MOJAVE MAX EDUCATION PROGRAM MANUAL

desert conservation
PROGRAM

GET OUTDOORS
NEVADA

CCSD
CLARK COUNTY
SCHOOL DISTRICT

Mojave Max Education Manual

Table of Contents

Mojave Max Education Manual
Section 1: Introduction

Welcome to the Mojave Max Education Program. This multi-faceted program is a culmination of more than a decade of research, diligence, commitment, communication, implementation and feedback.

Why?

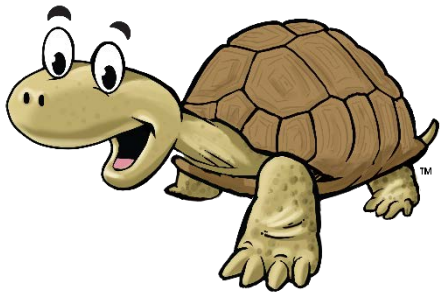
- To cultivate an understanding and appreciation of the Mojave Desert, and desert tortoises which are a threatened species.
- To foster positive behavior towards conservation of the Mojave Desert and the desert tortoise.
- To make a life-long impression on every participant and encourage them to respect, protect and enjoy the Mojave Desert and all native species.

How?

- By presenting assemblies, classroom programs, educational table-top programs, providing educational resources, and attending community outreach events.
- Incorporating extensive experience and expertise about desert tortoise and providing education to the public.
- Applying proven educational techniques.

What?

- Desert tortoise biology and conservation
- Mojave Desert weather
- Human conservation strategies



Background

In 1989 after the federal listing of the desert tortoise and the approval of a habitat conservation plan to protect the desert tortoise, the Clark County Desert Conservation Program (DCP) initiated a program to provide information and education about the desert tortoise and the Mojave Desert. Public Information and Education was identified as one of the conservation actions in the plan as a mitigation action to help protect the wild population of desert tortoise.

The Mojave Max caricature was developed by the DCP and was named through a student contest. A live desert tortoise, who was also given the name Mojave Max, was moved to the desert tortoise habitat at Red Rock Canyon National Conservation Area (NCA) in 1995. Subsequently, the Mojave Max program moved to the Springs Preserve in September of 2017.

The DCP started the annual Mojave Max Emergence Contest in 2000, whereby students in Clark County, Nevada predict when Mojave Max will emerge from his winter sleep each spring. Thousands of students over the years have studied Mojave Desert weather, temperatures and conditions to scientifically estimate when they believe Mojave Max will emerge from his burrow, in hopes of being the student and class to win this exciting contest. Mojave Max has his own website, **www.mojavemax.com,** where teachers and students make their best guesses as to the date and time when Mojave Max will emerge.

In 2001, personnel and volunteers with the Nevada Bureau of Land Management (BLM) developed desert tortoise educational materials and a simple classroom program to compliment the Mojave Max Emergence Contest.

The initial program has gone through a number of modifications with input from members of the Clark County Public Information and Education Committee, teachers, volunteers, agency representatives and tortoise biologists. What evolved was a set of interactive elementary and secondary school lessons which enhance the Mojave Max Emergence Contest that is sponsored each year by the DCP.

In 2001, the DCP partnered with Red Rock Canyon Interpretive Association (RRCIA) who began to help administer educational components of the Mojave Max Education Program under

contract with the DCP. Then, in August of 2017 the DCP partnered with Get Outdoors Nevada who continues to work with the DCP to help administer the Mojave Max Education Program. Over the years, the DCP and its partners have developed and administered several education programs supporting conservation messages, which include:

- Assembly Presentations – The Mojave Max Education Program provides educational assemblies in Fall and Winter of each school year. The assemblies include appearances by a Ranger who discusses desert tortoise biology and conservation, an educator who discusses Mojave Desert weather which plays an important part in Mojave Max's emergence, and the Mojave Max mascot. Students will learn about desert tortoises, the Mojave Desert and the Mojave Max Emergence Contest in this interactive one-hour presentation complete with quiz questions and prizes.
- Tortoise Talks – The science and biology of the Mojave Desert, desert tortoises and native species are taught to students by trained instructors. Classroom programs are about 45 minutes long and use photos, videos, demonstrations and activities to deliver the lessons. Messages also include information on how to use desert resources wisely and how to "respect, protect and enjoy our desert!" Tortoise talks are open not only to Clark County School District teachers and youth, but also to civic organizations.
- Teachers' manual, resources and curriculum enhancement materials – The DCP funded a public information and education program assessment in 2005. With regards to teachers' needs and desires, it was concluded that educators and teachers had many teaching mandates and were not always able to include information about native species in their curricula. Teachers were in need of resources to supplement their existing courses. The DCP continues to develop handouts, supplemental exercises, teaching examples and activities and provides them for teacher use.
- Administration of the Annual Mojave Max Emergence Contest – The DCP and its partners have been responsible for hosting the annual Mojave Max Emergence Contest each year. This contest congratulates the student who most closely estimates when Mojave Max will emerge from his burrow. The winner's entire class is rewarded with a field trip and pizza party at Springs Preserve, where they meet the live Mojave Max tortoise. At that time, the winner also receives the complete package of prizes, including a Springs Preserve year-long family membership, an "America the Beautiful" year-long pass to all National Parks and Federal Recreation areas, a backpack filled with outdoor goodies and a laptop computer. The winner's teacher will also receive a laptop computer.

As the years pass the lessons continue to be modified and revised. Many staff and volunteer instructors have been trained on how to teach in the classroom using teaching tools including puppets, tortoise shells, freeze-dried tortoises, and interactive lessons. Colorful PowerPoint presentations with video clips have been developed to accompany both the Mojave Max Assemblies and Tortoise Talks. In addition, this Education Manual has been developed as a teacher resource that allows them to teach in depth about the desert tortoise and the threats to the Mojave Desert ecosystem.

This comprehensive Mojave Max Education Manual describes the various components of the Mojave Max Program. Using tools and lessons found in the manual, teachers are able to provide more effective lessons concerning threatened species. It will help students be more proactive in their search for knowledge of the desert, its exceptional creatures, and their responsibility to "respect, protect, and enjoy our desert!"

The emergence contest, assemblies, and tortoise talks continue to raise awareness in the community of the status of the wild desert tortoise which is listed as a threatened species by the United States Fish and Wildlife Service. In cooperation with many federal agencies and other concerned partners, educational programs, such as this one, continue to provide information, spread awareness and help protect this native species and its habitat. Studying the environment and learning about local species, helps people to understand plants and animals, learn what is most important for their survival, and take action to benefit native species.

Although the desert tortoise is well adapted for desert survival, growth in the Las Vegas Valley has impacted its habitat. Increased development has resulted in road construction, in addition, off-highway vehicle travel and dumping of trash in the desert has also impacted tortoise habitat. Humans have also had a great impact on the loss and degradation of desert tortoise habitat in the Mojave Desert. Threats to the desert tortoise also include disease, and increased predation by ravens and other predators.

We can all play a role in the recovery of desert tortoise populations by taking simple steps such as picking up our litter, staying on roads and trails when traveling in the desert, and leaving tortoises alone if we encounter them in the wild. By being careful of our actions while having fun, we can help protect this federally listed threatened species.

The Las Vegas Valley

The Springs Preserve, a 180 acre property located approximately three miles west of downtown Las Vegas valley, includes a 15 acre desert tortoise habitat that is home to Mojave Max, a male tortoise born in 2005. Max serves as the official mascot for all threatened desert tortoises who live in the wild in the Mojave Desert.

The Springs Preserve, Red Rock Canyon National Conservation Area, Lake Mead National Recreation Area and areas like these represent some of the best geological, archaeological, and biological resources found in the Mojave Desert. These areas provide scenic and recreational opportunities for hundreds of people each day and are safe havens for wild plants and animals of the Mojave Desert.

Mojave Max Education Program Partners

As of August, 2017, Clark County partners with Get Outdoors Nevada, the Clark County School District, and the Springs Preserve to bring desert tortoise programs to local teachers, students, and civic and youth organizations.

Program Components

- The Mojave Max Education Program

  The Mojave Max Education Program is an umbrella program containing a compilation of documents, materials and curricula developed to support local environmental education in Clark County, Nevada. The overarching program focuses on native species of the Mojave Desert, proper desert use, appreciation of the local environment and pivots everything around the desert tortoise which is a keystone species (key to the health of the entire ecosystem). The Mojave Max character is used throughout all of the programs to add variety, fun and memorability.
- Mojave Max Assembly Program

  The DCP and its partners provide educational assemblies in Fall and Winter of each year. The assemblies include appearances by a Ranger who discusses desert tortoise biology and conservation, an educator who discusses Mojave Desert weather which plays an important part in Mojave Max's emergence, and the Mojave Max mascot. Clark County teachers for grades 1-5, can request a Mojave Max Assembly and have the Mojave Max team visit your

school to talk more about desert tortoises, the Mojave Desert and the Mojave Max Emergence Contest.

A minimum of 14 assemblies are scheduled at various Clark County schools each year. Several classes attend the assembly presentation in a large area such as a multi-purpose room. A Ranger, a weather educator and the Mojave Max mascot lead different parts of the presentation. The assemblies are interactive and prizes are given to students who answer pop quiz questions correctly.

Mojave Max Assembly applications must be completed by teachers and must be approved by the school Principal. The announcement indicating that assembly applications are being accepted is posted on www.mojavemax.com, Mojave Max's social media platforms and is posted on the Clark County School District's InterAct site. The announcement date may vary and applications are generally open a few weeks after the start of the school year and remain open for approximately 6 weeks.

Schools to be visited are selected by a committee composed of representatives from each of the program partners. The selected schools are notified via email and asked to confirm their preferred scheduled assembly date.

Schools that are not selected are also notified and are automatically offered a Tortoise Talk presentation.

