

How Spiders Hunt

More than you probably want to know about these creepy but impressive predators

Text and photos by Chris Helzer

It's no accident that a spider scared Miss Muffet off her tuffet. With the possible exception of snakes, no creatures in Nebraska are more likely than spiders to send people into irrational, arm-flailing, high-jumping, screaming fits. You could make an argument for mice, but I would counter that it's usually the surprise of seeing them skitter across a room that gets people. Spiders don't need the element of surprise to be creepy – they just are. Simply by putting big pictures of spiders in this magazine, I've probably run off 20 percent of *NEBRASKALAND*'s readers this month. Can you believe they're paying me for this?

The scary truth is that there are about 34,000 species of spiders in the world. But while at least 200-300 species can be found in Nebraska, only two of them are really a threat to people: the brown recluse and the black widow. The bites of both species can cause serious injury, but are rarely fatal if treated.

However, while the vast majority of spiders are harmless to people, they are very significant predators of insects and other small creatures. They're also impressive, even beautiful creatures, if you can get past the initial, visceral response many of us have when we see them (They're also less beautiful after they've been stepped on). The importance of spiders to Nebraska's ecosystems is difficult to gauge because we don't

really know much about their abundance, let alone how much they eat, but anyone who has seen their vast numbers of webs on dew-covered grass or tried to walk through woodlands without a stick to knock webs out of the way knows we have a lot of spiders. It's not hard to imagine the kind of impact spiders have on our environment.

How Spiders Hunt

Spiders are built for killing. First, most spiders have eight eyes (some spiders have six and a few species have fewer or none) to find and track their prey. All spider eyes are simple eyes, as opposed to the compound eyes that insects have. They usually have two main eyes, surrounded by secondary eyes. These secondary eyes help them catch the movement of prey within a broad field of vision, while the main eyes focus on the prey as it moves closer.

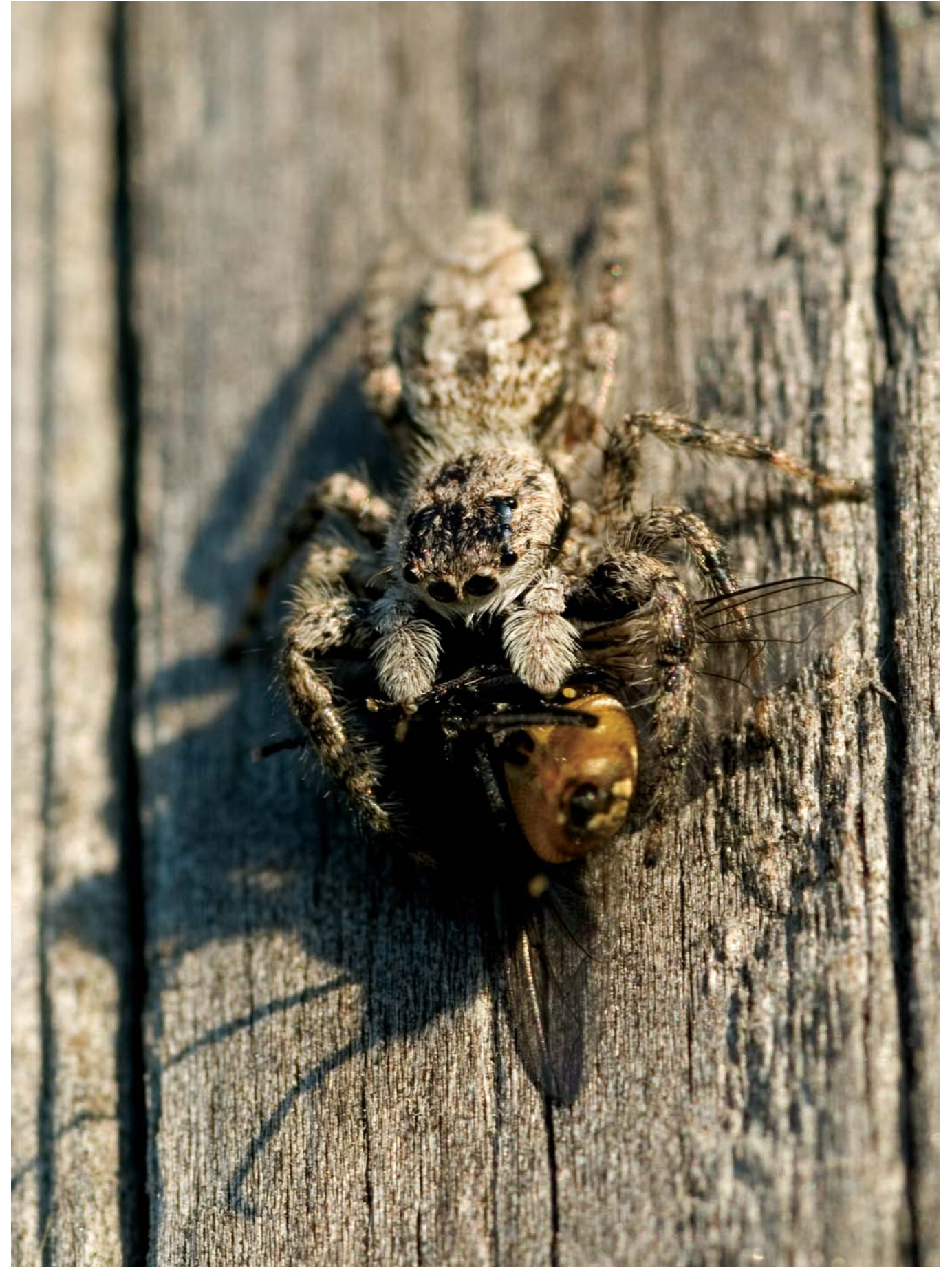
Besides their eyes, spiders have other sensory abilities. One is that their bodies are covered with hairs, and those hairs are attached to nerves, making them incredibly sensitive to vibrations. Some of these hairs are sensitive enough to pick up sound waves. In many cases, a spider can "hear" even small prey walking or flying nearby. In addition to these sensitive hairs, spiders also have what are called slit sense organs on their legs and elsewhere on their bodies that are probably used for "smelling." Finally, spiders have small appendages called palps (or pedipalps), that usually resemble small legs located beneath their eyes. These are actually sensory organs that function somewhat like the antennae of many insects. There are hollow hairs on the palps through which spiders can "taste" their prey or other things.

