

Pecan seedlings are available through MDC's George O. White State Forest Nursery near Licking and on the MDC website at mdc.mo.gov/seedlings.

When combined with those relocated by birds and squirrels, this movement results in an expanded pecan distribution and increased genetic diversity within a forest system.

Many animals eat pecans, which provide crucial nutrition to survive winter. The trees also are a host tree for many moths and insects, providing meals for birds and their hatchlings.

According to Leahy, Horton Bottoms NA is an important habitat for native bird species like the prothonotary warbler as well as many migratory species.

"Pecan trees offer birds a broad canopy and also form hollow open spaces for cavity nesting," he said.

Prothonotary warbler

PROTHONOTARY WARBLER: NOPPADOL PAOTHONG

Native Man and Native Nut Cross Paths

Native Americans made important use of pecans in their diets for thousands of years.

Two handfuls of shelled pecans provide 718 calories, 9.7 grams of protein, 2.4 grams of


Pecan twigs and shucks


Pecan nut within the shuck


Pecan nuts

fiber, 74 grams of fat, and significant doses of critical micronutrients — excellent nutritional value in return for a small amount of labor. In addition to being a healthy, high protein, high carbohydrate food source for Native Americans, pecans also were portable and could be stored for up to a year in a cool dry place.

"Indians primarily ate pecans whole — in many ways this was the food's greatest allure," wrote James McWilliams in his book, *A History of America's Native Nut*, adding that the nuts also were pounded into a powder, added to corn gruel and bread, and nut meal was worked into bison meat. He also noted evidence that Mississippian Indians used pecans for trade with other Indian groups whose migratory paths intersected their own.

"There's a lot of anecdotal information about Native Americans using and moving pecans," Leahy said. "The Osage Village Historic Site is 6 air miles from the Horton Bottoms NA within Four Rivers. The Osage undoubtedly utilized pecans."

Pecans "Discovered" and Assimilated

The words pecan and hickory originated as Native American words that meant "nuts cracked by a rock." Pecan's scientific designation, *illinoinensis*, refers to the region where American and English explorers first "discovered" the nuts. Don Kurz, author of MDC's *Trees of Missouri*, wrote that pecans were first referred to as "Illinois nuts" or "Mississippi nuts." American traders and fur trappers returned with pecans from the "Illinois Country," the area around the Mississippi and Ohio rivers that now encompasses Ohio, Indiana, Illinois, and parts of Kentucky. Spanish and French explorers and settlers had known of pecans for two centuries before.

Pecan Macros

Serving size is two handfuls

718 calories • 9.7g protein • 2.4g fiber • 74g fat

By the end of the 18th century, settlers had joined early and notable horticulturists George Washington and Thomas Jefferson in successfully planting pecan trees east of the Appalachians beyond their native range.

Most native pecan trees don't produce a dependable crop of pecans every year because of masting, a process through which trees produce very large crops of thin-shelled nuts every few years, thus overwhelming the likelihood of people and animals eating every nut. However, as a result of the pecan's genetic diversity, some trees in the forest produce more nuts with more dependability.

Locating more nut-producing wild trees and improving grafting techniques first developed in the early 1800s boosted nascent nut commercialization efforts in the late 19th and early 20th centuries.

Pecan wood is an attractive hardwood, used to make such things as furniture, tool handles, and flooring. However, because it is more difficult to work with than many other hardwoods, pecan trees in later years were left standing by loggers.

Joe Wilson (left), the general manager of the Missouri Northern Pecan Growers, gives a tour of his organic Rich Hill pecan farm to botany students from Cottey College. A tree shaker (center) is used to get the pecans from the tree, while a nut rake (bottom) scoops pecans off the ground and separates the nut from leaves and twigs.

Missouri's Pecan Economy

Up to 95 percent of the world's pecans are grown in this country. Texas and Georgia — the latter with no native trees — are the top producers.

According to USDA National Agricultural Statistics Service 2017, Missouri contributed 0.4 percent to total U.S. pecan production in 2015. That year, pecans ranked 24th in Missouri's total commodity cash receipts at slightly more than $2.4 million.

Native trees — rather than grafted varieties — account for more than 80 percent of Missouri's total bearing and nonbearing production pecan grove acreage. Vernon, Bates, and Chariton counties dominate production.

Certified Missouri organic pecan growers Paul and Peggy Droz have a 100-acre pecan farm in Bates County near Rich Hill where Paul grew up.

"I'd go to my grandparents as a boy and pick up pecans with them. Now my son has a home in that area, and I pick up pecans with my grandchildren," Droz said. "I think that's pretty neat."

Pecan trees are an alternate bearing species, which means the mast, or nut production, is heavy one year and light the next. There is no consensus on why this occurs.

"In 1955 and 1956, when I was a kid, there were two back-to-back bumper crops in Bates and Vernon counties," Droz said. "That's when they started to be a real commodity here. That really got people's attention."

Droz said most of his best pecans are natives but he also does what he calls "top work," or grafting.

"When grafting, you want to use the best varieties you can find because that tree might be there for 150 years — generations," Droz said. "Grafting guarantees the variety of pecan that will grow on that tree; cloning if you will. I've found that some varieties I've grafted over my lifetime do better in the uplands; some do better in the flood plain. That just comes with trial and error."

Pecans are sorted, shelled, and cleaned in the Missouri Northern Pecan Growers processing plant in Nevada, Missouri.

Brunswick was officially declared The Pecan Capital of Missouri in 1972. An annual Pecan Festival has been held in Brunswick the first weekend in October since 1980. In addition to other attractions and events, visitors can view and pose for photos with Missouri's biggest pecan: a 12,000-pound replica that is 7 feet tall and 12 feet long.

When looking for scion wood — a young shoot or twig of a plant — to use in a graft, he takes several things into consideration.

