

# Appendix E: Arthropods



The arthropods are animals that have an exoskeleton and jointed legs. They are by far the most numerous life form on Earth, both in the number of species and in the number of individuals. There are over five times more species of arthropods than all other species in the entire animal kingdom. Except for flat worms and a few others, arthropods are among the oldest terrestrial creatures. Fossilized impressions of primitive crustaceans have been found in 550-million-year-old shale deposits. The phylum Arthropoda includes:

- insects
- spiders
- crustaceans
- centipedes
- millipedes

Common names more familiar to us are used to refer to either a non-specific group of living things or to a specific type of arthropod. As an example, we can use the term “bug” when referring to anything from a microbe to a big insect. To people who study insects it specifically means a little insect that has its mouth parts modified into a piercing beak. There is no harm in using common names as long as care is taken to assure that both the speaker and listener agree what it refers to. Here both scientific and common names are used. Scientific names describe arthropods by common characteristics from class to family to species.

## *Class Insecta*

There are 26 orders of insects found in North America. This appendix limits its discussion to insects that are most commonly found in the Rio Grande bosque. Class Insecta includes flies, beetles, butterflies, grasshoppers, bees, etc. Insects can be differentiated from other arthropods by a few of their unique physical characteristics (these apply to adults):

- They have an exoskeleton which is generally hard and inflexible, rather than soft and pliable.
- They have three body sections: the head, the thorax and the abdomen.
- The three pairs of legs are attached to the thorax.
- They have paired compound eyes.
- They have one pair of antenna.
- Most have two pairs of wings.

Insects progress through the life cycle in a very complicated series of transformations in one of two ways: simple metamorphosis and complete metamorphosis.

The first process is actually not simple at all. The tiny insect hatches from its egg and first becomes a nymph. Except for size and bodily proportions the nymph resembles the adult which it will eventually become. The young larva progresses through several growth stages, called instars, where it feeds nearly continually.

When it grows too large for its ridged exoskeleton it breaks out of the old one and forms a larger new one.

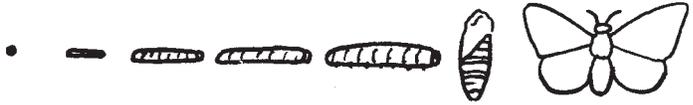




After about five instars it emerges as an adult. Only the adult insect has a complete set of wings and is sexually mature. All insects related to the dragonflies, grasshoppers, earwigs, plant bugs, cicadas, fleas, termites and mayflies develop through a process of simple metamorphosis.

### ***Complete Metamorphosis in Insects***

The other process by which insects develop is called complete metamorphosis. During this process the tiny hatchling, which is called a larva, does not resemble the adult in any way. It takes the form of a worm, grub, caterpillar, maggot or wood borer. During the larval stages it eats continually and often grows to be much larger than the adult. The larva's body covering is soft and flexible and it expands as the larva grows. Following the larval stage it transforms into a hard-shelled stage called the pupa. During the pupa stage the internal organs and body structure dissolve into an amorphous mass. Eventually, after a powerful enzymatic change, the body parts develop inside the case



When the embryo breaks out of the case it pumps fluid from its body into its wings, and the creature takes on the appearance of the adult insect. The members of the beetle, wasp, true fly and butterfly families develop through complete metamorphosis.

### ***Order Odonata (dragonflies and damselflies)***

The nymphs of all members of this order spend their lives in fresh water. The adults lay their eggs on the surface of the water or on grass stems at the water's edge. The hatchlings enter the water and feed on organisms in the water or on plant material.



*dragonfly*

They all develop through a process of simple metamorphosis. Eight or nine species of dragonflies can be seen around the Nature Center throughout the summer months. Several species of damselflies can also be found there. Damselflies and dragonflies can be distinguished from one another by their eyes and the way they fold their wings. The eyes on the dragonfly are very large and meet at the top of their head, and their wings remain extended perpendicular to their body when at rest. Damselfly eyes are large but do not meet at the top of the head, and the wings are folded along the abdomen at rest.

### ***Order Ephemeroptera (mayflies)***

Mayflies can be seen during the summer months, sitting at rest on twigs and wire fences. They have very fragile wings that are nearly transparent. The body has a very soft exoskeleton and two very long hair-like extensions from the rear of the abdomen. The nymph stages are spent in fresh-flowing water where they consume their lifetime supply of nutrients. When they emerge from the water and develop into adults they have no mouth parts. They only live long enough to mate, fly to a suitable stream and lay eggs before they die.

### ***Order Orthoptera (grasshoppers, crickets and katydids)***

All of the members of this order undergo simple metamorphosis. Most species lay



their eggs in the forest duff or in the ground at the base of a biannual plant. The young hatch in the spring or early summer and start to eat which they do nearly continuously. They progress through several instars and become adults in about two months. Generally the species is perpetuated by over-wintering in the egg stage. Occasionally a grasshopper in its third or fourth instar can be found in the spring but this is unusual rather than the norm.

