



DESERT TORTOISES AND PEOPLE THROUGH TIME

We witness change everyday as we watch bacteria and viruses become immune to antibiotics, or insects become immune to even the most lethal sprays. These changes, or adaptations, are a species' way of ensuring survival. If we can see these changes in a short amount of time (a couple of months or years), imagine what changes have taken place over millions, even billions of years! We know through fossil evidence that life has changed a great deal. The fossil record lays out a partial history of life on Earth, beginning with simple plant-like life and eventually complex animals such as the dinosaurs, followed by the incredible creatures during the Pleistocene, and the life that is around us today.



The first turtles and tortoises appeared on earth about 200 million years ago. Ancestral relatives of the desert tortoise date back to 50 million years ago. Records of gopher tortoises, belonging to the genus *Gopherus*, have been found that are 15 million years old. *Gopherus agassizii*, the modern desert tortoise itself, has been found preserved in fossils that are 35,000 years old.

A major driving force in the evolution of plant and animal life is climate change. By examining samples of glaciers and other climatic data, we are able to construct a simple model of what Earth's environment has been like throughout time. We have found proof of massive glaciers that covered entire continents, in periods known as ice ages. We also have evidence of very

warm periods of time by measuring the recession of glaciers. Patterns of changes can be observed in fossil records, geologic strata, the geochemical composition of rocks and landforms, and changes in vegetation distribution and plant communities. The inability to change enough to survive these climate shifts is considered to be a possible cause of extinction of many animals.

The desert tortoise, however, has adapted to many of these changes. One way they were able to survive, without much physical change, was to change geographic location. The desert tortoise range has varied greatly in response to the changing climate. Currently, desert tortoises live in the southwestern United States and northeastern and north central Mexico. However, during the Pliocene (roughly 5.5 million years before present), the desert tortoise occupied a much larger area. Fossilized remains of some types of desert tortoises have been found from Kansas to Mexico and from Arizona to Florida. Their range has shrunk 30-50 percent since the Pliocene era. There were two major contributors to the decline of desert tortoise habitat. One major change was a geologic uplift. This simply means that the Earth moved; a portion of Earth was shoved upwards as the surrounding areas sank. This cut the desert tortoise off from normal food supplies and caused entire populations in Mexico to be extirpated. The most dramatic changes took place approximately 30,000 years before present as a result of climate shifts. As the climate became colder, the ice sheets in the north began to creep farther and farther south. Desert tortoises are not tolerant of cold temperatures and so as the ice moved south, so did the tortoises. Even though we are no longer in an ice age, the climate is still cooler than it was during the Pliocene and, as a result, the desert tortoise continues to live in the south.



As the Earth and the climate change, the plants and animals change so must the people. People and tortoises have lived together for thousands of years but their relationship has changed over time. American Indian groups in the Southwest used the desert tortoise in a variety of ways. The carapace, or top shell, was used as a bowl, ladle, container, shovel, or as a pottery making tool. Some groups even used the whole shell as a rattle, by lacing the carapace and plastron (the upper and lower shell) together with seeds or pebbles inside, filling the openings with asphaltum, and tying the whole thing to a handle. Other groups used the tortoise shells as drums or as decoration on ceremonial clothing. Smaller bones were used as gaming pieces, jewelry, and as ornamental pieces. Most groups ate the meat of the tortoise, but a few did not.



The Southern Paiute fed young tortoises to eagles they were raising for ceremonial purposes.

The desert tortoise was important to the Indians for spiritual reasons. The turtle or tortoise was a symbol of patience, stamina for survival, and courage in hopeless situations for the Chemehuevi. Other common themes were long or eternal life, and revered old age. The shell has an integral part in creation myths.

Today, the desert tortoise is protected by the federal and state governments. There are strict regulations governing the collection of and harm to the desert tortoise. For this reason, and others, we no longer use the tortoise or its parts for tools or other survival needs, but the turtle and tortoise continue to be an important figure in our stories.