- Mojave Max Tortoise Talks

  The Mojave Max Tortoise Talks are provided to Clark County School District students and youth and civic organizations. Unlike assemblies, Tortoise Talks are conducted all year long. Mojave Max educators visit your classroom to teach a 45-minute lesson about the desert tortoise and its habitat, the Mojave Desert. The lesson also includes information about Mojave Desert weather, desert tortoise biology, the importance of desert conservation, and more about the Mojave Max Emergence contest. The presentation is fun, interactive, and curriculum-based.

- The Mojave Max Emergence Contest

  The Mojave Max Emergence Contest is an annual contest where Clark County students, in grades K-5, are encouraged to study the conditions of the Mojave Desert and how desert tortoises respond to these conditions, especially regarding brumation (the reptilian form of

hibernation). Students enter guesses on line to predict when they think the live Mojave Max tortoise will emerge from brumation in the spring. The student who guesses as closely as possible to the correct day, hour, and minute, without going over, that Max will emerge from his burrow is the winner. Any student from Clark County, Nevada, in grades K-5, who is enrolled in public, private, or registered home schools are eligible to enter their guess at https://mojavemax.com/emergence-contest.

Mojave Max Education Manual

Section 2: Lesson Plans

Specific lessons supporting the Mojave Max Education Program curriculum have been developed for use by educators. Lessons contain the following components:

- Subject
- Theme
- Objectives
- Nevada State Science Standards
- Materials
- Vocabulary
- Activity
- English Language Arts (ELA) Connections
- Evaluation

The following lesson plans have been developed to support the Mojave Max Education Program:

Lesson 1: Mojave Desert Weather
Lesson 2: Life Cycle of the Desert Tortoise
Lesson 3: Become a Tortoise
Lesson 4: Tinfoil Tortoises
Lesson 5: Habitat Comparisons
Lesson 6: Threats to Desert Tortoises
Lesson 7: Desert Tortoise Jeopardy
Lesson 8: Desert Tortoise Education for Grades K-2

Mojave Max Education Manual

Lesson 1: Mojave Desert Weather

Subject Mojave Desert Weather

Theme Desert tortoises, like all Mojave Desert animals, face the challenge of surviving in a *hot*, *dry*, and *windy* environment.

Objectives

- Students will describe the weather in the Mojave Desert.
- Students will state how temperature affects the desert tortoise.
- Students will identify at least two weather conditions that the desert tortoise has adapted to in the desert.
- Students will write at least one new vocabulary word correctly in a sentence.

Nevada State Science Standards

Earth and Space Science
E.5.A: E.5.A.2, E.5.A.5
Life Science
L.5.B: L.5.B.1*, L.5.B.2*   **L.5.C: L.5.C.2*, L.5.C.4, L.5.C.5***

* = CCSD Power Standard

Materials

- Paper and pencil
- Whiteboard

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.

- **Brumation** – the winter dormancy or torpid state that reptiles enter to escape the cold of winter.
- **Burrow** - a hole in the ground made by an animal.
- **Hibernation** – a deep sleep that some birds and mammals enter to escape the cold of winter.
- **Reptile** – a cold-blooded, air-breathing vertebrate with a bony skeleton and a body usually covered by scales or bony plates.
- **Thermometer** – an instrument used to measure temperature.

Activity - Group Weather Discussion

1. Have students get into small groups. Have each group discuss the kind of weather they have experienced while living in the Mojave Desert. Compile a list of their ideas on the board. What do they remember most about the summer? Since they wear light jackets sometimes, can it also be cold or cool?
2. Show the students a map of the United States and southern Nevada. Ask students why there is little rain. Point out all the mountains the clouds have to climb over to reach the Mojave Desert. Explain that clouds are heavy when filled with moisture and as they rise in elevation they release rain/snow to lighten the load.
3. Discuss how each animal in the Mojave Desert must adjust to survive in these harsh conditions.

English Language Arts Connections

- Assign each student a season or a type of weather event and instruct them to write a descriptive paragraph about it.

Evaluation

- Have students list what they have learned about the weather in the Mojave Desert.

Mojave Max Education Manual

Lesson 2: Life Cycle of the Desert Tortoise

Subject Life Cycle of the Desert Tortoise

Theme As desert tortoises grow, they pass through a series of developmental stages called a life cycle.

Objectives

- Students will describe the life cycle of the Desert tortoise.
- Students will identify at least two adaptations of the desert tortoise that enable the reptile to survive in desert conditions.

Nevada State Science Standards

Life Science
L.5.A: L.5.A.1, L.5.A.2, L.5.A.3*
L.5.B: L.5.B.1*, L.5.B.2*
L.5.C: L.5.C.1, L.5.C.2*, L.5.C.3*,
L.5.C.4, L.5.C.5*

* = CCDS Power Standard

Materials

- Ping Pong ball
- Small tortoise puppet
- Round plastic egg / plastic container

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.
- **Brumation** – the winter dormancy or torpid state that reptiles enter to escape the cold of winter.
- **Burrow** - a hole in the ground made by an animal.
- **Carapace** – the back of the tortoise shell.

- **Habitat** – a place where a plant or an animal lives in nature.
- **Hatchling** – a baby desert tortoise.
- **Plastron** – the underside of the tortoise shell.
- **Reptile** – a cold-blooded, air-breathing vertebrate with a bony skeleton and a body usually covered by scales or bony plates.
- **Scute** - external, horny plates overlaying the bony covering found on the carapace (back) and plastron (underside) of the desert tortoise shell.

Activity - Life Cycle Discussion

1. Using the Desert tortoise puppet explain to students that Mojave Max's life began when his mother used her hind legs to dig a hole (nest) in the ground and lay several eggs (4 - 8) during the spring.
2. Mojave Max's egg was only the size of a ping-pong ball (show ping-pong ball). Two to four months went by and Max grew big and strong inside his egg. Finally, Max was ready to face the outside world in late summer.
3. Slowly open round plastic container and pull out small puppet. The size of a silver dollar, Max had to be careful since his shell was still soft.
4. Ask the students - How can a tortoise fit inside of a small, round shell? Explain how the hatchling folds into the egg. Because of the soft flexibility of the shell, it can grow and fit into a circular shape. The shell begins to harden once the hatchling emerges from the egg.
5. Discuss how a hatchling digs its own burrow to provide protection from predators and temperature extremes.
6. Discuss the dangers of having a soft shell for first 5 years. Baby tortoises with soft shells are easy pray for ravens, coyotes, bobcats, and badgers. Eventually, the soft shell hardens as more and more bone is formed underneath the scutes, and the shell becomes a defense against predators.
7. Discuss the food of a tortoise - plants, flowers, and desert grasses.
8. Hatchlings grow up and become juveniles and then adults. Less than five out of 100 hatchlings survives to be an adult. Tortoises can live to be 60-80 years old.

English Language Arts Connections

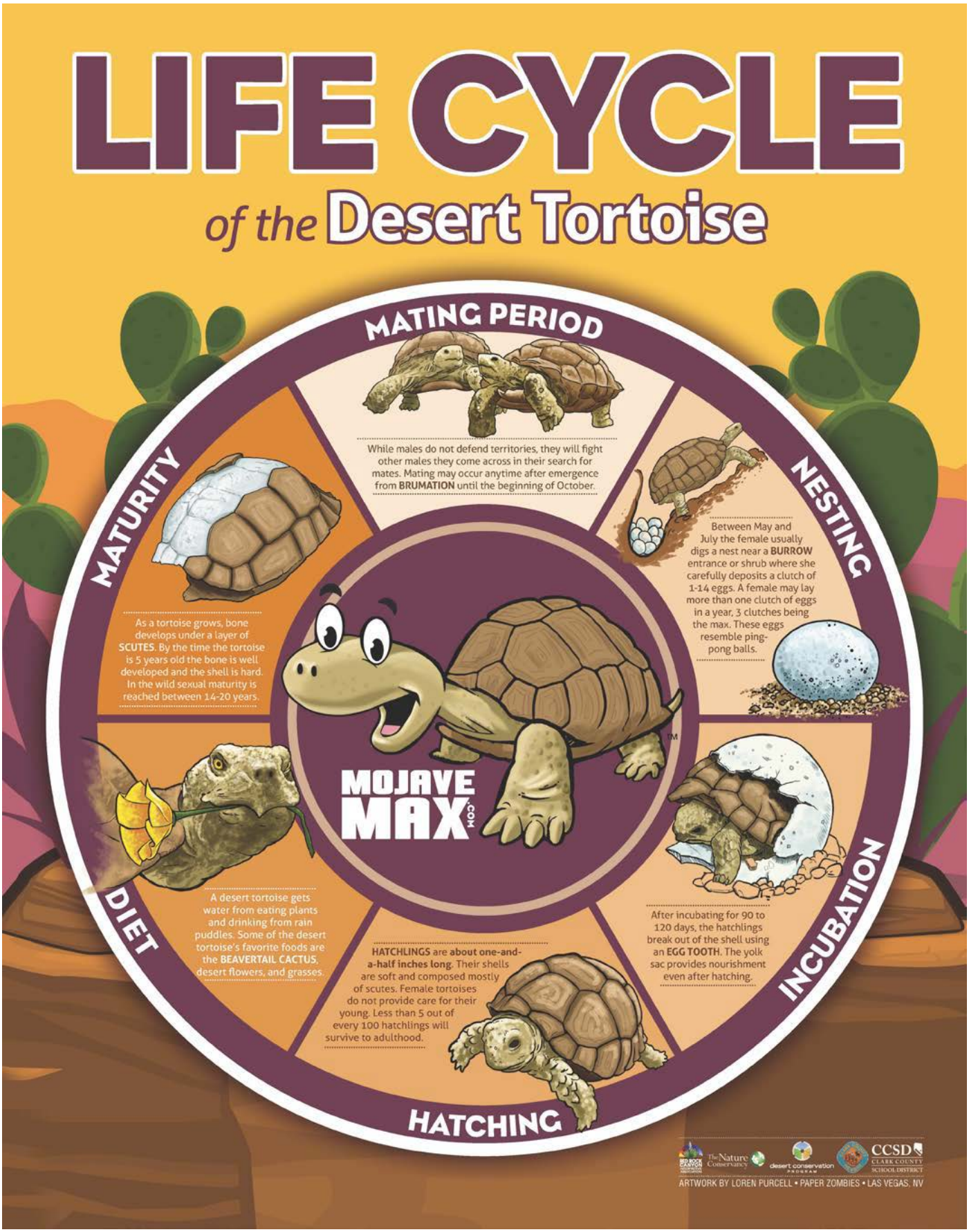
- Read the story *Life in the Slow Lane* by Conrad Storad.