There are several species of grasshoppers in the bosque, the most common being the differential grasshopper. Its size can range from about 1" to more than 2", and it can be identified by the distinct black chevron stripes on its hind femur (leg). Other species are the black grasshopper, the red-winged clicker, the Carolina locust, which is brown, the yellow banded wing and the valley green. In all, nine or ten different types of grasshoppers can be found here at different times of the summer months.

The common field cricket is generally black in color, with large hind legs and long antenna. They resemble a grasshopper but they fold their wings flat over the abdomen. They rarely attempt to fly and they only make short hops. The shrill chirping sound is produced when they rub their legs together. Adult and nymph crickets can be found under the leaf litter any time of the year when the ground is not frozen. The Jerusalem cricket, locally called the child of the earth and niño del tierra or niño del mundo, is commonly found in the loose soil under stones and in leaf litter throughout the bosque. This is a large, pale, slow-moving creature which vaguely resembles an immature cricket or, some people say, a grotesque human embryo. Even as adults they do not have wings and spend most of the daylight hours beneath the soil. They feed primarily on vegetation and decaying matter but will eat insects, grubs and even their own mates should the opportunity present itself.

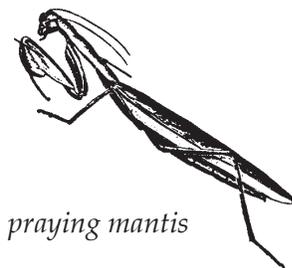


*Jerusalem cricket*

Katydids spend most of their time high in the trees during their nymph stages so they are rarely seen. The adults can be seen in late summer when they take flight to mate and find another suitable site to lay their eggs. Katydids resemble grasshoppers but have very long, fragile hind legs that are not suitable for powerful hops. They are generally green in color and have broad, leaf-like wings. The female has a large sword-like projection extending from the last segment of the abdomen. This is not a defensive weapon but apparently a tool to plant her eggs in crevices in the tree bark.

### ***Order Dictyoptera (praying mantis and cockroaches)***

Praying mantis nymphs emerge from their egg cases, which holds hundreds of eggs, early in the spring as tiny creatures that resemble the adults. They are ferocious predators and feed on anything that moves and does not eat them first, even their siblings. They continue to be predators throughout their lives. Some adults grow to be 4" in length and have been known to capture and eat hummingbirds. The adults do not over-winter. The eggs are left to perpetuate the species. Note that sometimes this group is split into two orders: Blattodea (cockroaches) and mantodea (mantids).



*praying mantis*

### ***Order Isoptera (termites)***

There are two types of termites commonly found in the bosque:

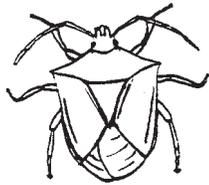


the brown termite and the white termite. Both consume wood that is in contact with ground. They live in colonies but without a strong social structure like that of ants and bees. The queen termite has the ability to produce eggs that will become either wingless workers or warriors, and when the conditions are right she will lay eggs that produce winged workers and a winged queen. The winged hatchlings fly off to form new colonies. Termites resemble ants but where the ant's thorax and abdomen are attached by a thread-like link, the termite's thorax and abdomen are broadly attached.

***Order Hemiptera (stink bugs, squash bugs, water boatman and water strider)***

All of the insects in this order have mouth parts modified into long and pointed beaks. This allows the bug to pierce its prey or a plant and suck out the contents. They can be identified by their half-leathery and half-clear membrane front wings. The wings lay flat over the abdomen when at rest. All hemiptera develop through simple metamorphosis. There are 41 families in the order.

Family Pentatomidae (stink bugs): There are several species of stink bugs in the bosque and their names generally relate to their color. The harlequin is mottled orange and black. The green is bright green with yellow spots along its edge, and the black is, of course, black. The stink bug's back appears to be in the shape of a shield with a small head projecting out of the top. The eyes are close together on the side of the head. Stink bugs are plant eaters but they can use their beak to pierce the finger of a careless handler.



*stink bug*

Families Miridae, Lygaeidae and Coreidae (plant bugs, seed bugs and leaf-footed bugs): The squash bug and leaf-footed bug are close relatives that have an elongated oval shape. They have a scent gland that produces an offensive odor. Another relative is the plant bug which has the same general appearance except for the size. Many of this group are less than 0.25" long and they are somewhat longer than they are wide. They are light gray or black. The milkweed bug and the box elder bug are smaller and narrower than the squash bug and they have red patches on the wings.

Families Corixidae and Gerridae (water boatman and water strider): The water boatman has modified hind legs which allow it to swim rapidly under the water, where it spends most of its life. This bug is a strong flyer and leaves its water habitat to fly to another pond or puddle. The water strider walks on the surface of the water, supported by surface tension around its long tarsi. The nymph stage of the water strider appears to have only two pairs of legs. Both the water boatman and the water strider are predators, feeding on insects and other aquatic life.