"All pecans have their own characteristics. Nut size is down on the list," he said. "You go out and find your best native, a tree that shows good production, one that is physically and structurally sound. Some trees are more disease-resistant, some nuts are more flavorful, and some have good cracking characteristics. And down to the nitty-gritty, the grooves in the nutmeat — with some, you have to pick the shell out."

Girdlers, Shuckworms, and Weevils

Growing pecan nuts is not without its challenges. Missouri is at the northern edge of the native pecan range with frosts potentially damaging flowers in the spring and before the nuts have time to mature in the fall. In addition to competing with a variety of wildlife for the harvest, pecans are subject to pecan scab, a fungus that destroys the shucks, rendering the crop worthless.

Pecan scab

Pecan weevil

"The pecan gets all of its nutrients from the shuck and the shuck protects it," said Droz. "Scab is more prevalent in wet years, and in the river bottoms where you have much more humidity — not so much in the uplands where there's a breeze."

Pecans are a favored food for a number of insects, including twig girdlers, hickory shuckworms, and pecan weevils.

"Insect damage can be significant," Droz said. "The pecan weevil is the biggest pest."

Pecan weevils are hard-shelled little beetles that puncture immature nuts to feed on developing kernels causing them to shrivel, turn black, and drop the nuts prematurely. Additionally, weevil larvae hatched from eggs laid within newly formed kernels feed on otherwise healthy nuts, only to be discovered after harvest.

"You're going to lose the same amount of the crop no matter what its size. A small crop is no crop," Droz said. Mast years with large numbers of pecans overwhelm the ability of insect pests and animals to destroy seeds needed to reproduce new trees.

Wayne Lovelace, president of Forrest Keeling Nursery in Elsberry, said that pecans had been the native plant nursery's number one specialty crop until being surpassed by pawpaws last year.

"The trend now is that people are getting more particular about what they eat and Missouri native plants like pecans, pawpaws, persimmons, and other nuts fit the trend," Lovelace said.

"Most of our work with pecans has been for conservation: reforestation, bottomland restoration, and for planting by communities and in parks," he said. "We start these market seedlings from native seed. Commercial orchard growers prefer grafted varieties."

Native pecan forests and groves can be very important pecan producers. Perhaps more important, native pecan forests are reservoirs of genetic diversity to overcome future disease and insect pests. Protection of native pecan trees at places like Four Rivers CA could be very important in the future to keep pecan trees and forests healthy. ▲

Jan Wiese-Fales is a freelance writer who lives in Howard County and enjoys camping, hiking, floating, and photographing in Missouri's wild outdoors.

PECAN SCAB: RUDINEI DE MARCO, BUGWOOD.ORG; PECAN WEEVIL: CLEMSON UNIVERSITY—USDA COOPERATIVE EXTENSION SLIDE SERIES, BUGWOOD.ORG

Flight Tracker

NEW TECHNOLOGY AIDS IN KEEPING TABS ON MIGRATORY BIRDS **by Sarah Kendrick**

In 2015, Colombian ornithologist Camila Gómez led a team of Colombian, Canadian, and U.S. researchers working in the lush, tropical forests of the Sierra Nevada de Santa Marta in northern Colombia to learn more about the area's role as a stop-over site for birds during spring migration.

Researchers tagged over 100 gray-cheeked thrushes and tracked their 2,000-mile migration over the Gulf of Mexico and Caribbean to their breeding grounds in the boreal forests of Canada. Through this study, Gómez and the others learned that gray-cheeked thrushes' final leg of spring migration can range from three to 40 days, depending on their fat content and body condition. One individual flew over 2,000 miles in three days, only stopping for a few hours along the way.

Neotropical migrants like this common yellowthroat breed across Canada and the U.S. and overwinter from southern Texas through Central America and the Caribbean. New lightweight tracking technology is allowing researchers to learn more about the migratory routes of long-distance migrants and what threats they may face along the way.

PHOTOGRAPH BY NOPPADOL PAOTHONG

This cerulean warbler breeds in riparian forests of the eastern U.S. and overwinters in South America, but little is known about their migratory routes or timing. Motus nanotag technology makes migration research possible on a bird this small to better inform conservation work for this threatened species.

Tracking wildlife with projects such as these helps researchers learn how an animal interacts with the space around it, at small and large scales. Tracking the movements of wildlife not only teaches us more about an animal's natural history (survival, territory size, breeding success, habitat use, and behavior), but also informs how land managers can best provide habitat for them or study potential positive or negative effects of changes to the landscape.

As insightful as Gómez's research is to the important role habitat plays in the migration of Neotropical songbirds from their Central and South American winter homes to their North American breeding grounds, it was the technology used in conducting the research that promises to improve our understanding of migrant species that pass through or breed in Missouri.

Tracking Small Birds

Advances in technology are revolutionizing the way researchers are tracking bird migration. The weight of transmitters has limited the bird species researchers can track, as most transmitters are too heavy for small Neotropical migrants. Advances in technology are producing incredibly light "nanotags," which are opening up this area of research for small Neotropical songbirds that travel over 1,000 miles twice a year to and from the wintering grounds. Many of our Missouri-breeding migrant warblers weigh between 10 and 20 grams; larger warblers or migratory thrushes between 50 and 60 grams. Because of these new lightweight tags, the smallest of these species are now candidates for study in tracking migration.

MDC and partners like the Missouri Conservation Heritage Foundation and the U.S. Fish and Wildlife Service are working to broaden the scope of this technology in Missouri and across the Midwest to learn more about the migratory timing and movements of birds that breed in or migrate through the middle of the continent.

