VERTEBRATES

Vertebrates other than humans, found in community environments can include, amphibians, birds, fish, reptiles, and mammals (which include rodents). Most of these animals are free-living in nature, and only occasionally enter human habitats. However, any of them can potentially interfere with human interests or activities, and thus become causes of concern or 'pests'. In such situations, they can cause injury by biting or scratching, by disfiguring and damaging food, articles and structures by their activities, being health hazards due to their venom, or by carrying and spreading pathogens and/or allergens; and sometimes their mere presence is inappropriate or unacceptable. Some of these animals have evolved to live in association with humans, so much so that they are dependent on human proximity; these are referred to as 'commensals'. Vertebrate pests can cause significant environmental, economic and social problems to humans, and as with all other pests, correct identification is important in their management.

MAMMALS

Bats are the only mammals that can fly in a sustained manner. They belong to the order Chiroptera, the name of which means "hand-wing", and indicates the modification of their limbs to form webbed wings. Sizes and appearances vary with species, wingspans of most southwestern species range from 8 -14 inches. Bats are known for their excellent flight capabilities and echolocation, which involves emitting an ultrasonic sound and listening to its echo as it "bounces" off objects. This ability helps bats interpret the distance, size, speed, and even texture of an object. Echolocation is particularly useful to bats for locating small, flying insect prey at night, such as moths and gnats.

General body structure of a bat (Townsend's big-eared bat)
Photo: US Bureau of Land Management

Common name(s): Bat
Scientific name, classification: Different genera, **Class:** Mammalia, **Order:** Chiroptera, **Family:** Different families. Mexican free-tailed bats *Tadarida brasiliensis* (Family Molossidae), Ghost-faced bats *Mormoops megalophylla* (Family Mormoopidae), California leaf-nosed bats *Macrotus californicus* (Family Phyllostomidae), Little brown bats *Myotis lucifugus*, Big brown bats *Eptesicus fuscus* and Pallid bats *Antrozous pallidus* (Family Verspertilionidae) are common species in the southwest U.S.
Distribution: Worldwide.
Description and ID characters: They have small to medium sized furry bodies, large, hairless ears and small black eyes. Their 'wings' consist of thin membranous skin stretched between long, thin, jointed 'fingers' of their forelegs, their hind legs, and including the tail. The tail extends beyond the membrane in some species. The first 'finger' or thumb of the forelimbs and the 'toes' of the hind limbs are free and usually not enclosed in the wing membrane, allowing the bats to grip on to surfaces or structures and hang upside down in their resting position. Bat faces may resemble that of a small dog or similar mammal, but with other unique features such as a long tubular nose or variously shaped flaps or folds of skin. They have well developed teeth on both jaws that enable them to chew and bite.
Best identifying feature(s):
Big brown bats are one of the larger species in the U.S., with bodies about 6-7 inches in length and wingspans of 12-16 inches. They have light brown or glossy copper-colored fur on their back, and paler fur underneath. Eyes, ears, muzzle and wings are all dark brown or black. The eyes are small and almost hidden in the muzzle, ears are small, and pointed. The muzzle is broad and not condensed, with fleshy lips and shiny black nose.


Big brown bat
Photo: US FWS (left), US Geological Survey (right)

California leaf-nosed bats are distinctive because of their large ears that are longer than 1 inch, and an erect triangular flap called a 'noseleaf', protruding above the nose. They are medium sized bats, with bodies about 6 inches in length and wingspan of 12-14 inches. Faces are small, but not wrinkled. Eyes are large and black. The fur is grayish to dark brown on the back and paler underneath. Wings are short and broad, and give them great maneuverability within short distances, but they are not suited for long-distance.


California leaf-nosed bat
Photo: Drew Stokes, US Geological Survey

Ghost-faced bats get their name from the unusual structure of their faces, which have a 'smashed-in' appearance. The appearance is due to several thick skin flaps on their face and chin, poorly developed nose, large round ears that seem to join across the forehead which rises abruptly above the nose, and small eyes that appear to be situated within their ears. They are medium to large sized bats, about 6 inches in length, and wingspan of 14-15 inches. The fur on the back is reddish-brown in color, and pale pink underneath.

Ghost-faced bat
Photo: Alex Borisenko

Mexican free-tailed bats are recognized by their long tails that extend more than one-third beyond the tail membranes and make up almost half the length of their bodies. They are medium sized bats, with bodies about 5 inches in length and wingspan of 12-14 inches. Wings are long and narrow. The fur on the back is dark or grayish brown, with a lighter underside. They have small black eyes; broad, gray-black, forward-pointing ears that are widely set on the head but close behind the eyes; a condensed muzzle and wrinkled lips.

Mexican free-tailed bat
Photo: J. Scott Altenbach, Univ. of New Mexico

Mexican free-tailed bat face
Photo: Ann Froschauer, US FWS

Pallid bats can be identified by their light fur and long ears. The fur is light-yellowish brown or cream colored on the back, and almost white underneath. The long, pointed ears are light pinkish brown in color and about 2 inches in length. Pallid bats are medium to large sized bats, about 6 inches in length and wingspan of 15-16 inches. Their faces are light pinkish brown, with large black eyes. The limbs and wing membrane are light brown or pale gray in color.

Pallid bat
Photo: Geoff Gallice

Pest status: Non-pest. May occasionally feed on fruit, or stray indoors in search of resting places. Cause some public health concern because they can harbor rabies viruses and parasites. None of the species encountered in the southwest feed on animals or blood.

Damage/injury: Most bats feed on insects, some feed on fruit or pollen and nectar from flowers. They provide valuable pest-control services by feeding on a large number of insects. A single bat can eat hundreds of insects an hour, every night.

If bats gain entry into homes and structures, they can create unsightly and unsanitary conditions with their droppings (guano), urine, rub-marks and musty odors. Bats can harbor various parasitic insects and mites that can be transmitted to humans by close contact. Notable among these are **bat bugs** (*Cimex pilosellus*) which are closely related to, and resemble bed bugs (*Cimex lectularius*) and can easily be mistaken for them. Bat bugs can be encountered in homes and buildings that harbor roosting bats, and often bite humans when their primary hosts, bats, move away or are eliminated. However, they cannot sustain on humans. Bat roosting sites should not be disturbed during maternity season, which varies by region.

More important is the role of bats as reservoirs of the **rabies virus**. The rabies virus attacks the nervous system and infection is almost always fatal. Bats are the principal vector by which humans can contract rabies. Symptoms in bats vary greatly, and often include the inability to fly or flying during daylight hours, lethargy, paralysis, and death. As a general rule, a bat found on the ground or in a weakened state is probably a sick bat, and therefore has a higher risk of being infected with rabies. The virus can be transmitted to humans and other mammals through bat saliva, feces or urine, or bites or scratches from their teeth or claws. It is very important to be aware about bats and their role in rabies transmission, and to teach children never to touch a bat, dead or alive. Handling of bats should be avoided as far as possible, as well as breathing in dust from bat droppings and urine. Exposure to a suspected rabid bat may require immediate medical assessment and care. Bat management often requires specialized training and permits.

A group of hibernating bats
Photo: Krynak Tim, US-FWS

Life history: Bats give birth to live young called pups, and the young are fed with milk produced by the females. They are some of the slowest reproducing mammals, producing only 1-2 pups in a year. Mating can occur in the spring or fall, in which case fertilization is delayed until spring – a feature only found in bats among the mammals. Most species form large maternity colonies for birthing and raising the young; solitary species also exist. Maternity colonies are usually formed in remote, undisturbed locations such as deep caves, and may contain thousands of individuals. Bat pups reach maturity in 1-2 years and leave their maternal colony.

Most bat species also hibernate or migrate during cool weather. Hibernating bats are very vulnerable to disturbances, as these cause them to wake up and utilize their stored fat reserves, which are meant to sustain them till the end of their hibernation period. Without these reserves, bats succumb to starvation or cold and therefore it is very important not to disturb hibernating bats in caves, mines, rock crevices, hollow trees, and buildings. White-Nose Syndrome (WNS) is an emerging disease affecting hibernating bats and is sometimes characterized a white fungus that infects skin of the muzzle, ears, wings and other body parts. WNS may cause bats to awaken more often during hibernation or display abnormal behavior, such as movement toward the mouth of hibernating caves and daytime flights during winter. These bats usually freeze or starve to death. However, such abnormal behavior is reported mostly from the eastern parts of the U.S.; and western bats, even when affected with WNS may not display the same behavior.

Bat with white nose syndrome
Photo: Marvin Moriarty, US-FWS

Sources, further information:

Bats
http://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1456.pdf
Bats in and around homes
https://ag.arizona.edu/yavapai/publications/yavcobulletins/Bats%20In%20North%20Central%20AZ.pdf
Bats in the desert and the southwest http://www.desertusa.com/animals/bats.html
Bat management
http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74150.html
Desert Animals http://www.desertusa.com/animals.html
Sonoran desert bat fact sheets https://www.desertmuseum.org/kids/bats/

RODENTS are mammals belonging to the order Rodentia, and almost all rodents are small, furry animals with short legs and a long tail. However their most characteristic features are their continuously growing front teeth, one pair on both upper and lower jaws. All rodents have to continuously wear down their teeth by use, or grinding them together, to prevent them from growing uncontrollably. **Mice and rats** are the most common rodents encountered in community environments and many species have evolved to live commensally with humans to such an extent that they may not survive in natural environments. Other rodents are gophers, squirrels, beavers, prairie dogs, hamsters and porcupines.

NOTABLE SPECIES

Mice

Common name(s): Deer mouse
Scientific name, classification: *Peromyscus maniculatus*, **Class:** Mammalia, **Order:** Rodentia, **Family:** Cricetidae.
Distribution: Throughout North America, except far southeast and north.
Description and ID characters: Small, grayish yellow mouse with pointed snout, large hairless ears, long tail and large, black beady eyes, very similar to the house mouse. Adults measure about 5 to 7 inches including the tail, the body alone is 2 ½ to 4 inches in length. Sizes can vary with the habitat.


