U.S. Fish & Wildlife Service

San Luis

National Wildlife Refuge Complex

San Luis, Merced, San Joaquin River

Mammals

Coyote
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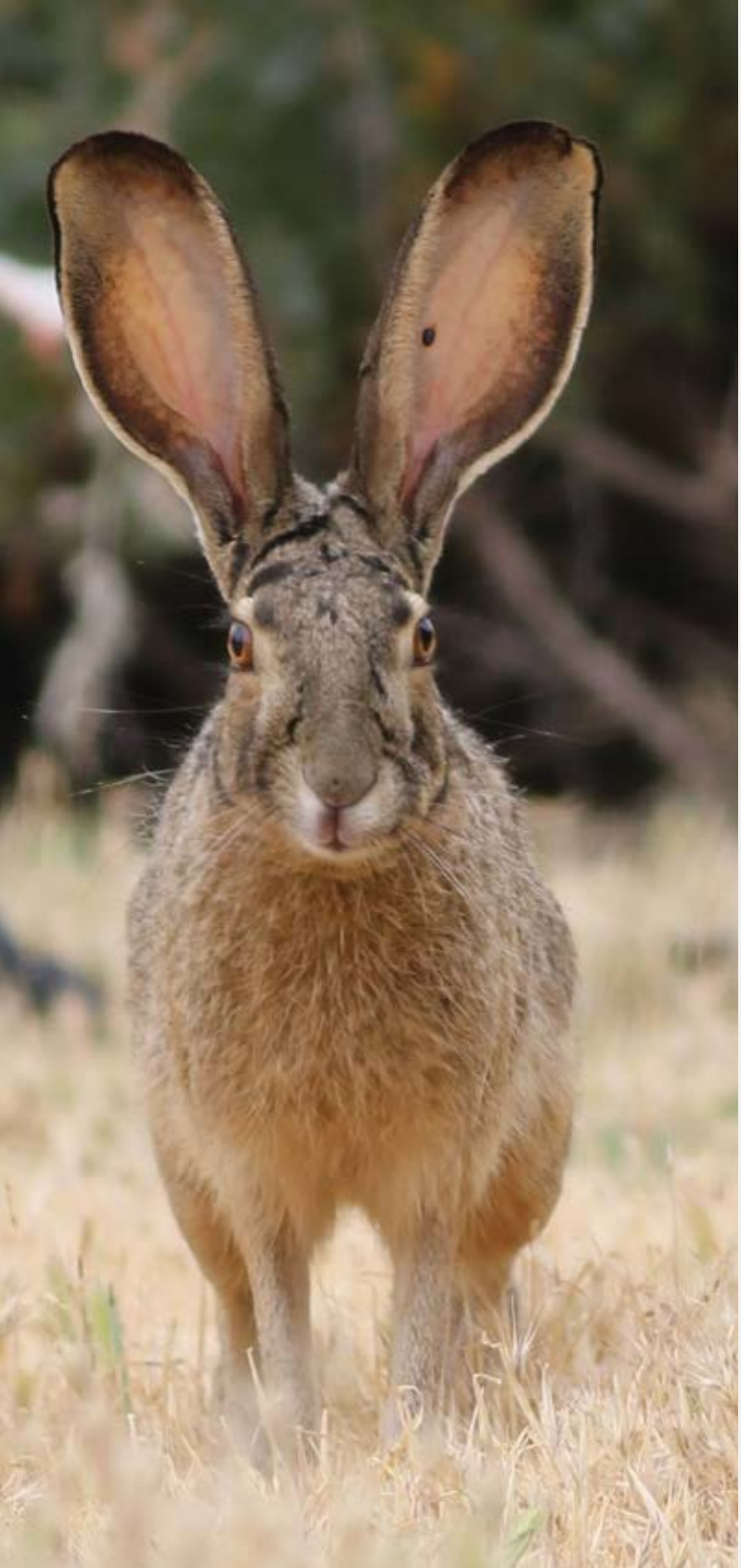


Black-Tailed Jackrabbit
© Rick Kimble

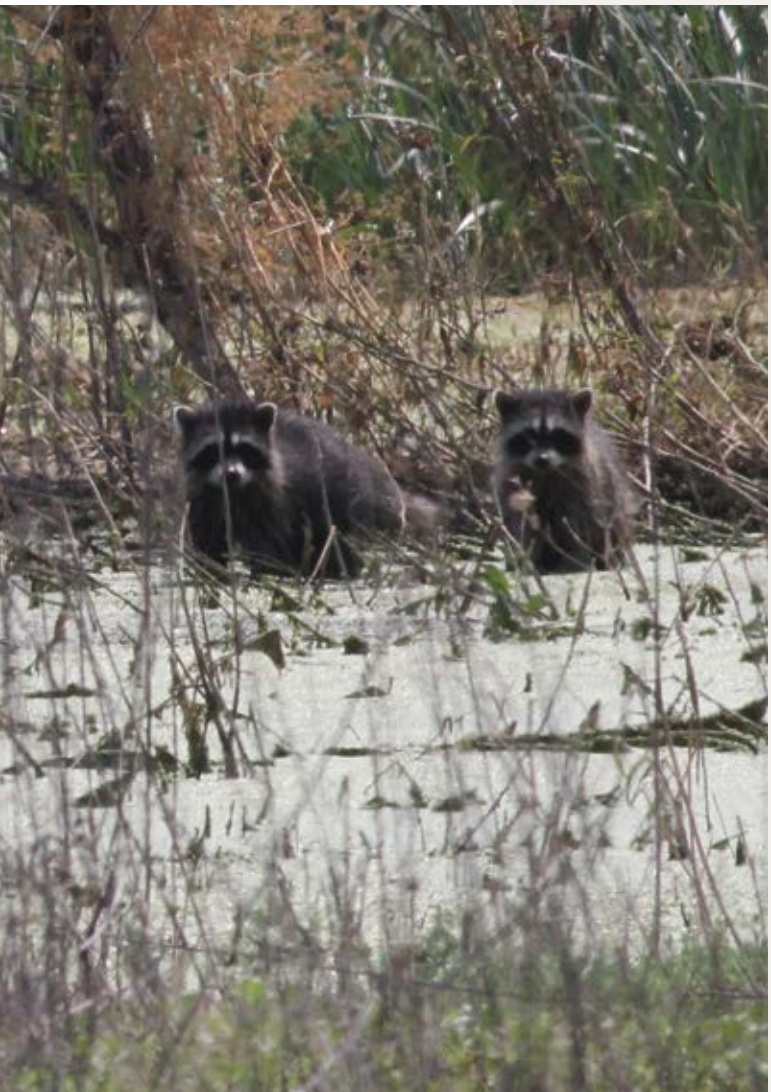
California is home to more than 200 native species of mammals including rodents, bats, lagomorphs, shrews, moles, hooved ungulates, and carnivores. California's mammals also include species of marine mammals like the California sea lion that has on several occasions made its way through the Sacramento River-San Joaquin River Delta and up the San Joaquin River to be observed on refuges of the San Luis NWR Complex.

This brochure of San Luis NWR Complex mammals lists 70 species. Fifty-five of those species are considered native to California – species known to have been present in what is now California prior to European settlement. Fifteen species have been introduced by human activity, either inadvertently or intentionally.

Introduced species include domestic animals like cattle, sheep, horses, dogs, and cats; they also include wild species brought here for commercial purposes like nutria and muskrats – species trapped for their fur. Other wild species, like the fox squirrel, are native to the eastern United States and were brought to California because people that relocated here from the eastern United States missed their common squirrel of woodlands and wooded parks.

This list also includes species that were historically present on (what are now) refuge lands, but have been extirpated – species such as the grizzly bear, gray wolf, and pronghorn. Species such as the grizzly bear have been extirpated from the entire state, while other species, such as the pronghorn, still reside in other areas of California. Other species are no longer here because of loss of habitat, due in large part to human developments and activities.

National wildlife refuges are often established in specific areas to protect particular species and habitat types. The refuges of the San Luis NWR Complex were established primarily to protect and benefit migratory waterfowl. However, these wildlife refuges in California's San Joaquin Valley also protect ecosystems for nearly complete mammal communities, provide dispersal corridors for mammals of all sizes (necessary for healthy and viable mammal populations), and protect habitat, supporting threatened and endangered mammal species.