### ***Order Homoptera (cicada, aphids and frog hoppers)***

The members of this order are highly variable in body shape and size. The largest is the cicada and the smallest are the white flies. Except for a few leafhopper families the other members of this group do not have the slightest resemblance to the cicada.

The cicada is a plant-eating insect which obtains its nutrients from the roots of deciduous trees. The adult lays its eggs on small stems at the base of a tree, perhaps



a cottonwood, in the late summer. The tiny hatchling makes its way down the stem and burrows into the ground to the roots. The little nymph will drive its beak into the tender root and suck out the plant's juices. It will stay in the vicinity of the same tree for months and even years, depending the species of cicada. It will go through a series of instars, each time getting larger and larger. When it has reached its full size it burrows out of the ground and climbs the nearest tree. There it molts for the last time and emerges as a winged adult. The adult survives for about three

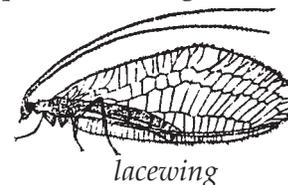
weeks before it dies.

Aphids have a very short development process of simple metamorphosis. They remain on the same leaf or plant bud until they fly off to lay their eggs on another plant. Like many members of this order, the aphids damage crop plants and are serious pests. Aphids feed on plant juices continuously and as a result they must secrete excess liquid and sugars. Some species of ants feed on this "honeydew" and they will protect the aphids from other predators. The ants' protection stops when there is no more "honeydew" and then the ants eat the aphids. The tiny gall aphids make galls (swollen tissue) on the leaves of cottonwood trees.

The leafhopper, the frog hopper, also called a spittle bug, and the tree hopper are all very small plant eaters that can be found in abundance during the late-summer months. Some of them have elaborate body structures which make them appear to be small leaves or thorns on a plant stem. The frog hopper produces a mass of frothy juice at the base of a leaf where it joins the stem and takes refuge in the froth from bug eaters.

### ***Order Neuroptera (antlions, lacewings and aphid wolves)***

The antlion, sometimes called a doodle bug, is, like all other neuropterans, a predator that feeds primarily on other insects, both in the larval and adult stages. It progresses through the life cycle with complete metamorphosis. The little antlion larva positions itself at the bottom of a small conical pit in the soft sand with only the mandibles exposed. When an ant or any other small insect stumbles into the pit the antlion grabs it with its powerful mandibles. After the antlion passes through its pupa stage the adult emerges as a long, slender-bodied insect with equally long membrane wings. It now resembles a damselfly but can be distinguished by the wing venation and antenna. The adult feeds very little if at all before it dies. The conical traps of the antlion larva are very numerous in the sandy soil in the shade of the cottonwood trees.



The larval stages of the lacewing and the aphid wolf are more worm-like, and they crawl about feeding on other slow-moving insect larvae and nymphs. The adults are strong fliers and continue to prey on other insects or anything else they can catch. The



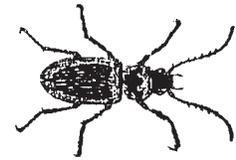
adults can occasionally be collected in the grassy areas of the bosque by sweep netting.

### ***Order Coleoptera (beetles)***

The order of beetles is a vastly diversified group of insects with over 100 separate families that occur in North America. Only the ones commonly found in the bosque are listed here.

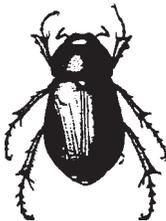
Family Cicindelidae (tiger beetles): One of the most common beetles found on the bosque trails is the tiger beetle. It is a fast runner and a strong flier. It is a small green or bronze beetle that sometimes has white spots on the wing covers. They are ferocious predators and feed on all types of insects that they catch on the ground. Like all beetles the tiger beetle develops through complete metamorphosis.

Family Carabidae (ground beetles): A close relative of the tiger beetle is the ground beetle, and very common but generally found under the leaf litter. They are ferocious predators and feed mostly on the tiny organisms in decomposing vegetation. They range in size from less than 0.25" to over 1" in length. Most of them are black but one species of large ground beetles is colored with a iridescent green or blue.



*ground beetle*

Family Scarabaeidae (scarab beetles): The scarab beetles make up a very large, diverse family ranging in size from 0.1" to over 1.2" in length. Members of this family can be identified by the club-shaped



*scarab beetle*

antenna and very stout front legs that have tiny spurs on them. They are all robust beetles and often covered with a coat of fine hairs. These beetles can be found in the bosque any time from early spring to late fall. Here a few of the common ones.

The brown chafer and the June bug are small to medium sized, robust, light brown beetles commonly seen in May and June. The green June beetle is identified by the iridescent green underside and a light brown triangular shape in the center of its dark green wing coverings. The adults are found later in the summer. The larvae of this group, called grubs, feed on humus in the soil or live roots under the ground for months and some for years before progressing through the pupa stage to the adult stage. The ten lined June beetle is a large beetle which is shaped like a large chafer but has white and brown longitudinal stripes down its wing coverings. The grub-like larva feeds on the roots of the cottonwood trees for a year before pupating. This beetle is commonly found from mid-July to early fall.