Deer mouse
Photo: Gregory 'Slobirdr' Smith

Best identifying feature(s): Small size, pointed snout, hairless ears, long and scaly hairless tail. Eyes and ears are larger than those of the house mouse. Fur is distinctly two-toned: the upper side of the body and tail varies from light grayish brown or tan to dark brown, and is clearly demarcated from the underside and feet which are white in color. The tail is covered with fine hairs, and is not completely hairless as in the house mouse. Deer mice are excellent runners and jumpers, much faster and higher than house mice.
Pest status: Occasional chewing, biting and structural pest indoors, occasional pest of crops and other plants outdoors. Principal reservoirs of hantaviruses.
Damage/injury: Deer mice are not usually encountered indoors, but can easily enter homes and structures due to their small size. Once indoors, they readily consume, damage and contaminate food, stored items and structures. Outdoors, they can be a pest of agricultural crops and garden plants. They feed voraciously on seed and also hoard them, which can lead to reduction in yields and regeneration of plants in the wild.
Deer mice are most important because they are carriers of the deadly hantavirus called *Sin Nombre* Virus, which is responsible for the often fatal disease Hantavirus Pulmonary Syndrome (HPS) in humans. Deer mice carry and spread the virus

through their saliva, urine and droppings. Humans can acquire the virus through inhalation or broken skin, when present in a contaminated area.
Life history: Deer mice are nocturnal and primarily an outdoor species by nature, spending the daytime hidden in tree holes, or underground burrows. They build small untidy nests with various kinds of plant material, near a food source and most activity is concentrated around the nest. Breeding can occur year-round but is mostly dependent on food availability. A single female can produce 4-5 litters in a year and the average adult lifespan is about 1 year in the wild.

Common name(s): House mouse
Scientific name, classification: *Mus musculus*, **Class:** Mammalia, **Order:** Rodentia, **Family:** Muridae.
Distribution: Worldwide.
Description and ID characters: Small, grayish brown mouse with pointed snout, hairless ears and tail and black beady eyes. Adults measure about 5 to 7 inches including the tail, the body alone is 2 ½ to less than 4 inches in length.


House mouse
Photo: J.N. Stuart

Best identifying feature(s): Small size, pointed snout, large hairless ears, long and scaly hairless tail. Upper side of the body is covered with short, grayish brown or tan hair, underside is lighter colored (but not white). Feet are hairless and grayish pink in color. A distinct notch in visible on the front teeth, when viewed from the side. Movement is by walking or running on all four legs, but are also known to jump, stand on their hind feet using the tail for balance, they also climb up rough vertical surfaces, to reach up to a food source or nesting site. Young mice can squeeze through openings as small as ¼ inch in diameter, and prefer to maintain contact with vertical surfaces such as walls as they move.


Notch on front teeth in side view
Photo: Magne Flåten

House mice are nocturnal by nature and tend to avoid light, but can occasionally venture out during the daytime in search of food. They are intelligent and cautious and easily escape notice. Signs of their presence, such as feet tracks, chew/gnaw marks, oily rub marks, droppings and urine, fallen hair, and chewed up paper, cloth or wood, are often found before the mice themselves.
Several other small rodent species found in and around homes and structures, e.g., deer mice and meadow voles, can be mistaken for house mice. House mice can also be mistaken for young black or brown rats. Fig.1 (under 'Rats') provides tips for quick differentiation between the species. Droppings can be helpful when identifying species, but are not conclusive, especially when viewed alone. Fig. 2 provides useful tips for identification of rodent droppings. Mice and rats leave

numerous micro droplets of urine wherever they travel, which fluoresce under UV light and can help in detecting their activity.

Pest status: Chewing, biting and structural pest. Can consume, damage and contaminate food, stored items and structures with their droppings and urine, produce allergens and carry and spread pathogens.

Mouse nest in bird box
Photo: Bet Zimmerman, Sialis.org

Damage/injury: In human homes and structures, house mice are omnivorous and will feed on almost any human food material as well as many other household items including cardboard, soap, leather, etc. Before feeding, they test the material by nibbling and this can cause unsightly chew or gnaw marks. They thrive in food storage areas or pantries if undetected for a long time, where along with consuming and damaging food and food packaging materials, they contaminate everything with their urine and droppings, and this can also cause a musky odor. Outdoors, house mice can occasionally damage crops and garden plants. They are known for their preference for seeds and grains, which they will consume in the field as well as bring to their nests for storage.

Mouse nest with young ones
Photo: Kelly Madigan

House mice can physically destroy a variety of materials found in homes and structures such as paper, cardboard, wood and cloth by shredding them to make nests. They can also cause structural damage to furniture, upholstery, woodwork, electrical and plumbing lines, computer systems and machinery by chewing or gnawing in an attempt to reach food or nesting sites.

House mice are not considered important public health hazards, but they are known to carry and spread pathogens that cause murine typhus, bubonic plague, leptospirosis and food poisoning. They can spread parasites such as fleas, mites, tapeworms and ticks to humans and domestic animals.

House mice have not been found to be carriers of the deadly hantavirus, but the similar species-deer mice are known to carry it.

Life history: House mice are almost always found closely associated with humans. They may occupy secluded spots outdoor, in wooded areas, fields and gardens during warm weather but these are not usually very far away from human homes and structures such as barns and outbuildings. Although they can survive outdoors, feeding on plant material, small insects and other invertebrates, they will try to move indoors as the weather gets cooler. Outdoors, they live in concealed spots such as tree stumps or under stones, or may dig underground burrows. In human structures, they will nest in any suitable hidden and undisturbed spot with a

nearby food source. Nests are untidy piles of any material they can collect, such as paper, cardboard, wires, wood shavings, etc., but the insides are lined with softer and more finely shredded materials such as cloth. House mice have an extremely high reproductive potential and they breed year-round in favorable conditions. A single female can produce 5-10 litters, each with 5-8 young ones or pups. The pups are born blind and hairless, but become fully furred by 2 weeks, weaned by 3 weeks and sexually mature by 5-7 weeks. Females can become pregnant again before the pups are weaned. The average lifespan is 1 ½ to 2 years in the wild, but mice can live for much longer in captivity (5 years). Social behaviors of house mice vary with their location and food availability. House mice tend to avoid black rats and Norway rats, which prey on them.

Mouse nest under car bonnet
Photo: John Hummel

Common name(s): Meadow vole, meadow mouse, field mouse
Scientific name, classification: *Microtus* spp., **Class:** Mammalia, **Order:** Rodentia, **Family:** Cricetidae. The montane vole *M. montanus* and the California vole *M. californicus* are common southwestern species.
Distribution: Western U.S., Canada
Description and ID characters: Small, grayish brown heavy-bodied rodent, with similarities to house mice and gophers, about 5-5 inches in length including the tail. Sizes and appearance can vary with the habitat.

Montane vole/ meadow vole
Photo: Roger W. Barbour, www.mnh.si.edu

Best identifying feature(s): Short, stout but compact body, short legs and small thin tail, covered with fine fur, small eyes, small and partially hidden ears. Fur is dark grayish brown on the upper side of the body and tail, and paler (not white) on the undersides and flanks; but the body is not distinctly two-toned as in deer mice. Voles spend most of the daytime in their burrows underground, but they have distinct runways above ground and these can be indicative of their activity. They try to cover runways with cut grass or other plant material, but sometimes green colored droppings can be found near burrow entrances.

Vole runways
Photo: Stephen M. Vantassel, UNL Extension

Pest status: Occasional pest of crops and other plants outdoors.
Damage/injury: Voles can feed on and damage a wide variety of agricultural crops, garden plants and turf. The damage can be severe when their populations build up during certain times of the year. They can also disfigure landscapes with their extensive burrows.
Voles are primarily outdoor species, and may be encountered in gardens, fields and other wooded areas near homes and structures, but rarely indoors.
Life history: Meadow voles are mostly crepuscular (foraging during dawn and dusk) throughout the year, and feed on different plant materials, fungi and small insects or other invertebrates. They build underground nests in their burrows, lined with plant matter. Breeding usually occurs from late spring to early fall, with 3-4 litters in a year. Average lifespan is less than a year.

Rats

Common name(s): Black rat, roof rat, house rat, ship rat
Scientific name, classification: *Rattus rattus*, **Class:** Mammalia, **Order:** Rodentia, **Family:** Muridae.
Distribution: Worldwide.
Description and ID characters: Medium sized, slender dark-brown to black colored rat with a long scaly tail almost always longer than the body. Adults measure about 12 inches from nose to tail, the body alone is 5-7 inches in length.


Black rat/roof rat
Photo: E.J. Taylor/CDC

Best identifying feature(s): Medium sized, heavier body than house mice, mostly covered with untidy dark brown, dark grey or black fur with lighter underside, with no demarcation between the upper and lower sides; pointed muzzle; large black eyes, large and almost hairless ears that can be pulled over the eyes; and long, hairless, tail as long as or longer than body, with annulations (rings). Movement is by walking or running on all four legs, but they can also stand on their two hind feet. They can squeeze through openings as small as ½ inch in diameter, and prefer to maintain contact with vertical surfaces such as walls. They are agile runners and climbers, and can easily and swiftly climb up trees and other rough, vertical surfaces, and even run along overhead electric wires and utility lines using their tail for balance. As with house mice, black rats are seldom seen during the daytime and tend to avoid light. However, signs such as foot prints, chew/gnaw


Roof rat in grain store
Photo: H. Zell

marks, oily rub marks, droppings and urine, hair, and chewed up paper, cloth or wood, are indicative of their presence.
Adult black rats can be confused with brown/Norway rats, and young ones with house mice. Fig.1 provides tips for quick differentiation between the species. Droppings can be helpful when identifying the species, but are not conclusive, especially when viewed alone. Fig. 2 provides useful tips for identification of rodent droppings.

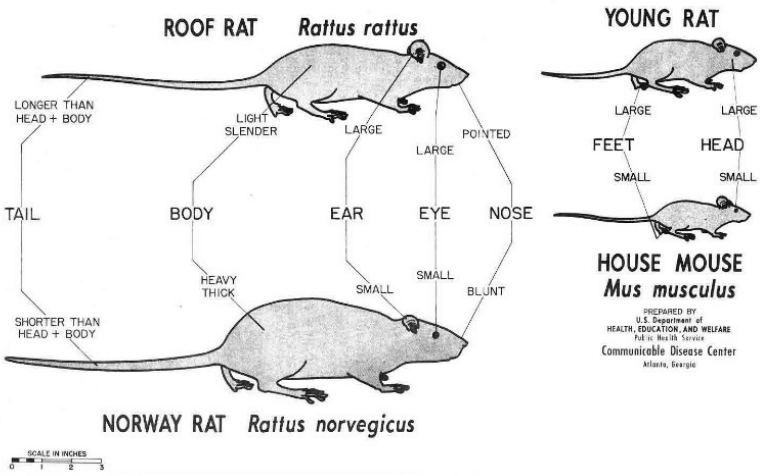


Fig.1. Field identification of domestic rodents
Photo: U.S. Department of Health, Education and Welfare

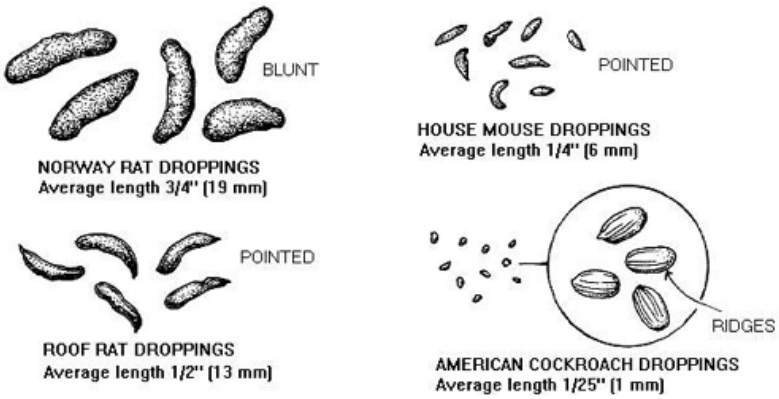


Fig.2. Field identification of rodent vs. cockroach droppings
Photo: EPA, www2.epa.gov/sites/production/files/documents/Module05.pdf

Pest status: One of the most important rodent pests worldwide. Serious biting, chewing and structural pest, of public health concern as carriers of fleas vectoring bubonic plague and other human diseases.