Raccoons
© Rick Kimble

Species Table Key

N/I

N = Native Species

I = Introduced Species

Conservation Status

FE = Listed by the United States as endangered under Endangered Species Act (ESA)

SE = Listed by state of California as endangered under California Endangered Species Act (CESA)

ST = Listed as threatened under CESA

FSSC = Listed as a Federal Species of Special Concern

SSSC = Listed as a State Species of Special Concern

SV = Listed as a Vulnerable Species under CESA

* = designation due to restricted range

Abundance

A = abundant

LC = locally common

C = common

U = uncommon, seldom seen because habitat-restricted or secretive behavior

P = present, but not often seen

R = rare, not often present even in suitable habitat

Presence

SL = San Luis NWR

MER = Merced NWR

SJR = San Joaquin River NWR

Complex = species occurs on all 3 refuges

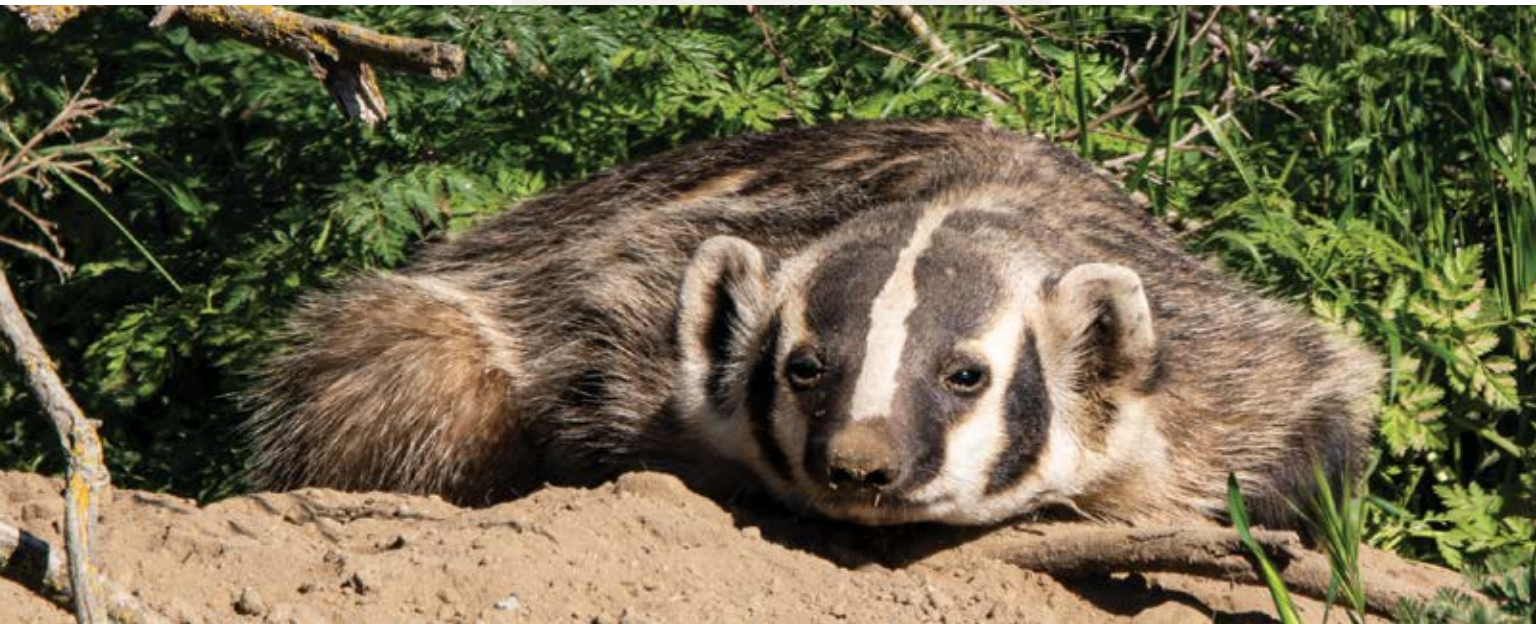
✓	Order Common Name *Scientific name*	N/I	Conservation Status	Abundance	Present	Likely Present	Historically Present	Extirpated
	Order Didelphimorphia							
	Virginia opossum	I		P	Complex			
	Didelphis virginiana							
	Order Rodentia							
	North American beaver	N		U	Complex			
	Castor canadensis							
	Nutria	I		P	Complex			
	Myocastor coypus							
	Botta's pocket gopher	N		U	Complex			
	Thomomys bottae							
	Heerman's kangaroo rat	N		P	Complex			
	Dipodomys heermanni							
	Giant kangaroo rat	N	FE, SE		Complex			X
	Dipodomys ingens							
	Short-nosed kangaroo rat	N		R	SL, MER			
	Dipodomys nitratoides brevinasus							
	Fresno kangaroo rat	N	FE, SE				SL, MER	X
	Dipodomys nitratoides exilis							
	San Joaquin pocket mouse	N			Complex			
	Perognathus inornatus inornatus							
	California vole	N		U	Complex			
	Microtus californicus							
	House mouse	I		U	Complex			
	Mus musculus							
	San Joaquin Valley woodrat	N	FE, SE	U	SJR		SL, MER	
	Neotoma fuscipes riparia							
	Muskrat	I		U	Complex			
	Ondatra zibethicus							
	Southern grasshopper mouse	N	SSSC*				Complex	
	Onychomys torridus							
	Deer mouse	N	C		Complex			
	Peromyscus maniculatus							
	Norway rat	I	U		Complex			
	Rattus norvegicus							

✓	Order / Common Name / *Scientific name*	N/I	Conservation Status	Abundance	Present	Likely Present	Historically Present	Extirpated
	Western red bat	N		P	Complex			
	Lasiurus blossevillii							
	Hoary bat	N		R	Complex			
	Lasiurus cinereus							
	Long-eared myotis	N				Complex		
	Myotis evotis							
	Little brown bat	N		P	Complex			
	Myotis lucifugus							
	Fringed myotis	N		R	MER	SL, SJR		
	Myotis thysanodes							
	Canyon bat	N				Complex		
	Parastrellus hesperus							
	Townsend's big-eared bat	N		R	SL	MER,SJR		
	Plecotus townsendii							
	California myotis	N		P	Complex			
	Myotis californicus							
	Yuma myotis	N		P	Complex			
	Myotis yumanensis							
	Order Eulipotyphla							
	Ornate shrew	N		U	SL	MER,SJR		
	Sorex ornatus							
	Broad-footed mole	N		R	SL	MER,SJR		
	Scapanus latimanus							
	Order Carnivora							
	Domestic dog	I		U	Complex			
	Canis lupus familiaris							
	Coyote	N		C	Complex			
	Canis latrans							
	Gray wolf	N	FE, SE				Complex	X
	Canis lupus							
	Gray fox	N		U	Complex			
	Urocyon cinereoargenteus							

	Order							
	Common Name	N/I	Conservation Status	Abundance	Present	Likely Present	Historically Present	Extirpated
✓	*Scientific name*							
	San Joaquin kit fox	N	FE, ST				Complex	
	Vulpes macrotis mutica							
	Red fox	I		U	Complex			
	Vulpes vulpes							
	Mountain lion	N				Complex		
	Felis concolor							
	Domestic cat	I		U	Complex			
	Felis catus							
	Bobcat	N		U	Complex			
	Lynx rufus							
	Striped skunk	N		C	Complex			
	Mephitis mephitis							
	Western spotted skunk	N					Complex	
	Spilogale gracilus							
	North American river otter	N		C	Complex			
	Lontra canadensis							
	Long-tailed weasel	N		U	Complex			
	Mustela frenata							
	American mink	N		U	Complex			
	Mustela vison							
	American badger	N	SSSC	R	SL, MER		SJR	
	Taxidea taxus							
	California sea lion	N					Complex	
	Zalophus californianus							
	Ringtail	N					Complex	X
	Bassariscus astutus							
	Raccoon	N		C	Complex			
	Procyon lotor							
	American black bear	N					Complex	X
	Ursus americanus							
	Grizzly bear	N					Complex	X
	Ursus arctos							

	Order							
	Common Name	N/I	Conservation Status	Abundance	Present	Likely Present	Historically Present	Extirpated
✓	*Scientific name*							
	Order Perissodactyla							
	Domestic horse	I		U	Complex			
	Equus ferus caballus							
	Order Artiodactyla							
	Pronghorn	N					Complex	X
	Antilocapra americana							
	Domestic cattle	I		LC	Complex			
	Bos taurus							
	Domestic goat	I		R	SL			
	Capra aegagrus hircus							
	Domestic sheep	I		LC	SL			
	Ovis aries							
	Tule elk	N		LC	SL		MER, SJR	
	Cervus elaphus nannodes							
	Black-tailed deer	N		C	Complex			
	Odocoileus hemionus							
	Domestic pig	I		R	Complex			
	Sus scrofa							