Evaluation

- Have the student draw a storyboard of the desert tortoise cycle of life.
- Have students compare and contrast the desert tortoise's life cycle with some other animals (e.g. a butterfly, a frog, a person).

LIFE CYCLE

of the Desert Tortoise



Mojave Max Education Manual

Lesson 3: Become a Tortoise

Subject Physical Adaptations of the Desert Tortoise

Theme Each of the tortoise's parts has a special function that help it survive.

Objectives

- Students will identify at least two adaptations of the desert tortoise that enable the reptile to survive in desert conditions.
- Students will name/identify the parts of the desert tortoise shell.
- Student will identify why feet/nails are important.

Nevada State Science Standards

Life Science
L.5.B: L.5.B.1*
L.5.C: L.5.C.2*, L.5.C.5*

* = CCDS Power Standard

Materials

- Large aluminum pan, size used for cooking turkey ("carapace")
- Pattern for making scutes on the carapace *(Paint tortoise shell brown with 13 scutes on back)*
- Cookie sheet ("plastron")
- Two pieces of string to hold shell together when draped over students shoulders
- Reptile-like gloves ("front legs")
- Animal slippers with nails ("hind legs")
- Salad tong ("gular horn")

PHOTO SHOWING HOMEMADE TORTOISE COSTUME USING MATERIALS FROM THE LIST ON THE PREVIOUS PAGE.

Vocabulary

- **Adaptation** - a physical or behavioral feature or trait of an animal or plant that helps it survive in its environment.
- **Burrow** - a hole in the ground made by an animal.
- **Carapace** - the back of the tortoise shell.
- **Plastron** - the underside of the tortoise shell.
- **Reptile** - a cold-blooded, air-breathing vertebrate characterized by a bony skeleton and a body usually covered by scales or bony plates.
- **Scute** - external, horny plates overlaying the bony covering found on the carapace (back) and plastron (underside) of the Desert tortoise shell.

Activity - Become a Tortoise

1. Ask for a volunteer to come up and become the tortoise.
2. Begin by placing the “shell” over the student’s body. The flat side (cookie sheet - plastron) goes in front and the large aluminum pan (carapace) goes on the back of the student. The pans are held together with cloth ‘straps’.
   What is an advantage or disadvantage of having a shell to the desert tortoise?
3. Discuss the shape of each part, number of large scutes on the carapace, and the color of the shell.
4. To distinguish between males and females you have to look at the plastron. Females will have flat plastrons and males will have a concave (or dish-shaped) plastron.
5. Add the gular horn to the top of the plastron under the chin. Explain that the female has a short horn and the male has a long horn.
6. Next, place the custom gloves on the student. Ask the students how the tortoise’s flat scales on the forelegs might function? What would the tortoise use the large nails for?
7. Next, place the slippers on the student. Compare and contrast the different uses of the legs and nails, such as digging burrows or nests. If time allows, you could ask the student to move like a tortoise SLOWLY.
8. Explain that most of the external differences between the male and female do not develop until they reach the teen years – just like the students.
9. Have select students place magnetic vocabulary words on appropriate parts of tortoise costume as they are being discussed.

English Language Arts Connections

- Have students complete one of the vocabulary worksheets in the “Additional Activities” section of this handbook.

Evaluation

Ask the students the following questions:

- What are the different parts of a desert tortoise’s shell?
- How does having a shell help desert tortoises?
- Why is the gular horn longer on the male tortoise?
- How do tortoises use their large legs and nails?
- What can students do to protect the habitat of the desert tortoise?

Mojave Max Education Manual

Lesson 4: Tinfoil Tortoises

Subject Desert Tortoises and Temperature Control

Theme Desert tortoises use their burrows to help them stay just the right temperature.

Objectives

- Students will observe how temperature affects the desert tortoise.
- Students will identify at least two adaptations of the desert tortoise that enable the reptile to survive in desert conditions.

Nevada State Science Standards

Nature of Science
N.5.A: N.5.A.1, N.5.A.2, N.5.A.3
Life Science
L.5.B: L.5.B.1*, L.5.B.2* L.5.C: L.5.C.2*, L.5.C.3*, L.5.C.4, L.5.C.5*

* = CCDS Power Standard

Materials

- Five tinfoil pie plates
- Brown construction paper
- Pattern for head, legs, tail of tortoise
- Small temperature gauges (can use gauges in FOSS kits)
- Two large laminated thermometers

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.
- **Aestivation** – a slowing of activity during hot temperatures.
- **Brumation** – the winter dormancy or torpid state that reptiles enter to escape the cold of winter.

- **Burrow** - a hole in the ground made by an animal.
- **Habitat** – a place where a plant or an animal lives in nature.
- **Hibernation** – a deep sleep that some birds and mammals enter to escape the cold of winter.
- **Reptile** – a cold-blooded, air-breathing vertebrate with a bony skeleton and a body usually covered by scales or bony plates.

Activity - Tinfoil Tortoises

1. This activity should be done in a relatively quiet area outdoors.
2. Split the class into five groups and give each group a tinfoil tortoise.
3. Briefly explain to students that their tinfoil tortoise represents how a real tortoise is affected by temperature.
4. Direct the students to five different locations where each tinfoil tortoise will be placed: such as a grassy area in the shade, blacktop, on top of a piece of playground equipment, and a sunny, grassy area.
5. Give the groups two minutes to find the best place to put their tortoises in the area you have selected for them.
6. After two minutes, have them gather back at the meeting place for a ten minute discussion – **leaving the tinfoil tortoises in the places that previously chosen**. Allow the tinfoil tortoises to sit at least 10 minutes to warm up.
7. Discuss what makes a reptile a “reptile” and how the desert tortoise is able to survive in the Mojave Desert (burrows, brumation, and aestivation).
8. What would happen if the tortoise gets too hot or cold?
9. Have one person from each group retrieve their tinfoil tortoise. While you are waiting, name off each area the tortoises are located and have the students raise their hands if they think that area will have the hottest tortoise. Feel each of the tortoises and rate them from hottest to coolest. If the weather is too cold for the tinfoil to warm then refer to the temperature gauges attached to the tinfoil tortoises for comparison.

English Language Arts Connections

- Research other animals of the Mojave Desert. What are their adaptations for living in this climate?

Evaluation

- Ask students why certain tortoises were hotter than others. Did it have to do with the area they were in? The type of surface they were placed on? You should be able to correlate between the temperatures of the tortoise with the area it was placed in (blacktop tortoise should be the hottest while the shade tortoise should be the coolest).
- Are there other conditions besides temperature that might cause a tortoise to aestivate? Discuss type and condition of forage/plants, water availability, and physiological / health status of the tortoise.

Mojave Max Education Manual

Lesson 5: Habitat Comparisons

Subject Habitat Needs of the Desert Tortoise

Theme Tortoises need food, water, shelter, and space just like you!

Objectives

- Students will list the four resources all living organisms must have in their habitat.
- Students will compare and contrast the ways desert tortoises satisfy their habitat needs with the ways people satisfy their habitat needs.

Nevada State Science Standards

Life Science
L.5.A: L.5.A.1, L.5.A.2, L.5.A.3*
L.5.B: L.5.B.1*, L.5.B.2*
L.5.C: L.5.C.1, L.5.C.2*, L.5.C.3*,
L.5.C.4, L.5.C.5*

* = CCDS Power Standard

Materials

- Whiteboard
- Habitat Magnets

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.
- **Burrow** - a hole in the ground made by an animal.
- **Habitat** – a place where a plant or an animal lives in nature.
- **Herbivore –** an animal that eats only plants.
- **OHV –** Off highway vehicle.
- **Reptile** – a cold-blooded, air-breathing vertebrate characterized by a bony skeleton and a body usually covered by scales or bony plates.

Activity – Habitat and Resource Identification

Tell the students you are going to talk about habitat, and ask one of the students to define "habitat" for you. Point out that an animal's habitat must contain certain resources, whether that animal is a person or a tortoise. Pass out the habitat magnets, and then make two columns on the board: one labeled "people" and one labeled "tortoises." Ask the students to name the parts of a habitat, and as you discuss each one, have the students with the corresponding magnets place them on the board in the appropriate column. You may want to include the following information and conservation tips as you discuss each resource:

Food:

Tortoises can't get their food in restaurants or grocery stores like people do. Tortoises are herbivores ("plant-eaters"), and they eat plants like grasses, cactus, and flowers.

Much of the trash people leave in the desert (wrappers, balloons, etc.) may look like flowers to a tortoise. Tortoises that mistakenly eat trash can get sick and die. Putting your garbage in a garbage can where tortoises can't eat it is a good way to help protect tortoises.

Water:

Although tortoises get some of the water they need from eating plants, they also like to drink out of rain puddles. They have been known to dig their own puddles to drink from, and to wait by their puddles if it looks like it may rain. Unlike people, tortoises can drink from three places on their body: their mouth, their nose, and under their shell. Once their bladder is full, they don't empty it like people do - they save the water so they can use it later.

Tortoises that become frightened will "lose their water." If you see a tortoise in the desert, never get too close, pick it up, or do anything else that may scare it.

Shelter:

We go into our houses when it gets too hot or too cold. Tortoises use their burrows the same way. Because they are cold-blooded animals, their body temperature changes with the air temperature. So, it is very important that they not be exposed to extreme temperatures. Tortoises spend the whole winter in their burrow in a state of brumation (the reptilian form of hibernation). Tortoises also use their burrows to hide from predators, animals that may try to eat them. Coyotes, kit foxes, badgers, birds, snakes, and lizards can all eat tortoises, especially when they are small. Tortoises dig their burrows using their very strong front legs and nails. They may have a dozen or so burrows within their home range, with some being just deep enough to cover them, and others being ten feet deep or more.