Damage/injury: Black rats are generalist omnivores, and will feed on almost any kind of food material. They will readily feed on human food as well as pet, livestock or poultry feed, and have a preference for fruits and nuts. Before feeding, they test the material by nibbling and this can cause unsightly chew or gnaw marks. They thrive in food storage areas, granaries or pantries if undetected for a long time, where along with consuming and damaging food and food packaging materials, they contaminate it with their urine and droppings, and this can also cause a foul odor.

In addition to food damage, black rats physically destroy a variety of materials found in homes and structures such as paper, cardboard, wood and cloth by shredding them to make nests. They can also cause structural damage to furniture, upholstery, woodwork, electrical and plumbing lines, computer systems and machinery by chewing or gnawing in an attempt to reach food or nesting sites. Burrowing and nesting activities of black rats can weaken and damage building foundations, and can also result in water leaks and electrical fires.

Black rats can be agricultural pests by damaging crops and a wide range of garden plants and trees. They can attack standing crops in the field for their fruit, damage roots and underground stems by burrowing, and even strip off the bark from trees and shrubs. They can be invasive threats to the natural ecosystem in certain areas by feeding voraciously on birds and insects.

Roof rat damage to mattress
Photo: Joan Kovatch

Black rats, together with their parasites such as mites and fleas, carry and spread number of pathogens causing human diseases. Notable among them are bubonic plague, typhus, salmonellosis and leptospirosis. Rats are one of the preferred hosts of the Oriental rat flea, *Xenopsylla cheopis* which is the primary vector of bubonic plague. However, rats are not regarded as important vectors of plague today- the disease is more associated with squirrels, prairie dogs, chipmunks and other wild rodents. Rats also host other flea species, mites, nematodes and other worms.

Extensive roof rat damage on a roof
Photo: Bart Teeuwisse

Life history: Black rats are primarily nocturnal, but can be active occasionally during the daytime. They usually spend the daytime hidden in their nests and tend to avoid light. Because of their climbing abilities, they are easily able to reach higher locations such as treetops, attics and higher floors of buildings for food and

nesting sites. They rarely burrow underground, and prefer to nest in these higher locations. Nests are built of various materials that are available in their habitat, and may include plant parts, wood, cardboard, or cloth. They are known to tear up insulating material in walls and machinery and use it for nesting. Breeding occurs year-round if favorable conditions exist. A single female can produce up to 5 litters in a year. The young are born blind and hairless, but become fully furred and weaned by 4 weeks, and sexually mature by 3 months. The average lifespan is 2 years. Black rats may form small social, male-dominated groups especially during breeding season and may co-exist with other black rats in a location, but they are generally aggressive towards other rodents, especially Norway rats. Black rats and Norway rats can occur in the same location, but do not exist in harmony and always occupy different spots. For example in a building, black rats restrict themselves to attics, or higher floors, while Norway rats may stay in the basement or ground floors. Norway rats are dominant and will easily kill black rats in encounters.

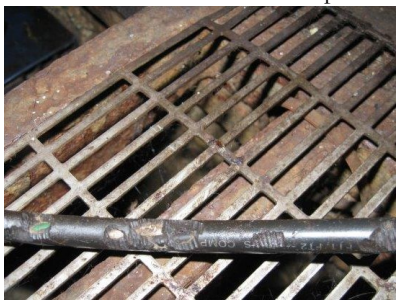
Common name(s): Brown rat, Norway rat, sewer rat
Scientific name, classification: *Rattus norwegicus*, **Class:** Mammalia, **Order:** Rodentia, **Family:** Muridae.
Distribution: Worldwide.
Description and ID characters: Large sized, grayish brown rat with a short scaly tail almost always appearing shorter than the body. Adults measure about 18-20 inches from nose to tail, the body alone is 8-10 inches in length. One of the largest domestic rodents in the U.S.

Brown rat/Norway rat
Photo: Sergey Yeliseev

Best identifying feature(s): Large size, heavy and stocky body much larger than black rats; coarse, thick brown or dark gray fur that is lighter on the underside but with no demarcation between upper and lower sides; blunt muzzle; small eyes; small, hairless ears that cannot reach over the eyes if pulled; thick tail, about the same length or shorter than the body and covered with short hair. Movement is by walking or running on all four legs, can stand on the two hind feet. They can squeeze through gaps as small as ½ inch in diameter, and prefer to maintain contact with vertical surfaces such as walls. Good runners and swimmers, but do not climb as well as black rats. As with house mice and black rats, Norway rats are secretive and averse to light, seldom being seen during the daytime. However, they leave several signs of their activity such as feet tracks, chew/gnaw marks, oily rub

Closer view of brown rat features- coarse, brown fur, blunt muzzle, small eyes and ears
Photo: Dawn Gouge

marks, droppings and urine, hair, and chewed up paper, cloth or wood that can indicate their presence. Any of these signs near gaps or holes in building walls or foundations, burrows in the ground and tracks through ground cover near homes or structures may indicate a brown rat infestation.
Adult Norway rats can be confused with black rats. Refer Fig. 1 above for tips to differentiate between them, and Fig. 2, to distinguish between their droppings.
Pest status: One of the most important rodent pests worldwide. Serious biting,



Rat gnaw marks on electric cable
Photo: NY State IPM Program

Brown rat burrow entrance
Photo: Gary Alpert, Bugwood.org

chewing and structural pest, of public health concern as vectors of bubonic plague and other human diseases.
Damage/injury: Norway rats are very similar to black rats in their feeding habits. They are generalist omnivores, feeding on a wide range of food material, with a preference for cereal grains, which form a major part of their diet. Before feeding, they test the material by nibbling and this can cause unsightly chew or gnaw marks.

Holes in the ground (left) and tracks through ground cover near buildings (right) are indicative of rat infestations. Photos: Dawn Gouge

They thrive in food storage areas, granaries or pantries if undetected for a long time, where along with consuming and damaging food and food packaging materials, they contaminate it with their urine and droppings, and this can also cause a foul odor.
In addition to food damage, Norway rats physically destroy a variety of materials found in homes and structures such as paper, cardboard, wood and cloth by shredding them to make nests. They can also cause serious structural damage to furniture, upholstery, woodwork, soft metals such as copper or aluminum, electrical and plumbing lines, computer systems and machinery by chewing or gnawing in an attempt to reach food or nesting sites. Their burrowing and nesting activities can

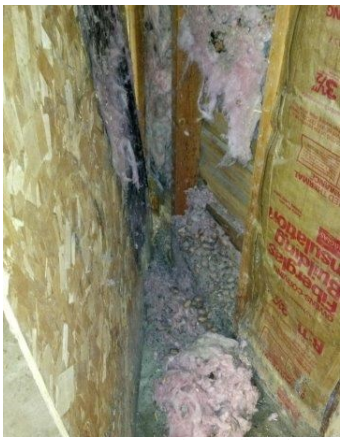
weaken and damage building foundations, and can also result in water leaks and electrical fires. They have been reported to harm and even kill humans, especially infants, small children and infirm adults. They can inflict painful bites if handled. Norway rats can be serious agricultural pests by damaging crops and a wide range

Gaps or holes in walls or foundations provide entryways to rats..
Photo: Dawn Gouge

Poorly maintained trash areas are preferred habitats for rats and mice
Photo: Gary Alpert, Bugwood.org

of garden plants and trees. They can attack standing crops in the field for their fruit, damage roots and underground stems by burrowing, and even strip off the bark from trees and shrubs. They can be invasive threats to the natural ecosystem in certain areas by displacing native fauna and feeding voraciously on birds and insects. They are known to have displaced black rats from many parts of the world. Norway rats, together with their parasites such as mites and fleas, carry and spread number of pathogens causing human diseases. Notable among them are bubonic plague, typhus, salmonellosis and leptospirosis. Rats are one of the preferred hosts of the Oriental rat flea, *Xenopsylla cheopis* which is the primary vector of bubonic plague. However, rats are not regarded as important vectors of plague today- the disease is more associated with squirrels, prairie dogs, chipmunks and other wild rodents. They also host other flea species, mites, nematodes and other worms.

Life history: Norway rats are nocturnal or crepuscular. They have established foraging routes and seldom stray from these. New foraging paths are explored with great caution and once established, they are retained in their memory. Nests are built underground in soil, or in sewers and cellars, and are often linked to an extensive system of burrows and tunnels. Nests are dug out in the soil, but lined with various soft, finely shredded materials. Breeding can occur year-round and up to 5 litters are produced in a year, each with 7-14 young ones. Average lifespan is about 1 year. Norway rats live in large hierarchical groups within the burrows, and exhibit different kinds of social behavior such as grooming and foraging together. However, they do not exist in harmony with other rodent species, especially the black rat.



Brown rat nest in a wall void
Photo: Joseph LaForest, Bugwood.org

Norway rats and black rats can occur in the same location, but always occupy different spots. For example in a building, black rats restrict themselves to attics, or higher floors, while Norway rats may stay in the basement or ground floors. Norway rats are dominant and can easily kill black rats in encounters.

Common name(s): Cotton rat
Scientific name, classification: *Sigmodon* spp., **Class:** Mammalia, **Order:** Rodentia, **Family:** Cricetidae. The hispid cotton rat *Sigmodon hispidus* is common in the southwest.
Distribution: Throughout North and South America.
Description and ID characters: Small to medium sized, grayish-brown rodents. Adults measure about 6-12 inches from nose to tail. Sizes and appearances vary with the habitat.
Best identifying feature(s): Small, rounded body; fur color on the upper side of the body is often a coarse mixture of tan, brown and black; the lower sides being pale gray or white; short tail, often shorter than the length of head+body. An additional characteristic feature of *Sigmodon hispidus* is the 'S'-shaped crown pattern on the second and third molars.