American Badger
© Cecelia Sheeter

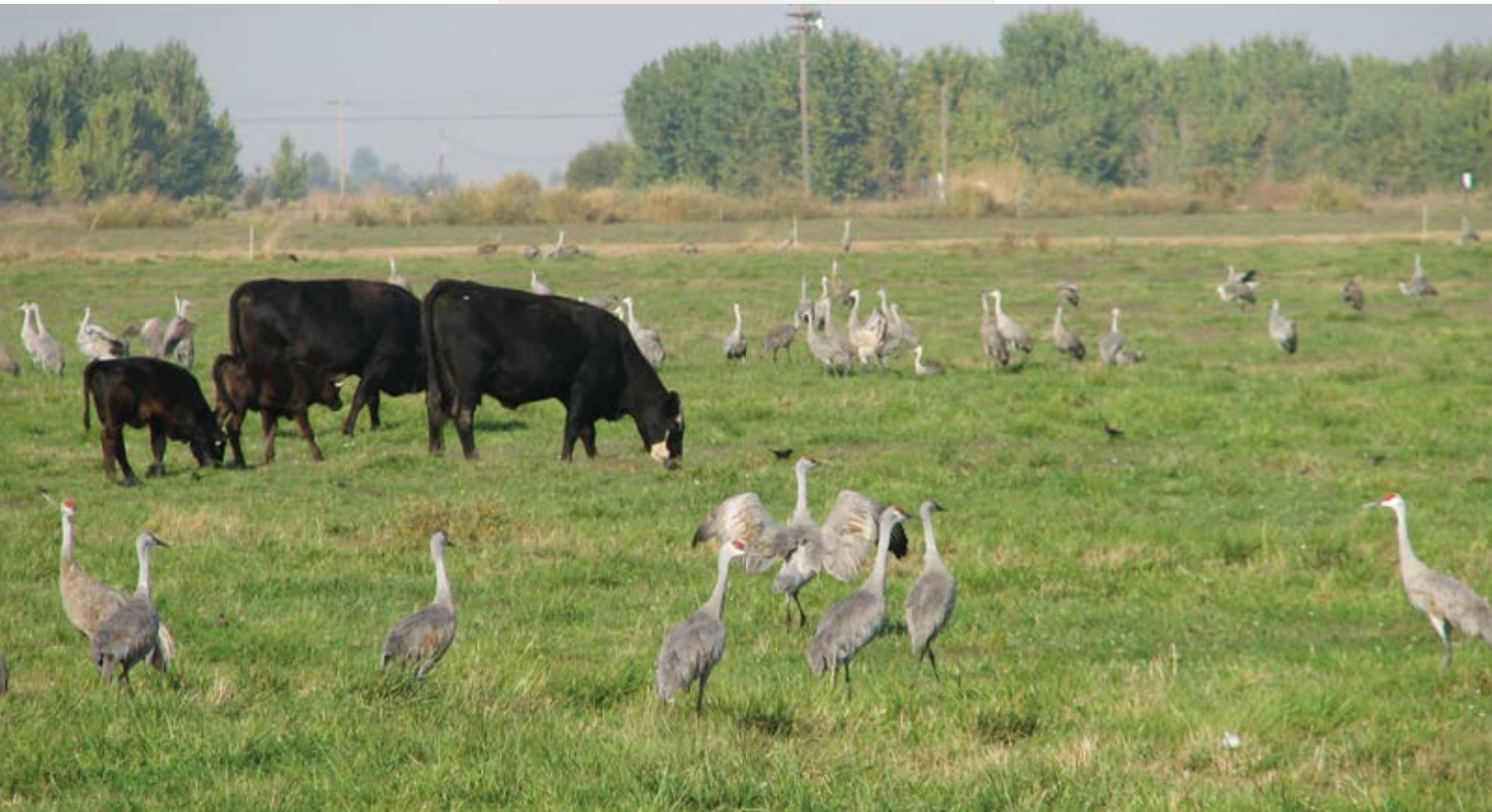


Grazing Mammals

Grazing animals play an important role in grassland and upland ecosystems. One normally thinks of natural grazers as hooved animals like tule elk, black-tailed deer, and pronghorn. However, grazers also include other herbivorous animals like rabbits, ground squirrels, kangaroo rats, and many insects.

Vast herds of tule elk, black-tailed deer, and pronghorn once migrated through California's Great Central Valley, feeding on the grasslands and shrublands, while also reinvigorating them. Those vast herds of large native grazers are gone now, and the number of small grazers has also greatly declined.

Today, domestic grazing animals like cattle, sheep, and goats are used on refuges to help play the role once filled by wildlife. Domestic cattle and sheep can frequently be seen on the San Luis and Merced refuges. Their presence is through cooperative agreements between private ranchers and the refuge complex. The program is mutually beneficial: ranchers gain a source of productive forage for their livestock, and countless wildlife species that evolved with open grassland habitats—long-billed curlews, horned lizards, and kangaroo rats to name a few—are better able to utilize these areas when the vegetation is shorter and sparser. Grazing programs on refuges also help control non-native "weedy" plants. Grazers remove the thick thatch that hinders the growth of many beneficial native plants, creating more open uplands like the bunchgrass-dominated grasslands historically found in California's Central Valley.



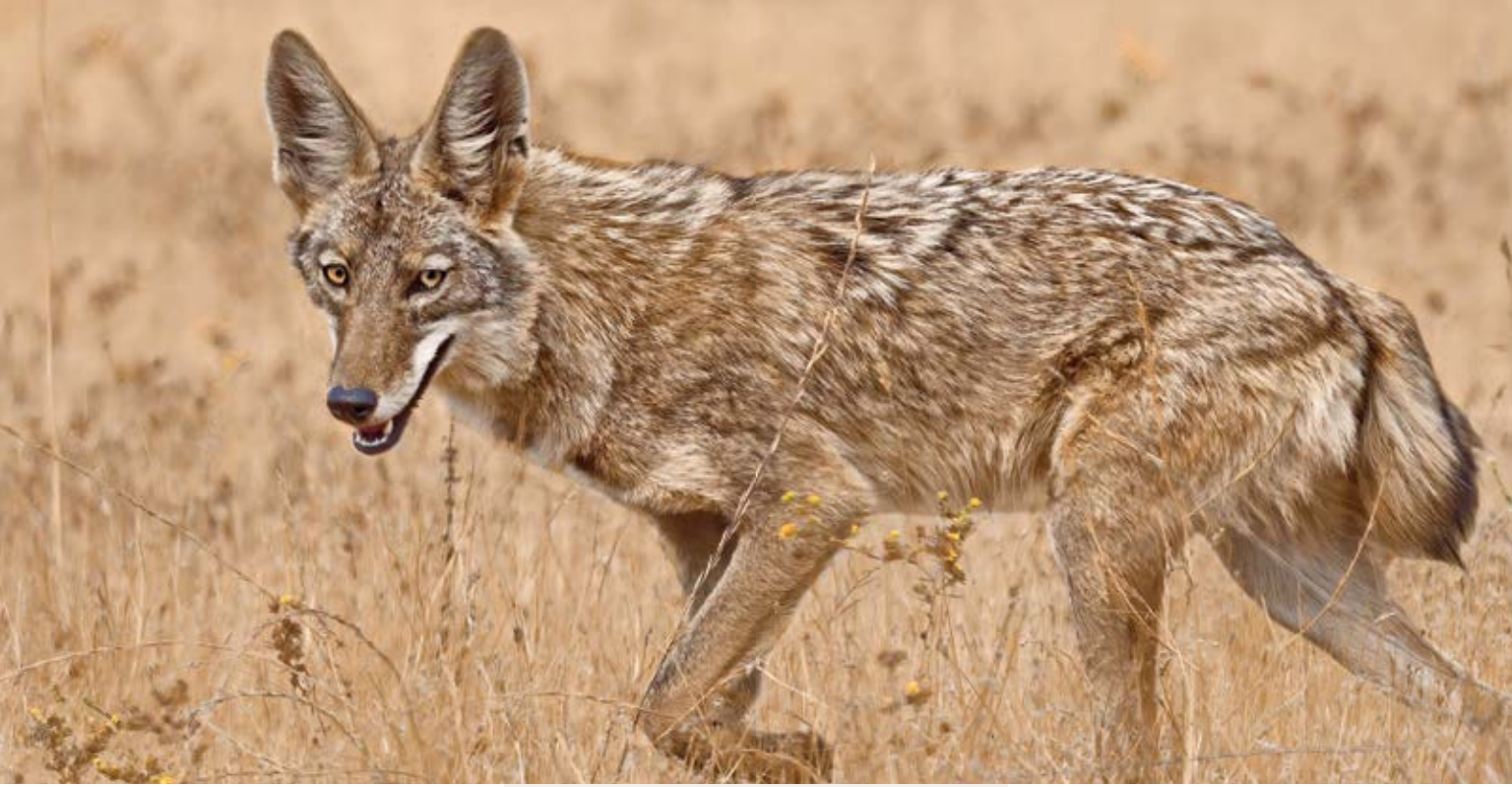
Cattle Grazing with Sandhill Cranes
© Paul Prado

California Ground Squirrel
© Rick Lewis

Species Highlights

California Ground Squirrel

The California ground squirrel (also known as the Beechey ground squirrel) has grayish-brown fur speckled with white-peppered spots and a white eye-ring. Their bushy tail distinguishes them from other species of ground squirrels. California ground squirrels are seed-eaters and are especially fond of grass seeds and acorns. When seeds are in short supply, they will eat a variety of other plant parts like leaves, flowers, stems, shoots, roots, twigs, and bark. They are burrow-dwelling mammals, but spend most of their time above ground during the daytime, sunning, feeding, and grooming. Ground squirrel societies are colonial and interactions among burrow-mates are mostly friendly; however, interactions with adults from other burrows may be hostile, resulting in chasing, biting, and pushing. They are known for sounding a variety of alarm calls to warn others in the colony of approaching danger. Chattering calls signal the approach of a ground predator like a rattlesnake or coyote, while whistles indicate an aerial predator like an eagle or hawk is near. To make their alarms more audible, ground squirrels will raise the elevation of their head by standing on their hind legs, or they will scamper to the top of a fence post or tree branch. California ground squirrels are critical members of their ecosystems. They are prey (food) for countless mammal, bird, and reptile species; and their burrows provide homes for many other species of wildlife like burrowing owls and snakes. Look for the energetic and entertaining ground squirrels in the grassland/upland habitats of all three refuges of the San Luis NWR Complex.