Burrows can be crushed by hikers and Off-Highway Vehicles (OHV's). Please be responsible and stay on the trail when you are enjoying the desert.

Space:

Like people, tortoises need space to live. Our space contains houses, roads, schools, stores, etc., but tortoises need undisturbed desert space. The public lands that surround the Las Vegas Valley (Red Rock Canyon NCA, Lake Mead National Recreation Area, the Desert National Wildlife Refuge, etc.) provide safe space for tortoises to live.

By protecting our local public lands, we can ensure that tortoises have the space they need to survive.

English Language Arts Connections

Have students write a story of a day in the life of a desert tortoise and include descriptions of the habitat and examples of threats and opportunities form the view of the tortoise.

Evaluation

Have students draw a picture or map of a desert tortoise's habitat. Make sure it includes the four resources a desert tortoise needs to survive.

Mojave Max Education Manual

Lesson 6: Threats to Desert Tortoises

Subject Desert Tortoises and Stewardship

Theme Desert tortoises are well adapted for life in the desert, yet they are struggling to survive because of the impacts humans have on them and their habitat. *You can help* by remembering to respect, protect, and enjoy our desert.

Objectives

- Students will identify the threats to the ecosystem of the desert tortoise.
- Students will identify at least one way they can help protect the desert tortoise.

Nevada State Science Standards

Life Science
L.5.B: L.5.B.1*, L.5.B.2*
L.5.C: L.5.C.1*, L.5.C.2*, L.5.C.3*, L.5.C.4, L.5.C.5*

* = CCDS Power Standard

Materials

- Blank Game Boards
- Colored Pencils
- Tortoise Patrol cards

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.
- **Burrow** - a hole in the ground made by an animal.
- **Ecosystem** – a community of interacting organisms and their environment.
- **Habitat** – a place where a plant or an animal lives in nature.

- **Reptile -** a cold-blooded, air-breathing vertebrate characterized by a bony skeleton and a body usually covered by scales or bony plates.
- **Stewardship –** responsibility for taking good care of the environment.
- **Threatened Species –** a classification given to a species that is likely to become endangered if present trends continue.

Review the following conservation information with your students:

Water

Tortoises can go long periods of time without taking in water. A wild tortoise will lose its water when startled or picked up. Although the tortoise can withstand considerable dehydration, to replace this water requires additional rainfall and/or moist food that may not be available. **Therefore, it is important to NOT disturb a wild tortoise UNLESS it is in imminent, life-threatening danger.**

Burrows

Tortoises dig numerous burrows. Some are shallow and some extend more than 10 feet. The tortoise can have a dozen or more burrows scattered throughout its home range. It can easily escape the heat of the day by finding and entering a burrow. **Watch out for burrows in the desert – they are easy to step on and crush.**

Brumation

In the fall the temperatures begin to drop in the Mojave Desert. One way to escape the cool temperatures and to survive the winter with little or no food is to brumate. During the dormant time, several tortoises may occupy the same burrow. **Be careful where you travel as the tortoises may be underground.**

Tortoise Sightings

I**f you see a tortoise in the wild it should be left undisturbed**. In other words, leave it alone. The only time you should consider moving a tortoise in the wild is if it is injured or in the middle of a busy road. To move a tortoise to safety, approach it from the front to avoid startling it. When lifting the tortoise, keep the plastron (underside) level to the ground. Move the tortoise gently several steps from the road in the same direction it was heading. If possible, place it in the shade of a shrub.

Tortoises seem to have a good sense of direction and use local landmarks to find drinking sites, mineral licks, and food sources. The home range of a tortoise may be from 2.6 acres to over a square mile. In most places the juveniles have the smallest home ranges and those of males are larger than females.

Activity - Desert Tortoise Survival Game

1. Have students create a list of threats to the desert tortoise, as well as a list of ways that people can help.
2. Pass out a blank game board to each student.
3. Using their lists, have the students fill in the squares on the game board using pictures or words. Squares with “threats” should instruct the player to move back once space, lose a turn, return their game piece to home, etc. Squares with “ways to help” should instruct the player to move forward.
4. The object of the game should be to reach the safety of the burrow.
5. Create game pieces out of cardboard, and have each student decorate his or her own tortoise.
6. Have the students pair up and try playing their new games.
7. Discuss the results of the games. Was it difficult to reach the burrow? Compare the game to the desert tortoise’s survival in real life.

Activity - Tortoise Pledge

1. Ask students, if they wish, to join the Tortoise Patrol. This means they are taking a pledge to help protect desert tortoises.
2. Distribute the Tortoise Patrol card to each student.
3. Have everyone hold up his/her right hand.
4. Have them repeat the pledge after you as you read it line by line.
5. They are now official Tortoise Patrol members.
6. Have each student sign their Tortoise Patrol card.

English Language Arts Connections

- Instead of reciting the tortoise patrol pledge, have a class discussion about what they think should be included in a pledge. Then have each student write his or her own pledge. Have a class vote to determine which pledge the class will recite together.

Evaluation

- Ask students to list two things they can do to protect the habitat of the desert tortoise.
- What would they do if they saw a tortoise in the wild?
- What would they do if they saw a tortoise in the city?

Mojave Max Education Manual

Lesson 7: Desert Tortoise Jeopardy

Subject Desert Tortoise Review

Theme Desert tortoises are well adapted for life in the desert, yet they are struggling to survive because of the impacts humans have on them and their habitat. *You can help* by remembering to respect, protect, and enjoy our desert.

Objectives

- Students will describe the life cycle of the desert tortoise.
- Students will identify the adaptations of the desert tortoise that enable the reptile to survive in desert conditions.
- Students will identify ways to protect the desert tortoise.
- Students will review content by playing a game together.
- Students will match vocabulary words to their meanings.
- Students will work cooperatively together in small groups.

Nevada State Science Standards

Life Science
L.5.B: L.5.B.1*, L.5.B.2*
L.5.C: L.5.C.1, L.5.C.2*, L.5.C.3*, L.5.C.4, L.5.C.5*

* = CCDS Power Standard

Materials

- Jeopardy board
- Game cards (four categories),

Vocabulary

- **Adaptation** – a physical or behavioral trait of an animal or plant that helps it survive in its environment.
- **Aestivation** – slowing of activity during hot temperatures.

- **Brumation** – the winter dormancy or torpid state that reptiles enter to escape the cold of winter.
- **Burrow** - a hole in the ground made by an animal.
- **Carapace** – the back of the tortoise shell.
- **Habitat** – a place where a plant or an animal lives in nature.
- **Hibernation** – a deep sleep that some birds and mammals enter to escape the cold of winter.
- **Plastron** – the underside of the tortoise shell.
- **Reptile** – a cold-blooded, air-breathing vertebrate characterized by a bony skeleton and a body usually covered by scales or bony plates.
- **Scute**- external, horny plates overlaying the bony covering found on the carapace (back) and plastron (underside) of the Desert tortoise shell.
- **Stewardship –** responsibility for taking good care of the environment.
- **Threatened Species –** a classification given to a species that is likely to become endangered if present trends continue.

Activity - Desert Tortoise Jeopardy

1. Set questions up in four categories: Body, Life History, Places, and Miscellaneous.
2. Display vocabulary words on the board, if needed.
3. Divide class into groups of 3-5 students who will work together to formulate the question.
4. Teacher is the moderator and decides who “buzzed” first.
5. All groups will come together and compare answers.
6. Each question is worth a set amount of points shown on the Jeopardy activity table (Page 34).
7. The group with the most points wins.

English Language Arts Connections

- Have each student write their own jeopardy questions relating to the desert tortoise, the Mojave Desert, other species of the Mojave Desert or their own lives as inhabitants of the Mojave Desert.

Evaluation

- Have student's list adaptations and explain why aestivation is important.
- Have student's list ways to protect the habitat of the desert tortoise.
- Have students write a poem or short story about the desert tortoise.
- Have students create a tortoise word search and exchange with another student.

Mojave Max Education Manual

Activity – Jeopardy Questions and Answers

QUESTION	ANSWER	POINTS
BODY		
The desert tortoise digs its burrow with these.	Nails / Front legs	100
The desert tortoise has 13 of these on the carapace.	Large Scutes	200
Structure used to flip other males others.	Gular Horn	300
The protective shell underneath the desert tortoise.	Plastron	400
The protective shell forming back of the desert tortoise.	Carapace	500
LIFE HISTORY		
The season Mojave Max will first appear.	Spring	100
The season baby desert tortoises hatch.	Late summer	200
The lifespan of a wild desert tortoise.	60 – 80 Years	300
Classification of an animal that does not have internal body temperature	Reptile	400
The legal status of the desert tortoise.	Threatened Species	500
PLACES		
The desert tortoise is the state reptile of this state.	Nevada	100
The desert we share with the desert tortoise.	Mojave Desert	200
The shelter a desert tortoise makes.	Burrow	300
Where the desert tortoise spends most of its time.	Underground	400
Place you can visit Mojave Max.	Red Rock Canyon	500
MISCELLANEOUS		
The name of a baby desert tortoise.	Hatchling	100
Action to take if you see a desert tortoise.	Leave it Alone	200
The desert tortoise eats these exclusively.	Plants	300
Dormancy entered during cold of winter.	Brumation	400
Sleep state animal enters during hottest and driest part of summer.	Aestivation	500

Mojave Max Education Manual

Lesson 8: Desert Tortoise Education for Grades K-2

Subject Desert Tortoise Overview

Theme What is a desert tortoise and how does it live in the desert?

Objectives

- Students will describe the weather in the Mojave Desert.
- Students will identify at least two weather conditions that the desert tortoise has adapted to in the desert.
- Students will write at least one new vocabulary word correctly in a sentence.

