

**Red Rock Canyon National Conservation Area
Environmental Education Program**

Mojave Max Emergence

www.Mojavemax.com

Classroom Program

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- Grade** Third Grade
- Subject** Desert Tortoise
- Theme** Mojave Max is a member of a threatened species that has adapted to the desert life by various methods including brumation.
- Goal** Expose students to the desert tortoise, its natural history and how the student's actions affect its existence.
- Objective** Students will describe the weather in the Mojave Desert
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.
Students will identify at least one way they can help protect the desert tortoise.
Students will identify the threats to the ecosystem of the desert tortoise.

Curriculum

- Science
 - 8.0 Heredity and Diversity
 - 9.0 Evolution – Process of Biological Change over time
- Essential Concepts, Skills, and Experiences
 - Life Science 2.1, 2.2
 - Environmental Science 4.1, 4.2
 - Scientific Inquiry 6.1

Vocabulary

Incorporate the following words into your discussions as you move through the lesson plans. As the students discover more about the tortoise interactively these words should naturally be built into their vocabulary base.

- Adaptation – a physical or behavioral feature or trait of an animal or plant that helps it survive in its environment.
- Aestivation – a sleep-state that some animals enter to escape the summer seasonal heat.
- Brumation – term used for reptiles that enter a deep sleep or torpid state 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 – an animal with a backbone that is cold-blooded (ectothermic) and can not regulate its body temperature internally. It is dependent on the environment around it. It has dry skin covered with scutes or scales, and breaths by a set of lungs.
- Scute- external, horny plates overlaying the bony covering found on the carapace (back) and plastron (underside) of the desert tortoise shell.
 - Weed – a non-native plant.

Background

The growth of the Las Vegas Valley over the past few years has caused increased development, more road construction, off-road vehicle travel, and the dumping of trash in our fragile desert environment. Humans are largely responsible for the loss and degradation of desert tortoise habitat in portions of the Mojave Desert and why the tortoise is now under federal protection. The introduction of non-native plants has also impacted the habit of the desert tortoise. It is important to manage the protected lands surrounding the valley and realize how each persons actions impact the desert tortoise. Red Rock Canyon, an area west of the valley, is home to Mojave Max, an approximately 40 year-old male tortoise, who is the representative for all threatened desert tortoises who live in the Mojave Desert.

Red Rock Canyon Conservation Message

Red Rock Canyon National Conservation Area represents some of the best geologic features, and unique plants and animals found in the Mojave Desert. The area provides scenic and recreational opportunities for hundreds of people each day, and is a *safe haven* for wild plants and animals of the Mojave Desert. It is protected by legislation passed in 1970 that set this 200,000-acre habitat aside as a natural setting for present and future generations to enjoy. The actions taken today by people who frequent this conservation area affect not only the plants and animals that live here but also future visitors to southern Nevada.

Federal Agencies/Clark County

Clark County has partnered with the United States Fish and Wildlife Service, Bureau of Land Management, National Park Service, and the U.S. Forest Service, the federal agencies who manage the natural habitat that surrounds the Las Vegas Valley, to bring a desert tortoise program to teachers and students throughout the district. The Multiple Species Habitat Conservation Plan and its Public Information Education committee sponsor the Mojave Max Emergence Contest and continuing education classes in the local schools.

Background on Mojave Desert

The Mojave Desert is among the hottest and driest deserts in North America. Temperatures range from over 120 degrees in the summer to below freezing in the winter. The average yearly rainfall measures only four to six inches and almost all of it is during the winter. At Red Rock Canyon, precipitation is close to 10 inches due to the snowfall in the winter months. The drying effects of the wind and the intense sunlight also contribute to the desert conditions.

Desert Tortoise – General Background

Tortoises are a type of reptile. Other reptiles include lizards and snakes. Reptiles have scaly skin, most lay eggs, and are cold blooded. Cold-blooded, or ectothermic (ecto = “outside”, thermic = “heat”), animals 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 reptiles basking in the

sun they are not trying to get a suntan but warming their bodies. The tortoise is most “comfortable” when its body temperature is between approximately 85 degrees and 95 degrees.