Coyote
© Tom Olejniczak

Coyote

On and around the San Luis NWR Complex, coyotes might be mistaken for domestic dogs; however, coyotes have tall, pointed, erect ears that appear large for their head. Their tails are long and drooping with a black tip and the tail remains down when the animal is running. The coyote's snout is long and pointed. Their fur color ranges from grayish-brown to yellowish-gray on top. Underneath, their color is paler by comparison. The coyote's eyes are typically yellowish. Coyotes are omnivorous, eating all sorts of small mammals, birds, insects, fruits and berries, and they will scavenge carrion (dead animals). It has been discovered that coyotes often live in packs, with un-mated progeny from previous seasons remaining in the family group to help care for the current-season's pups. However, they usually hunt alone, leading to the prior belief that they are solitary animals. Coyotes will house their pups in dens or burrows underground, or they may place them in cavities beneath downed trees or logs. It is not unusual for refuge visitors to hear coyotes before seeing them. The coyote is North America's "Song Dog." They communicate with a variety of barks, howls, and yips that convey alarm, pass information along to other members of the species across great distances, establish territories, promote bonding, or signal the gender and motivation of the "singer." Coyotes play an essential role in ecosystems. They provide the top-down regulation of smaller species in the food web, helping maintain balance among species. Coyotes can be seen – or heard – throughout the San Luis NWR Complex in a variety of habitat types. It's not uncommon to see a coyote splashing through a wetland in the winter, hunting for sick or injured waterfowl.

Raccoons
© Paul Prado

Raccoon

The gray-furred raccoon is easily-recognized with its black "bandit" mask and ringed tail. Raccoons are intelligent, curious, and highly-adaptable which allows them to survive in a wide variety of habitats and a wide range of climates. Raccoons are about the size of a small dog, weighing up to 25 pounds. They have five toes on their front feet, which makes them quite dexterous and able to be used much like a human hand. It is believed their characteristic black mask helps reduce glare allowing them to see better at night. Raccoons are omnivorous, but their diets change with the seasons. During the spring they are mostly carnivorous, eating a variety of amphibians, crustaceans, and invertebrates, including frogs, fish, crayfish, insects, small mammals, birds, and eggs. In the summer and fall, they eat primarily plant material including grains, acorns, nuts, and fruits. The raccoon's adaptability for different habitat types, climates, and diversity of diet enables them to live almost anywhere. The limiting factors are the availability of water and den sites in their environment. Not only do raccoons house their young in dens, the adults live in them too. They will generally find an abandoned cavity that is as much as 6 feet above ground. Raccoons are generally solitary. Encountering multiple raccoons at once usually indicates a family group – a mother and her young. Raccoons are nocturnal, so it may be difficult to see them during the daytime, but visitors to the refuges may catch sight of them early in the morning, as they head to their dens for their daytime sleep; or just before and after sundown, as they head out for their nighttime foraging. It may be difficult to see raccoons during the winter, as they are less active and spend more time sleeping in their dens, living off fat reserves they've gained during the summer.

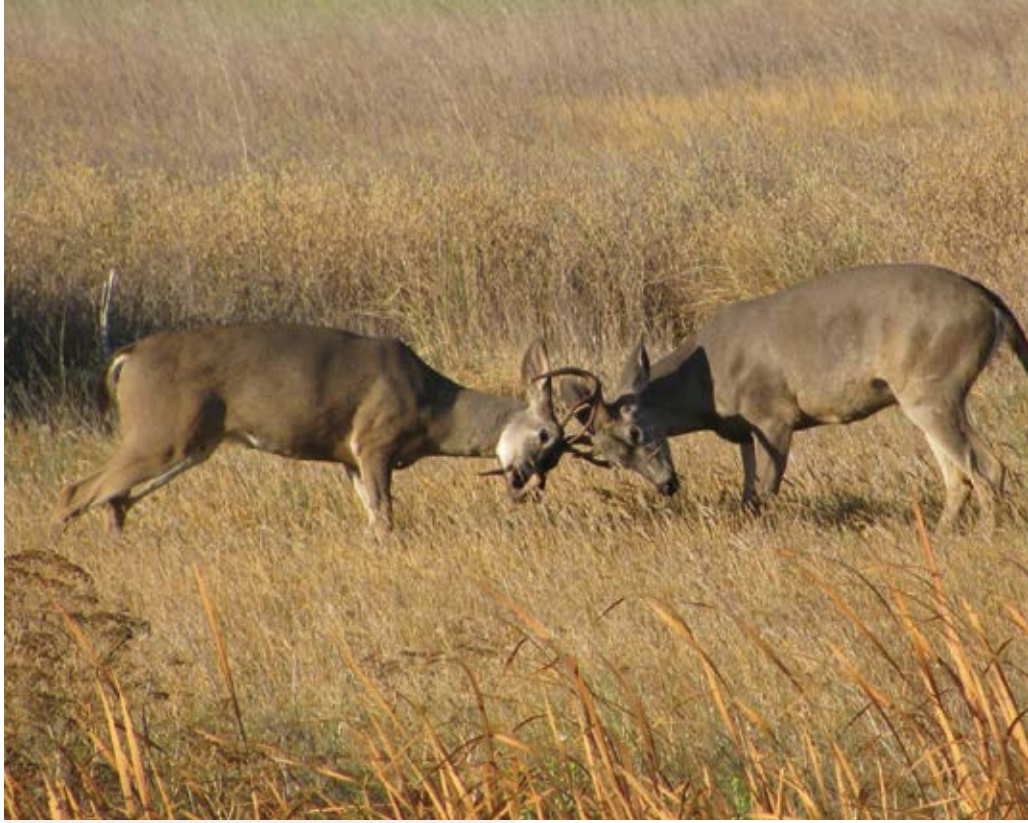
Black-Tailed Deer

Black-tailed deer on the San Luis NWR Complex are a species of mule deer. Like tule elk, deer are members of the family Cervidae; animals with long slender legs, small tails, cloven hooves (two toes in front and in back), and most males grow antlers. Black-tailed deer were extirpated from the floor of the San Joaquin Valley because of loss of habitat and the construction of barriers and obstacles like major roadways (Interstate-5 and Highway 99) and the California aqueduct. Black-tailed deer were reintroduced to the San Luis NWR and surrounding lands two decades ago, resulting in the establishment of a robust population on the refuge.