Nevada State Science Standards

Nature of Science
N.2.A.1*
Earth and Space Science
E.2.A, E.2.A.3*
Life Science
L.2.A, L.2.A.1*, L.2.B, L.2.B.1*, L.2.C, L.2.C.1*, L.2.C.2*, L.2.D, L.2.D.1*

* = CCSD Power Standard

Materials

- Book: Life in the Slow Lane

Vocabulary

- **Brumation** – the winter dormancy or torpid state that reptiles enter to escape the cold of winter.
- **Burrow -** a hole in the ground made by an animal.
- **Habitat** – a place where a plant or an animal lives in nature.
- **Hibernation** – a deep sleep that some birds and mammals enter to escape the cold of winter.

- **Predator** – an animal that hunts and eats another animal.
- **Prey** – an animal that is hunted and eaten by another animal.

Activities

Desert Weather Discussion

Explain that desert tortoises live in the desert, just like us. What is the weather like in the desert? The weather is 1) hot and sunny (make a circle over your head with your arms to represent the sun, and have the kids do the same), 2) with very little rain (make rain motions with your fingers, and point out that they're little movements for little rain), and 3) windy (make waving motions with your arms and blowing noises). Go through the characteristics two or three times, with the kids mimicking your motions.

"Life in the Slow Lane"

Explain that you want to start talking about the tortoise by reading a story. Give students three questions to think about as you read: 1) What do tortoises like to eat? 2) How do tortoises move? 3) How do tortoises stay safe? Read the story, pointing out interesting facts and asking questions as you go (Example questions: Is Shelly a good name for a tortoise? Why? What is a predator? What are hind legs?) After the story, discuss the answers to the three questions.

Tortoise Life Cycle

Show a tortoise puppet and discuss how mother tortoises lay eggs after they awake from brumation in the spring. Show the different stages of a tortoise's life.

Become Tortoises

- Tell the students that we are all going to use our imaginations to transform into tortoises.
- Put on some imaginary back legs (make motions as if you are pulling on some large boots). Stomp your feet to make sure they are big and round.
- Put on your front legs, which are scaly and strong. Hold your arms up like a body builder to show how strong they are, and wiggle your fingers to show off your strong nails.
- Next, put on your shell. Tap on it and make a knocking sound to show that it is hard. Have the students tap both the front and back of their shell, and then tap their neighbors shell *gently*.
- Now, practice some of the things a tortoise must be able to do.

- Dig a burrow: make swimming motions with your front legs, then push the dirt away with your back legs.
- Hide in your shell: have students practice tucking their head and legs into their shell on the count of 3. Do this a couple of times.
- Eat: remind students that tortoises do not have teeth, so they can only eat with their strong, sharp mouths and tongues.
- Drink: unlike people, tortoises like to drink out of their noses! When they come across a puddle, they stick their whole face in and suck through their nose.

- Now, show the students some pictures and ask them to react as a tortoise would.
  - When you hold up a picture of a predator, they should hide in their shells.
  - When you hold up a picture of a plant, they should pretend to eat it. When you hold up a picture of a puddle, they should drink it (through their nose!), and
  - When you show a picture of a burrow, they should practice their digging.
  - You can also try to surprise them with a picture of a cheeseburger.

The supplementary materials section contains information that might be useful teachers, instructors, and volunteers.

This section includes additional miscellaneous information, student worksheets, references, resources and quizzes.

The Mojave Desert

Mojave Desert weather can be described as hot, dry, and windy. Temperatures range from over 120º Fahrenheit in the summer to below freezing in the winter. The hottest temperature ever recorded in the western hemisphere, 134.6º F, occurred within the Mojave Desert.

The average yearly rainfall measures only four to six inches and almost all of it occurs during the winter.

The Mojave Desert is known as a "rain shadow desert." The Sierra Nevada mountain range separates the Mojave Desert from the coastal lands of California. When moisture-filled clouds develop off the coast and blow ashore, they travel across the state and encounter a massive mountain range, as well as a number of smaller ranges stretching across Eastern California. As the clouds begin to gain elevation, the air cools, the water condenses, and the clouds drop their moisture in the form of rain or snow. By the time these clouds have moved inland to the Las Vegas Valley, there is little moisture left in the air to distribute over Southern Nevada. We are in the "rain shadow" of the mountains.

The harsh conditions found in deserts make them difficult places to survive. All desert wildlife must have adaptations for dealing with extreme temperatures, drought, and scarce food availability.

Plants survive the drought conditions of deserts by being either "drought avoiders" or "drought tolerators." Drought avoiders have adaptations that prevent them from losing too much water. Examples of drought avoiders are annual plants, which escape periods of drought as seeds; cactuses, which have the ability to store water to keep from drying out; and drought deciduous plants, which lose their leaves when it gets too dry.

Other plants are considered "drought tolerators," because they simply tolerate being dry. Their specialized chemistry allows them to function at water levels much lower than those tolerated by other kinds of plants. The most common drought tolerator is the Creosote Bush, which gives the desert air its distinctive aroma during rainstorms.

Desert animals must cope with the conditions of high heat, scarce water, and scarce food. There are several strategies for keeping cool in the desert. One is to be light-colored, since light colors

absorb less heat than dark colors. Many desert animals are active only at night to avoid heat, at least during the summer months. Another common strategy is to make use of burrows, since temperatures below ground are much cooler than those above ground, even on the hottest days. Panting also helps some animals cool off, although since it requires water, it is a strategy that must be used carefully. Finally, many desert animals tend to have long body parts, such as ears and legs, which help carry heat away from their bodies.

Like plants, desert animals must have the ability to find and/or store water. Animals with the ability to travel long distances, like birds or Bighorn Sheep, can travel as far as they need to for water. Animals without this ability, like insects and small mammals, must carefully conserve water. Many have a water-proof covering to prevent water loss. Others have the ability to store water in various places (e.g. under the skin or in their bladders.) Others can even produce their own water from the food they eat, like Kangaroo Rats. Finally, just like plants, there are some animals that can simply tolerate losing a large percentage of their water without ill effects.

A third challenge for desert animals is that there is little food available. For this reason, many desert animals are cold-blooded (like insects and reptiles), which means they require much less food than warm-blooded animals. Small animals are also common in deserts, since they require less food than larger animals. Many animals also have the ability to store energy, which allows them to take advantage of food when it is available.

Although deserts have a reputation for being lifeless places, they are actually filled with wildlife. Equipped with special adaptations that allow them to survive hot and dry conditions, they thrive in this environment.

The Desert Tortoise – General Background

Desert tortoises are reptiles that have developed physical and behavioral traits that enable them to live in the desert. Other reptiles include lizards and snakes. Reptiles have scaly skin, are cold-blooded, and most of them lay eggs. The desert tortoise has a basic skeleton with an attached shell that covers its back and underside for protection. Some physical traits include its protective shell, strong forelegs and nails for digging burrows, and the ability to store water in their bladders.

Behavioral traits include brumation (i.e. reptilian form of hibernation) in the winter months and aestivation during the heat of the summer. The tortoise protects itself from extreme desert temperatures by going into an underground burrow.

Cold-blooded (or “ectothermic”) animals like the desert tortoise depend on heat from outside their bodies (unlike mammals and birds that generate their own heat), so they must rely on an external energy source (the sun) to keep them warm to survive. When you see a reptile basking in the sun it is not trying to get a suntan, it’s trying to warm its body. The tortoise is most “comfortable” when its body temperature is between approximately 85º and 95º Fahrenheit.

Is a tortoise a turtle? Yes, but not all turtles are tortoises. When we think of turtles, the first thing that comes to mind is a turtle spending its time sun bathing next to a pond. But, there aren’t many ponds in the desert and the tortoise doesn’t know how to swim. The tortoise is a land dwelling turtle and only goes to the water to drink. The desert tortoise is not green like so many cartoons depict turtles, but varies in colors ranging from light tan to yellow-brown to blackish – all of which can blend in to the desert environment.

Life Cycle

A desert tortoise's life begins when its mother uses her hind legs to dig a hole in the ground where she'll lay between four and eight eggs. The eggs are about the size of a ping-pong ball. Baby tortoises, known as hatchlings, are about the size of a silver dollar and hatch from the egg between 80-120 days after being laid. Once tortoises emerge from the eggs in late summer they are independent and live solitary lives except during mating season. The female tortoise does not stay to protect her young. The hatchlings know what to do as soon as they're born.

Baby tortoises are less than two inches long when they hatch and are very vulnerable to predators because of their soft shells. The soft shells are pliable for the first five years of life as the shell has very little bone formed under the scutes. This flexibility allows the shell to grow and fit into the circular shape of the egg, but having soft shells leaves the hatchling vulnerable to predation by ravens, coyotes, bobcats, and badgers.

Maturity does not occur until around age fifteen or older in the wild and because of their vulnerability, less than five out of one hundred hatchlings will survive to reach maturity. Wild tortoises that do make it to maturity, can live to be 60 to 80 years old.

Adaptations

Desert tortoises have made the Mojave Desert one of their homes for thousands of years. How is a desert tortoise able to survive such harsh conditions? This animal has developed *physical* and *behavioral* traits that enable it to occupy the desert in numerous ways, some of which are:

- hard shells, strong nails, and powerful front legs that allow them to dig underground burrows
- brumation in the winter months
- aestivation in the extreme heat of the summer season
- conservation of water over long periods of time by retention in its bladder

Physical Traits

The desert tortoise's forelegs, with their strong ligaments, give them an advantage when digging the burrows that are critical to their survival. The forelegs are scaly, muscular and flattened with thick, long toenails acting as tiny shovels for digging. The scales help reduce injury. Strong hind legs with their long nails facilitate the tortoise in digging nests in the dry, sandy soil.

All tortoises have shells. The desert tortoise has a dome-shaped shell that ranges in color from yellowish-brown to brownish-gray to nearly black. The shell has three basic parts: the plastron on the underside (belly) of the tortoise, the carapace which covers the back (top) of the tortoise and the large scutes which are arranged in a pattern on the carapace. Bony bridges connect the plastron and carapace and smaller scutes rim the perimeter of the carapace.