Cotton rat
Photo: Stephen Pollard

Pest status: Occasional pest of agricultural crops and other plants. Can harbor and spread parasitic insects, mites, pathogenic bacteria, tapeworms and other worms.
Damage/injury: Cotton rats do not generally cause direct damage to humans, but can feed on and damage several garden and landscape plants, as well as agricultural crops. They can occasionally cause damage to grasses, fleshy roots and tubers and fruits, resulting in reduced yields. Crop damage is related to their population densities, which fluctuate throughout the year.
Cotton rats can also harbor various parasites on their bodies, which can be transferred to humans and domestic animals.
They are also known to compete with some native fauna such as the bobwhite quail for food resources, and feed on quail eggs.
Life history: Cotton rats are active throughout the day, but the main activity is from late afternoon to midnight. They construct nests using various plant materials under logs and rocks for protection, or abandoned dens of larger mammals such as skunks or squirrels. They also construct an elaborate system of runways and tunnels below the ground surface. Main runways are regularly maintained by trimming away grasses and weeds and piling them along the sides. Breeding can occur throughout the year. Females usually produce 1-2 litters per year. Average lifespan is about 6 months.

Common name(s): Wood rat, pack rat, trade rat
Scientific name, classification: *Neotoma* spp., **Class:** Mammalia, **Order:** Rodentia, **Family:** Cricetidae. The white-throated wood rat *N. albigula*, the desert wood rat *N. lepida*, the dusky-footed wood rat, *Neotoma fuscipes*, the Mexican wood rat *N. mexicana* and the bushy-tailed wood rat, *N. cinerea* are common southwestern species.
Distribution: Southwest U.S.
Description and ID characters: Medium sized, rat-like rodents with large years, large eyes and long furry or hairy tail. Body sizes range from 12-14 inches including the tail, the body alone can be 6-7 inches in length.
Best identifying feature(s): Medium size; much larger than house mice, and resemble roof rats in general size and shape but distinguished by the long tail covered with fur or long hairs, larger eyes and ears, and a generally clean, soft appearance. Fur is soft; colored cinnamon, brown, gray, yellowish gray or creamy buff on the upper side of the body; the lower side and feet are generally much lighter; tail fur may be slightly darker than the rest of the body, and is paler on the underside. External ears are large, rounded and hairy; eyes are large and dark and somewhat slanting and deeply set into the face.
Pest status: Occasional pests of various plants, harbor several parasites on their bodies and in their nests. They can be a nuisance by their noisy, nest-building activities.
Damage/injury: Pack rats do not generally cause direct damage to humans, but can feed on and damage several garden and landscape plants. Packrat nests are known to harbor many parasitic mites, ticks, fleas and other insects on their bodies and in their nests. Notable among these are the conenose bugs, which are an important bloodsucking pest of humans.
Life history: Pack rats are primarily nocturnal and solitary animals, except when mating or rearing young. However they are known to build nests close together, forming a community. Their nests, called dens or 'middens', are complex structures consisting of several chambers, with piles of stored food


White-throated wood rat
Photo: Brad Fiero, www.wc.pima.edu


Desert wood rat
Photo: Eric Gofreed


Dusky-footed wood rat
Photo: Peterson B. Moose, US FWS


Bushy-tailed wood rat
Photo: Steve Schubert, www.condorlookout.org

and debris. They can be built on the ground, among rocks or tree bases, or among tree branches, or in abandoned nests and burrows of other animals. In the desert, packrat dens are common in cholla cactus bases, using the cactus spines as a protection from predators. Ground dens measure 3 to 5 feet in height and diameter; tree nests are somewhat smaller. One animal may inhabit several nests, and in good feeding areas, a den may be occupied for several years or a lifetime. Packrats are known to use aromatic plant leaves to line their nests to keep out parasites. They are also very attracted to small, bright, shiny objects such as coins, small pieces of jewelry, broken bits of mirrors, metal spoons, etc. and often pick these up, leaving sticks, nuts, cactus pieces or other materials in 'trade'. Breeding usually occurs in early summer and females can produce up to 5 litters per year, each with 4-5 young. The young ones become sexually mature in 2 months. Average lifespan is about 1-2 years.

Mexican wood rat
Photo: R.B. Forbes, Am. Soc.of Mammalogists

Pack rat nest under among cactuses
Photo: Cliff Hutson

Desert wood rat near midden
Photo: Dick Hartshorne, SearchNet Media

Sources, further information:

Mammal pests including rattlesnakes http://ucanr.org/sites/vpce/files/86153.pdf
Mouse management
http://ag.arizona.edu/urbanipm/buglist/mousemanagement.pdf
Integrated pest management of the house mouse in schools
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/38106/em9062.pdf
Roof rat control around homes and other structures
http://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1280.pdf
Vertebrate pests-mammals
http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY

Common name(s): Pocket gopher, gopher
Scientific name, classification: *Thomomys* spp., **Class:** Mammalia, **Order:** Rodentia, **Family:** Geomyidae. Valley/Botta's pocket gopher *Thomomys bottae* is the most common southwestern species. The desert pocket gopher *Geomys arenarius* and the yellow-faced pocket gopher *Pappogeomys castanops* are other species that may be found in parts of New Mexico, Colorado and Texas.
Distribution: Throughout the U.S.


Pocket gopher with mound
Photo: Royal Tyler

Description and ID characters:
Medium to large sized, stout-bodied rodent, measuring 7-10 inches in length, with short hairless tail of about 2 inches. The term 'gopher' may refer to any member of


Botta's pocket gopher-full view. They are seldom seen above ground in this manner.
Photo: Dave Beaudette

the family Geomyidae, which are the "true gophers" as well as other related rodents such as ground squirrels; or moles, which belong to a different family and are not technically rodents.
Best identifying feature(s): Gophers are rarely seen above ground, and so it is difficult to observe them for identification. The best indicators of gopher activity are the mounds of soil that they create during their tunneling activities underground. Sometimes they emerge briefly from their tunnels, and during these short sightings, they can be quickly recognized by their stout, stocky bodies, well adapted for a life under the soil. Botta's pocket gophers have fine dark gray, brown or black fur mostly matching the soil in the habitat; with paler undersides. The muzzle is blunt and rounded, with long pale white whiskers on both sides. Four large,


Botta's pocket gopher showing front teeth
Photo: Eric Gofreed

smooth orange front teeth are visible in front of the face towards the lower side, with lips closing behind them so that the teeth are always exposed and the lips prevent soil and debris from entering their mouth while the teeth are used for digging. Eyes are small and beady, ears are small, hairy and almost sunken into the fur. Cheeks have fur-lined pouches or pockets that give them their common name, and are used to carry food or nesting materials. The pockets extend from the sides of the mouth back to the shoulders, and can be turned inside out for emptying and cleaning. Legs are short and powerful; front legs are equipped with long claws for digging. Whiskers and tail are used for navigation within tunnels.

Pocket gopher with cheek pouches full
Photo: Dave Kirkeby

Desert pocket gophers are similar in size and appearance to Botta's pocket gophers, but have 2 prominent grooves on each of their upper front teeth and longer claws on their front paws. Yellow-faced pocket gophers are usually smaller than the other two; have lighter fur, single grooves on their upper front teeth, and larger front feet and claws. Fig. 3 provides identification tips to distinguish between the three genera.

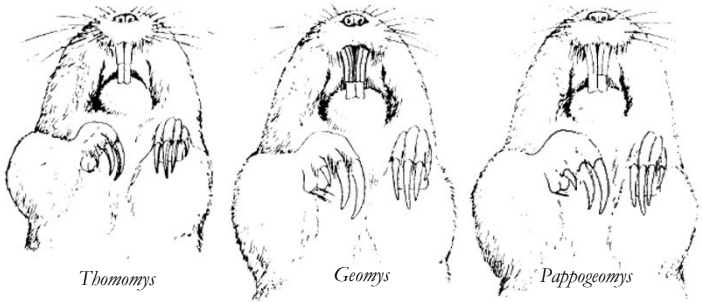


Fig. 3. Diagrams showing the differences between the common pocket gopher genera
Source: Turner et al. 1973. Colorado State Univ. Exp. Stn. Bulletin 554S

Gophers create an intricate network of tunnels under the ground, which provide them shelter, protection and pathways to collect food. The mounds of loose soil that can be seen above the ground as indicators of their activity are actually covered up entrances to their tunnels. The mounds are crescent or fan shaped, and are created when the gophers throw out loose soil from the tunnel entrance. Often, they will open up some of these entrances to air the tunnels, dry them out after a heavy rain, or to forage for short distances. Round patches of missing vegetation in a new area may indicate gopher activity under the ground, because they are known to open up small holes in the ground from within their tunnels and pull whole plants down by their roots.

Pest status: Important pest of turf and landscapes, because of their tunneling activities. Can inflict painful bites if threatened or cornered.

Gopher mounds in a school playing field (top); in open unoccupied ground (bottom left); and in adjacent property (bottom right)
Photos: Shaku Nair

Damage/injury: Gophers are mostly herbivorous, and feed on a wide range of crop and garden plants, cutting up their roots, as well as above ground parts. More important is the damage caused to lawns, yards, playing fields, gardens and other landscaped areas by their extensive mounds and tunnels. The tunneling can also destroy water hoses, and drip and sprinkler irrigation systems, often diverting large amounts of irrigation water causing water loss and erosion. Gopher activity aerates the soil to some extent, but over long periods of time, it creates large areas devoid of vegetation and limits establishment of new seedlings.

Typical crescent-shaped gopher mound with soil plug in the center. Photo: Cynthia Cheney

Life history: Gophers are mostly solitary animals, with each individual developing its own tunnels and territories. They need moist soil, and irrigated landscapes in the southwest serve as ideal habitats, where they have deep permanent tunnels for nesting and storing food, as well as shallow tunnels to forage. Nests are excavated inside their tunnels and are cushioned with grass or other softer plant material. They also have large food storage chambers with bare sides, where they hoard grains and other food material for the colder months. Gophers group together only for mating. A female can produce up to 2 litters per year, each with 2-6 young, which become sexually mature in 3 months and leave the mother's nest. Average lifespan is 2 years.