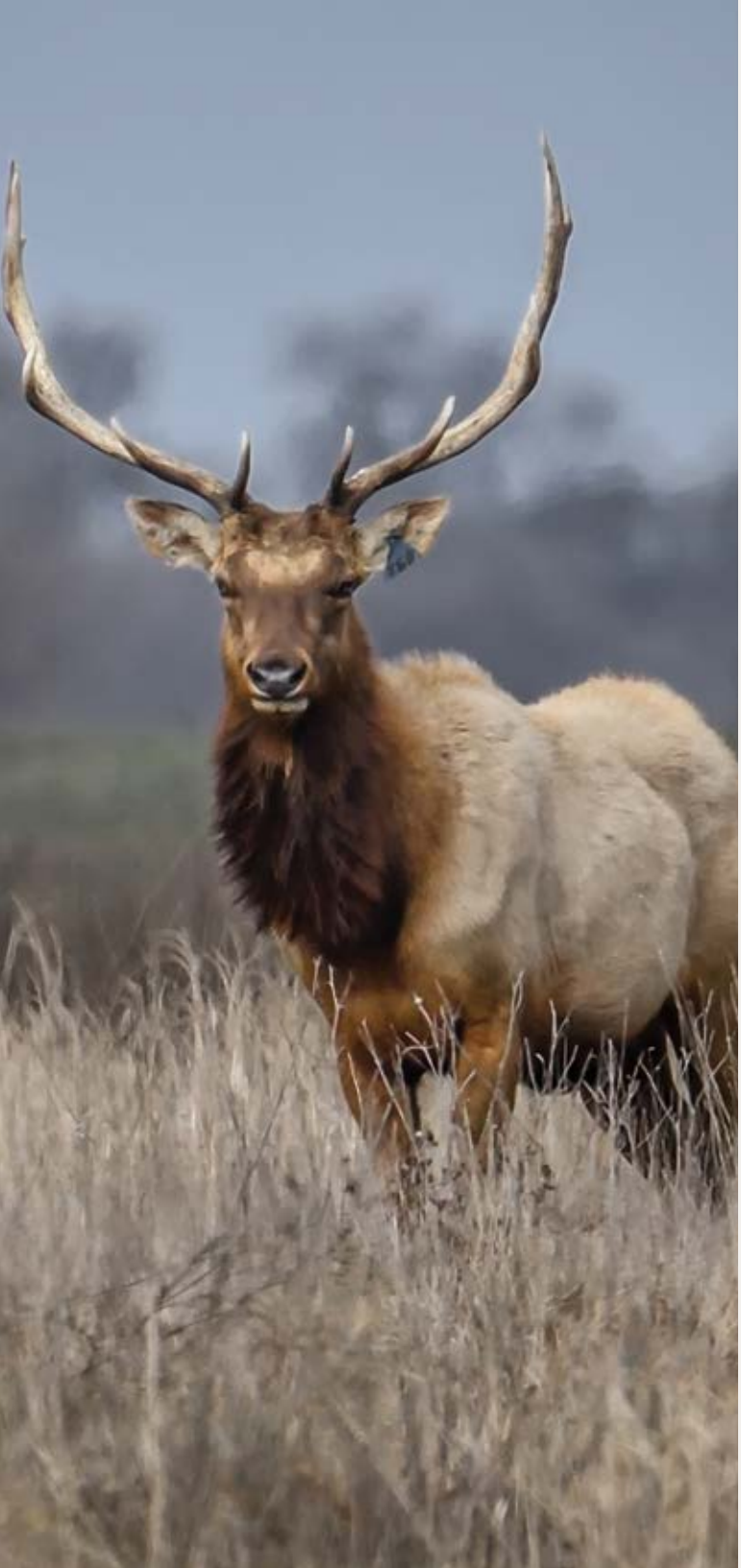
Male black-tailed deer are called bucks, females are called does, and young are called fawns. Black-tailed deer range in size from about 165 pounds (does) to 330 pounds (bucks). Young bucks begin growing their first set of antlers about 3 months after birth. They will drop or "shed" their antlers early the following spring. Thereafter, bucks grow and shed a set of antlers every year.

Deer breed in fall or early winter and give birth about six months later during spring. Does find a sheltered, secluded place in which to give birth and their fawns remain hidden until they're strong enough to keep up with their mother and run from predators. Fawns are born with spots that help camouflage them in their hiding place.

Black-tailed deer are crepuscular, or most active during dusk and dawn. During these periods, they are out foraging in the uplands and wetlands adjacent to riparian areas. Black-tailed deer are primarily browsers, meaning they feed on shoots, stems, leaves, and young twigs of forbs (herbaceous plants with broad leaves), shrubs, and trees – these are plants that grow higher above the ground, as opposed to grasses. During the daytime, deer hide and rest in the riparian woodlands of the refuge. The best time to see them is during their active periods as they are out foraging in more open areas. Look for them as you walk refuge nature trails or drive the auto tour routes.



Black-Tailed Deer
USFWS



Tule Elk
© Brad R. Lewis

Tule Elk

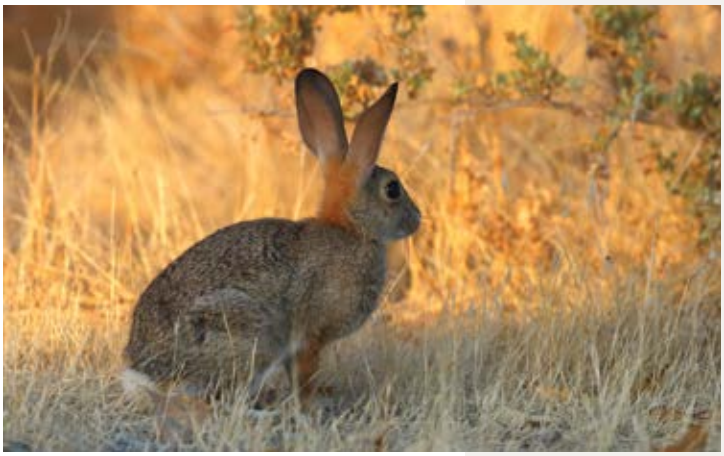
The San Luis NWR has played a significant role in the conservation and recovery of tule elk, a subspecies of North American elk found only in California. The population of tule elk had collapsed by the mid-1850s because of market hunting, competition for food from domestic cattle and sheep, and the loss of habitat to a rapidly-expanding agricultural industry in California's Great Central Valley. Cooperative partnerships between state and federal agencies, and private landowners pulled the tule elk from the brink of extinction. However, by the 1970s, there were still only two populations remaining in California; so, a captive herd was established at the San Luis NWR in the early 1970s. This population has been maintained and managed specifically to reintroduce and support wild populations of tule elk throughout California. Today, there are 22 herds throughout the state, due in large part to the conservation work done here at the San Luis NWR.

Tule elk at the San Luis NWR inhabit an enclosed area of 800 acres. Since the herd is enclosed, it is usually maintained at between 30 and 100 individuals. In order to manage their numbers, elk are periodically captured and relocated to one of the other herds throughout the state. Tule elk are visible at the refuge all year, though a fine time to see them is during their breeding season or "rut" which occurs each year from about the end of July through early October, when one can hear their high pitched "bugle" or call. Calving season for the herd is usually in April and May. The best way to view the tule elk is from the 5-mile auto tour route that follows the perimeter of the elk enclosure. For much more information about tule elk, see the San Luis NWR Complex brochure, "California's Tule Elk – A Species Almost Lost," available in the visitor center.

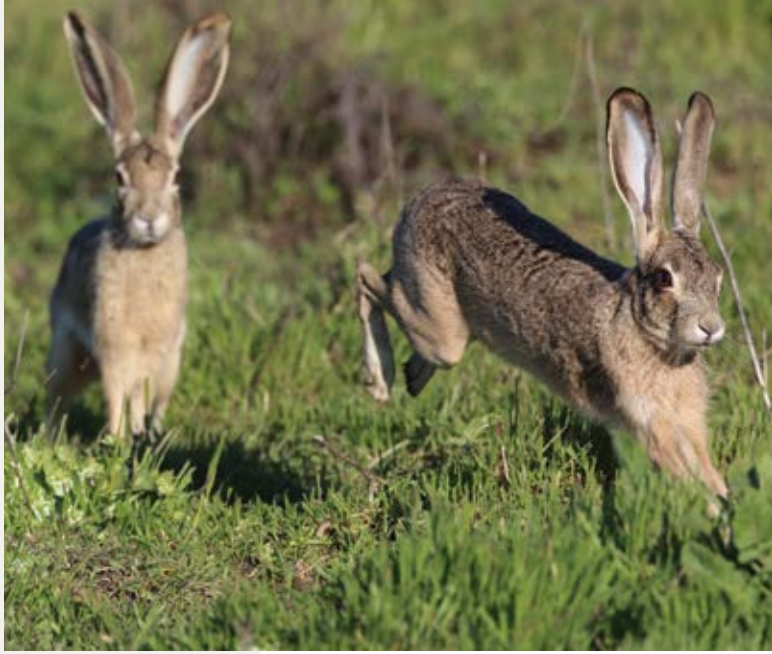
Lagomorphs

Desert Cottontail

Desert cottontails are abundant and can be seen throughout the refuges of the San Luis NWR Complex. They are most readily seen during morning and evening hours, since they take shelter from extreme high temperatures of mid-day. Desert cottontails are herbivores, foraging solely on plants. They particularly like the tender young terminal growth of nearly any plant they find at a height they can reach. While feeding, these rabbits warn others of danger by lifting their "cottontail" – exposing the white underside as an alarm signal. They will also heed the alarm signals of other animals such as sparrows. The desert cottontail is a member of the order Lagomorpha and they share the San Luis NWR Complex with two other lagomorph species, the black-tailed jackrabbit (at the San Luis, Merced, and San Joaquin River refuges) and the riparian brush rabbit (at the San Joaquin River NWR). The desert cottontail is much smaller than the jackrabbit with shorter ears and shorter legs. The cottontail is about twice as large as the riparian brush rabbit and has ears edged in black, with a much more prominent white cottontail.