Both male and female tortoises have a gular horn located on the front of the plastron. The gular horn is longer on the male and often upturned. Males use these to fight with other males and flip their opponents on their backs. The opponent attempts to stand as high as possible to prevent this from happening.

Seasonal Behavioral Traits

A tortoise can function between the temperatures of approximately 68 - 95º F. When temperatures are outside this range, tortoises survive by retreating to their burrows.

Aestivation

Burrows also provide protection from the intense heat of the desert. The ground in the Mojave Desert can reach up to 140º F and since the tortoise cannot control its internal temperature it must find ways to keep from overheating. A tortoise might only be active above ground in the early morning and late afternoon or evening. The rest of the day a tortoise will retreat to the burrow. During aestivation, the tortoise is underground during the hottest and driest part of the season. They may squeak or be aroused by touch when aestivating and their respiratory movements are more apparent than when brumating. Preventing death from overheating is at the root of much of the tortoise's behavior.

Brumation

In the fall, temperatures begin to drop. One way to escape the cool temperatures and to survive the winter with little or no food is to brumate. The desert tortoise typically enters long underground burrows which can be more than 10 feet long. The burrow channel can conform to the shape and girth of the tortoise and may not even be wide enough for the tortoise to turn around except at the very end. This snugness is efficient for temperature regulation and helps maintain a slightly higher humidity in the burrow. Several tortoises may occupy the same burrow during brumation.

While brumating, the tortoise is in a period of inactivity. The body slowly loses heat and stabilizes to the air temperature found in the burrow, about 40-60º F. All body processes are slowed including the heart rate and respiration rate.

Emergence

It is impossible to predict exactly when tortoises will come out of their burrows in the spring. Generally, there are three factors that tell a tortoise when it's time to emerge:

1. Warmer Temperatures - The outside temperature is the first factor. Since tortoises are reptiles, they respond quite quickly to temperature change. As winter retreats, the sun's rays become more direct, the ground begins to heat gradually and eventually the warmth reaches the depth of the burrow. As the weather gets warmer so do their bodies, which causes them to eventually leave their burrows.
2. Longer Days - The amount of daylight each day is another factor. As spring approaches, the days get longer.
3. Internal Clock - The third factor is the tortoise's internal clock. It seems that sometimes tortoises have an unexplained behavior or "instinct," regardless of the temperature or amount of daylight, to just emerge one day.

Habitat Needs

The desert tortoise has several specific habitat needs. Some basic habitat needs of the Mojave Desert Tortoise are as follows:

Water

Tortoises can go long periods of time without taking in water. A tortoise's bladder is capable of storing over a cup of water, which is reabsorbed by the body as needed. Tortoises typically urinate only when they are drinking.

Much of the water intake comes from moisture in the grasses and wildflowers they eat. Tortoises will also drink from rain puddles, even constructing their own puddles by digging shallow depressions in the soil to catch rain. A third source of water is the metabolic water from the breakdown of stored fat over time.

Years of successive drought are not uncommon in the desert. Sometimes in a given year the rainfall completely misses part of the tortoise population because of localized showers that occur over the desert.

While tortoises can go long periods of time without taking in water, they cannot tolerate the consumption of salty foods or plants, as they do not have the compensating mechanisms to excrete excess sodium as mammals do.

A wild tortoise may void its bladder when startled or picked up. Although the tortoise can withstand considerable dehydration, to replace this water requires additional rainfall and/or moist food, which may not be available. Therefore, it is important NOT to disturb a wild tortoise UNLESS it is in imminent, life-threatening danger.

Food

The tortoise has a horny beak-like mouth and no teeth. Tortoises are herbivores that eat grasses, blossoms, and succulent cactus flesh. Their metabolism allows them to go months without eating and drinking. They derive almost all of their water from consuming plants. As the spring plants dry out, the tortoise will eat some of the drying shrubs, flowers and grasses. Tortoises will eat the plants that are readily available but they have foods that they prefer, such as Globemallow, Desert Willow, and cactus pads and fruits.

As weeds become more widespread, tortoises may lose native forage. This invasion may also lead to an increase in the frequency of fires as many non-native plants, such as Sahara Mustard and Red Brome, create dense patches of vegetation not normally found in a desert environment.

Shelter

Tortoises dig numerous burrows, some of which are shallow and others that extend ten feet or more. They may have a dozen or more burrows scattered throughout their home range. The incline in the burrow may vary anywhere between 4 and 40 degrees. Burrows typically have a characteristic, moon-shaped entrance. Tortoises also live on the rocky slopes of hills and mountains. They will dig their burrows under large boulders and outcrops in contact with the soil.

Temperature regulation is the main function of a burrow. Although temperatures range greatly within the burrow throughout the year it still acts as a temperature buffer against the extreme above ground temperatures. In summer, the burrow provides protection by being under the surface which allows the tortoise to keep from heating its body to lethal temperatures. It can easily escape the heat of the day by finding and entering a burrow. Tortoises use burrows to prevent freezing during the dormant season as well.

Space

The home range for a given tortoise may range between approximately 2.6 acres for a juvenile to over a square mile for an adult. They require this to meet their needs for food, protection, and reproduction. Generally juveniles have smaller ranges than adults and adult females have smaller ranges than adult males.

Tortoises seem to have a good sense of direction and use local landmarks to find drinking sites, mineral licks, and food sources. It is important for a tortoise to remember where these things are for its survival.

Food Chain

The tortoise is an important part of the desert food chain. As the desert tortoise is grazing contentedly, it is stalked by predators such as the coyote, fox and raven. These animals prey on the tortoise, especially small hatchlings. Ravens hunt for vulnerable hatchlings and young tortoises with soft shells that are easily pecked apart. The coyote will occasionally attack and eat parts of the extremities and clean out the inside of an unbroken shell. When small mammals such as rabbits and rodents are in short supply the tortoise becomes even more in demand as prey. As development has reached the furthest edges of the valley, in recent years domestic and feral dogs have attacked wild desert tortoises and have contributed to the loss of this threatened species.

The Future

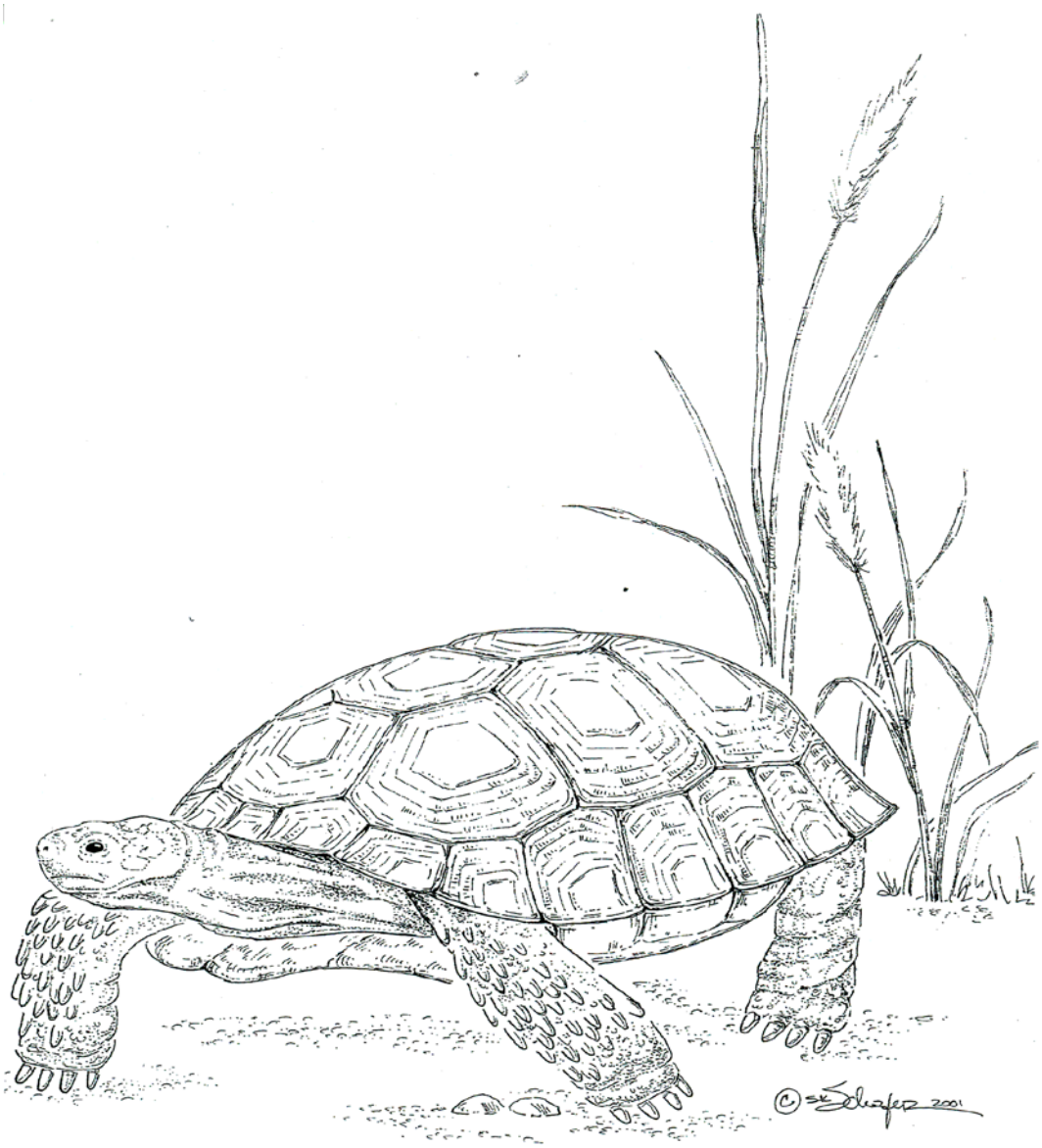
Although it does not need as much acreage to survive as some of the larger animals found in the Mojave Desert, the desert tortoise is an umbrella species for the Mojave Desert ecosystem. Umbrella species have large home ranges, small population densities, and narrow habitat requirements. Protection of the habitat of the tortoise protects the habitat of many other species.