Sources, further information:

Controlling pocket gophers in New Mexico http://aces.nmsu.edu/pubs/_l/L-109.pdf

Controlling pocket gophers http://www.okrangelandswest.okstate.edu/files/wildlife%20pdfs/NREM-9001.pdf

Mammal pests including rattlesnakes http://ucanr.org/sites/vpce/files/86153.pdf

Pocket gophers http://icwdm.org/handbook/rodents/PocketGophers.asp

Pocket gopher control techniques http://agr.mt.gov/agr/Programs/PestMgt/VertebratePest/Bulletins/pdf/PocketGopher.pdf

Vertebrate pests-mammals http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY

Common name(s): Squirrel
Scientific name, classification: Different species, **Class:** Mammalia, **Order:** Rodentia, **Family:** Sciuridae. The rock squirrel *Otospermophilus variegatus*, California ground squirrel *Otospermophilus beecheyi*, round-tailed ground squirrel *Xerospermophilus tereticaudus*, and Harris' antelope squirrel *Ammospermophilus harrisii* are common southwestern species.
Distribution: Worldwide.
Description and ID characters: Small to large sized, furry grayish brown rodents with long, bushy tails and large dark eyes. Sizes and appearances vary with the species.
Best identifying feature(s):

California ground squirrels are medium to large animals, measuring up to 20 inches in length. Their fur is brownish-gray, speckled with white on the back. The sides of the face and shoulders are lighter in color and the belly is light gray or tan.

California ground squirrel
Photo: Thomas O'Brien

Harris's antelope squirrels are much smaller than rock squirrels, measuring up to 15-18 inches including the tail. They have distinctive grey fur with brown highlights on the sides and legs, and a white stripe along both sides of the trunk. The bushy tail is about 4 inches long and covered with long, dark gray or black hairs. Eyes are large, black and lined with white; ears are small and short.

Harris's antelope squirrel
Photo: Eric Gofreed

Round-tailed ground squirrels are the smallest of the southwestern species, measuring about 8-10 inches in length, including the tail. Their fur is uniform sandy brown in color with no markings, matching the soil of their habitat, and lighter on the underside. The tail is long and round and not bushy, but covered with short fur similar in color to the body. Eyes are large, black and lined with a light margin. Ears are small and placed back on the head.

Round-tailed ground squirrel
Photo: Ryan Kaldari

Rock squirrels are the largest of the southwestern ground squirrels, their bodies measuring about 12 inches and their long bushy tails adding another 10 or 12 inches to their total length. The head is light brown or tan, fur on the back of the neck and shoulders is speckled gray, black and white, while the lower back is tinged with brown. The underside of the body is pale gray or white. The long bushy tail is edged with white. Eyes are large and black, surrounded by a light colored ring, and pointed ears projecting above their heads.

Rock squirrel
Photo: Marcia Bradley

Various species of **tree squirrels** are also found throughout the southwest.
Pest status: Pests of crops, landscape and garden plants, can cause structural damage to wooden structures. Can harbor and spread various pathogens causing human diseases, notably bubonic plague.
Damage/injury: Squirrels mostly cause damage by feeding on fruit, nut and grain bearing plants in gardens and landscapes. They can also damage young seedlings, strip bark from trees causing girdling, and burrow around roots.
Squirrels can also chew on plastic water hoses and irrigation tubes. Some species burrow into the ground and create unsightly mounds in landscaped areas and around buildings, resulting in weakening and structural damage.
They carry many parasitic insects, mites and ticks and along with them, may spread pathogens to humans who come in contact with them, especially when squirrel populations are high. Notable among these is the plague bacterium *Yersinia pestis*. Squirrels are highly susceptible to plague and they are infested through fleas which parasitize them. Dead squirrels should never be handled, and large

Rock squirrel near its nest in a rock crevice
Photo: Siobhan Basile

numbers of dead squirrels in an area should be reported immediately to public health officials.
Life history: Squirrels vary greatly in their habitat and nesting behavior. They mostly nest in burrows, in the ground or in trees or rocks. Most squirrels are daytime foragers and are active from midmorning to late afternoon. They feed on various plant materials as well as small insects and other invertebrates.

Sources, further information:
Controlling rock squirrel damage in New Mexico
http://aces.nmsu.edu/pubs/_circulars/CR574.pdf
Desert Animals http://www.desertusa.com/animals.html
Vertebrate pests-mammals
http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY

OTHER LARGE MAMMALS

Coyote
Photo: Jitze Couperus

Common name(s): Coyote
Scientific name, classification: *Canis latrans*, **Class:** Mammalia, **Order:** Carnivora, **Family:** Canidae.
Distribution: Throughout North America and parts of Central and South America.
Description and ID characters: Coyotes are medium-sized animals resembling dogs or wolves, and are closely related to them. Instances of mating between these related species are also known, producing hybrids known informally as 'coywolves' or 'coydogs'. Most coyotes are 1 ½ to 2 feet in height at the shoulders. Coat colors are various shades of brown or gray, mostly darker on the back and lighter on the belly. Tails are usually bushy and darker towards the tip.
Best identifying feature(s): Resemblance to dogs or wolves, but usually smaller and thinner, with longer, bushier tails; longer, narrower muzzles and large pointed ears. Coyote activity can also be identified by their tracks (more elongated than dog tracks), fallen hair, droppings, tooth marks, or remains of food or animals that they prey on. They also produce various typical sounds known as howls, yelps or barks.
Pest status: Nuisance pests, can attack native and pet animals and birds, cause public health concern because they can harbor pathogens and parasites.
Damage/injury: Coyotes readily feed on a variety of food material including human food, pet food, fruits, seeds, small animals, insects, as well as garbage. They can cause damage to household articles and structures, garden and irrigation structures, and objects stored in yards and outside homes, in their attempts to reach food materials. They also prey on native birds and small animals and rodents. Coyotes can react aggressively, and are known to stalk and attack children, adults and pet animals causing injuries. As with other wild mammals, coyotes can harbor the rabies virus, as well as many other parasitic insects, mites, ticks, worms, and disease-causing microorganisms. These can be transmitted to humans and domestic animals by close or regular contact.
Life history: Coyotes are extremely adaptable, and this is one of the reasons for their success and ever-expanding range. They can live in diverse habitats, and are known to change their diet, breeding habits and social aspects to suit the environment they inhabit. By nature, coyotes are wary of humans and tend to avoid them, but many individuals are known to have lost their fear and thrive in and around human habitats. They are also known to recognize and avoid trapping or snaring devices, which enables them to freely inhabit human environments. It is important to recognize coyote activity and avoid practices that encourage them, to tackle the problems they might create around community environments. Providing food intentionally or unintentionally (such as by leaving pet food and garbage

open), can greatly attract and encourage coyotes to come closer to homes and buildings, and should be avoided.
Coyotes form small social groups called packs, consisting of a dominant female and her mate, and several younger males and females. Breeding usually occurs once a year in late winter, and a pair will form a small nesting area called a 'den' in tree hollows, burrows, or under rock ledges. The young ones called 'pups' are born in March-April and a litter has 6 pups on average. They are cared for by the parents for 2-3 months till they are completely weaned and start hunting on their own. They mature by 8-10 months, after which some pups leave their pack and seek out new groups, while others stay with their parents till they are much older.

Common name(s): Feral cat
Scientific name, classification: *Felis catus*, **Class:** Mammalia, **Order:** Carnivora, **Family:** Felidae.
Distribution: Worldwide.
Description and ID characters:
Feral cats are descendants of domestic or housecats or their young ones, which have turned wild. They belong to the same genus and species as domesticated cats and are physically indistinguishable from them, but behave differently due to lack of any kind of socialization or human contact. Feral cats are different from free-range cats and stray cats, which have or have had contact with humans in their lives.


A group of feral cats
Photo: Boris Dimitrov

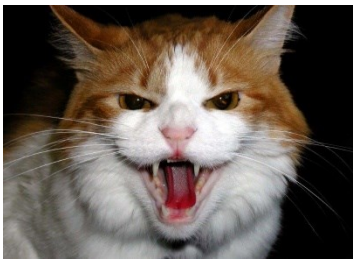
Feral cats are those that have never had human contact in their lives. Offspring of stray cats can be considered feral if they are born in the wild, and never found by their owners. Feral cats are also different from the 'true wildcats' *Felis sylvestris*, from which present day domestic or housecats are believed to have descended. Wildcats occur only in truly wild areas and are rarely encountered in community environments, except those that are very close to forested or mountainous regions. They bear many resemblances to domestic cats, but are generally larger, with longer legs, more robust body and larger, rounded heads with wider spaced ears. Their fur and tails are thicker and usually of uniform gray-brown or color with different spots, stripes or bands.


Wildcat
Photo: Sylvia Rost

The problem of feral cats is a growing one, aggravated by failure to neuter pet cats resulting in their uncontrolled breeding, and the following abandonment of their kittens.
Best identifying feature(s): Aggressive, defensive or avoidance behaviors such as growling, hissing, hiding behind, under or above structures and reluctance to come

close to humans. Often have injuries on various parts of the body due to encounters with other feral cats or other animals.

Pest status: Nuisance pests, can attack native and pet animals and birds, cause public health concern because they can harbor pathogens and parasites.



Feral cat showing typical defensive features
Photo: Eric Gofreed

Damage/injury: Feral cats are hunters by nature. They can pose serious threats to local native wildlife such as birds, amphibians, reptiles, rodents and other small mammals and insects. When they are unable to catch prey in the open, feral cats often turn to domesticated animals and birds such as poultry and even domestic cats.

Feral cats can harbor several parasitic insects, mites, ticks, worms and pathogens on their bodies because of their wild lifestyle. These can be easily transmitted to domestic animals, birds and humans by close or regular contact. Disease that can be transmitted by feral cats include salmonellosis, toxoplasmosis, ringworm, rabies

Male feral cat with injured left ear (left): Photo: Philip Kahn;
and a female with an injured or diseased right eye (right): Photo: Chriss Haight Pagani

and plague.

It is important to avoid feeding feral cats, even though it might be considered humane. Feeding provides them an easy source of food, but will not cause them to lose their feral nature which is established when they were born and raised in the wild. Some feral cats may appear more docile than others, but truly domesticating them is difficult.

Feral cat with prey (rabbit)
Photo: Eddy Van3000

Life history: Feral cats are adapted to live and survive in a wide variety of situations. They inhabit a number of structures around community environments such as alleys, sewers, dumpster areas, barns and outbuildings, and surrounding wooded areas, and forage within a radius of about 2 miles from their resting spots. They will feed on any available

food of plant or animal origin, including small animals and birds, as well as garbage. Many feral cats are regularly provided food by humans.
Even in their hostile environments, feral cats breed prolifically. Mating takes place in late spring through summer and females can produce up to 5 litters per year with 2-10 kittens in each. The kittens are cared for by their mothers who will move them frequently to avoid detection by predators which include the male cats. The kittens mature by 7-10 months and disperse. Average life expectancy is 3-5 years, compared to 15 years in domestic cats.