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 vary in colors ranging from light tan to yellow-brown to black - all of which blend in to the desert environment.

Tortoises can live to be nearly 60 in the wild and more than 80 in captivity.

Adaptations

The Desert Tortoise has made the Mojave Desert its home 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 (hibernation in mammals/birds) in the winter months
- aestivating in the heat of the season
- conserving water over long periods of time by retention in its bladder

Physical Traits

Its legs, with their strong ligaments on the forelegs give the tortoise the advantage when digging burrows (to escape the above ground temperature) which are critical to the reptiles survival. The forearms 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 characteristic dome-shaped shell. The shell has three basic parts: the plastron on the underside, the carapace covering the back with 13 large scutes arranged in a pattern on the top of the carapace, and the bony bridges that connect the plastron and carapace. Smaller scutes rim the perimeter of the carapace.

Both the male and female have a gular horn located on the front of the plastron. The horn is longer in the male and often upturned. Males use these in fighting with other males throughout the year and many times can flip the other male on its back. The opponent attempts to stand as high as possible to prevent this from happening.

Needs

Food

The tortoise has a horny beak for a mouth and no teeth. These herbivores - plant eaters - 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 annuals/flowers and grasses. Tortoises will eat the plants that are readily available, but they have foods that they prefer. 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 create dense patches of vegetation not normally found in a desert environment.

Water Conservation

Tortoises can go long periods of time without taking in water. A tortoise's bladder is capable of storing over a cup of water, to be reabsorbed by the body as needed. Much of the water intake comes from moisture in the grasses and wildflowers they consume in the spring. Tortoises will also drink from rain puddles, even constructing their own puddles by scraping shallow depressions in the soil to catch rain. A third source of water is the metabolic water from the break down of stored fat over time.

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. This may not be available. Therefore, it is important NOT to 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 incline may vary anywhere between 4 and 40 degrees. 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

overhead. In summer the protection provided by being under the surface prevents continued heating of the body to lethal temperatures. Tortoises use burrows to prevent freezing during the dormant season as well.

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 these burrows.

Seasonal Behavioral Traits

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. They typically enter long burrows, many of which have a characteristic half-moon shape entrance and can be more than 10 feet long. The burrow channel can conform to the shape and girth of the tortoise and may not even allow the tortoise to turn around except after reaching the end. This snugness is efficient for temperature regulation and helps maintain a slightly higher humidity in the burrow. During the dormant time, several tortoises may occupy the same burrow.

While brumating the tortoise is in an extended period of inactivity. The body slowly loses heat and stabilizes to the air temperature found in the burrow, about 40-60 degrees Fahrenheit. All body processes are slowed including the heart rate and respiration rate. Tortoises are not “asleep” like antelope ground squirrels, which hibernate, but their body metabolism does slow and they’re just waiting for warm weather again.

Aestivation

Burrows also provide protection from the intense heat of the desert. The ground in the Mojave Desert can reach up to 140 degrees 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 mornings and late afternoons or evening. The rest of the day a tortoise will retreat to the burrow. During aestivation, the tortoise is underground conserving energy and water during the **hottest** and driest part of the season.

Emergence

It is impossible to predict exactly when the tortoise will come out of its burrow in the spring. There are three factors that may influence the tortoise to emerge. 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, allowing them to begin to move. When the above ground temperatures permit the tortoise to move, some will walk out of their burrows. The amount of daylight each day is another factor. As spring approaches each day gets longer. The third, and most important 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.

Hatchlings

Baby tortoises – also known as hatchlings - hatch from eggs in late summer, approximately 80-120 days after being laid in early spring. They are less than two inches long and very vulnerable as the shell is pliable for the first five years of life and very little bone has formed under the scutes. Approximately one hatchling out of every 100 reaches maturity. Maturity does not occur until around age 15 or older in the wild. Once the tortoise emerges from the shell they are independent and live solitary lives except during mating season.