Spiders, of course, have eight legs, which they use to run, jump and climb, but also to catch and hold prey. In many species, only the front set or two of legs are typically used to grasp prey, but in some cases all eight are needed to hold onto particularly large and powerful creatures. In addition to the sensory hairs mentioned earlier, spiders also have fuzzy feet, which help them walk on vertical surfaces and upside down – even on very slippery surfaces.

All spiders have the ability to make silk threads, including wandering spiders. Webs that snare prey



Above: A long-jawed orb weaver dangles from grass in the early morning light near Wood River. Opposite: A jumping spider feeds on a fly it captured on a fence post along the Platte River west of Grand Island.



are one obvious use of that silk, but there are many others. Jumping spiders use silk as a safety line when jumping, some spiders use silk to pin their prey to the ground before biting it, spherical egg cases are woven from silk, and silk is commonly employed in the construction of various types of safe shelters for spiders to retreat into. Spider silk is surely one of the natural wonders of the world, with a tenacity only slightly less than nylon but with twice its elasticity. Its ability to stretch until broken surpasses that of bone, tendon or cellulose, and it is half as strong as the best steel humans can make.

Finally, the jaws (chelicerae) of spiders include hollow fangs, through which a potent venom is injected into their victim upon biting them. That venom contains enzymes that dissolves the inside of the prey, allowing spiders to then suck that liquid out through the bite holes. The fangs of jumping spiders are some of the easiest to see because they are often brightly colored.

While spiders employ a wide variety of hunting strategies, some with webs and some without, most spiders follow a fairly consistent set of steps when they capture and kill prey. Typically, the prey is first grabbed with the spider's front legs and held while the spider bites the prey and injects it with venom. Once the prey is immobilized by the venom, the spider typically lets go with its legs and uses its chelicerae to continue grasping the prey. It then proceeds to feed.

Some spiders, including jumping spiders, crab spiders and wolf spiders, do most of their hunting during the day, but the majority of spiders are more active at night. There are several reasons for this, including the fact that many of their prey species are also nocturnal. Another likely reason for spiders to be active at night is that birds and reptiles, common predators of spiders, do most of their hunting during the day. Finally, spiders can avoid desiccation in the dry sun by hiding in the shade during the day and coming out to hunt in the darkness.

What Spiders Eat

Spiders can be voracious eaters. Many species can eat up to 12 percent of their own body weight in a day – the equivalent of a 150-pound person eating an 18-pound steak. However, a large meal can last a spider several days and their slow metabolism allows spiders to go very long periods, even months, without food. Spiders consume only about one-fifth as much oxygen at rest as cold-blooded vertebrates, and about one-hundredth as much as warm-blooded animals. In other words, spiders can afford to be very patient. Since the vast majority of spiders are ambush hunters, that's a

good trait to have.

The two most common prey for spiders are flies and springtails (*Collembola*). The latter are very abundant, but tiny, insects that live and feed in leaf litter, and they are especially important sources of food for small spiders. For larger spiders, beetles, grasshoppers, and butterflies are also common prey, but nearly any insect is a possible target. However, there are some insects that have developed defenses against spiders, including stink bugs, ants, wasps, some beetles, moths and caterpillars. These species either have chemical defenses, or simply a bad taste, that make them less attractive prey.