The tumble bugs or dung beetles can be found around deposits of dung any time during the summer. Some species roll the dung into round balls which they roll into a hole in the ground that they have prepared. Then they lay an egg on it and cover the ball with dirt. The larvae feed on the dung safely under the ground. Other species will attempt to bury the dung in an excavation they dig below the dung pile. This may be a cooperative effort because you will see many beetles at work on the same dung pile. The abdomen of the dung beetle is greatly reduced in size so that it appears the hind legs are near the rear end of the beetle.

The bumble flower beetle is a robust beetle that is about 0.5" long and gray with black mottling on its wing coverings. The adult feeds on juices that drip from cuts in



the plant stem that have been made by the beetles. They can sometimes be found in great numbers on the annual sunflower, feeding on juices that ooze from the stems.

Family Tenebrionidae (darkling beetles): The darkling beetles found in the bosque range in size from 0.25" to over 1.5" in length. They have a very hard shell that is shiny black. Some have smooth wing covers and some have longitudinal grooves in the wing covers. Most of them have a pointed abdomen. When disturbed the desert stink beetle will raise up its rear end and release a foul odor. Other darkling beetles are flat and scurry along the ground and can be mistaken for ground beetles.

Family Cerambycidae (longhorn beetles and wood borers): The longhorn beetles are identified by their very long thin antenna and square shoulder appearance of the wing coverings. The antenna are very long, extending to over half as long as the body, and some have antenna that are longer than the entire length of the body. This beetle ranges in size from a fraction of an inch to over 2". The larvae of many species of this family feed on the wood in both live and dead trees.

There are several kinds of wood-boring beetles in the bosque. They are not often seen but evidence of their presence can be found under the bark, in the cambium layer of dead cottonwood limbs. There the little squiggly grooves in the wood have been made by one or another member of the wood-boring beetle families.

The cottonwood borer is about 1" long and has lateral white and black stripes, and the locust borer is about the same size but is yellow and black. Both can be occasionally found in the bosque in mid to late summer. The largest beetle found in the bosque is the ponderosa borer which is a uniform brown in color, about 2.5" long, and has antenna longer than its body.

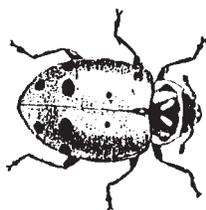
Family Chrysomelidae (leaf beetles): The leaf beetles are generally small, about 0.25" long, and often highly colored. The larvae feed on the leaves of trees and annual plants. They all over-winter in the egg stage and they all hatch at the same time early in the spring. Their coincidental hatching is the reason there are so many all at the same time. Several species in this group have successive life cycles during the growing season.

Every few years there is an infestation of cottonwood leaf beetles. They are small to medium sized beetles that are gray with black spots on their wing coverings. The elm leaf beetles are small beetles that have two light stripes down the wing coverings. They carry on with a number of breeding cycles during the summer months.

The spotted cucumber beetle resembles a ladybird beetle except it is yellow-green with black spots. The longhorn flower beetle resembles the Cerambycidae in size and length of its antenna but it has the other characteristics of the Chrysomelidae.



*spotted cucumber beetle*



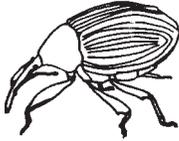
*ladybird beetle*

Family Coccinellidae (ladybird beetles): There are several kinds of ladybird beetles commonly in the Rio Grande bosque and the most commonly found kind is the small round red beetle with black spots on its wing coverings. The various species are identified by the number and arrangements of the spots. Occasionally a red spotted ladybeetle can be found which has red spots on black wing coverings. All but one group of ladybeetles are predators, both as larvae and as adults. They



feed on aphid nymphs and the larva of the leaf beetles. The Mexican bean beetle is about the same size as the ladybird beetles but it is yellow-green with black spots. This beetle feeds on vegetation rather than other insects. Most often they are garden pests but they may be found in the bosque in late summer.

Family Curculionidae (weevils and snout beetles): All of the members of this family have a protruding mouth part which is really an extension of the head not a proboscis. The antenna and eyes are often located on the head's extension. The snout beetles have extensions that are about as long as their head is wide, whereas the weevils have greatly elongated extensions several times longer than the width of their heads. The



*weevil*

antenna is generally attached midway down the extension, just in front of the eyes. They are characterized by being very small in size, very hard shelled and gray in color. Generally they are crop pests in open fields but they also can be found in the grass and leaves along the trails and in collections made with a sweep net.

### **Order Lepidoptera (butterflies, moths and skippers)**

The beauty and grace of butterflies flying about over a field of flowers is always a source of wonderment. Unfortunately space does not allow a detailed description in this guide of all the butterflies that may be seen in the bosque.