DESERT TORTOISE LIFE HISTORY

Taxonomy is the classification of living organisms based on shared characteristics. Groups of organisms are recognized because they share common characteristics. Organisms are grouped based on similar appearance, genetic makeup, and geographic occurrence, from the largest classification categories -- kingdoms -- to the most specific categories --species and subspecies. The study of classification is complex, but some basic concepts are valuable to understand.

One category of the classification system is order. Turtles and tortoises belong to the group Testudines. Turtles are generally considered to be more associated with fresh water, while tortoises are associated more with land. Further distinctions between turtles and tortoises can be made by examining their morphological characteristics (the form and structure of the animals). Most turtles have feet shaped like flat flippers, with webbing between them on their hind feet to help them get around in their watery environment. Tortoises usually have round, sturdy “elephantine” legs that work well for walking on land. Further trait distinctions are shell patterns, extent of the shell’s domed shape, and the degree to which a turtle or tortoise can pull its head and feet into its shell for protection.

Turtles and tortoises are reptiles. Other reptiles include lizards, alligators, crocodiles, and snakes. Reptile is the class name of animals that have scaly skin, lay eggs, and are ectothermic, which means their body temperature varies with the environment. Mammals, including humans, generate their own heat to maintain body temperature, which is typically above the surrounding temperature. Turtles and tortoises are different from other ectothermic animals (such as fish) in that they produce amniotic eggs and do not have gills. Animals that are ectothermic do not generate enough body heat to maintain a constant temperature, and so rely on an external energy source, the sun, for the heat energy they need to function efficiently. As a result, reptiles can be seen basking in the sun or in warm water, gathering the heat they need to be active.

Tortoises, like most reptiles, lay eggs. Often using only their hind legs, female turtles and tortoises lay their eggs in a hole they dig in soil or sand. Most eggs end up in the burrow, but occasionally a few will be laid outside of the shelter. Mothers



leave their eggs after they are laid, and rarely return. When baby turtles hatch, using an egg tooth to break their shell, they are ready to face the world, finding their own food and shelter. Many of the hatchlings do not survive for very long due to disease, starvation, or predation. These factors contribute to the decline of the desert tortoise populations.

All turtles and tortoises have shells. Desert tortoises have characteristic shells that are heavy and dome-shaped. Some species of turtles and tortoises have shells that are relatively flat, while others have a high dome. Some turtles can even pull their head and legs completely into their shell and close it up tight for protection. Although turtle shells differ, they all have three parts: the plastron on the under side, the carapace covering the back, and the scutes (pronounced skoots), which are usually arranged in a consistent pattern on the back. In temperate regions, scutes develop one or more growth rings every year. With age the scutes wear down, making counting rings an unreliable method of telling the age of the animal.

Turtles and tortoises do not have teeth. They have a horny beak that they use to tear and rip their food. The beaks are adapted to eat different types of food. For example, the desert tortoise eats vegetation so its beak is serrated along the edges. Turtles or tortoises that eat meat have a sharp, curved beak.

Tortoises avoid predators by staying inside their burrows much of the time. Tortoises are slow movers and cannot run away from predators. Often, people think of the shell as the turtle or tortoise's only defense, but the legs are very important to the desert tortoise as well. Tortoises have thick scales on their front legs. They use their legs to shield their head when in danger. Once their head and legs are pulled into their shell, only tough scales and a hard shell are left for a hungry hunter to nose. Nevertheless, foxes, coyotes, badgers, and bobcats occasionally enjoy a tortoise meal. Ravens and eagles prey on hatching tortoises, taking them when their shells are still pliable. Desert tortoises have had to adapt to survive these harsh conditions for thousands of years.

Desert tortoises have lifestyles and body parts adapted to life in the desert. They hibernate to avoid cold winter conditions, and they estivate (similar to hibernation, but done just during the hottest part of the year) during the summer, to avoid hot summer conditions. A tortoise's bladder is capable of storing over a cup of water, to be used by the body when water is scarce in the desert. Tortoises will drink from rain puddles, even constructing their own puddles by scraping shallow depressions in the soil to catch rainwater. Tortoises have claws for digging, and they dig long burrows that protect them from the desert heat. They survive mostly on grasses and annuals that grow low to the ground. These plants are most abundant in the spring, and perhaps in the fall after summer rains, and tortoises are able to store enough fat and water in these times to get them through the year.