"Motus" Operandi

The Motus Wildlife Tracking System (Motus) is a revolutionary program of Bird Studies Canada, in partnership with Acadia University, that began in 2014. The Motus network is based on two components — the nanotags and a network of passive receivers, or mini computers hooked to antennas, placed on the landscape — all set to the same radio frequency. Tiny Motus tags, ranging from 0.2–2.6 grams, are placed on birds and set to the same frequency as all Motus receivers. When the tagged bird or bat passes within range of the receiver (about 15 km each way with a clear line of sight), the tag's unique signal is detected and recorded. There are over 400 Motus receivers in the Western Hemisphere alone, and 880 across the world, set to the same frequency. If a Motus-tagged bird passes within range of any Motus receiver along their migratory route, that bird's unique signal is detected and stored.

CERULEAN WARBLER: © GALE VERHAGUE | DREAMSTIME.COM; BIRD BANDING, RADIO ANTENNA: NOPPADOL PAOTHONG; TURKEY TRANSMITTER: DAVID STONNER; BLACK-THROATED BLUE WARBLER: BETHANY THURBER; BOBOLINK: JOEL SARTORE/NATIONAL GEOGRAPHIC PHOTO ARK

Bird Tracking Basics

Bird Banding
Bird banding is the oldest method of tracking birds and likely the one that most are familiar with. The U.S. Geological Survey's Bird Banding Lab is the sole source for small, lightweight aluminum bands with a unique number combination that are placed on a bird's leg or foot. The Banding Lab distributes and tracks all bird bands, so when a band is placed on a bird, details for that bird are recorded and reported back to the Banding Lab. If the bird is recaptured later in its life, the unique number on the band is reported again, giving researchers details of the bird (age or sex, body condition) and locations of previous captures. While bird bands can be very useful and give us exact locations of a bird in its life (if it is recaptured after its initial banding), this method doesn't provide information on where the bird has been in between those two points in time.

A wild turkey is outfitted with a radio transmitter.

This black-throated blue warbler is fitted with a Motus tag.

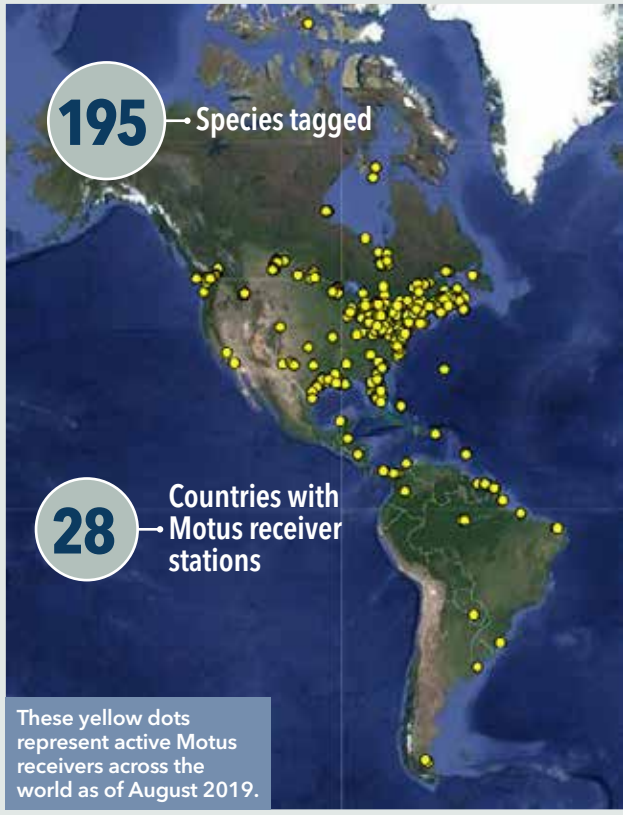
Radio Telemetry
Radio telemetry is the most commonly used method to track the movements of wildlife, including birds. A transmitter, or tag, is attached to a bird and emits a unique signal on a set frequency. The tag's signal is picked up by an antenna and receiver carried by the researcher and tuned to the same frequency as the tags. By logging the specific locations of the various individuals in a study over a period of weeks or months, the researcher can later map out individuals' movements, behavior, habitat use, or other metrics that answer their research questions.

Data Loggers and Satellite Tags
Data-logging tags, sometimes called light-level geolocators, are different in that they don't emit real-time signals but store a bird's location data within the tag. These tags turn on a few times per day to record light and dark time and are used to calculate latitude and longitude to determine location. One challenge of this approach is that researchers have to recapture the bird the following year and scan the tag to retrieve the data. Many songbirds return to the same breeding areas year after year, but even these site-faithful birds face many threats throughout the year and not all return. The rates of recapture for geolocator-tagged birds are fairly low, about one in five. Although researchers may not recover most of the tags they deploy, the data they are able collect from returning birds is amazing. The tags map the birds' general pathway and record how long the journey takes, both ways.

Larger and more expensive satellite transmitters ping satellites in space and can either store the data in the tag or provide real-time data on the movements of birds large enough to carry them — mostly raptors, large shorebirds, seabirds, and waterfowl. Batteries are the limiting factor when it comes to attaching tags to birds. To avoid impacting the bird's ability to fly, federal regulations state the total weight of the transmitter and battery must be limited to about 3 percent of the bird's total weight. Some satellite transmitters have their own mini solar panels, but this is only feasible if the bird weighs enough to carry the transmitter.

This bobolink is sporting a geolocator that calculates latitude and longitude and stores the bird's location in the tag.