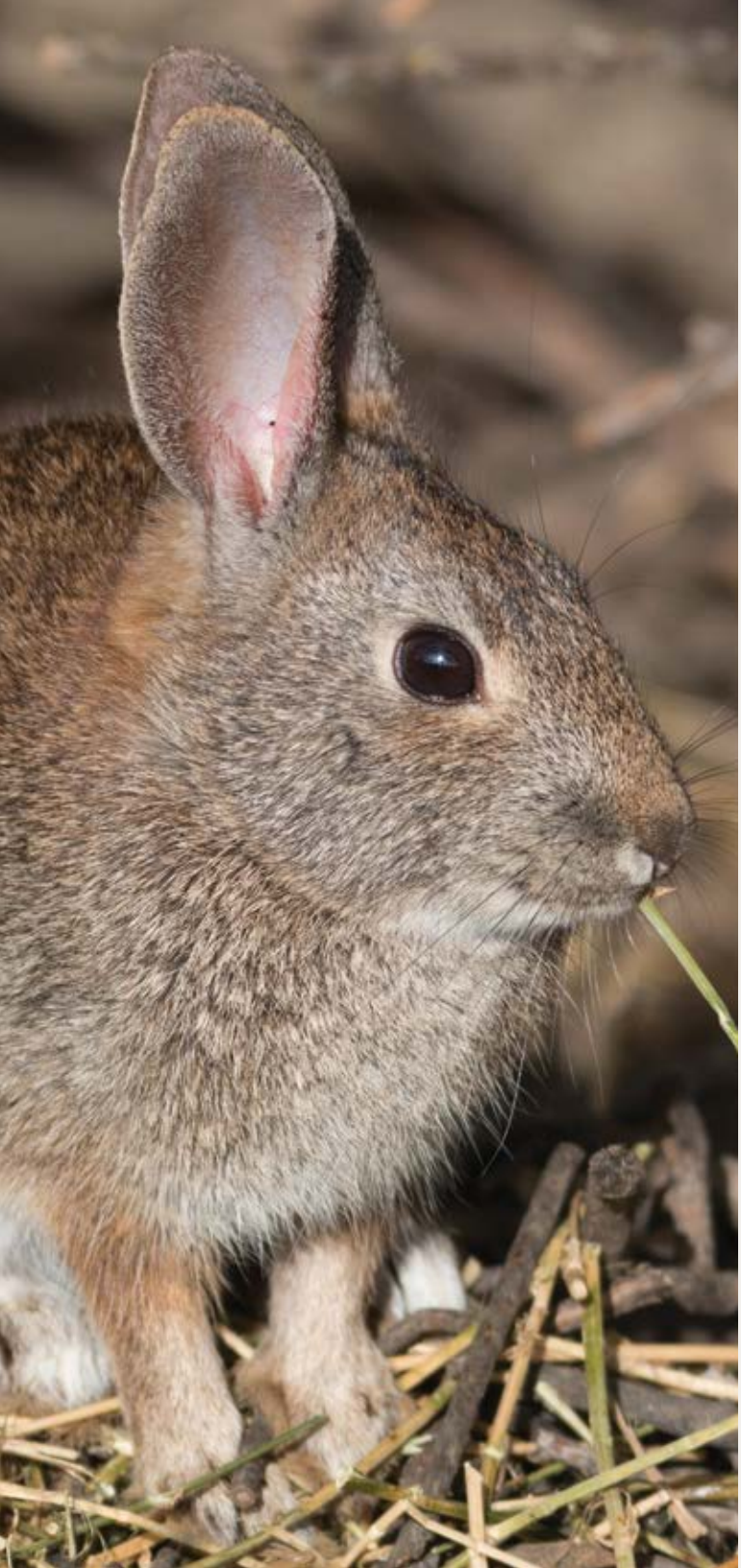
Desert Cottontail Rabbit
© Rick Lewis



Black-Tailed Jackrabbit
© Gary R. Zahm

Black-Tailed Jackrabbit

Despite its name, the black-tailed jackrabbit is not a rabbit, but a hare. Hares are generally larger than rabbits with longer ears and longer legs. Hares prefer habitats with open spaces and less vegetation because their inclination is to run from danger rather than hide (as a rabbit would). Hares give birth to fully-developed young – fully-furred with eyes open, able to fend for themselves within a few hours of birth. By contrast, rabbits are born naked, blind, and unable to care for themselves. Like rabbits, hares are herbivores, consuming a wide range of plants, including dried and dormant shrubs that other species find unpalatable. However, lush more succulent forage, such as that available during the spring and early summer, is preferred and provides more nutrition. The black-tailed jackrabbit's ability to regulate its body temperature – with those large, wide ears – and survive on less-nutritious forage and scarce water, makes it especially well-adapted to survive in the hot arid San Joaquin Valley.



Riparian Brush Rabbit
© Don Cool

Riparian Brush Rabbit

The riparian brush rabbit is listed as endangered by both the State of California and by the federal government. No other subspecies of brush rabbit in the United States is listed as threatened or endangered. They were considered possibly extinct in the late 1990s, but due to a 20-year habitat restoration and rabbit propagation and reintroduction program, the largest population of riparian brush rabbits now lives on the San Joaquin River NWR. Brush rabbits are about half the size of a desert cottontail. Their color is a more uniform greyish-brown and their ears are not edged with black. The tail on a brush rabbit is a small white "patch" compared to the very conspicuous "cotton" tail on the desert cottontail rabbit.

Like all rabbits, the riparian brush rabbit is herbivorous. Grasses make up the bulk of their diet, but they also eat clovers, young bark, leaves, and vine tendrils. The riparian brush rabbit derives its common name from the dense brushy riparian woodlands it inhabits. Its habitat is dominated by oak, cottonwood, and willow woodlands with a dense understory of wild rose, wild grape, blackberry, and coyote brush. Riparian brush rabbits forage in open areas, but they rarely venture more than a few meters from tall, dense cover. Look for them along the Pelican Nature Trail at the San Joaquin River NWR right after sunrise and sunset.

North American Beaver

North American beavers are large aquatic rodents weighing 24 to 75 pounds. They are 3 to 4 feet long – not including their tail. They have webbed feet and scaly, horizontally-flattened, paddle-shaped tails. Their tail can be used like a rudder (to steer) or like an oar (to propel). A beaver's tail is a unique characteristic helping to distinguish it from other large aquatic rodents, like muskrats and nutria. A beaver's fur can be rather pale yellowish brown to a darker reddish brown, to black. Their fur consists of two layers: an undercoat of dense, fine insulating hairs and an overcoat of long, coarse guard hairs.

Beavers are herbivores, feeding on leaves and aquatic vegetation, like cattails and algae. However, they are best known for feeding on branches and cambium, the layer found just beneath the bark, of trees in their environment. On the San Luis NWR Complex, that includes willows and cottonwood trees.

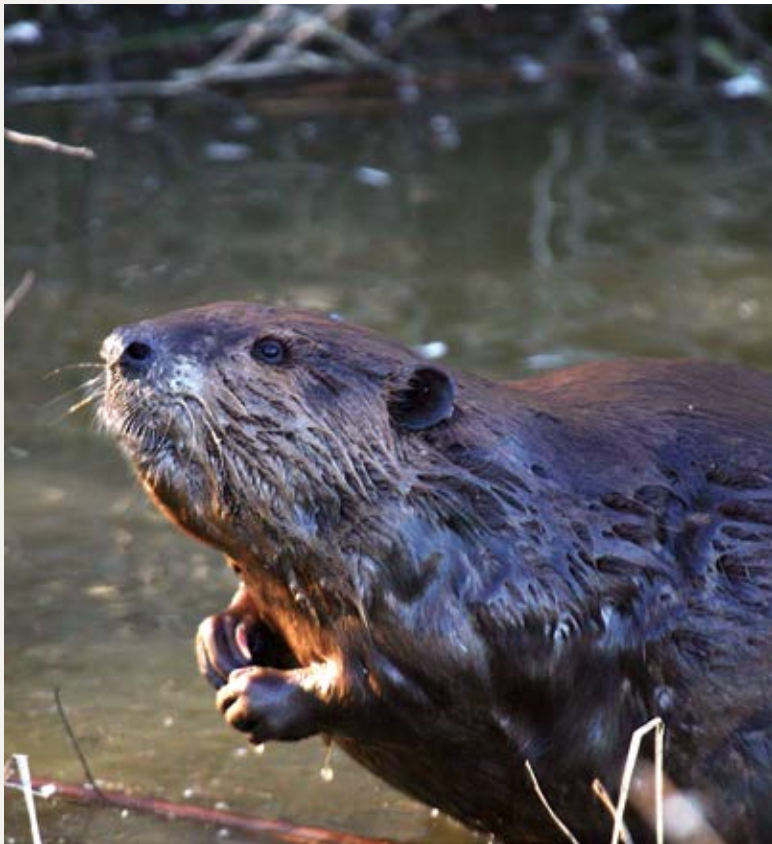
Besides feeding on the branches and small trees they cut down, beavers use them to build their iconic dams and lodges. A beaver lodge is an elaborate structure that is watertight and constructed of wood, mud, and moss, with multiple entrances both above and below the water's surface. Beaver lodges can often be found by looking for a large pile of branches and sticks in the middle of a wetland. Beavers use their lodges for shelter, food storage, and rearing their young. Beavers in the San Joaquin Valley, however, tend not to build lodges. Instead, they live in burrows dug into the banks of rivers and wetlands.