Tortoises are somewhat territorial, although there is no typical size of territory. They have a tremendous sense of direction, as their home ranges can range from 25 to 200 acres. Territories may overlap, and since tortoises largely are solitary animals, they encounter each other mostly by chance as they wander through shared areas.

There are over 270 species of turtles in the world and 55 in the United States and Canada. Only four species of land tortoises live in North America, ranging mostly in the south, and the southwest and western deserts. These tortoises are very similar in appearance, and so identification is somewhat difficult for the layman. The Mojave

population of the desert tortoise, *Gopherus agassizii*, ranges from southwestern Utah, through the southern portions of Nevada, Arizona and California, and into Mexico.

Taxonomy is a relatively new science, so our understanding of how living things are related is still incomplete. The more we study the more we learn about relationships among organisms, and the more we can build on the taxonomic system. In the meantime, a basic understanding of taxonomic groups is relatively easy to achieve. Relationships of living things can be graphically represented in many ways. Students can begin by sorting and diagramming objects they are familiar with, and then apply their skills to groups of living organisms.



ECOSYSTEM INTERACTION

Never ending sand dunes... Scorching temperatures... Vultures circling over the remains of an unlucky traveler... These are images the word “desert” brings to mind for many people. December and January trigger phone calls to desert parks from potential visitors hoping to escape the chill of winter. They are amazed to hear of nighttime temperatures below freezing. Snow in the desert is an impossibility to them. Isn't the desert always hot and dry?

What is a desert anyway?

Check five sources and you will probably find five slightly different definitions. Some sources define a desert as an area receiving no more than 10 inches of precipitation annually. However, many areas receiving this amount of precipitation are not deserts. This simple definition is not complete.

Both the timing and type of precipitation determine the environment established. In a desert, rain isn't evenly distributed throughout the year. Weather patterns often create short, violent, downpours. Flash floods are often produced. Much of the water runs off before it can soak into the sand.

A lot of moisture is also lost to evaporation. Many deserts lie in areas of high pressure systems where there is little cloud cover. At least 90 percent of the sun's rays reach Earth's deserts, producing seasonal hot temperatures. (For comparison, the surface of more humid lands, covered with more vegetation, receives only 40 percent of possible solar radiation.) The hot, dry air causes any available water to evaporate quickly. When temperatures are extremely hot, rain can evaporate before it reaches Earth. This weather phenomenon is called virga. It is observable when there is a streak in the sky suggesting rain but none reaches the ground.



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The conditions producing high daytime temperatures reverse the process after sundown. Approximately 90 percent of the day's accumulated heat radiates back towards the sky. In moister climates only about 50 percent of this heat is lost. These conditions produce the wide range of daily temperatures characteristic of deserts. This range is often fifty degrees or more. The rapid heating and cooling of air creates another characteristic of most deserts - strong winds. These winds, circulating air which is often hot and dry, increase the already high rate of evaporation. Evaporation in American deserts ranges from 70 to 160 inches per year.

A desert then is not so easily defined. All these characteristics - seasonal, high temperatures; low, sporadic rainfall; a high rate of evaporation; wide temperature ranges and strong winds are part of the definition.

Where are deserts?

Draw a line around the world, starting mid-center between Joshua Tree and Death Valley, and you will touch or come close to many of the world's great deserts: Mojave, Great Basin, Sahara, Arabian, Iranian, Gobi. Most deserts occur between the latitudes of 15 to 40 degrees on either side of the equator. They are found around the world on every continent, covering approximately 20 percent of Earth's land area.

Sand dunes cover only about 10 percent of this area. Some deserts are very mountainous. Most are hot, with warm daytime temperatures much of the year, but others are cold, getting over half their moisture as snow.



Why are deserts where they are?

Deserts can be divided into four types - subtropical, coastal, interior, rain shadow - depending on the conditions creating them.