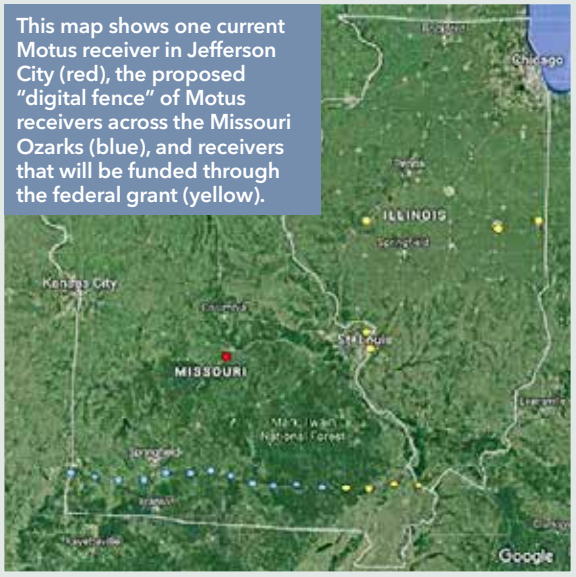
Motus Wildlife
By the Numbers



These yellow dots represent active Motus receivers across the world as of August 2019.

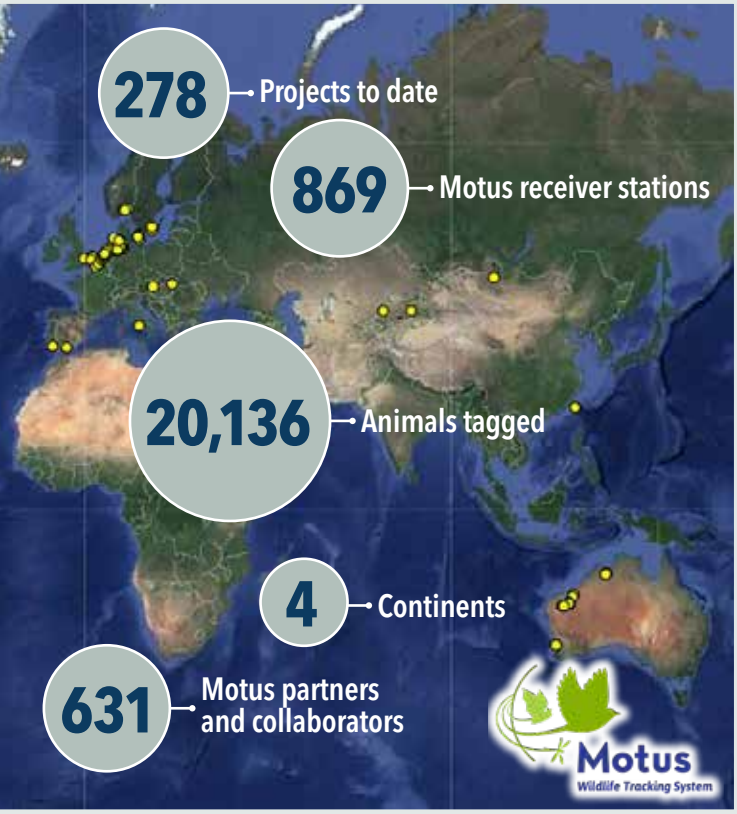
These two horizontal antennas hooked up to a Motus receiver were fitted to an existing tower at MDC Headquarters in Jefferson City last fall with support from the U.S. Fish and Wildlife Service. Placing Motus equipment on existing MDC communications towers in a latitudinal array across southern Missouri will allow any Motus-tagged bird (or bat) to be detected entering or leaving the Ozarks. This May, the Jefferson City Motus receiver detected a Swainson's thrush that was fitted with a Motus tag at Rockefeller Wildlife Refuge on the Louisiana coast in late April. That bird was detected 12 days later by a Motus receiver in Saskatchewan. All three of these detections helped track this bird on spring migration north to its breeding grounds in the boreal forests of Canada.

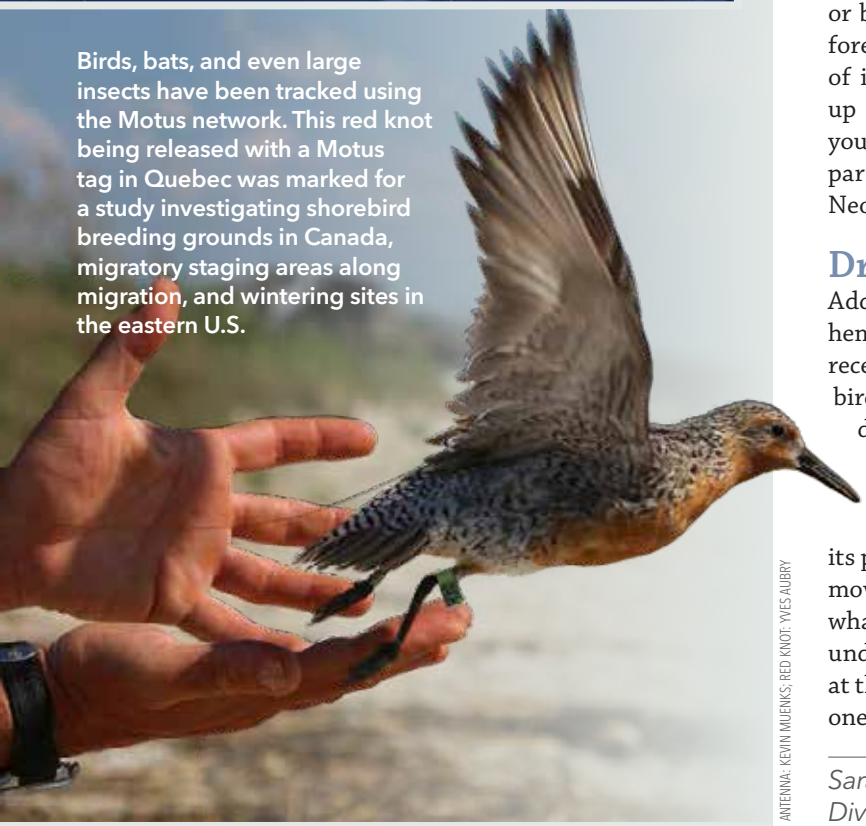
MDC and its partners, including the Illinois Natural History Survey, the St. Louis Zoo, and American Bird Conservancy, were recently awarded a grant from the U.S. Fish and Wildlife Service to expand the Motus network across Missouri, Illinois, and on the wintering grounds in Guatemala.