Family Papilionidae (swallowtail butterflies): The western tiger swallowtail which is nearly 4" across the wings is brightly colored yellow and black. The larvae (caterpillars) feed primarily of the leaves of deciduous trees. The anise is another swallowtail which is occasionally seen at the Nature Center. Their caterpillars can be found feeding on the fennel and other members of the dill family.

Family Nymphalidae (brush-footed butterflies): One of the more common butterflies is the mourning cloak which is nearly 3" across the wings. The wings are dark brown with a dusty yellow marginal wing band. A row of faint blue spots lie inside the marginal band. This butterfly over-winters as an adult and makes its first appearance as early as February 20. The caterpillars of the mourning cloak feed on the cottonwood leaves and may go through several successive life cycles during the summer. The red admiral, the checker spots, the painted lady and the viceroy, as well as many other very colorful, medium to large sized butterflies that are found in the bosque belong to the brush-footed butterfly family.



*tiger swallowtail*

Family Pieridae (sulphur and white butterflies): The cabbage butterfly is a bright yellow, medium sized butterfly that has black markings near the wing tips. It is often seen fluttering about among the green vegetation at the Nature Center, starting early in the spring and continuing throughout the summer. The white butterfly is about the same size as the cabbage butterfly but it has white wings with black spots.

Family Danaidae (milkweed butterflies): The monarch is a large, 4" wing span butterfly with red-orange panels with black wing veins. Its larvae feed on the milkweed plant and it takes on the foul taste of the milkweed. Some authorities say that the bright red coloring of its wings sends a warning message to potential predators. These beautiful insects can be seen during the late-summer months. The Rio Grande bosque is not on one of the monarch's normal flyways so we do not have the swarms of migrating



butterflies reported in other parts of the country.

Family Sphingidae (sphinx moths): The sphinx moth is a common visitor to the Nature Center during the mid-summer months. They are a large, strong flyers that mostly travel at night. The larva is the horned tomato worm which is a garden pest. The underwing has pastel red coloring. There are a great number of different species of moths and primitive moths found in the bosque. The identification of them is difficult and beyond the scope of this guide. It can be said that, when one encounters a small, fuzzy, gray insect with its broad wings laid flat over its abdomen when it is at rest, it is probably a member of one of the 75 different families of moths found in the area.



*sphinx moth*

Family Hesperidae (common skippers): The skippers are a cross between the butterflies and the moths. They have the body shape of a moth and the coloring of a butterfly. Where the butterfly's antenna is nearly always clubbed and the moth's antenna is nearly always plumate, the skipper's antenna has a flattened club and it forms a hook at the end. Skippers are fairly common during the summer in the bosque.

### ***Order Diptera (two-wing flies)***

All of the members of this order have only one pair of wings. Most often the wings are a transparent membrane with readily visible cross veins. Except for the fungus gnats, they have very small hair-like antenna. The compound eyes are relatively large and cover most of the head. The members of this order are numerous and highly diversified. There are over 95 families and some 16,000 species of true flies in North America alone. Only a few of the more common species found in the Rio Grande bosque are listed here.

Family Tipulidae (crane flies): Crane flies are about .75" long and resemble very large mosquitoes except they do not have biting mouth parts and their antenna are very small. They are commonly found in the shade of buildings under overhanging eaves. The larvae live in water. They are first seen in the early months of spring and will be found all summer long.

Family Culicidae (mosquitoes): Only the female mosquito has piercing mouth parts and takes blood meals that provide an animal protein needed to produce fertile eggs. The male mosquito resembles the female but has a large, plumate antenna where as the female has hair-like antenna. The mosquito's larva and pupa live in standing pools of water. They are equipped with a breathing tube so they can survive in highly contaminated, stagnate water. The adult mosquito only lives for a few weeks to a month, and the female will take several blood meals during her lifetime.

Family Chironomidae (midges): There are several kinds of midges found at the Nature Center. They generally appear in swarms in early spring and are only prevalent for a few weeks. The larvae are bright red thread-like worms and live in water or in an environment that is saturated with water.



*mosquito*

Family Asilidae (robber flies): The robber flies are ferocious predators capable of catching the insect prey while on the wing. They are a large fly, nearly 1" long. The thorax is enlarged and the abdomen is relatively small and pointed. They appear to



be menacing but they are not a biting fly. They are most commonly seen in the bosque from late summer into the fall.

Families Calliforidae (blow fly), Sarcophagidae (flesh fly), Muscidae (house fly): These are the common house flies. The blow fly often has a brightly iridescent blue, green or bronze abdomen. They are also called blue-bottle flies or green-bottle flies depending on their color. The last abdomen segment on some of the flesh flies is a distinctive red color. It is also known as the hemorrhoid fly. Others have a checkerboard pattern on the abdomen. The house fly is the smallest of this group and can be recognized by tiny gray and black stripes down its thorax.