Subtropical deserts lie along the Tropic of Cancer (23 degrees N latitude) and the Tropic of Capricorn (23 degrees S latitude). Near the equator hot, moist air rises; it cools, dropping heavy rains on tropical areas. The resulting cooler, drier air then descends, creating zones of high atmospheric pressure as it moves away from the equator. The descending air hinders cloud formation and precipitation. It also warms up, absorbing any available moisture. The Sahara, the world's largest hot desert, located in northern Africa, is a subtropical desert about the size of the United States.

Coastal deserts are also in areas of high pressure. Damp, chilly fog forms when air, chilled by water contact as it blows toward shore, meets warm air over land. Although humidity is high, atmospheric disturbances that can cause rainfall are not present. Two coastal deserts, the Atacama of Chile and the Namib in southern Africa, are among the driest places in the world.

Interior deserts, like the Gobi in Asia, exist because they are too far from moisture-laden ocean winds. By the time these winds reach the center of a large landmass, the air is very dry.

Rain shadow deserts are created when mountain ranges parallel moist, coastal areas. Prevailing winds moving inland cool as air is forced to rise over the mountains. Trapped moisture falls on slopes facing the winds. When the winds move over the crest and down the far side, they are very dry. Descending air also makes it hard for additional clouds and precipitation to form. Without another source of moisture, rain shadow deserts are formed on the far side of these mountain ranges. Of North America's deserts, the Great Basin, Mojave, Sonoran, and Colorado (a subsection of the Sonoran in California) are rain shadow deserts. The Chihuahuan is considered a subtropical desert.

Additional background information on deserts can be found in resource books found in the Study Kit. Naturescope: Discovering Deserts has information and activities on pages 3-14.



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Desert Tortoise Habitat

Desert tortoises inhabit subtropical, semiarid, and arid lands. They live in desert areas subject to long droughts, sporadic rain, poor drainage where desert pavement occurs, flash floods, violent sandstorms, large temperature fluctuations, freezing winters, hot summers, and sparse vegetation. Average precipitation in desert tortoise habitat is 4.9 inches per year and, in many areas, evaporation is greater than precipitation. Desert tortoises are specifically adapted for desert environments. Like other desert dwellers, tortoises possess morphological, physiological, and behavioral characteristics that enable them to survive in a harsh desert climate, such as elephantine limbs and claws for digging burrows to escape the heat, unique water storage mechanisms, and excavating shallow basins to capture and drink water when the rains finally come.

Their distribution within these areas is also related to soil textures and surface types. Soil texture and composition are very important to tortoises because they spend so much time underground to escape the extreme temperatures of both summer and winter. The soil must be easily crumbled and free enough of rocks for burrow construction, yet firm enough so that burrows don't collapse. In the Mojave Desert, tortoises are generally most common on gently sloping terrain with sandy-gravel soils, although tortoises have been found in very rocky steep terrain where they will take shelter in rock caves.

Food availability also affects distribution and abundance. Tortoises live in areas where annual wildflowers, annual and perennial grasses, and cactus are available when their above-ground activity is high.

Desert Tortoise Communities

In the United States, the Mojave population of desert tortoises is found in southeastern California, southern Nevada, extreme southwestern Utah, and western Arizona. They most commonly occur between 2,000 and 4,000 feet elevation. Desert tortoises found in the Mojave/Colorado deserts live in close association with the many desert plants and animals in creosote bush scrub, blackbrush scrub, and Joshua tree woodland communities. A community is an association of plants and animals bound together by food chains and other relationships. An ecosystem also includes all the nonliving parts interacting to produce a stable system, such as soil, air, and water.

Desert tortoises feed on many desert plants, which also provide temporary shelter from heat and good protection for burrow sites. Rodents, such as the antelope ground squirrel and kangaroo rat, help loosen the soil for tortoises and provide softer areas for digging. Some birds help keep down insect populations so that plants may thrive, providing food for tortoises and other herbivores.



Tortoise burrows provide shelter for many other animals (commensals). One of the most common is the woodrat. The woodrat scatters pieces of cactus, sticks, leaves, and other debris as it builds a permanent home along the burrow passageways. This litter, in turn, provides homes for antlions and beetles. Spiders use the tunnels as anchor points for their webs. Lizards and snakes, such as the banded gecko and sidewinder, use the burrows for hibernation. It is also likely that some birds utilize the burrows to escape predators. Jackrabbits and cottontails use burrows for shelter from heat or predators.