Common name(s): Javelina, collared peccary, musk hog
Scientific name, classification: *Pecari* (*Tayassu*) *tajacu*, **Class:** Mammalia, **Order:** Artiodactyla, **Family:** Tayassuidae.
Distribution: Southwest U.S.; North and Central South America.
Description and ID characters: Medium sized, pig or boar-like mammal, about 2 feet in height at the shoulders.


Collared peccary/javelina
Photo: Wing-Chi Poon

Best identifying feature(s): Boar-like appearance; body covered with short, coarse dark brown and black colored hair. Some hairs have whitish bands, giving the coat a salt-and-pepper appearance. Hair around the neck or shoulders is lighter in color, giving the appearance of a collar. Hairs on the back of the neck (mane) are longest (up to 6 inches long) and can stand erect when the animal is excited. Face is pointed towards the front into a snout with a flat end, resembling a pig's snout. Sharp canine teeth (tusks) protrude about 1 inch beyond the jaws. Legs are short and have hooves.
Pest status: Occasional pests of turf, garden and landscape plants and other garden and irrigation structures. Can cause damage to mobile homes and other temporary structures when seeking shade under them. Can also cause physical injury to humans and other animals with their tusks.
Damage/injury: Feed on and damage a number of cultivated crops, landscape and garden plants. They are more problematic in communities near desert washes, mountains or other wooded areas. Javelina usually ignore humans, but can charge to attack if threatened, and can injure humans and other animals with their tusks. They also release a strong musky odor when alarmed. Mothers are especially protective of their young.


Group of javelina resting in shade
Photo: Anonymous, Opencage.net

Life history: Javelina are mostly active after sunset, although they can be seen moving during the daytime. They usually rest in the shade of trees or rocky outcrops during the heat of the day. In natural settings, they can occupy various habitats and opportunistically feed on

the available plants as well as other small reptiles, vertebrates and insects. Prickly pear cactuses are a preferred and important part of their diet. Javelina form small social groups of about 6-20 individuals, sometimes larger. Breeding can occur throughout the year and females produce up to 2 litters, each with 1-2 young in a year. The young ones are weaned at 6 weeks and become sexually mature in about 10 months. It is important to never purposefully feed wandering javelina, because this will prompt them to become regular visitors to an area and lose their shyness of humans. This can give rise to further problems, including damage of crops and property and attracting larger predators of javelina such as coyotes or mountain lions.

Common name(s): Skunk
Scientific name, classification: Different species, **Class:** Mammalia, **Order:** Carnivora, **Family:** Mephitidae. The western spotted skunk *Spilogale gracilis* is a common southwestern species. The striped skunk *Mephitis mephitis* is also common and widely distributed throughout the U.S.
Distribution: Southwest U.S.
Description and ID characters: Medium sized, stout and elongated mammals about 1 ½ -2 feet in height at the shoulders and about the same in body length, and a long hairy tail about 10-12 inches in length. The head is conical with a pointed muzzle, and beady black eyes. Legs are short, hairy and muscular and equipped with long claws. They walk with a distinctive slow, waddling or shuffling gait and cannot move very fast, and therefore they have other defense methods: their fur has vivid warning coloration and they are well known for their ability to spray strongly-scented, pungent liquids from their rear ends that can temporarily disable most predators.


Western spotted skunk
Photo: US National Park Service

Best identifying feature(s):
Spotted skunks are the smaller of the two species. Their bodies are covered with thick, glossy black fur with distinct white broken stripes and spots; with a single white spot on the forehead or above the nose. They have a conspicuously large hairy tail, also colored black with a white tip and often held up like a feathery fan behind the animal.
Striped skunks are slightly larger and heavier, and their bodies are almost fully covered with thick, glossy black fur except for two distinct broad white stripes on the back. The stripes join and extend to form a broad white area above the neck, and backwards over the large hairy tail. The forehead bears a single narrow white stripe.


Striped skunk
Photo: Dan & Lin Dzurisin

Pest status: Occasional pest of crop, garden and landscape plants. Their defensive sprays can be extremely irritating to the eyes and skin

of humans and other animals. Cause some public health concern because they can harbor rabies viruses and parasites.

Damage/injury: Skunks are opportunistic omnivores and will feed on any food material, including plants, insects and other smaller arthropods, reptiles, birds, carrion of all kinds and human food. They can damage garden and landscape plants, dig up holes in lawns and turf in search of grubs and worms, as well as destroy garden structures such as bird houses, bee hives and boxes, and irrigation structures. Bird eggs are one of their preferred foods, as are honey bees and honey. They are known to disturb bee hives and catch the emerging bees, their long thick hair offering protection against stings. Skunks also feed on garbage and will regularly visit porches, garages or basements that have an assured supply of pet food.

Western spotted skunk with raised tail
Photo: Ray Bruun

If threatened or disturbed, skunks typically assume a warning stance by stamping their feet and raising and fluffing up their long tails. If the disturbance continues, they will turn around and by stand up on their forelegs with their rear end facing the intruder and raise their hind legs into the air. Finally, they will react in their characteristic manner, and spray the notorious pungent fluid. The fluid is produced from scent glands located on either side of their anus and they can shoot it as far as 10 feet. It is powerful smelling and potent, and can cause nausea, severe burning and temporary blindness on eye contact, and is difficult to remove from clothing. Skunks themselves often hesitate to use the fluid and will not spray if they are in a confined space and cannot get their tails out of the way. It takes them about 10 days to refill their supply after it is exhausted.

Skunks are more frequently encountered in urban communities because of disturbances of their natural habitat, and are very often run over by passing vehicles, which also releases their characteristic smell. Some people try to trap, domesticate and keep skunks as pets, for their attractive fur. However, it is important to remember that skunks carry several parasitic insects, mites and ticks in their luxuriant fur that can be transmitted to humans and pet animals by close and regular interaction.

More importantly, skunks are reservoirs of the rabies virus, which can cause the deadly disease, rabies, in humans and pet animals if transmitted by bites, scratches or other bodily fluids from infected skunks. Skunks are also known as carriers of other human and animal diseases such as leptospirosis, listeriosis, canine hepatitis, tularemia, etc.

Life history: Skunks are nocturnal and solitary by nature. They build single dens, sometimes occupying abandoned dens of other animals or other suitable spots such as wood piles, hollow logs, or under crawl spaces and mobile homes and forage around their dens. Spotted skunks are good climbers and may occasionally forage in trees. Skunks mostly breed once a year in the spring and the young ones called

'kits' are born in the summer, around May. Spotted skunks breed in the fall, but they have delayed implantation of the embryo, because of which their young are also born in the summer. Litters have 4-8 kits, which stay with the mother for several months, mature at about 1 year and disperse. Mothers are very protective of their kits and will spray at the slightest sign of danger.

Sources, further information:

Desert Animals http://www.desertusa.com/animals.html
Feral cats and their management
http://ianrpubs.unl.edu/live/ec1781/build/ec1781.pdf
IPM tactics for managing feral cats
http://www.ipminstitute.org/school_ipm_2015/Feral_cats_pest_press.pdf
Managing a feral cat colony http://zimmer-foundation.org/art/pdf/08.pdf
Managing skunk problems in Missouri http://extension.missouri.edu/p/g9454
Striped skunks
http://wildlifecontrol.info/pubs/Documents/Skunks/Striped%20Skunks.pdf
The javelina in Texas
https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_1669.pdf
Urban coyote ecology and management
http://ohioline.osu.edu/b929/pdf/b929.pdf
Vertebrate pests-mammals
http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY

REPTILES

Lizards are some of the most common reptiles in community environments. The term 'lizard' can technically refer to any of several similar scaly reptiles, including some that are legless such as the legless lizards. However, most lizards can be differentiated from snakes, which are also elongated, legless and scaly, by the presence of legs and external ears. The common reptiles that are referred to as 'lizards' mostly belong to a group (suborder) of reptiles called Iguania. They are characterized by dry, scaly skin, four short legs with claws, external ear openings and eyelids. Sizes and appearances vary greatly with species and their habitats. They are mostly terrestrial (land-dwelling), many are arboreal (live in trees). Lizard tails are differently colored and textured, compared to the rest of their bodies. Many species shed their tails in defense, and regenerate them later. The detached tail continues to move by reflex action for some time, distracting the predator and allowing the lizard to escape. Most lizards are carnivorous and are important predators in their natural environments, feeding on many other smaller animals. Some species feed on plants, and some are omnivorous. Most species reproduce by laying eggs, some give birth to live young.

Common name(s): Lizard (Iguanian lizard)
Scientific name, classification: Different genera, **Class:** Reptilia, **Order:** Squamata, suborder Iguania, **Family:** Different families. The desert spiny lizard *Sceloporus magister* and the horned lizards *Phrynosoma* spp. (Family Phrynosomatidae) are common and important southwestern species.
Distribution: Worldwide.
Description and ID characters:
Best identifying feature(s): The **desert spiny lizard** is robust, medium to large sized, measuring 5-6 inches including the tail. The entire body is covered with small pointed scales with raised tips or keels, giving an overall spiny appearance. Scales on the belly do not have raised tips. Base body color is pale gray or tan scattered with dark gray, black, white, tan or blue scales. There is a ring of dark or black scales around or under the neck, forming a collar. Some individuals have vivid bluish green throats and bellies. Desert spiny lizards exhibit metachromatism, by which they adjust their internal temperature by changing color, and appear darker during cooler

Desert spiny lizard
Photo: Ryan Kaldari

Desert spiny lizard showing ventral color
Photo: Philip Kahn

times and lighter when it gets warm. Its body colors enable it to be camouflaged among its surroundings, and escape notice by predators. The belly/throat colors are used in communication with other lizards.

Horned lizard
Photo: Kevin D. Hartnell

Horned lizards exhibit excellent camouflage and often go undetected in the desert landscape. They have flat, toad-like bodies (and are sometimes referred to as 'horny toads'), often in shades of light brown or gray and covered with numerous warts and thorn-like projections, arranged in characteristic patterns specific to the species. Body lengths range from 3-5 inches. Most species have a row of larger thorns around the base of the head often encircling the head like a collar. Some species have rows of fringe-like spiny scales along the sides of the body. A defensive strategy adopted by some species is squirting blood from around their eyes. The blood produced by the rupturing of blood capillaries around the eyes in the excited state and can be shot out for a distance of up to 5 feet. It often serves to surprise predators, but can also be irritating to the skin on contact.

Pest status: Non-pests.

Damage/injury: Lizards are primarily outdoor reptiles, but can stray indoors occasionally in search or pursuit of prey. None of the common lizards are venomous, but can bite if disturbed or handled roughly. They have sharp teeth that can puncture the skin.