### ***Order Hymenoptera (ants, bees and wasps)***

This group includes all of the venomous or stinging insects. Nearly all of them have the ability to sting and inject venom into their victim. While a few species are overtly aggressive and attack without provocation, most will only sting as a defensive response when they think they or their nest is threatened. They all have two pairs of clear or smoky transparent wings. Their antenna are nearly always segmented filaments.



*flesh fly*

Family Cynipidae (gall wasp): The adult gall wasp is seldom seen because of its small size and because it flies during the night. The gall it produces can be found on the small branches of cottonwood trees and the stems of willow bushes. The female deposits her eggs in the soft bark of a tree or bush, and when the egg hatches the larva produces a hormone that stimulates the plant to accelerate the growth of fibrous material around the larva. The larva feeds on this material. When the insect reaches maturity it cuts its way out and becomes a flying adult.

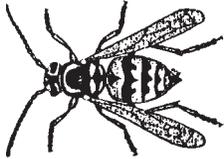
Family Mutillidae (velvet ants): Only the male velvet ant has wings. The very colorful orange or red and black female can be found crawling on the ground during the mid-summer months. Only the female can sting and she can sting with vengeance. Her stinger is nearly as long as her abdomen. The velvet ant larva feeds on the eggs and larvae of ground-dwelling bees and wasps.

Family Formicidae (true ants): The true ants are found everywhere in the bosque throughout the summer. They are social insects and generally live in well-structured colonies. They are the result of a high level of specialization. They produce individuals that are physically adapted to perform a specific function. Only the queen ant lays the egg and she determines what type of adult it will become. The larvae are fed and protected by worker ants until they reach the adult stage and they can start performing their assigned functions in the colony. When the queen wants to start another colony she will program one egg to be a queen and the rest to be winged workers and males. Then the new queen and the new workers hatch and fly off in a swarm to a new location. On the way, the males will mate with the new queen. Only one colony of the southern fire ant has ever been found in the bosque. It was destroyed when it was discovered 20 years ago.

Family Vespidae (paper wasps, yellow jackets and hornets): Yellow jackets are very common on the trails in mid to late summer. They are identified by the distinctive yellow and black bands around their abdomens. They are omnivores and they are



attracted to people food, which makes them a nuisance at the picnic table. They will inflict a painful sting when they perceive that they are being threatened. The way to avoid being stung is to be mindful of their presence but allow them to make their investigations in their own time and not attempt to brush them away. The nest of the paper wasp can be found under the eaves of buildings and in the ceilings of unoccupied buildings. Some paper wasps are yellow and black similar to the yellow jacket, and others are gray and black.



*yellow jacket*

Family Sphecidae (sand-loving wasp, mud dauber and cicada killer): The sand-loving wasp is white and black and a little larger than the yellow jacket. During the late spring time they will be found flying very close to the ground in sandy areas in search of ground-crawling insects. They make holes in the ground where they lay their eggs. The insects that the wasp catches are stung to anesthetize them and then stuffed into the hole. The larva feeds

on the insect until it matures. The mud daubers and the tarantula hawks provide food for their young in the same manner. The mud dauber's nest is a series of mud tubes stacked together that are attached to the underside of eaves or other protected places. The cicada killer looks like a very large yellow jacket with brown stripes on a yellow abdomen. The large size of this insect allows it to inject more venom than smaller wasps which results in a very painful sting.

Family Apidae (honey bees and bumble bees): The honey bee is most social of the communal insects. Like the ants, it has reached a higher level of adaptation in that individuals can only perform a specific function for the betterment of the hive. Honey bees were introduced into America from Europe several hundred years ago and have spread through the country. The killer honey bee is the latest introduction into the western world and has over the years spread throughout the tropics and as far north as southern New Mexico. Fortunately, it appears that it has now reached the northern limits of its range.

The bumble bee is a native to North America and it is a solitary insect. Its nests are in the ground and it lays several eggs in the one nest. They feed their larvae pollen which they have collected from flowers while they are feeding on the nectar. Bumble bees are not aggressive but they will sting when provoked and their sting is very painful.



*bumble bee*

## ***Class Arachnida***

### ***Order Araneae (spiders)***

Spiders are among some of the oldest terrestrial animals on Earth. Some authors believe that they first appeared as terrestrial animals over 350 million years ago. The tarantula has remained virtually unchanged to this date. Except for Antarctica, they are found on every continent. They are all terrestrial; one species has adapted to feed under fresh water but returns to dry land to lay eggs. All spiders are solitary and only tolerate the company of their own species during the courting process. Even then the encounter may end with one or the other being eaten. Spiders are all carnivores and



only pursue live prey. Insects and other spiders make up nearly all of their diet. Unlike insects, spiders do not have antenna and cannot detect odors. They have sensory hairs on their bodies and legs which have developed into very sensitive vibration (sound) detectors.