Predation on desert tortoises

Coyotes, bobcats, ravens, and badgers are a few of the known predators of tortoises. Younger tortoises, with shells not fully hardened, are especially vulnerable. Although the ability to withdraw legs, head, and tail into its shell offers formidable protection,

larger tortoises may be killed if predators can break out even a small piece of shell. Then additional pieces can be broken out until the predator can reach the soft body inside.

Scientists have had particular interest in predation of juvenile tortoises by ravens. The raven population is increasing, due in part to the enticement of open landfills being built and expanded to accommodate a growing human population, as well as new nesting areas and artificial water sources provided by newly developed human structures. Researchers are collecting data that will be analyzed to learn more about this probable threat to tortoise populations.

Activity patterns

Terrestrial ectothermic animals, such as the desert tortoise, are challenged in maintaining suitable body temperatures. This is especially true in the desert where there is great temperature variability, both daily and seasonally.

Each organism has an optimum range of temperatures, its normal range of temperatures within which it can best carry on its life processes. Inactivity in animals resulting from lowering temperatures below the optimum is called hibernation. Inactivity resulting from temperatures rising above the optimum is called estivation.

For many animals their normal activity range is as great as the normal range of temperatures in their habitat either during the whole year or during their active season. But in the desert, temperatures within the normal activity range for tortoises do not occur continuously and are broken into short periods by both daily and seasonal variations.

Tortoise body temperature is closely related to that of the ground upon which its body rests. In deserts so much of the soil surface is exposed that the surface temperatures often are far above the lethal limits for tortoises. A tortoise has two ways to deal with this extreme heat - move into shade or go underground.

Tortoise burrows

Temperature regulation is the main motive for tortoises that use a burrow. Tortoises hibernate in winter burrows for months without much activity. During the rest of the year there is a daily behavior pattern. Then tortoises are active for at least part of almost every day, except during the hottest temperatures when they might estivate in summer burrows, or even in their old winter burrows. During peak activity and while temperatures are suitable in the spring and fall, tortoises

have been known to dig very small pallet burrows, often to provide shelter from heat and predators.

This movement from summer holes to winter burrows is a short two-way annual migration. All movement, whether daily or seasonal, primarily occurs to seek comfortable temperatures and conserve moisture. Tortoises instinctively find the most optimal conditions available.

During hot summer months a tortoise might only be active above ground in the early mornings and late afternoons or evenings. The rest of the time shelter is found in shade or summer holes. In shady areas soil temperatures are approximately the same as air temperatures. The move underground happens when shade no longer offers temperatures within the normal range of activities.

Most burrow openings are half-moon shaped to accommodate the dome of the tortoise's shell. This distinctive shape makes them generally easy to differentiate from other animals' burrows.

Summer holes are dug at an angle of 20 degrees to a depth of at least 3 feet and possibly up to 10 feet or more. These holes, much shallower and at least 4 times more numerous than winter burrows, are used for temporary shelters, although during the hottest periods a tortoise might estivate in one for a while. Summer holes sometimes last from year to year, but often they become at least partly filled and need to be re-excavated.



As temperatures begin to cool, a tortoise might be active mainly at midday. Eventually, as winter temperatures arrive, the tortoise seeks shelter in a winter burrow. These are usually horizontal tunnels dug into banks of washes, usually 8-15 feet long but sometimes as long as 20-30 feet.

Greater depth is needed for adequate protection from the winter cold. The longer the burrow, the more stable the temperature at its end. These burrows are usually deep and long enough that the soil temperature remains nearly constant year round. Here the tortoise hibernates, utilizing stored fat for nutrition, not emerging until temperatures start to warm in spring. Winter burrows are often permanent homes that may be reused year after year for winter hibernation.