Daniel Helzer shows off his new friend. Jumping spiders are fun to observe and play with, and pose no danger to people.

Hunting Strategies

Spiders can be generally categorized into one of two groups relative to their hunting strategies – wandering spiders or web spiders. Wandering spiders are those species that do not use webs for hunting and are therefore free to wander the world in search of food. Although many wandering spiders can move very quickly in pursuit of prey and have better eyesight than web spiders, the majority of wandering species are ambush predators. In Nebraska, the three most common groups of wandering spiders are jumping spiders, wolf spiders, and crab spiders.

Web spiders rely on silken structures to help them catch their prey. A great variety of web-weaving spiders and web designs can be found in Nebraska, but three of the most common and recognizable types are orb weavers, funnel-web spiders and sheet-web spiders. All three use their webs to snare prey, after which they run to the prey and subdue it with a venomous bite. Because they rely on their webs to catch their prey, web spiders tend to have small eyes and poor eyesight, relying on their ability to sense vibration much more than their vision.

Regardless of strategy, spiders are important predators in Nebraska. Their abundance and diversity make them valuable parts of the ecosystems they live in, but I think they're worthy of respect for other reasons as well. Anyone who has watched a jumping spider pounce on a fly or a garden spider dash out and wrap up a startled grasshopper can't help but be impressed. Spiders eat many of the same creatures we find to be pests, so even if you don't appreciate the aesthetic or athletic values that spiders have, they can still be helpful.

But only if you don't step on them. ■

Following are six examples of spiders and their hunting strategies.

Jumping Spiders

Perhaps the most charismatic of spiders is the jumping spider. Its very large eyes set it apart from other spider species, most of which have very small eyes and poor eyesight. Its short legs and compact fuzzy body make it look more like a tiny teddy bear than a spider. They are also relatively easy to catch and tolerate being handled relatively well, making them fun to play with (assuming you aren't in the middle of a screaming fit).

Jumping spiders hunt by ambush, but they see relatively well, so they generally stalk their prey until they are close enough to make a final pounce. Because they often hunt on vertical surfaces, pouncing can be particularly challenging. To compensate, jumping spiders attach a safety thread to whatever they're standing on before they jump. If they miss their target or muff the landing, the safety thread catches them and they can simply climb the thread back to where they started.

Though most are less than ½-inch long, jumping spiders justify their name by jumping up to six inches or more, especially when trying to flee danger. That distance is even more impressive considering that they don't have oversized legs, as do many other invertebrates known for jumping (grasshoppers, fleas, etc.). Furthermore, spiders don't use muscles to extend their legs when walking or jumping. Spiders contract their legs muscularly, but they extend their legs hydraulically – by increasing their blood pressure. (This is why the legs of dead spiders curl up – they've lost blood pressure and there is no resistance to the contraction muscles.) So when a jumping spider jumps, it lifts its front legs and extends its rear legs with a sudden and forceful boost of its blood pressure. It's likely that their prey also experiences a sudden boost of blood pressure when they realize the jumping spider is pouncing on them, but that's difficult to confirm.

Jumping spiders have very large eyes and good eyesight



A large female wolf spider with her egg sac



Wolf Spiders

In contrast to the cuddly jumping spiders, wolf spiders are everything arachnophobes dream of – large, fast spiders with long hairy legs and beady eyes. Contrary to what their name and speed might indicate, wolf spiders usually don't chase and bring down prey on the run. Instead they tend to sit in quiet ambush for prey to come to them. In addition, and fortunately for the world of small animals, wolf spiders hunt alone, not in packs.

Wolf spiders have two large eyes and six smaller eyes, but they rely on sensing vibrations from prey as much or more than they do on their eyesight. They are sensitive enough that they can sense wingbeats or footfalls of nearby prey and direct their attack based on those vibrations. Like jumping spiders, wolf spiders pounce on their prey, but they have to be much closer because most can only jump about one to one-and-a-half times their body length. Wolf spiders usually catch prey with their front pair or two of legs and hold on while they bite. With larger and stronger prey they will sometimes use a basketlike grasp employing all eight legs.

Smaller wolf spiders roam freely around the landscape and find shelter where they can, but larger ones dig burrows and line them with silk.

Burrows can be up to ½-inch in diameter or more, and are relatively easy to recognize if you're looking for them. Wolf spiders are probably best known for the level of brood care undertaken by females. After laying eggs, the female attaches the spherical egg case to her spinnerets and carries it until hatching time. Then she rips open the case to release the spiderlings, which ride around on her back before dispersing.