Valley beavers do, however, build equally-elaborate dams with sticks, mud, and vegetation, creating deep wetland habitats. At the San Luis NWR Complex, beavers commonly pack wetland water control structures with mud and sticks.

Beavers are one of just a few species (humans are another) that significantly alters their environment, making them a sort of wildlife ecosystem engineer. In so doing, they directly impact resource availability for other wildlife species that share their landscape. Beavers are, therefore, considered a keystone species because of the important role they fill in their ecosystem.

Beavers are primarily nocturnal, so they are not often seen by refuge visitors. However, they can sometimes be seen swimming across wetlands, rivers, and sloughs. One may also be alerted to a beaver's presence when they slap their flat tail on the surface of the water to warn of an intruder. Look for beavers in the refuges' riparian and wetland habitats where the trees and other woody plants they need for food, and for building their dams, are abundant.

American Beaver
© Rick Lewis



Muskrat

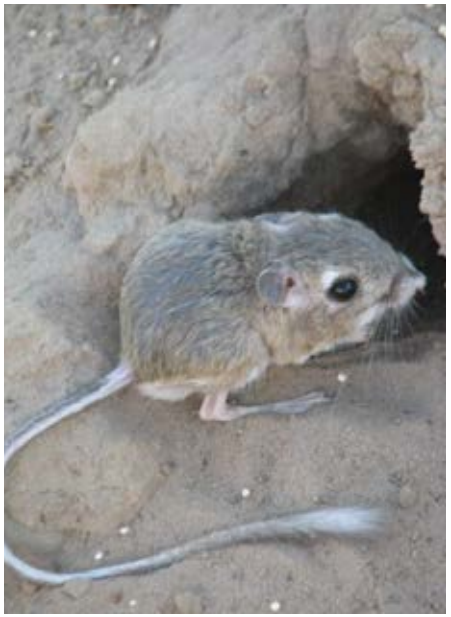
Muskrats are large semi-aquatic rodents weighing 1.5 to 4 pounds, and are about 16 to 25 inches long, not including their tail which adds another 7 to 12 inches. The muskrat's tail, like a beaver's tail, is scaly. Muskrats have webbed feet. Their fur is thick, waterproof, and typically dark brown, though their color can vary from a silvery-white to black. Muskrat's get their name from the musky odor emanating from their musk glands, and because they look somewhat like a rat. The secretions from their musk glands are used to mark their territory and as a warning against intruders. The musk markings are also used to communicate with members of their family group.

Muskrats are similar in shape to beavers and nutria, but smaller than either one. They are easily distinguished from a beaver by their tails. Beaver tails are flattened from top-to-bottom. Muskrat tails are flattened from side-to-side. A nutria's tail is round like that of a rat. Muskrats are excellent swimmers, capable of swimming forwards and backwards. They can also evade a predator by diving underwater and remaining there for as long as 15 minutes.

Muskrats are primarily herbivorous eating aquatic plants like cattails, year-round. They are opportunistic feeders, however, and are known to also eat fish, crustaceans, snails, mussels, and other small animals. Muskrats are active year-round, and are known to be active throughout the day or night. However, they are considered to be primarily crepuscular – mostly active at dawn and dusk.

On the San Luis NWR Complex, muskrats are typically found near wetlands and sloughs – they prefer water depths of about 6 inches. Muskrats do not tolerate heat and dryness well, so they are usually not far from water. Muskrats' homes are either burrows dug into banks of nearby waterways, like canals, or conical-shaped shelters built from dominant plants in the area. They may build and maintain multiple homes in which they sleep or feed.

Muskrats
Tom Koerner/USFWS



Kangaroo Rat
USFWS

Heerman's Kangaroo Rat

The Heerman's kangaroo rat is a small rodent weighing only a few ounces. They have large kangaroo-like back legs which are used in locomotion – hopping like a kangaroo – and very small front legs that are used to gather food and feed themselves. They are tawny-brown to buff-colored on the back, white underneath, with a white stripe along their upper thigh. They have a long tail with a "brush" on the end. Their tail is often used to stabilize themselves as they hop along on their hind legs. Heerman's kangaroo rat is solitary, rarely interacting with other adults except during breeding season. Even then, interactions between genders can become aggressive. They are nocturnal, spending as much as 23 hours below ground in their burrows, which they may dig themselves, or they may use burrows made by other animals such as California ground squirrels. During their short time above ground, they forage and feed, eating a variety of plants. Grasses are eaten on-site, while seeds are stuffed into cheek pouches and carried back to the burrow to be stored and eaten later. They're known to also eat insects like moths, beetles, and grasshoppers. Feeding is frequently followed by dust bathing, believed to help maintain the health of their fur and skin. Dust bathing is also thought to deposit scent, marking an individual's territory. Kangaroo rats are not known to vocalize, though they do perform "footdrumming" or beating their hind feet against the ground. Footdrumming is believed to warn predators, like snakes, that they've been detected and the rat is aware of the threat. On the wildlife refuges, Heerman's kangaroo rats reside in the open upland areas with scarce vegetation. It is difficult to see them, however, because they are nocturnal and not above ground while most visitors are present. While walking nature trails or the visitor center grounds, many of the holes one sees are the openings to kangaroo rat burrows.

Striped Skunk
© Paul Prado

Striped Skunk

The striped skunk is easily recognizable with its jet black fur and bold white stripe that starts on top of its head, splits in two down each side of its back, and re-converges down its bushy tail. Striped skunks are about the size of a large housecat. They have stocky bodies with short stubby legs and cannot run very fast, so they have adapted a unique way to defend themselves. First, they will arch their back and stick their tail straight up to look bigger. They may even stomp their feet. If that doesn't work, they'll turn their back on the approaching danger and spray the intruder with an overpowering pungent yellowish musk that can reach as far as 12 feet away. Most people are familiar with the unmistakable scent of skunk spray. The spray can be an intense irritant, so it is an effective deterrent for a would-be predator.

Skunks primarily eat insects, but they are opportunistic foragers that will eat almost any plant or animal material they can find. Their diets change with the season and the availability of different foods. On the San Luis NWR Complex, skunks are found in open areas with a mix of habitats like grasslands and riparian woodlands. They are rarely seen by visitors because they are mostly nocturnal, but can also be crepuscular (active at twilight). Skunks will actively forage all night until daybreak when they retreat to their dens for the day. Dens can be underground burrows abandoned by other animals, or skunks may dig their own burrows. Skunks will also create dens in hollowed-out trees or logs, underneath rock or brush piles, or underneath buildings. In cold-winter climates skunks do not hibernate, but they may be less active during the winter, living off stored fat reserves. At the San Luis NWR Complex, skunks remain active all winter. Skunks are also solitary animals, so it's rare to see more than one at a time.