Life history: Lizards are found in diverse habitats throughout the southwest. They are mostly diurnal (active during day) and carnivorous, feeding on insects or other smaller reptiles and invertebrates, rarely on some plants. Like other reptiles, lizards are cold-blooded, and their body temperatures are affected by the environment. They are adapted to the heat in the deserts, by having higher preferred body temperatures than other reptiles. When mid-day temperatures get too high, they will seek shade in underground burrows, which are much cooler than the surface soil, or under vegetation.

Desert spiny lizards are territorial, and the males defend their territories by performing 'push-ups' revealing their brightly colored bellies and throats. A territory will have a dominant male and several females and sub-adults. However, the males are mostly seen alone or paired with a female during breeding. Females lay one clutch of about 5-20 eggs in the summer, which hatch in 2-3 months. Horned lizards are known as important predators of harvester ants, but they will also feed on other insects. Their body shape and size often reduce their mobility, but also serves to intimidate predators when they appear suddenly from their surroundings. They can also puff themselves up and appear larger than usual when confronted. The horned lizard's flat bodies enable them to obtain the maximum warmth from their surroundings during cooler days, but on hotter days, they burrow into the soil. Most species lay eggs, in clutches of about 30, but some

produce live young. Nests are usually formed at the end of small burrows underground.
Horned lizards have cultural significance in many regions of the southwest, and it is considered bad luck to kill them. Some species of horned lizards are believed to be declining due to several reasons, including overuse of pesticides and invasive fire ants-both of which reduce native ants which are the lizards' preferred food source. The Texas horned lizard *P. cornutum* is now a protected species.

Texas horned lizard
Photo: Steve Hillebrand, US-FWS

A different group of lizards that might be encountered in some desert communities, especially in rocky areas, are **chuckwallas** (*Sauromalus* spp.) belonging to the family Iguanidae. They are larger and bulkier lizards, sometimes measuring up to 16 inches in length, with long thick tails, short stocky limbs, and characteristic, loose folds of skin over the sides of their body and around the neck. The head ends in a large, blunt snout. Body colors are variable, often black, dark brown or dark gray, sometimes with reddish, orange, pink or yellow tinges. Males, females and young ones often vary in their coloration. The males are territorial and mark their territories using secretions produced from glands on their inner thighs. Chuckwallas are primarily herbivorous and feed on different plants throughout their habitat. Although they may look threatening, these lizards are harmless and will always run away when disturbed. Their characteristic defense strategy is squeezing their body into tight concealed spaces and inflating themselves to stay tightly wedged, till the intruder passes.

Common chuckwalla
Photo: Adrian Pingstone

Ornate tree lizard (left) and side-blotched lizard (right)
Photos: Ben Lowe

Other iguanian lizards that are frequently observed in community environments of the desert southwest are the Yarrow's spiny lizard *Scleroporus jarrovii*, the side-blotched lizard *Uta stansburiana*, and the ornate tree lizard *Urosaurus ornatus*. Tree lizards are well adapted to urban environments and are often moved around by people enabling them establish outside their natural ranges.

Yarrow's spiny lizard
Photo: Thomas Brennan, www.reptilesofaz.org

The only venomous lizards in the U.S. are the Gila monsters *Heloderma suspectum* (Family Helodermatidae). They are rarely found in urban community environments, and are mostly restricted to wild habitats. However, they can be encountered on communities near their natural habitats, especially on well watered properties adjacent to forested or wooded areas. Being large (about 2 feet in length) and conspicuously patterned, they are easily noticed, but they do not pose a threat to humans because of their slow and sluggish nature. They occur in low densities, and spend most of the year underground.
Gila monsters are protected throughout their range, and it is illegal to disturb them. In situations where there is a need to remove them, help must be sought from local forest or wildlife departments.


Gila monster
Photo: H. Zell

Geckos are terrestrial lizards characterized by their colorful skin patterns and large bulging eyes. All geckos (except those belonging to the family Eublepharidae) lack eyelids and they lick their eyes periodically to keep them clean and moist. Sizes and appearances vary with species. Geckos can lose their tails in defense and regenerate them. The feet of most species are equipped with specialized toe-pads that enable them to climb smooth vertical and even some horizontal surfaces upside down. They produce distinct sounds or squeaks that are used to communicate about their territory, or for courtship.

Common name(s): Gecko
Scientific name, classification: Different species, **Class:** Reptilia, **Order:** Squamata, infraorder Gekkota, **Family:** Different families. The western banded gecko *Coleonyx variegatus* (Family Eublepharidae), the peninsular leaf-toed gecko *Phyllodactylus nocticolus* (Family Phyllodactylidae), and the Mediterranean house gecko *Hemidactylus turcicus* (Family Gekkonidae) are common southwestern species.
Distribution: Worldwide.

Description and ID characters: Small lizards, mostly 4-6 inches in length including the tail. Their bodies are covered with small, fine scales (as opposed to larger, raised scales in other lizards), giving them a shiny or smooth appearance.

Best identifying feature(s):

Western banded geckos range are about 4-6 inches in length including the tail. The upper surface of the body is covered with fine scales, giving it a velvety texture. Base color is light brownish yellow with dark brown bands and sopts. The skin on the belly and limbs is thin and translucent pink and toes are long and thin.

Western banded gecko
Photo: David Scriven

Peninsular leaf-toed geckos are smaller, about 3 inches long with tail. The body is covered with minute raised scales giving them a rough appearance. Base color is pale gray, grayish-pink or light yellow with a number of dark blotches or patches, sometimes forming a pattern. Belly skin is pale gray or cream colored. It has long, widely spaced toes with expanded tips, and walks with a splayed gait. They are restricted to rocky fields or canyons and are rarely found around human habitats.

Mediterranean house geckos are one of the most widely distributed species in the world, and popular as pets. They measure 2-3 inches in length. Upper surfaces of the body and legs are covered with small granular scales, some larger than others. Base color is pinkish brown, gray or tan, with numerous dark spots and often dark stripes on the tail. Skin on the belly and undersides of the feet is translucent creamy white in color. Toes are short and stubby, hind toes have slightly expanded tips.

Peninsular leaf-toed gecko
Photo: Ben Lowe

Pest status: Non-pests.

Damage/injury: Geckos are primarily outdoor lizards, but often wander indoors in following small prey. They are harmless and non-venomous, feeding on small insects, spiders and scorpions, providing some pest control in and around community environments.

Life history: Geckos are secretive and nocturnal by nature, although they can be occasionally spotted during the daytime. They usually forage at night, and capture prey by quick motions and sharp teeth. They shed their skin at regular intervals, including their teeth. Geckos are oviparous, and lay up to 3 clutches of 2 soft-shelled eggs (occasionally 1) per year. The surface of the eggs of most

Mediterranean house gecko
Photo: Hexasoft

species are covered with an adhesive substance that hardens and attaches the eggs to any surface they are laid on. Some species can reproduce asexually by producing eggs that are clones of the mother and develop without fertilization.

Snakes are reptiles with narrow, elongated bodies and can be distinguished from other similar elongated reptiles (such as lizards) by their lack of legs, eyelids and external ears. Sizes and appearances vary greatly with species and habitats. All snakes are carnivorous and feed on other animals including other snakes and are important predators in their natural habitats. They can even swallow animals that are much larger than the size of their mouths, because of their highly flexible jaws. Most of the non-venomous species swallow their prey alive, or coil around and suffocate it before swallowing. Venomous snakes primarily use their venom to paralyze their prey. Snakes, even the venomous ones, rarely bite in defense, and prefer to use vivid body colorations or behaviors such as raising or puffing up their heads, rattling their tails against the ground or surface, to ward off predators as far as possible. However, many species will bite as a last resort, and their bites and venom, in venomous species, can have painful effects. Most species of snakes lay eggs in some sort of nest, and most of them also attack , some retain their eggs till they are ready to hatch, and others give birth to live young.

NOTABLE SPECIES

Common name(s): Western diamondback rattlesnake

Scientific name, classification: *Crotalus atrox*, **Class:** Reptilia, **Order:** Squamata, suborder Serpentes, **Family:** Viperidae.

Distribution: Southwestern U.S.

Description and ID characters: Large, grayish-brown snake measuring about 5-6 feet in length. Body colors vary from dusty gray-brown and chalky white, with variations of reddish or yellowish brown, with black and white bands near the tip of the tail. Most individuals have diamond-shaped patterns in various shades of brown, gray, or black on their backs and blend in well with their surroundings; some are devoid of patterns and are uniformly grayish brown. The 'rattle' in rattlesnakes consists of a group of hollow, interlocking segments

Western diamondback rattlesnake-cryptic
Photo: Ben Lowe

Western diamondback rattlesnake – full length view
Photo: Roger Shaw

which are modified scales that cover the tip of the tail. The segments are attached to specialized muscles in the tail, which causes them to vibrate and knock against one another and the sound is amplified because the segments are hollow. Rattling is widely used by rattlesnakes as a warning to predators. Newborn young ones only have a 'prebutton' at the tips of their tails, and a new segment is added each time the snake molts. Rattlesnakes are protective of their rattles but often lose segments during their activities and therefore, the length of the rattle is not a definitive indicator of the snake's age, contrary to popular belief.

Many other rattlesnake species are found in the desert southwest; some of these include the sidewinder/horned rattler *Crotalus cerastes*, Mohave rattlesnake *C. scutulatus*, black-tailed rattlesnake *C. molossus*, tiger rattlesnake *C. tigris*, speckled rattlesnake *C. mitchellii*, Arizona black rattlesnake *C. cerberus*, etc. but the most common and iconic southwestern species is the western diamondback.

Best identifying feature(s): Distinctive, triangular head; rattle on the tail, and diamond pattern on the back. Some non-poisonous snakes have coloration and patterns similar to rattlesnakes and many will also flatten and widen their heads when threatened, to look like a rattlesnake. In such cases the rattle is the most definitive identifying character. In young rattlesnakes, the 'prebutton' will not make rattling sounds, but the tail will still look different from the normal, tapering snake tails.

Pest status: Non-pest. Most important venomous snake in the southwest. Important predator of many rodents and other mammals.

Western diamondback rattlesnake
-striking pose
Photo: Dick Hartshorne, SearchNet Media

Damage/injury: Can deliver extremely painful and venomous bites.

It is very important to understand that rattlesnakes do not strike or bite at first sight. In fact, the snake's first line of defense is to remain still and wait for the intruder to pass, or to try and get away as quickly and quietly as possible. If repeatedly disturbed or threatened, they will coil and rattle to try and ward off the intruders, but if the intrusion continues they will aggressively strike in defense. Rattlesnakes mostly use their venom only when capturing prey. They will avoid using it for defense as far as possible, relying more on rattling, because it takes them time to regenerate their supply of venom. Also, in most cases, a defensive strike ends in the snake's death, or severe damage to its body as to its victim's.