This map shows one current Motus receiver in Jefferson City (red), the proposed "digital fence" of Motus receivers across the Missouri Ozarks (blue), and receivers that will be funded through the federal grant (yellow).

Tracking System:





Birds, bats, and even large insects have been tracked using the Motus network. This red knot being released with a Motus tag in Quebec was marked for a study investigating shorebird breeding grounds in Canada, migratory staging areas along migration, and wintering sites in the eastern U.S.

ANTENNA: KEVIN MUENKS; RED KNOT: YVES AUBRY

The collaborative nature of Motus is the real game changer. Previously, researchers studying movements of small birds placed their own receivers along a migratory path, hoping their tagged birds would fly within range. These receivers were specific to that one project, resulting in a large investment of time and funds for a small research benefit. Since all Motus receivers work together to detect Motus-tagged birds on an unlimited number of research projects (currently 283), expanding the network of those receivers greatly broadens the scope of what we can learn about migratory birds of any size. Motus expands the horizons of what we can learn about the migratory patterns of birds, bats, and large insects, which is why Missouri is working to place receivers across the state.

Motus in Missouri

While there are over 400 receivers in the Western Hemisphere, only a few dozen are in the Midwest, mostly along the coast of Lake Superior and east of Missouri. The Midwest is still largely a "black hole" for Motus detection, but this region acts as a major thoroughfare for many migrants to the north and south, called the Mississippi Flyway.

The plan for Missouri is to place Motus receivers on existing infrastructure, such as MDC communication or fire towers, with overlapping detection diameters to create a "digital fence" across the state. This means that any Motus-tagged animal moving through the state will be detected. The first goal is to place an overlapping digital fence roughly along U.S. Highway 60, a corridor that passes through our Missouri Ozark forest. Many Neotropical migrant songbirds stop over on migration or breed in these large swaths of oak-hickory-shortleaf pine forest. These extensive forest tracts produce an abundance of insects that feed hungry long-distance migrants to fuel up for migratory travel or to sustain themselves and their young during the breeding season. While it's known that this part of the state provides abundant nesting habitat for many Neotropical migrant songbirds, there is still much to learn.

Driving the Research

Additional Motus receivers across the Midwest support a hemispheric effort to learn more about migratory birds. Each receiver placed provides an additional opportunity for tagged birds of research projects to the north and south of us to be detected and studied. More Motus coverage in Missouri will also attract new research to the state. Not surprisingly, there are few Motus research projects in the Midwest due to this lack of infrastructure. Motus will allow MDC and its partners to continue to delve deeper into the long-distance movements of migratory birds and bats, but also help us learn what roles Missouri habitats play in their life cycles. Further understanding leads to improved conservation and a glimpse at the bigger picture — that these birds' time spent here is just one part of their annual story. ▲

Sarah Kendrick is the state ornithologist in the Wildlife Division. She has a master's degree in avian ecology.

Get Outside in OCTOBER

Ways to connect with nature


Aromatic sumac

How Trilling

Listen for the trill of **field crickets**. These nocturnal insects are common and can be found in grassy areas and in the woods. Their distinctive chirping signifies calm autumn evenings to us. They make excellent fish bait.


Red-bellied woodpecker

Bird-O'-Feeder

Wondering what to do with those carved pumpkins after Halloween? Don't just pitch them. Turn them into bird feeders. Put a few inches of birdseed along the bottom. Enlarge the openings to make it easier for the birds to eat. Then enjoy the many different birds (and probably a few squirrels) that will feast at your jack-o'-lantern turned bird-o'-feeder.


Northern cardinal and purple finch

KANSAS CITY REGION

Youth Waterfowl Clinic and Hunt

Sunday, Oct. 13 • 8 a.m.–2 p.m.
Duck Horn Lodge
13633 NE County Road 14243, Urich, MO 64788
Registration required. Call 888-283-0364 or register online at short.mdc.mo.gov/ZMS by Oct. 6.
For more information, call 660-885-6981.
Ages 11–15

Activities will include wing shooting, duck calling, and hunting strategies. Clinic participants will be invited to waterfowl hunt sometime during the youth or regular duck season.

CRICKET: JOSEPH BERGER, BUGWOOD.ORG; PUMPKIN: © PRYZMAT | DREAMSTIME.COM; DOWNY GENTIAN: ALEX KATOVICH, BUGWOOD.ORG

Natural Events to See This Month

Here's what's going on in the natural world.


Downy gentians bloom on prairies


Bullfrogs begin hibernating


White-throated sparrow

Early wintering sparrows arrive

Find more events in your area at **mdc.mo.gov/events**

Elk, Fall Colors, and Driving Tours

Fall colors are at their peak this time of year in Missouri. MDC has driving tours where you can not only bask in the colors of fall, but catch a glimpse of **elk** and so much more. Plan your tour at **short.mdc.mo.gov/ZcT**.

SOUTHEAST REGION

Fall Festival

Saturday, Oct. 19 • 4–8 p.m.
Cape Girardeau Riverfront Park
Water Street, Cape Girardeau, MO 63703
No registration required. Call 573-290-5218 for information.
All ages

Come out for a cornucopia of fun at the Fall Festival. We'll celebrate the bounty that Missouri has to offer in the fall both through human and wild animal eyes. Taste a few fall treats, enjoy a campfire, try out crafts and games, or join us for a hike. There's so much to do at our festival.