Despite their ability to survive the harsh conditions of the Mojave Desert, desert tortoise populations are in decline. Habitat loss and degradation, vandalism, increased predation by ravens attracted by garbage dumps, and upper respiratory disease have all taken their toll. The fact that reproductive maturity takes many years, combined with the fact that most hatchlings do not survive to adulthood, means that recovery of tortoise populations is slow.

Because we share the Mojave Desert with many native species, our actions have a direct impact on their survival. By taking simple actions like leaving wild tortoise's alone, disposing of trash properly, staying on roads and trails, and never releasing pet tortoises in the wild, we can all participate in the recovery of this incredible species.

Mojave Max Education Manual

Desert Tortoise Coloring Page



Mojave Max Education Manual

Body of Knowledge Quiz

List three weather conditions found in the Mojave Desert.

1.
2.
3.

Name at least four parts of a desert tortoise's shell.

1.
2.
3.
4.

List the temperature range for a tortoise to survive comfortably above ground?

Describe the life cycle of a desert tortoise.

What is the scientific term for the dormant state some reptiles enter in winter?

What are three factors that cause the desert tortoise to emerge in the spring?

1.
2.
3.

Name three adaptations of the desert tortoise.

1.
2.
3.

Name three threats to the desert tortoise.

1.
2.
3.

What is the appropriate action to take if you discover a desert tortoise?

1. On a busy street near the desert?
2. In the wild?

Mojave Max Education Manual

Body of Knowledge Quiz - Answers

List three weather conditions found in the Mojave Desert.

1. **Extreme temperatures**
2. **Dry**
3. **Windy**

Name at least four parts of a tortoise shell.

1. **Carapace**
2. **Plastron**
3. **Scutes**
4. **gular horn**

List the temperature range for a tortoise to survive comfortably above ground.

68 - 95º F

Describe the life cycle of a desert tortoise.

- **Mating can occur anytime tortoises are not in brumation. Females have the ability to store sperm for several years.**
- **In late spring or summer, the female digs a nest with her hind legs and deposits 4-8 eggs. After burying the eggs, the female leaves the nest and does not return. Females can lay 2 - 3 clutches per year.**
- **The sex of the hatchlings is determined by nest temperature - cooler temperatures usually produce males, while warmer temperatures usually produce females.**
- **After 80 - 120 days, the hatchlings emerge from their eggs. They have soft shells for their first five years of life. Only 1 out of one hundred will survive to maturity.**
- **Growth rate varies depending on food availability.**
- **Tortoises are sexually mature when they have a shell length of 7 - 8 inches. This may take 15 - 20 years on the wild.**
- **Tortoises in the wild typically live 60 - 80 years; in captivity, they may reach 100 years or more.**

What is the scientific term for the dormant state some reptiles enter in winter?

Brumation

What are three factors that cause the desert tortoise to emerge in the spring?

1. **Warmer temperatures**
2. **Longer days**
3. **Internal clock (natural instinct)**

Name three adaptations of the desert tortoise.

1. **protective shell**
2. **strong legs and nails for burrowing**
3. **ability to store water in bladder**

Name three threats to the desert tortoise.

1. **Habitat loss and degradation (by littering, off-road travel, etc.)**
2. **Collection and vandalism by people**
3. **Increased predation by ravens (attracted by increased trash)**

What is the appropriate action to take if you discover a desert tortoise?

1. **On a busy street near the desert?**
   Move it to safety by approaching it from the front, grabbing it securely with both hands, and moving it in the direction it was traveling without lifting it too far off the ground. Place it several yards from the road, preferably in the shade.
2. **In the wild?**
   Leave it alone!

Mojave Max Education Manual

Vocabulary Matching Worksheet

Draw a line connecting each vocabulary word with the correct definition:

Adaption	The sleep-like state that some cold-blooded animals enter during winter.
Brumation	The underside of the tortoise shell.
Burrow	A species that is in danger of going extinct.
Carapace	A built-in trait that helps an animal or plant survive.
Gular Horn	An animal that hunts and eats another animal.
Habitat	A place where a plant or an animal lives in nature.
Herbivore	Part of a tortoise's shell that sticks out under its chin.
Plastron	The back of the tortoise shell.
Predator	A hole in the ground made by an animal.
Prey	A cold-blooded, air-breathing vertebrate with a bony skeleton and a body usually covered by scales or bony plates.
Reptile	An animal that is hunted and eaten by another animal.
Scute	An animal that eats only plants.
Threatened Species	A plate made of keratin that covers the tortoise shell.

Vocabulary Matching Worksheet - Answers

Adaptation: A built-in trait that helps an animal or plant survive.

Brumation: The sleep-like state that some cold-blooded animals enter during winter.

Burrow: A hole in the ground made by an animal.

Carapace: The top part of the tortoise shell.

Gular Horn: Part of a tortoise's shell that sticks out under its chin.

Habitat: A place where a plant or an animal lives in nature.

Herbivore: An animal that eats only plants.

Plastron: The underside of the tortoise shell.

Predator: An animal that hunts and eats another animal.

Prey: An animal that is hunted and eaten by another animal.

Reptile: A cold-blooded, air-breathing vertebrate with a bony skeleton and a body usually covered by scales or bony plates.

Scute: A plate made of keratin that covers the tortoise shell.

Threatened Species: A species that is in danger of going extinct.

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Vocabulary Worksheet

Use the following vocabulary words to fill in the blanks in the sentences below:

adaptation	**habitat**	**prey**
brumation	**herbivores**	**reptiles**
burrow	**hibernation**	**threatened species**

1. Desert tortoises are plant eaters, or _____, that like to eat grasses, cactus, and flowers.

2. Desert tortoises are known as a _____ because their numbers are falling and scientists are concerned about their survivability.

3. A tortoise's _____ is where it finds the food, water, shelter and space that it needs to survive.

4. A desert tortoise spends most of its life in its _____.

5. Some mammals and birds enter _____ during the winter, but the sleep of cold-blooded animals like the desert tortoise is called _____.

6. Desert tortoises may become _____ to animals like coyotes, birds, and snakes.

7. Desert tortoises, lizards, and snakes are all animals called _____.

8. Storing water in their bladders is an example of an _____ that tortoises have for living in the desert.

Vocabulary Worksheet - Answers

Use the following vocabulary words to fill in the blanks in the sentences below:

adaptation	**habitat**	**prey**
brumation	**herbivores**	**reptiles**
burrow	**hibernation**	**threatened species**

1. Desert tortoises are plant eaters, or **herbivores,** that like to eat grasses, cactus, and flowers.

2. Desert tortoises are known as a **threatened species** because their numbers are falling and scientists are concerned about their survivability.

3. A tortoise's **habitat** is where it finds the food, water, shelter and space that it needs to survive.

4. A desert tortoise spends most of its life in its **burrow.**

5. Some mammals and birds enter **hibernation** during the winter, but the sleep of cold-blooded animals like the desert tortoise is called **brumation.**

6. Desert tortoises may become **prey** to animals like coyotes, birds, and snakes.

7. Desert tortoises, lizards, and snakes are all animals called **reptiles.**

8. Storing water in their bladders is an example of an **adaptation** that tortoises have for living in the desert.

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Vocabulary Matching Worksheet

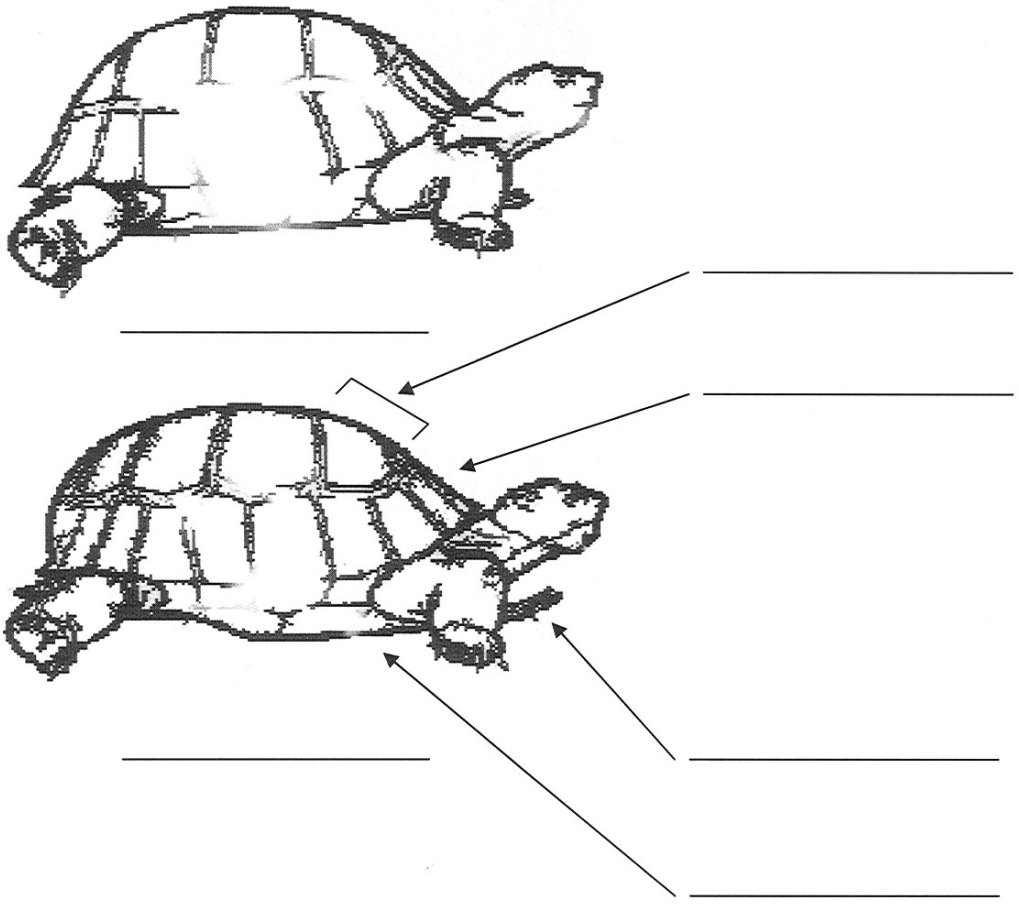
Use the following vocabulary words to label the parts of the tortoises. Below each tortoise, label it “male” or “female.”