Home range

Studies show that tortoises have small areas that they use for normal daily activities, or home ranges, usually covering 25 to 200 acres. Adults typically have larger ranges than young tortoises. One range may overlap those of other tortoises. Although feces and urine may be used as territorial markers, there is little evidence that ranges are defended. Tortoises tend to stay in areas with which they are familiar, knowing the location of food and shelter. For more background information and activities, see Naturescope: Discovering Deserts - desert animals: pages 15-25, desert plants: pages 26-33, desert communities: pages 34-40.



Desert Tortoise Communities

The creosote bush scrub community occurs from sea level to 4,000 feet elevation in the Colorado and Sonoran Deserts and from 1,000 up to 5,000 feet elevation in the Mojave Desert. In California creosote bush scrub covers more land than any other community - over 21 million acres. The Joshua tree woodland community occurs from 2,200 up to 6,000 feet elevation in the Mojave Desert.

Common plants of tortoise communities:

- barrel cactus (*Ferocactus acanthodes*)
- beavertail cactus * (*Opuntia basilaris*)
- blackbush (*Coleogyne ramosissima*)
- bladderpod (*Isomeris arborea*)
- brittlebush (*Enceliafarinosa*)
- burro weed (*Ambrosia dumosa*)
- catclaw acacia (*Acacia greggii*)
- cheesebush (*Hymenoclea salsola*)
- creosote bush (*Larrea tridentata*)
- desert buckwheat* (*Eriogonum fasciculatum* spp.)
- desert chicory (? *afinesquia californica*)
- desert dandelion * (*Malacothrix glabrata*)
- desert pincushion* (*Chaenactis fremontii*)
- desert primrose* (*Camissonia boothii*)
- desert trumpet* (*Eriogonum inflatum*)
- desert-willow (*Chilopsis linearis*)
- fairyduster* (*Calliandra eriophylla*)
- filaree* (*Erodium cicutarium*)
- forget-me-not * (*Cryptantha* spp.)
- fourwing saltbush (*Atriplex canescens*)
- gafleta grass* (*Pleuraphis rigida*)
- globemallow* (*Sphaeralcea ambigua*)
- golden poppy (*Eschscholzia glyptosperina*)
- indigo bush (*Psoralea schottii*)
- ironwood (*Olneya tesota*)



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- Joshua tree (*Yucca brevifolia*)
- lupine* (*Lupinus* spp.)
- mesquite (*Prosopis* spp.)
- Mojave yucca (*Yucca schidigera*)
- Mojave prickly pear* (*Opuntia phaeacantha*)
- Monnon tea* (*Ephedra* spp.)
- muhly grass* (*Muhlenbergia porteri*)
- ocotillo (*Fouquieria splendens*)
- owl's clover (*Orthocarpus purpurascens*)
- pancake prickly pear* (*Opuntia chilotica*)
- paper-bag bush (*Salazaria mexicana*)
- scorpion weed (*Phacelia distans*)
- senna (*Cassia armata*)
- silver cholla (*Opuntia echinocarpa*)
- teddy-bear cholla (*Opuntia bigelovii*)

*tortoise food

Common animals of tortoise communities:

Birds

black-throated sparrow (*Amphispiza bilineata*) burrowing owl (*Athene cuniculada*) cactus wren (*Cainpilorhynchus brunneicapillus*) common raven (*Corvus corox*) Costa's hummingbird (*Calypte costae*) Gambel's quail (*Callipepla gambelii*) great homed owl (*Bubo virginianus*) greater roadrunner (*Geococcyx caitfomianus*) ladder-backed woodpecker (*Picoides scalaris*) Le Conte's thrasher (*Toxostoma lecontel*) loggerhead shrike (*Lanius ludovicianus*) mourning dove (*Zenaida macroura*) northern mockingbird (*Mimus polyglottos*)



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Reptiles

California kingsnake (*Lampropeltis getulus californiae*) chuckwalla (*Sauromalus obesus* spp.) collared lizard (*Crotaphytus* spp.) desert banded gecko (*Coleonyx variegatus variegatus*) desert iguana (*Ipsosaurus dorsalis*) desert night lizard (*Xantusia vigilis* spp.) desert rosy boa (*Lichanura trivirgata gracia*) desert tortoise (*Gopherus agassizii*) Mojave rattlesnake (*Crotalus scutulatus scutulatus*) red coachwhip (*Masticophis flagellum piceus*) side blotched lizard (*Uta stansburiana*) sidewinder (*Crotalus cerastes* spp.) southern desert homed lizard