Hen Hunt

Head out to the woods on a hen hunt. No, not the feathered kind. During this hunt, you'll be looking for **hen of the woods**, an edible mushroom. It grows in a large cluster at the base of oak trees or stumps. It often comes back to the same tree year after year. For more information on Missouri mushrooms, visit **short.mdc.mo.gov/ZNf**.

Places to Go

SOUTHEAST REGION

Angeline Conservation Area

Irregular in shape; extraordinary in opportunity

by Larry Archer

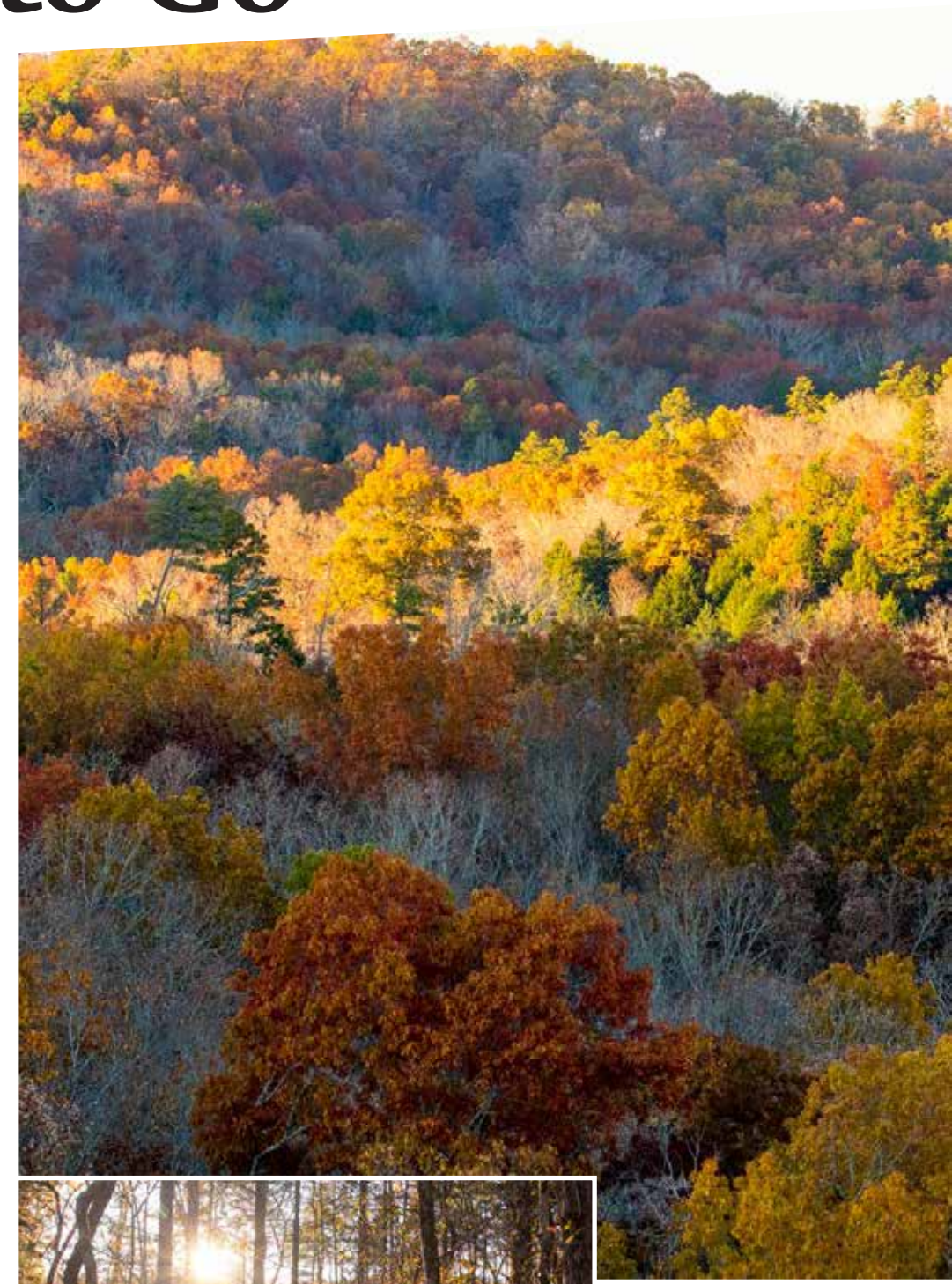
If an outline map of Angeline Conservation Area (CA) makes you think of an unfinished jigsaw puzzle, it's likely because the area is the result of a combination of many different pieces.

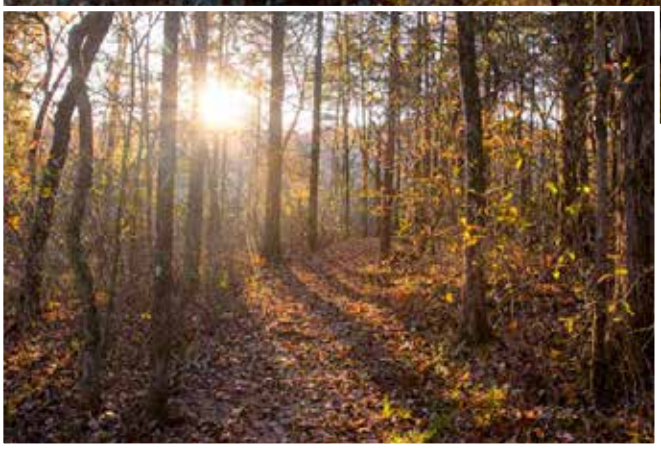
"Angeline has been pieced together from a lot of different parcels," said Resource Forester Eileen Eck. "Some of it was Kerr-McGee land before, which was a private company, and then some of it was old state forest."