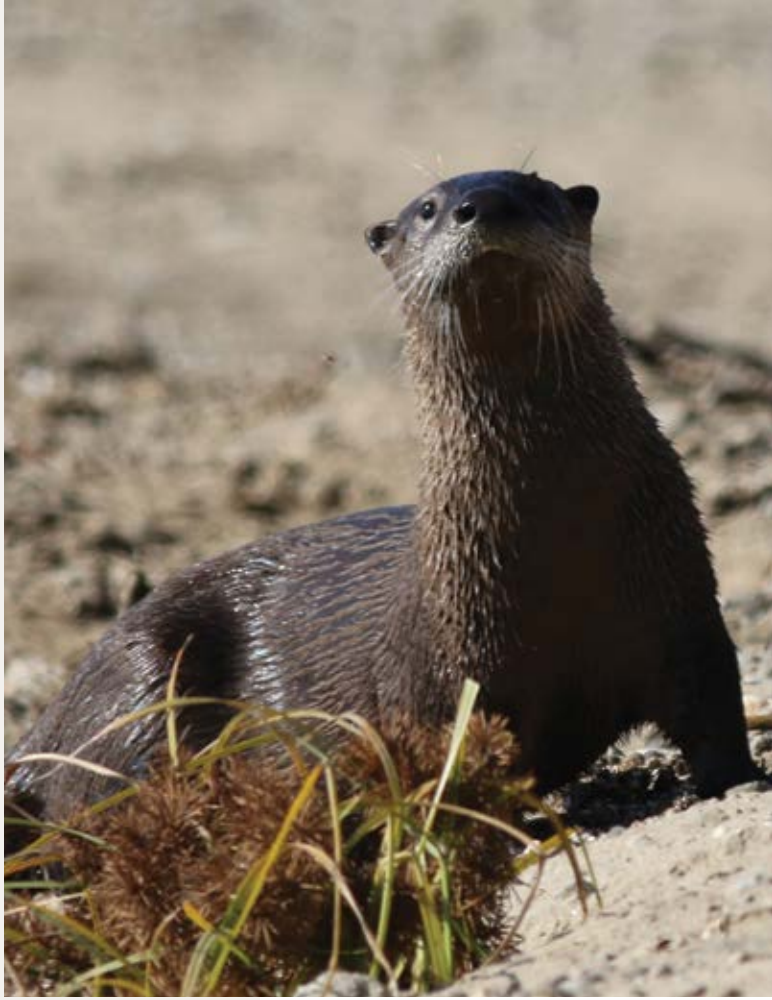
Mustelids

River Otter

River otters are members of the weasel family (Mustelidae), and are distinctive because of their size, fully-webbed feet, long tapered tail, and short glossy fur. River otters weigh between 11 and 30 pounds and they are 3 to 5 feet long. Their tail is usually about 1/3 their total body length. Their fur is fine, dense, and velvety in various shades of brown, darker on the top and lighter underneath. River otters are built for life in the water. Their ears are short with valve-like structures enabling them to close when the otter is submerged. Their neck is the same diameter as their head and body, giving them a serpentine shape and making them more streamlined. Their legs are short and powerful to propel them through the water and give them great maneuverability when pursuing prey. River otters are agile swimmers using both their limbs and tails. They employ a variety of paddling techniques – forelimbs only, hindlimbs only, all four limbs together, or alternate limbs. A river otter's tail is thick at the base tapering to a point, and is muscular and flexible, propelling the animal for bursts of high-speed swimming. A river otter's tail also helps it steer when swimming at slower speeds and helps the animal balance when standing on its hind legs. River otters can walk, run, and bound when on land, but locomotion on land is clumsy compared to their agility in the water.

River otters are carnivores, eating mostly aquatic prey found in the sloughs, rivers, and wetlands of the San Luis NWR Complex. Their prey includes amphibians, fish, crustaceans, and other invertebrates. River otters have long whiskers they use to detect their prey along muddy bottoms or in dark water. Their heads are flattened with their eyes situated towards the front – typical of predators.

River Otter
© Rick Kimble



On the San Luis NWR Complex, one may see individual river otters or several together in family groups. River otters are active year-round, but are seen more frequently in the spring through summer and early fall. They tend to be most active during dawn and dusk. Look for them along the margins of wetlands, in rivers and sloughs, and even in the water-delivery canals. During summer, when the young otters have left their dens, listen for their bird-like "chirps" as they call for their parents.

American Mink

American mink are semi-aquatic members of the weasel family. They have long slender bodies, long bushy tails, short legs, and a flat pointy face. They range from 18 to 28 inches long and weigh from 1 ¼ to 3 pounds. Their brown fur is soft, thick, and waterproof. They have a white patch under their chin and throat. Wild mink often have various-sized patches of white fur on other parts of their body. This is believed to have resulted from the mating of wild mink with farmed mink that were released to the wild. Mink are similar in color to river otters, but the mink is significantly smaller than an otter and have only partially-webbed toes.

American Mink
Michelle Kane/USFWS

Mink are carnivorous and their diet varies with the season. In summer, they feed on a variety of aquatic animals like crayfish, frogs, waterfowl, and fish, as well as birds and other small animals. During the winter, mink prey largely on small mammals. Mink rush at their prey as opposed to stalking and ambushing it. If they acquire particularly large prey, or if prey is abundant, they may cache (or store) excess food.

Mink are crepuscular, most active during dusk and dawn. They are skilled climbers and swimmers. They can climb trees and are capable of diving up to 15 feet deep and swimming as far as 115 feet at a time in pursuit of prey. They can swim for as long as 3 hours in relatively warm water, but cannot remain in cold water as long. Mink have excellent vision, sense of smell, and hearing. They have a bounding gait on land and can run as fast as 8 mph. Mink live in burrows typically found along the banks of rivers, sloughs, or deeper wetlands. They may dig their own burrows, or use burrows abandoned by other animals like muskrats, skunks, or badgers.

Mink are solitary animals with large individual ranges that rarely intersect with another mink of the same sex. However, a male's home range often overlaps the home ranges of several females. On the San Luis NWR Complex, look for mink in riparian and wetland habitats. They are usually never far from water or from areas of dense vegetation that provide adequate cover.

Long-Tailed Weasel

Long-tailed weasels, as the name denotes, are members of the weasel family. Their bodies are 11 to 16 inches long and they weigh 3 ounces to 1 pound. Their long bushy tails are about half the length of their body with a black tip – looking as if their tail has been dipped in black paint. A weasel's head is short and narrow with long whiskers and small rounded ears. Long-tailed weasels have short cinnamon- or reddish-brown fur with white to yellowish-white underparts. In colder climates, weasels shed their summer coat and grow a winter coat that is usually lighter in color. Weasels of the San Luis NWR Complex keep their brown fur all year.

The long-tailed weasel is smaller than the American mink and, unlike the mink's solid brown fur, the weasel can be recognized by darker fur on top, and lighter fur underneath. Long-tailed weasels of the southwest also have yellow to white facial markings between their eyes and on the sides of their head, with a dark-colored mask on their face.

Long-tailed weasels are carnivorous and are fierce predators. They primarily eat small mammals like mice, rats, voles, squirrels, and rabbits, but are also known to eat birds, bird eggs, snakes, frogs, and insects. Their long bodies and flexible backs permit them to enter other animals' tunnels to hunt for food. Long-tailed weasels do not hesitate to attack prey larger than themselves. They will also attack larger animals that threaten them.

Long-tailed weasels are mainly solitary except during breeding season. While the home ranges of males may overlap with the home ranges of females, the ranges of individuals of the same sex never overlap. Long-tailed weasels are also very aggressive towards intruders in their home territory. They are quick, agile, and alert. Weasels will utter a loud chirping sound when scared or ready to attack. When feeling friendly, they make a low trilling sound described as similar to a whistle. Long-tailed weasels run with their backs arched and tail held straight out, bouncing up and down. They are good swimmers and can quickly climb trees. Weasels have excellent hearing and sense of smell, but their vision is poor. They typically smell or hear their prey before they see it.

Long-tailed weasels are active mostly from dusk until dawn. On the San Luis NWR Complex they are found in open upland areas with an abundance of small mammals for prey. They avoid habitats with dense vegetation like riparian woodlands. They use areas with water nearby – they are often seen drinking or splashing around in water. Long-tailed weasels make their homes in rock or brush piles, in hollow logs, or in burrows abandoned by other animals.

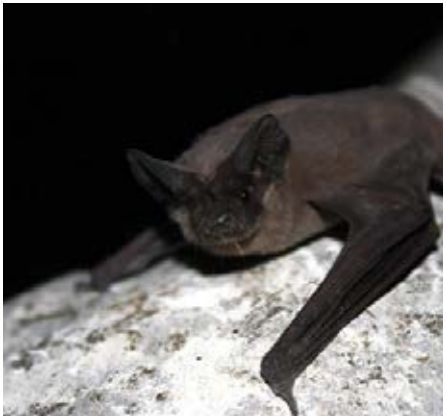
Long-Tailed Weasel
© Rick Kimble

Bats

California has the 4th highest bat species diversity in the United States, hosting 25 species of bats. It is believed that 18 of the 25 species make the San Luis NWR Complex their home during at least part of the year. Like many bird species, many bats are migratory – moving back and forth between their winter non-breeding grounds, and their summer breeding grounds. Formal bat surveys have only recently been conducted at the refuge complex, so until recently, little was known about the species present, their distribution throughout the complex, and the habitat types utilized by bats. To answer the basic question, "which bat species do we have," refuge biologists began a Passive Acoustic Bat Monitoring program. Like birds, bats produce a variety of calls and, also like birds, those calls are distinctive to species. Therefore, calls can be used to identify bat species. The bat monitoring program has other objectives as well; to determine which habitat types bats use throughout the refuge complex and the amount of bat activity occurring during different months and seasons of the year; to contribute data to the North American Bat Monitoring Program; and to collect baseline information on the refuge bat community regarding disease threats like the fungus that causes White-nose syndrome (detected in California in 2019).

The acoustic bat monitoring program has produced interesting and exciting information about refuge bat populations. The most commonly-identified species on the refuge is the Mexican free-tailed bat (a subspecies of the Brazilian free-tailed bat), followed by the silver-haired bat. Like all bat species in the San Joaquin Valley, these two are voracious consumers of insects. Mexican free-tailed bats are referred to by some as the "jets" of the bat world, being very fast fliers. In contrast the silver-haired bat is one of the slowest flying bats in the United States. Specialized in eating moths, they are abundant in habitats ranging from old-growth forests to grasslands and meadows.

Mexican Free-Tailed Bat
Ann Froschauer/USFWS



Biologists have also learned that bat activity throughout the refuge complex is highest from February through October, dropping sharply during the winter months of November, December, and January. So far, the Mexican free-tailed bat appears to be the only bat species that remains active during the winter, possibly indicating a resident non-migratory population of free-tailed bats that use the complex year-round. Other bat species may migrate away during the winter or remain on the refuge, but in winter hibernation. There is much more to be learned about the bats of the San Luis NWR Complex. To observe bats on the refuges, start looking for them just after sundown, continuing for an hour or two during twilight hours.

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