(*Phrynosoma platyrhinos calidiarum*) western diamondback rattlesnake (*Crotalus alrox*) western whiptail (*Cnemidophorus tigris* spp.) zebra-tailed lizard (*Callisaurus draconoides*)

Mammals

antelope ground squirrel (*Ammospermophilus leucurus*) badger (*Taxidea taxus*) bighorn sheep (*Ovis canadensis*) black-tailed jackrabbit (*Lepus californicus*) bobcat (*Lynx rufus*) California leaf-nosed bat (*Macrotus californicus*) coyote (*Canis latrans*) desert cottontail (*Sylvilagus audubonii*) deer mouse (*Peromyscus maniculatus*) desert woodrat (*Neotoma lepida*) kit fox (*Vulpes macrotis*) Merriam's kangaroo rat (*Dipodomys merriam*) mountain lion (*Felis concolor*) southern grasshopper mouse (*Onychomys torridus*)



Insects, spiders, scorpions

antlion (*Brachynemurus* spp.) cochineal bug (*Dactylopius coccus*) creosote bush grasshopper (*Boottettix punctiatus*) darkling beetle (*Eleodes arinata*) giant desert hairy scorpion (*Hesperocheilus arizonensis*) ground mantid (*Litaneutria minor*) painted lady (*Vanessa cardui*) red velvet ant (*Dasymutilla coccineohirta*) rough harvester ant (*Pogonomyrmex californicus*) tarantula (*Aphonopelma chalcodes*) tarantula hawk (*Pepsis* spp.) walking stick (*Pseudosermyle straminea*) white-lined sphinx moth (*Hyles lineata*).



CONSERVATION AND TAKING ACTION

Through our studies in this unit, we have learned about ecosystems and how everything interacts. We have focused on the living aspects of an ecosystem and their interdependence. More specifically, we have examined the desert tortoise and the adaptations that have helped it to live in the desert environment for thousands of years. So, now that we have all of this knowledge, what do we do with it? Well, we can use it to help us make educated decisions about the desert tortoise and the desert.

Threats to the Desert Tortoise

Some of the decisions humans have made over time have adversely affected desert tortoise populations. Some of the outcomes of those decisions have created serious threats to the survival of the species. Habitat loss, introduction of disease,



predation by non-native species such as ravens and feral dogs have all caused negative changes in desert tortoise populations.

For some time, the fragile desert habitat has been misunderstood and often considered to be a wasteland. Many ranchers graze cattle over the desert, supplementing desert forage with non-native hay or grain. This practice, among other human activities, introduced exotic plant species into the desert, interfering with the tortoises' natural diet. Invasive plants have also increased the frequency of wildfires, which results in degraded habitats and a lack of forage. There is also evidence that livestock trample desert tortoises and collapse their burrows, which can result in mortality, and compete for forage.

Further habitat loss occurs when urban and agriculture development encroaches upon tortoise habitat. Urban

development also causes fragmentation and isolation of desert tortoise populations. Off-road vehicle use and cars speeding over the highways that cross the desert are often unable to stop fast enough to avoid hitting a desert tortoise.

Diseases such as upper respiratory tract disease, herpes virus, and shell disease are considered threats to desert tortoises. Many people mistakenly return captive desert tortoises that are infected with disease to the wild, potentially causing infection of healthy wild tortoises. Returning captive tortoises to the wild may seem like a good idea, but more often than not, this practice is detrimental to resident populations.

Species Recovery

In light of all the challenges the desert tortoise faces, a large effort is underway to recover the species. Under the protection of the federal and state governments, and through the implementation of new and existing programs, the desert tortoise has a chance for recovery.