The acreage purchased in 1995 from the Kerr-McGee Corporation was combined with the Clow, Alley Spring, and Flat Rock state forests to create the nearly 40,000-acre Angeline CA, located in Shannon County.

Also contributing to the area's irregular boundaries is its proximity to the Ozark National Scenic Riverways, which borders the area to the south and east along the routes of the Current and Jack's Fork rivers. Although the right of way along the rivers is U.S. National Parks Service property, both rivers are accessible through Angeline CA.

What the area lacks in symmetry, it makes up for in opportunity for equestrians, hikers, and nature watchers. In addition to a 9.5-mile equestrian trail, the area has a 1-mile hiking-only trail, a shooting range, and three natural areas.





"Angeline is a pretty big chunk of wilderness."

—Resource Forester Eileen Eck

NOPPADOL PAOTHONG

ANGELINE CONSERVATION AREA

consists of 39,582 acres in Shannon County. From Eminence, go north on Missouri Highway 19 or west on Highway 106.

N37° 09′ 47.16″ | W91° 21′ 15.12″

short.mdc.mo.gov/Zg7 573-226-3616

WHAT TO DO WHEN YOU VISIT

Bird-Watching Included in the National Audubon Society's Current/Jack's Fork Watershed Important Bird Area (**short.mdc.mo.gov/ZcC**). Included in the Great Missouri Birding Trail (**short.mdc.mo.gov/Zg8**). The eBird list of birds recorded at Angeline CA is available at **ebird.org/hotspot/L352394**.

Camping Designated camping areas available. Backpacking or float-in open camping allowed.

Fishing Black bass, rock bass, sunfish

Hiking 1-mile hiking-only loop

Horseback Riding 9.5-mile equestrian trail system

Hunting **Deer** and **turkey**
Deer and turkey regulations are subject to annual changes. Please refer to the *Spring Turkey* or *Fall Deer and Turkey* booklets for current regulations.

Also **dove, quail**, **rabbit**, and **squirrel**

Shooting Range Firearms range with 50-, 100-, and 200-yard targets.

WHAT TO LOOK FOR WHEN YOU VISIT

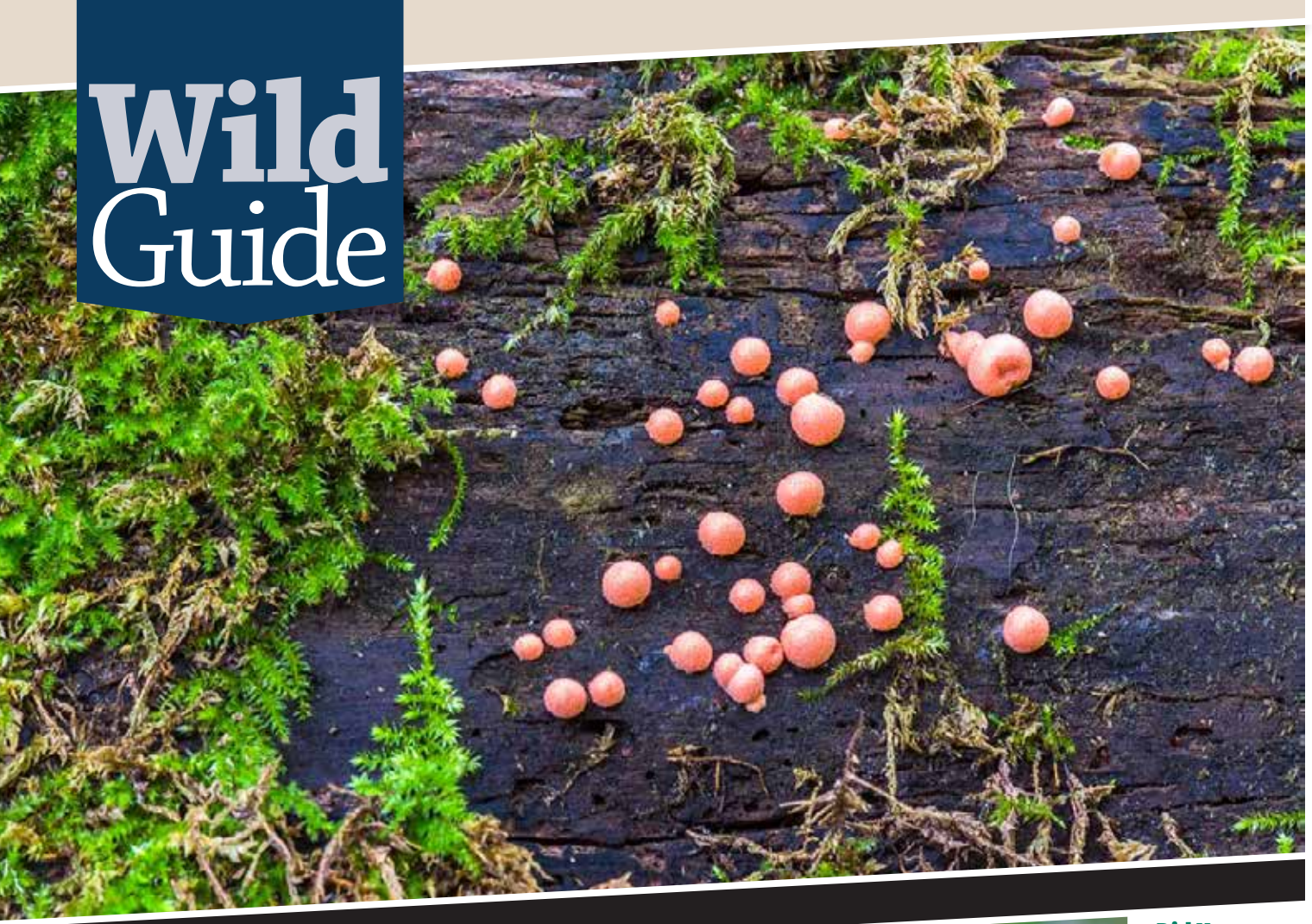

Black bear


Prairie lizard


Eastern hog-nosed snake


American woodcock

Wild Guide



Wolf's-Milk Slime (Toothpaste Slime)