Rattlesnake venom contains a mixture of toxic substances that cause hemorrhage, destroy cells and muscles, and cause failure of the cardiovascular system. Immediate effects following a bite include local pain, heavy internal bleeding, severe swelling and muscle damage, bruising, blistering and necrosis; these may be accompanied by headache, nausea and vomiting, abdominal pain, diarrhea, dizziness and convulsions. Rattlesnakes have a highly advanced venom delivery system and they can control the amount of venom that flows out through their fangs during a strike. Most strikes are not lethal, but can involve significant trauma.

Even fangs of dead snakes can deliver venom for a short period by reflex action, and therefore it is important to leave rattlesnakes alone as far as possible, or handle them with extreme caution, including dead ones.
Nearly all rattlesnake envenomations (venomous bites) are avoidable. Many people are bitten or shot in attempts to kill rattlesnakes, often in situations where killing/removing the snake are unnecessary. If required, help should be sought from local snake removal services.
Life history: Rattlesnakes occupy different kinds of habitats in the low desert and feed on a variety of small rodents, reptiles and birds in their natural habitat. They can hunt during any time of the day, but are most active during the night or early morning. At other times, they hide under rocks, vegetation and other concealed spots.
Rattlesnakes are solitary, and pair only for mating. Females are viviparous, and a single female can produce about 25 young ones at a time. The young rattlesnakes are about 12 inches in length and fully capable of striking venomously even at birth.

The Sonoran gopher snake *Pituophis catenifer*, and the San Diego gopher snake *P. catenifer annectens*, are often mistaken for rattlesnakes because of their coloration and defensive nature. When disturbed, they rapidly vibrate their tails against a surface to generating a rattling sound, and will also flatten their heads to a triangular shape, but they are not venomous. Many other snakes use this method of rattling against a surface or the ground, to deter predators.


San Diego gopher snake in defensive position-note the triangular head
Photo: Ben Lowe

The desert nightsnake *Hypsiglena chlorophaea*, is sometimes encountered in kitchens or bathrooms, entering through small cracks and crevices. They are small snakes, usually less than 1 foot in length and are mistaken for baby rattlesnakes. However, they are harmless and coil into a tight ball when confronted.


Sonoran gopher snake
Photo: Julia Larson


Desert nightsnake
Photo: Ben Lowe

The Arizona coral snake *Micruroides euryxanthus* is a small, slender snake with vivid red, black and yellow bands completely encircling the body, and its head is fully black up to the eyes. It is venomous, but due to its small size, it does not pose a serious danger as do rattlesnakes. However, it should not be handled as far as

Arizona coral snake
Photo: Jeff Servoss, US FWS

Sonoran mountain kingsnake
Photo: Natalie McNear

possible. The Sonoran mountain kingsnake *Lampropeltis pyromelana* is another non-venomous species occasionally found in higher elevations. It is often mistaken for the venomous coralsnake, but can be distinguished by its light-cream colored square nose.

The lizard-eating long-nosed snake *Rhinocheilus lecontei* is another snake occasionally mistaken for the coral snake due to its red-and-black patterns, but is non-venomous and rarely bites if captured. It can be identified by its narrow pointed snout as opposed to the blunt snout of coral snakes. True to its common name, it has a preference for lizards which form the major part of its diet. Yet another coral-snake look alike is the western shovel-nosed snake *Chionactis palarostris*, which has a dark brown or black and orange bands on a cream background. It has a pointed cream colored snout, and a black crescent shaped mask covering the eyes.

Some other snakes that are frequently observed in community environments of the desert southwest are the coachwhip snake *Masticophis* (= *Coluber*) *flagellum*, and the California kingsnake *Lampropeltis getula* (= *californiae*). Both are harmless, and they are more likely to be seen by desert southwest property owners than coral snakes or mountain kingsnakes.

Lizard-eating long-nosed snake
Photo: William Wells, www.reptilesofaz.org

Western shovel-nosed snake
Photo: Thomas Brennan, www.reptilesofaz.org

A common problem in desert southwest properties adjoining forested or other natural areas is wildlife falling into pools. Leaving a styrofoam board in the pool will allow the animals to climb out and avoid drowning. Avoiding storing firewood, piles of brush or leaves, boards, children's toys and other articles in the backyard will reduce the chances of wildlife seeking shelter in them.

Sources, further information:
California herps http://www.californiaherps.com/
Desert Animals http://www.desertusa.com/animals.html
Lizards of the American southwest http://southwesternherp.com/lizards/
Reptiles and amphibians of Arizona http://www.reptilesofaz.org/
Reptile and amphibian accounts
http://www.desertmuseum.org/books/nhsd_reptile.php
Vertebrate pests-reptiles
http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY

NOTABLE SPECIES

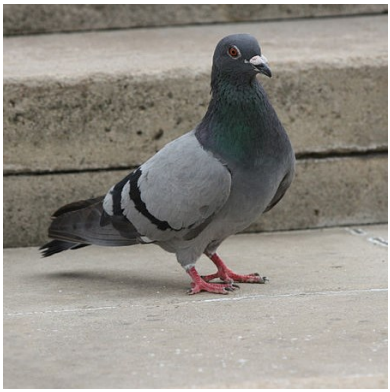
Common name(s): Pigeon, feral pigeon, city pigeon, street pigeon
Scientific name, classification: *Columba livia domestica*, **Class:** Aves, **Order:** Columbiformes, **Family:** Columbidae.
Distribution: Worldwide.
Description and ID characters: Feral pigeons are descendants of domestic pigeons, which have turned wild. Domestic pigeons are believed to have descended from wild rock doves (*C. livia*), and some domestic pigeons may look different due to selective breeding for various purposes and external traits. However, feral pigeons are generally similar in appearance throughout the world and resemble their original ancestors, the wild rock doves. They also retain the character of perching on narrow ledges of buildings and other structures, which is believed to be derived from the rock doves' habit of perching on narrow rock ledges on cliffs and mountains.

A group of feral pigeons of different colors
Photo: John Donges

Domestic pigeons with color variations
Photo: Michael Baranovsky

Wild rock doves
Photo: Andrew Dunn

Best identifying feature(s): Medium sized, stout birds with blue-gray feathers on their wings and body. Adults are 12-15 inches in height, and the wingspan is 24-28 inches. The wings have two broad black bands and are fully capable of flight. The feathers on the head and neck are darker and iridescent purple, indigo, green or dark



Feral pigeon
Photo: Von Grzanka

blue in color; the rump feathers are pale gray or white. Tail feathers are longer and darker and have a broad black band across the ends. They eyes are red, with a pale ring of skin around them. The beak is short and sharp with a conspicuous white patch above it. Feet are red or pink in color, and are not covered with feathers. Slight color variations of the overall plumage have been observed, with individual birds colored uniform white, brown or gray or mixtures of these colors.
Although they have flight-capable wings, feral pigeons are generally sedentary or walk with short, waddling steps, but do not hop or jump like crows or sparrows. They are well adapted to human surroundings and feed on the ground in flocks. They are not disturbed by human presence, and will continue their activities around humans. If alarmed by sudden movements or sounds, they will fly short distances, rapidly flapping their wings with a clapping sound, but soon return to their local feeding and resting areas. However, they can fly long distances if necessary, and can also glide, holding their wings in a V shape.

Pest status: Nuisance pests, can damage grain or fruit crops, damage and disfigure buildings and surroundings with their droppings, and cause public health concern because they can harbor pathogens and parasites.

Damage/injury: Feral pigeons are generally docile, sedentary birds and will not cause direct injury to humans. However, in a suitable location with assured food supply, their populations explode and they can cause significant damage by their activities. They have a

Pigeon droppings on window ledge
Photo: Sarah B. Boyle

Pigeon droppings damage machinery and work spaces
Photo: Simon Laver, www.flickr.com/people/urban-spaceman/

preference to perch on high narrow ledges, door and window frames, above porches, and beams and rafters around and inside buildings, and this causes the most problems. The major form of damage is by their droppings, containing highly corrosive uric acid that can cause structural damage to buildings and structures if not removed regularly. They also cause unsightly accumulations of fallen feathers, nesting materials, food and other debris in the areas they frequent, which, along with attracting other pests such as cockroaches, flies and rodents, can also damage machinery and other equipment, block drains and rain gutters, and even cause structural damage to roof margins and other architectural structures and causing them to collapse from their weight.
Pigeon-proofing, with the help of metal wire nets or spikes on ledges and other perching spaces, is effective but these also need monitoring and maintenance.

Pigeon nesting above an external light (left), spikes help to prevent nesting (right)
Photos: Dawn Gouge

Pigeon-proofing structures are effective (left), but need to be monitored and maintained. Torn nets (right) will not keep pigeons out. Photos: Dawn Gouge

Feral pigeons also harbor several parasitic insects, mites, ticks and pathogens which can easily be transmitted to humans and pet animals because of their close association with human surroundings. Pathogens associated with pigeons include

bacteria (*Salmonella*, *Streptococcus* and *Pasteurella*); fungi (*Aspergillus* and others), protozoans, tapeworms, parasitic nematodes and other worms.

The problem of feral pigeons is aggravated by humans feeding them. It is important to avoid feeding them in and around homes, schools and other

Feeding pigeons in public places aggravates the problems caused by them
Photo: Laura Hadden

community environments, as this increases chances of pollution from their droppings as well as transmission of bird-borne diseases.

Life history: Feral pigeons pair for life, and have elaborate courtship rituals. Nests are untidy, loose collections of twigs, and other plant or any available material built on ledges or small sheltered spots on buildings or structures. They have a preference for abandoned or rarely used buildings, but when numbers increase, they will nest even in regularly used buildings. Females lay clutches of 2 eggs, up to 6 times a year. Young ones, called squabs, hatch in about 3 weeks. Both parents take turns in incubating the eggs as well as feeding and caring for the squabs, which are ready to leave the nest in a month. In captivity, pigeons can live up to 10 or 12

Courting feral pigeons
Photo: David Slater

Young pigeon (squab)
Photo: Leena J.

years, but the average lifespan in the open is 3-4 years due to predation, diseases and other stresses.

Sources, further information:
Feral pigeons http://ovocontrol.com/pigeons/pigeons/
Feral pigeon control
http://www.public.health.wa.gov.au/cproot/1408/2/feral_pigeon_control.pdf
Pigeon pest control and the law
http://www.pigeoncontrolresourcecentre.org/html/pigeon-pest-control-and-the-law.html
Pigeons(Rock doves) http://icwdm.org/handbook/birds/Pigeons.asp