Young spiderlings are hatched from eggs and reach the adult stage after several molts, a process similar to the insect's simple metamorphosis. As adults some can survive for several years and they molt at least once a year. Tarantulas have been known to live for 30 years and the female recluse spider has been recorded to live as long as nine years. Many spiders will mate and lay several batches of eggs a year. Some species protect their egg sacs until the spiderlings hatch and even carry their fresh-hatched spiderlings on their backs until their first molt.

All members of this order have unique physical characteristics that make them readily distinguishable from other arthropods:

- The exoskeleton is leathery and relatively soft, not hard and crusty like the insect's exoskeleton.
- They have two distinct body parts: the cephalothorax and the abdomen.
- The abdomen is not segmented as it is in most other arthropods.
- They all have four pairs of jointed legs.
- The legs have seven articulating segments and the last segment is equipped with tiny hooks.

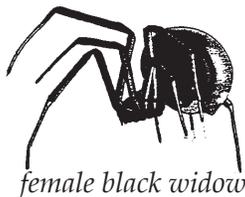
Spiders do not have chewing mouth parts but have hollow fangs which they use to inject their prey with a digestive enzyme. The spider can only swallow liquid food, therefore it must pre-digest food before it is taken into the body.

Generally spiders have eight eyes which are located near the front of the cephalothorax. The number of eyes and their arrangement is a key characteristic for determining the spider's scientific name.

All spiders are capable of making filament web material. The spinneret, as it is called, is located on the underside of the abdomen near the rear end. Many spiders use the web material to construct snares, but only a few spiders construct geometric web snares. Some construct tangled web snares but most spiders use their web material for making egg sacs or protective shelters or simply as safety.

There are about two dozen families of spiders that can be found in the Rio Grande bosque and each family has from 10 to 50 species in it. It is beyond the scope of this manual attempt to describe every species but we list only the ones that may be frequently encountered by the nature interpreter.

Family Theridiidae (black widows and house spiders): The tangled filaments of the black widow's snare can be found in stacks of dry branches or building material, in the corners of buildings near the ground, in small enclosures and under buildings.



*female black widow*

The black widow remains near the edge of the snare when not disturbed. When disturbed she quickly takes shelter in a nearby crevice. The venom of the black widow contains a neurotoxin as well as protein enzyme which may result in a far more serious wound than a bite from most other spiders. The house spider constructs a similar web snare as the black widow and can found



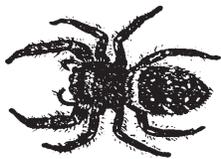
in the same kind of locations. It is brown with white mottling and does not have the neurotoxin component in its venom.

**Family Araneidae (orb weaver):** The symmetrical webs of the orb weaver can be found throughout the bosque. Look for the snares in stacks of windfall limbs, between the stems of tall grasses, in bushes and attached to sides of buildings. The webs can be found as early as late spring but they are most noticeable in late summer when the spiders have reached their adult size. Some orb weavers remain in the center of their web while waiting for the prey to fly into their snare, while others will seek a secluded resting place at the edge of the web. The black and yellow argiope and the barn spider are common species in the bosque.

**Family Agelenidae (funnel weaver):** The sheet web of the funnel weaver can be identified by the funnel-shaped tube that leads down from the sheet web into the loose dry grass, sticks or rocks beneath the web. It is a small gray spider with light colored strips on its carapace. The spider can be enticed out of its retreat by very carefully stroking the sheet web with a fine stem of grass. This makes the spider believe that there is a trapped insect on its web.

**Family Tetragnathidae (long-jawed spider):** The long-jawed spider builds an orb web snare, but not nearly so symmetrical as those of the arachnids. It can be identified by the long, narrow abdomen and long cephalothorax. It gets its name from the very long chelicera (fangs).

**Family Salticidae (daring jumping spider):** The jumping spider does not build a web snare of any kind. It stalks its prey and when in range pounces upon it. Most species are less than 0.5" long and may be highly colorful. Look for them on flowers, on rocks and around shrubbery. By using a hand magnifying lens you can see two of the eight eyes on the front of the cephalothorax which are much larger than the others. They have remarkable depth perception out to several inches, which allows them to be effective hunters.



*jumping spider*

**Family Thomisidae (crab spider):** Look for crab spiders on flowers and in the tall grasses. They do not build a web snare. They simply locate themselves where it is likely that some flying insect will come by and then they snap out with their long front legs and pull the insect back to where they can sink their fangs into it. Crab spiders are identified by the relatively small size and two pairs of very long front legs. Most species are highly colorful in shades of pastel pink or green.

**Family Lycosidae (wolf spider):** The most frequently seen spider in the bosque is the wolf spider. There are several species there but most of them are dark brown in color with light colored strips along the carapace and abdomen. When viewing them with a hand lens, the eyes can be seen on a raised portion at the front of the carapace. Some females carry their egg sac attached to their spinnerets and after the spiderlings have hatched they attached themselves to the mother's back until they go through their first molt.