Carapace

Gular Horn

Plastron

Scute



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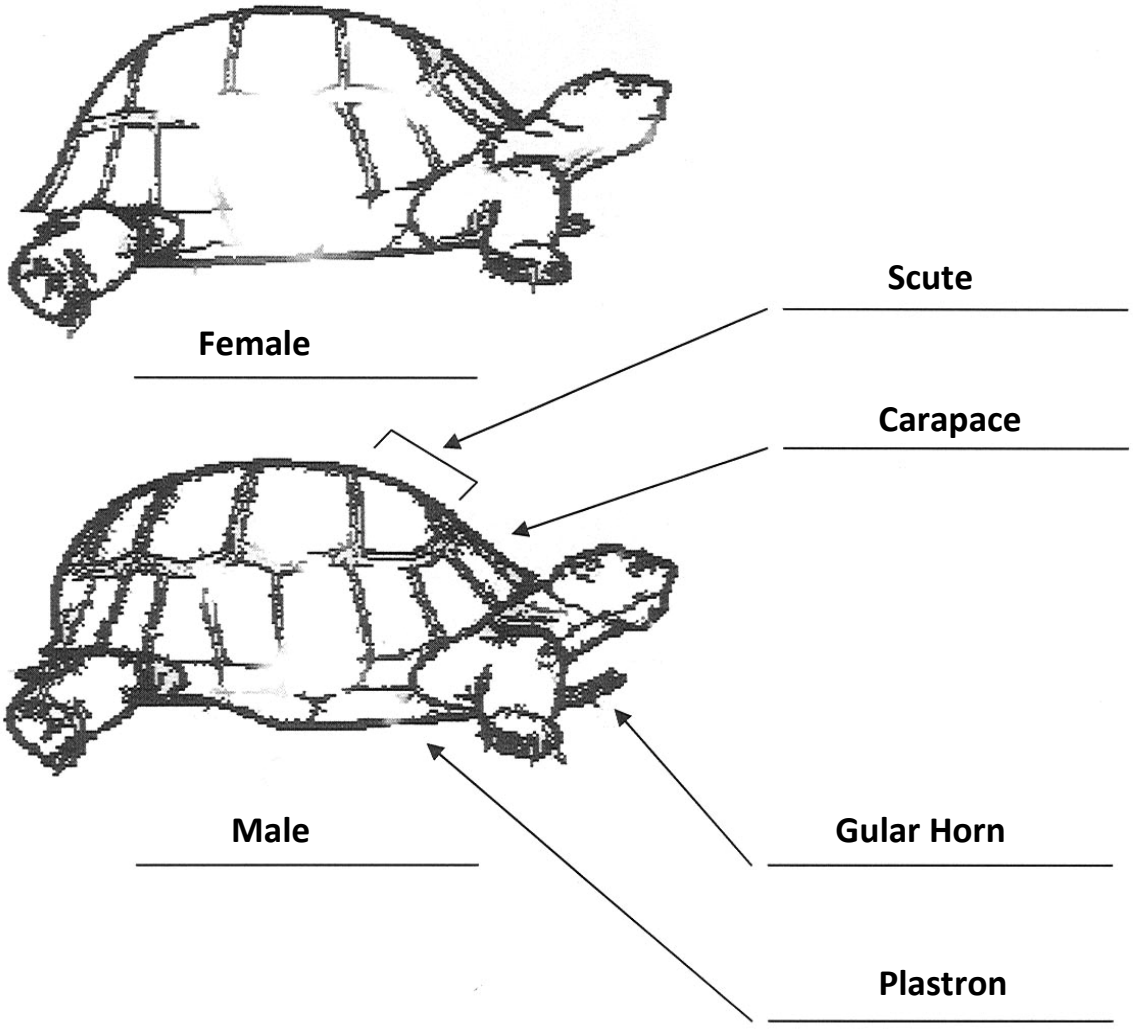
Vocabulary Matching Worksheet - Answers

Use the following vocabulary words to label the parts of the tortoises. Below each tortoise, label it “male” or “female.”

Note that one of the ways we can determine the sex of the tortoise is by the size of the gular horn. Males have a longer gular horn than females.

Carapace
Gular Horn
Plastron
Scute



Mojave Max Education Manual

Desert Tortoise Quiz

1. List three weather conditions found in the desert.

    1.

    2.

    3.

2. What is the name of the desert we share with Mojave Max and other desert tortoises?

3. Where does a desert tortoise go to stay warm in the winter and cool in the summer?

4. What do desert tortoises eat?

5. What are things that people do that can hurt tortoises?

6. What is one thing you can do to help desert tortoises and other wildlife?

Mojave Max Education Manual

Desert Tortoise Quiz - Answers

1. List three weather conditions found in the desert.

    1. **Extreme Heat**
    2. **Extreme Cold**
    3. **Wind**

2. What is the name of the desert we share with Mojave Max and other desert tortoises?

    Mojave Desert

3. Where does a desert tortoise go to stay warm in the winter and cool in the summer?

    Burrow

4. What do desert tortoises eat?

    Plants, Flowers, Cacti and Grasses

5. What are things that people do that can hurt tortoises?

    Not staying on marked roads and trails when travelling in the desert
    Littering
    Vandalism
    Not preserving their habitat

6. What is one thing you can do to help desert tortoises and other wildlife?

    Leave them alone

VOCABULARY – List of commonly used terms in the Mojave Max Education Program

Adaptation – a physical or behavioral trait of an animal or plant that helps it survive in its environment.

Aestivation – a slowing of activity during hot temperatures.

Biome – broad term describing an environment that has a characteristic collection of plants and animals.

Brumation – the dormancy that reptiles enter in cold temperatures.

Burrow - a hole in the ground made by an animal.

Carapace - the back of the tortoise shell.

Gular Horn - an extension of the plastron used (in males) for fighting.

Habitat – a place where a plant or an animal lives in nature.

Hatchling – a newly hatched animal

Herbivore – an animal that eats only plants.

Hibernation – a deep sleep that some birds and mammals enter to escape the cold of winter.

Plastron - the underside of the tortoise shell.

Predator – an animal that hunts and eats another animal.

Prey – an animal that is hunted and eaten by another animal.

Reptile – a cold-blooded, air-breathing vertebrate characterized by a bony skeleton and a body usually covered by scales or bony plates.

Scute – external, horny plate overlaying the bony covering found on the carapace (back) of the Desert tortoise shell.

Stewardship – careful and responsible behavior toward the environment.

Threatened Species – a species that is likely to become endangered if present trends continue.

Internet Resources

American Museum of Natural History
http://www.amnh.org/ology/
A kid-friendly exploration of topics including archaeology, anthropology, astronomy, and biodiversity. Includes games, activities, and interviews with real "-ologists."

Bureau of Land Management
https://www.blm.gov/learn
Information for students and teachers.

Desert Survivors
http://sciences.unlv.edu/desertsurvivors/index.htm
Information about many of our local wildlife species.

Environmental Protection Agency
https://www.epa.gov/students
Kid-friendly information about various environmental topics.

Mojave Max Education Program
www.mojavemax.com
Learn more about desert tortoises and their environment.

National Park Service
http://www.nps.gov/learn/
Lots of fun activities for kids, including educational games and an opportunity to become a junior ranger. For teachers, there is curriculum information and PDE opportunities.

Nevada Department of Wildlife
http://www.ndow.org/Education/Kids/
Activities for kids, as well as information for teachers, and the Nevada Wild! Newsletter.

North American Association for Environmental Education
https://naaee.org/
Lesson plans and professional development opportunities.

San Diego Zoo
http://blogs.sandiegozoo.org/
Blogs about the Zoo's efforts to help a variety of threatened and endangered species, including the desert tortoise.

Southern Nevada Water Authority
https://www.snwa.com/education/education.html
Fun activities to teach kids about water-related conservation issues.

U.S. Fish and Wildlife
http://www.fws.gov/educators/
Information about wildlife, including photographs and videos.

U. S. Geological Survey
http://education.usgs.gov/common/primary.htm
A resource for lesson plans involving biology, geology, geography, and water.

Suggested Field Trip Destinations

Clark County Wetlands Park
http://www.clarkcountynv.gov/parks/Pages/cc-wetlands-park-homepage.aspx

Desert National Wildlife Refuge
https://www.fws.gov/refuge/desert/

Lake Mead National Recreation Area
https://www.nps.gov/lake/learn/education/planafieldtrip.htm

Las Vegas Natural History Museum
http://www.lvnhm.org/education

Nevada State Museum, Las Vegas
http://museums.nevadaculture.org

Red Rock Canyon National Conservation Area
http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/blm_special_areas/red_rock_nca/environmental_education0/educational_programs.html

Springs Preserve
https://www.springspreserve.org/events/events_youth_education.html

Valley of Fire State Park
http://parks.nv.gov/parks/valley-of-fire-state-park/

Suggested Desert Tortoise Books

The Desert Tortoise by Sue Fox
Two Mountain Press, 2002
56 pages

Desert Tortoises by Christopher Blomquist
PowerKids Press, 2004
24 pages

The Desert Tortoise by James W. Cornett
Palm Springs Desert Museum, 2002
32 pages

Life in the Slow Lane: A Desert Tortoise Tale by Conrad J. Storad
(illustrated by Nathaniel P. Jensen)
RGU Group, 2006

The Tortoise and the Jackrabbit by Susan Lowell
(illustrated by Jim Harris)
Rising Moon Books, 1994
32 pages
Ages 4-8

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