Crab Spiders

Crab spiders get their name from their long front legs and flattened bodies, which give them a crablike appearance. They can also move both sideways and backwards like crabs. In Nebraska, the species most often seen are those that sit on flowers, waiting to ambush any small insect that might land near them. Unlike most other wandering spiders, crab spiders have very small eyes. Those eyes function more like motion detectors than true eyes, but are good enough to see when prey is within reach.

Crab spiders sit motionless until prey comes within reach and then quickly grab the prey with their long front legs and bite it. Accordingly, most crab spiders are very well camouflaged, including both their color and the texture of their bodies. Some species can even change color – between white and yellow – to match the color of the flower they're hunting on. Although they can be difficult to see, if you look closely at flowers it won't take long to find crab spiders in just about any natural area you visit across the state.

Orb Web Weavers

Among web-weaving spiders, the orb web-weavers are probably the most familiar. Although there can be tremendous variability between species, the standard orb web has three main elements: frame threads, radial threads and the catching spiral. The frame

threads are the rim, or outside edge, of the web and give the web its shape. Radial threads are like the spokes of a wheel and run from the frame threads to the hub in the center. The catching spiral consists of silk that spirals from the center of the web to the frame, and is the only part of the web that is sticky. The silk that makes up the catching spiral is studded with glue droplets that hold hapless insects fast when they blunder into the web. Most web designs also include a free zone outside the edge of the hub, which is a gap between the hub of the web and the beginning of the catching spiral. The spider can squeeze through this gap in order to switch from one side of the web to the other.

In most cases, the spider either sits in the center of the web or in a retreat on or near the edge of the web while it waits for prey to come along. Insects that hit the web get stuck, at least momentarily, and the spider runs to them and either bites the victim immediately or wraps it in silk to immobilize it before biting it. Since orb web spiders have poor vision, they locate the prey by sensing the vibrations of the web.

The most recognizable of the orb web spiders in Nebraska are probably the large yellow and black garden spiders. These spiders sit in the hub of their webs and are easy to see, especially in late summer and early fall. Garden spiders seem to have a system that helps them decide whether to bite their victims immediately or wrap them before biting. Small prey are usually just given a quick bite and carried back to the hub to be eaten. If the prey is large and difficult to carry, the spider will sometimes tie a thread to them and drag them.

Potentially dangerous insects such as wasps are often wrapped up in silk before being bitten. Moths are often wrapped as well because the numerous scales on their wings flake off so easily that they aren't often trapped for long by sticky web silk. Other large insects are often bitten immediately, but grasshoppers are usually an exception and are wrapped first – presumably to prevent their strong legs from damaging the web.



A crab spider waits in ambush on a purple poppy mallow flower

Funnel-web Spiders

Funnel-web spiders are commonly seen in the corners of buildings or in the short grass of lawns, where they make sheetlike webs that narrow to a funnel on one end. However, the webs are also abundant outside of town, particularly in grass and low bushes. The spider sits in the silken funnel tube, which is open on both ends so the spider can quickly access the web or escape through the other end, when necessary. Funnel web spiders use their front legs to feel for the vibrations from an insect hitting the web and then run out to bite the prey and carry it back to the tube to be eaten. Many webs have vertical threads that help hold the web up, but that also are hit by flying insects which then fall to the sheet and are caught by the spider.

One of the intriguing things about funnel web spiders is that they can run quickly across their webs without getting stuck the way other insects do. Unlike orb web spiders that can simply avoid stepping on the sticky spiral catching thread, the funnel-web spider's secret is that it runs on tip toe. As it crosses its web, only the very narrow tips of its legs contact the web. In contrast, prey insects walk or run in a much more flat-footed manner, and get stuck in the dense network of silken fibers.

Sheet Web Spiders

There are a number of different kinds of sheet webs built by a wide variety of spiders, including the dome- or bowl-like webs often found in bushes. These webs are delicate, horizontal and convex webs



A funnel web spider waits in its funnel, ready to attack any insect that happens by its web

suspended by threads above and below. As with funnel webs, those vertical threads are often hit by insects, which fall to the sheet. Sometimes insects get caught in the vertical threads themselves and the spider will shake the web until the insect falls to the sheet. The spider hangs underneath the bowl or dome while waiting for prey to arrive, and when an insect hits the sheet of the web the spider bites it through the web and then drags the victim through the web to eat it.

Another type of sheet web is called a tangle web or cobweb, constructed of loose and irregular threads. Glue droplets are used on some of those threads (trapping threads). When an insect hits a trapping thread and sticks to it, the bottom of the thread breaks off and leaves the insect dangling in the air. Usually, its struggles carry it to other nearby trapping threads and the insect becomes more tangled. The spider comes down from its hiding place above, throws more sticky threads over the victim and then bites it.

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The web of a bowl and doily spider (sheet web spider) in a plum bush

An orb web spider hangs in the center of its web on a dewy morning