Lycogala epidendrum

Status	Size	Distribution
Not edible	1/3–5/8 inch	Statewide

These little round, reddish-pink balls, called wolf's-milk slime, have certainly rolled around the scientific community. They belong to a group called slime molds, funguslike organisms once regarded as animals. Later, they were considered plants and then fungi. Now, due to DNA studies, slime molds are believed to be closer to protozoa and studied by botanists and mycologists. You can find them in large groups on dead wood between June and November. If you pop one, a pinkish-orange substance, the texture of toothpaste, will ooze out.

Did You Know?
Slime molds have long-been a source of fascination and have even inspired science-fiction movies, such as *The Blob* in 1958.

LIFE CYCLE

Wolf's-milk slime has two life-cycle stages — plasmodium and sporangia. During the first stage, huge, single-celled amoeba go unnoticed as they creep along dead plant material, engulfing and digesting bacteria, yeasts, and fungi. At the second, more funguslike stage, spores float away to reproduce elsewhere, starting the cycle all over again.

ECOSYSTEM CONNECTIONS

Wolf's-milk slime feeds on bacteria, yeasts, and fungi on decaying materials, like rotting wood. It is consumed by other organisms, such as fungi, nematodes, and small insects.

MAIN: JOLANDA AALBERS / SHUTTERSTOCK; INSETS: NK-55 / SHUTTERSTOCK, BOGDAN IONESCU / SHUTTERSTOCK

Outdoor Calendar

MISSOURI DEPARTMENT OF CONSERVATION

FISHING

Black Bass
Impounded waters and non-Ozark streams:
Open all year

Most streams south of the Missouri River:
May 25, 2019–Feb. 29, 2020

Bullfrogs, Green Frogs
June 30 at sunset–Oct. 31, 2019

Nongame Fish Gigging
Streams and Impounded Waters, sunrise to midnight:
Sept. 15, 2019–Feb. 15, 2020

Paddlefish
On the Mississippi River:
Sept. 15–Dec. 15, 2019

Trout Parks
Catch-and-Keep:
March 1–Oct. 31, 2019

Catch-and-Release:
Nov. 8, 2019–Feb. 10, 2020

TRAPPING

Beaver, Nutria
Nov. 15, 2019–March 31, 2020

Other Furbearers
Nov. 15, 2019–Jan. 31, 2020

Otters, Muskrats
Nov. 15, 2019–Feb. 20, 2020

Rabbits
Nov. 15, 2019–Jan. 31, 2020

For complete information about seasons, limits, methods, and restrictions, consult the *Wildlife Code of Missouri* at **short.mdc.mo.gov/Zib**. Current hunting, trapping, and fishing regulation booklets are available from local permit vendors or online at **short.mdc.mo.gov/ZZf**.

Free MO Hunting and MO Fishing Apps

MO Hunting makes it easy to buy permits, electronically notch them, and Telecheck your harvest. MO Fishing lets you buy permits, find great places to fish, and ID your catch. Get both in Android or iPhone platforms at **short.mdc.mo.gov/Zi2**.

HUNTING

Bullfrogs, Green Frogs
June 30 at sunset–Oct. 31, 2019

Coyote
Restrictions apply during April, spring turkey season, and firearms deer season.
Open all year

Crow
Nov. 1, 2019–March 3, 2020

Deer
Archery:
Sept. 15–Nov. 15, 2019
Nov. 27, 2019–Jan 15, 2020

Firearms:
- Early Youth Portion (ages 6–15): Nov. 2–3, 2019
- November Portion: Nov. 16–26, 2019
- Late Youth Portion (ages 6–15): Nov. 29–Dec. 1, 2019
- Antlerless Portion (open areas only): Dec. 6–8, 2019
- Alternative Methods Portion: Dec. 28, 2019–Jan. 7, 2020

Dove
Sept. 1–Nov. 29, 2019

Groundhog (woodchuck)
May 6–Dec. 15, 2019

Other Furbearers
Nov. 15, 2019–Jan. 31, 2020

Pheasant
Youth (ages 6–15):
Oct. 26–27, 2019

Regular:
Nov. 1, 2019–Jan. 15, 2020

Quail
Youth (ages 6–15):
Oct. 26–27, 2019

Regular:
Nov. 1, 2019–Jan. 15, 2020

Rabbit
Oct. 1, 2019–Feb. 15, 2020

Sora, Virginia Rails
Sept. 1–Nov. 9, 2019

Squirrel
May 25, 2019–Feb. 15, 2020

Turkey
Archery:
Sept. 15–Nov. 15, 2019
Nov. 27, 2019–Jan. 15, 2020

Firearms:
- Fall: Oct. 1–31, 2019

Waterfowl
See the Waterfowl Hunting Digest *or visit short.mdc.mo.gov/ZZx for more information.*

Wilson's (Common) Snipe
Sept. 1–Dec. 16, 2019

Woodcock
Oct. 15–Nov. 28, 2019

ILLUSTRATION: MARK RAITHEL

Serving nature and you®

This Ouachita map turtle (pronounced WAH-shi-tah) is enjoying an early autumn swim. Ouachita map turtles are active from late March through early October. They overwinter in the muddy bottoms of the water they inhabit. Get out and discover Missouri turtles. For more information, visit **short.mdc.mo.gov/ZM2**.

by **Noppadol Paothong**

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