While precise correlations between the multitude of threats and desert tortoise populations have not been clearly shown, a great deal of effort has been put forth by research scientists and land managers to actively conserve and recover the species. For instance, substantive information regarding disease, non-native invasive plant species, and fire has been assembled over the years that will be used to inform decisions relative to recovery of the desert tortoise and its habitats. On-the-ground conservation actions such as land acquisitions, installing protective fencing, retiring grazing allotments, limiting off-highway vehicle access, and implementing restoration projects have been important recovery and management efforts based on

what we do know about threats to the desert tortoise at this time. Other research and monitoring of predators, such as the common raven, are also being conducted to determine the impact of predation on desert tortoises.

Education of the public is a great benefit to the road to recovery for the desert tortoise. Based on what we know about desert tortoises, we can now make informed decisions about the future of this animal while encouraging the general public to participate in its conservation and recovery through education and outreach programs.

What You Can Do

Everyday we make decisions. We have to decide what we want to wear in the morning, what we want to eat in the afternoon, and when we want to go to bed at night. These decisions can be made with little or no fear of the consequences. However, when we are making decisions about the environment we have to think about all of the effects our decisions will have on the area in question and all its supports. Once we have enough information to make an educated decision, we have to act, even if that means we decide not to do something. For example, deciding not to participate in off-road activities in undesignated areas is just as important as deciding to recycle.

One important decision facing human desert dwellers and visitors is whether or not to take a desert tortoise home when they come across them in the desert. Many people don't realize that all California native reptiles and amphibians are



legally protected. As a native reptile, the desert tortoise shares this legal protection, as it is protected by the California Department of Fish and Game as a threatened species. In fact, the desert tortoise is federally protected in California, Nevada, and portions of Utah and Arizona north and west of the Colorado River, where it is listed as threatened by the U.S. Fish and Wildlife Service. Both federal and state laws prohibit the "take" of any desert tortoise. "Take" is defined as killing, harassing, harming, hunting, shooting, wounding, trapping, capturing, collecting, or attempting to engage in any such conduct regarding a tortoise or its eggs. There are penalties for breaking these laws, which are important to understand if you happen to encounter a desert tortoise

while hiking in the desert. Please respect the desert tortoise as a living creature and a wild animal, and do not handle or disturb them when you happen upon them in the wild.

There are special circumstances that allow people to have desert tortoises as pets, but a legal adoption is required. If you or someone you know is interested in having a desert tortoise for a pet, contact your local Turtle and Tortoise Club. They can provide information about legal adoptions, available animals, and care of your pet tortoise. While it is legal to keep a tortoise in captivity with the proper permits, consider carefully the commitment that is required when keeping any live animal. Tortoises are long lived and require special care. As discussed above, captive tortoises should never be released into the wild. Tortoises that have lived in captivity often carry diseases and parasites that are not apparent with casual inspection. These diseases can infect wild tortoise populations with disastrous results and in some cases already have.

Once you have made the decision to help protect and recover the desert tortoise, the next step is to take action. There are many simple things you can do that will contribute to the success of the desert tortoise recovery program. For example, you can read about the desert tortoise, talk to people who have more information than you do, or visit sanctuaries and preserves. The easiest thing is to share your knowledge with others, be aware of your impact on the environment, and actively participate in conservation practices.



ADOPT A DESERT TORTOISE

THINGS TO KNOW

- There is no charge for adoption
- All captive tortoises and their offspring must be registered with the California Fish and Wildlife Dept., or through a wildlife veterinarian, or tortoise club.
- Tortoises for adoption are legally acquired former pets
- NEVER release a captive tortoise into the wild



WHAT CAPTIVE TORTOISES NEED

Housing

- Tortoises must live outside, in an escape proof yard at least 25x50 feet
- Shelter from the sun and cold
- A place to retire (one burrow per tortoise)
- A dry area and a patch of grass

Feeding

- Shaded area for shallow water dish
- Grow plants: grass, weeds, dandelions, alfalfa, rose, hibiscus, and native plants
- Supplement with vegetables: endive, escarole, broccoli, squashes, carrots (chopped) and small amounts of kale, romaine, and other dark-green leafy vegetables
- Add extra fiber (rabbit food), calcium (supplement), and vitamin supplement to meals occasionally

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Websites:

<http://www.tortoise.org>

<http://www.mojavemax.com>