**Family Loxosclidae (recluse spider):** The recluse spider, commonly referred to as the violin spider, is a large spider with a small body and long thin legs. It has a triangular carapace with a furrow down the



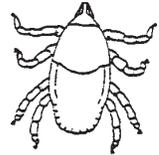
*wolf spider*



center of the back. The color can range from gray to light brown. It is rarely found in the bosque of New Mexico but its bite is so dangerous that it is listed here as a warning. The bite is not notably painful but the venom that is injected causes disfiguring and progressively worsening necrosis which is very slow to heal.

### ***Order Acarina (ticks and mites)***

Woodticks are commonly found in the bosque but rarely in heavy infestations. They are more commonly parasites on furry animals than on humans but care should be taken to check for the presence on one's body after walking through the tall grass and bushes away from the trails. Some woodticks are known to transmit serious diseases in geographic regions around New Mexico but as yet the diseases have not been linked to ticks found in the bosque.



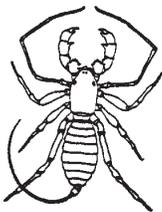
*woodtick*

### ***Order Opiliones (harvestmen)***

There are several families of harvestmen, also called the daddy-long-legs, in New Mexico but only one is found in the bosque. Harvestmen can be distinguished from spiders because they have only one body part. The cephalothorax and abdomen are broadly fused together. The back half appears to be segmented. Ticks and mites have fused body parts but the harvestmen are distinguished from them because they have very long filaments legs and the body is nearly round, not flattened like a wood tick.

### ***Order Uropydigi (whip scorpions)***

The whip scorpion, also called the vinegarone, is a very large (over 2" long), dark brown or black creature that has pincers like a scorpion but does not have a broad, flattened tail; instead it has a thread-like whip extension from the thorax. A gland at the base of the tail produces acetic acid (i.e. vinegar) which is used to soften the exoskeleton of the insect prey and to discourage predators. The vinegarone can be found under logs and burrowed in the sand.



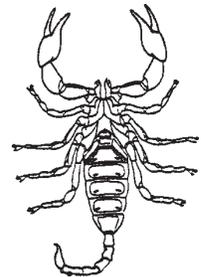
*whip scorpion*

### ***Order Sulpugida (sun scorpions)***

The sun scorpion is a yellow-ochre, medium sized spider-like arthropod with eight legs and a pair of palps that may or may not have small pincers on them. It may be occasionally found on the trails and in buildings.

### ***Order Scorpionida (scorpions)***

Scorpions are indigenous to New Mexico and they may be encountered in the bosque just about anywhere. They are fairly large creatures, from 2.5" to over 4", and they are equipped with a segmented, broadly flattened extension from the thorax region. There is a poison gland near the claw on the end of the tail which can be used inject venom into prey or adversary. The sting from a local scorpion is painful but not fatal. They are all equipped with large pincers which are on jointed extensions in front of their first pair of legs.



*scorpion*

### ***Order Pseudoscorpionida***

These tiny black creatures (0.2") can occasionally be found in leaf litter and loose soil. They have eight legs and unusually large pincers. They do not have a extension or tail from the thorax.



## *Class Crustacia*

### *Order Isopoda (pillbugs and sow bugs)*

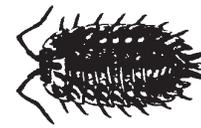
There are two families of isopods in the bosque. The difference between the two is that the pillbug rolls into a little pill-sized ball when disturbed and the sow bug tries to run away. Other than that they look much alike. They are numerous during the warm months, particularly when the ground and leaf litter are moist.

### *Order Decepoda (shrimp and crayfish)*

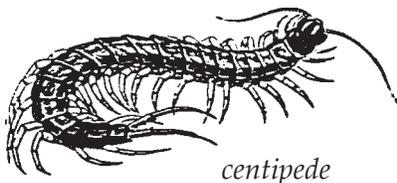
Fresh-water shrimp and crayfish can be found in the irrigation drain ditches and in the ponds. Occasionally a crayfish will briefly wander out of its normal water habitat and be found on the ground.

### *Class Chilopoda*

The centipede is recognized by a long-segmented body with numerous legs on either side. It has one pair of legs per segment and one paired antenna on the first segment. They have very poor vision and some have no eyes. As it crawls along its body undulates in a snake-like motion. It can grow to a length of over 4". Immature centipedes look like the adults only much smaller. The segments of their bodies are broad and flattened. They have poison glands near their mandibles which allow them to inject venom into the bite wound. The bite is reported to very painful but rarely fatal. One author suggests "using two hands while attempting to catch a large centipede," and "well-protected hands" would be an appropriate additional suggestion.



*isopod*



*centipede*

### *Class Diplopoda*

Millipedes are sometimes found in the bosque and can be identified by the multiple, paired legs on each segment and the segmented body which is nearly round rather than flattened. Movement is slow and deliberate.

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