Outline of Program

* These are required elements in all programs

Today we are going to talk about the desert tortoise –

10 minute – Introduction / Background*

Introduce yourself and tell them the agency you represent. Explain a little about the habitat at Red Rock Canyon (Mojave Desert) and that it is the home of Mojave Max. Mojave represents all the tortoises that live in the wilds of Southern Nevada and he is important to our state.

2 minute – Conservation Message/Partnership with Clark County*

Discuss Mojave Max emergence contest, give them the website address, and explain how Clark County is sponsoring the contest because we are trying to raise the awareness of the community of the dangers Mojave Max faces.

Choose at least 2 from the following activities for the rest of your program. (Spend 20 minutes)

5 minutes - The Native American Story

How Tortoise Flew South for the Winter

Explain to the students that this is an Indian legend. This is how the Indians long ago made sense of how tortoises came to live in burrows. Read story

15 minutes – Description of Life Cycle

Mojave Max's life began when his mother used her hind legs to dig a hole (nest) in the ground and lay several eggs (1-14 eggs). Mojave Max's egg was only the size of a ping-pong ball (show ping-pong ball). Two to four months went by and Mojave grew big and strong inside his egg. Finally, Mojave was ready to face the outside world. The size of a silver dollar, Mojave had to be careful since his shell is still soft (like a baby's head after birth) and his mother is not around to protect him.

How can a tortoise fit inside of a small, round shell?

Show Pokey-Mon toy and explain how the hatchling folds into the shell. Because of the soft flexibility of the shell, it can grow and fit into a circular shape even though it begins to harden once it emerges.

Then discuss the dangers of having a soft-shell for first 5 years.

A soft-shelled tortoise makes a great lunch for ravens, coyotes, bobcats, and badgers. It is known in the tortoise world only one to five out of every 100 hatchlings will survive to be an adult. If you do make it, a tortoise may live to be 60 to 100 years old. Eventually, Max's soft shell hardens as more and more bone is formed underneath the scutes and his shell can be a defense against predators while outside his burrow.

10 minutes – Become a Tortoise Activity

Ask for a volunteer to come up and become the tortoise. Begin with the shell, or large aluminum pans, by placing the flat side in front. What is an advantage/disadvantage of a shell to the Desert Tortoise? Explain the shape, each of the three parts, number of large scutes on the carapace, the color of the shell, and the use of the horn. 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 dished) shaped plastron. Next, place the custom gloves on the student. Ask the students how the tortoise's flat scales on the forelegs might serve the tortoise? What would the tortoise use the large nails for? Explain 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.

10 minutes – Neighborhood discussion

4th-5th-grade

Have students compare their home and neighborhood to the habitat of the tortoise. Make a list on the board of similarities/differences.

What do you find in a neighborhood? You are looking for answers like home, apartment, condo (shelter), grocery store (food), sinks, faucets, swimming pools (water) streets, sidewalks (animal paths, trails).

Ask the students if all neighborhoods are the same? Some have houses, some apartments, schools, stores, grocery stores, etc. Do you know your way around your neighborhood, the shortcuts, who's friendly, who's not so friendly.

In the desert we have neighborhoods as well. And the Desert Tortoise selects certain parts of the desert to live in for survival. They have a better chance of survival in a particular habitat.

Tortoises seem to have a good sense of direction and use local landmarks to find drinking sites, mineral licks, and food sources. Tortoises are plant eaters, live in underground burrows, and their home range for a given tortoise may range between 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.

20–25 minutes – Tinfoil Tortoise activity

3rd through 5th

This activity is an outside activity. Make sure you allow time in your program to move from the classroom to the activity area. The activity should be done in a relatively quiet area, so take the students to a corner of the schoolyard away from students at recess.

Split the class into five groups and give each group a tinfoil tortoise. Briefly explain to them their tinfoil tortoise represents how a real tortoise is affected by temperature. 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. Give the groups 2 minutes to find the best place to put their tortoises in the area you

have selected for them. Select boundaries for the students to work in so you are able to control the group.

At the end of the two minutes, have them gather back at the meeting place for a 10-15 minute discussion. Discuss what makes a reptile a “reptile” and how the Desert Tortoise is able to survive in the Mojave Desert (burrows, brumation, and aestivation). Explain the tortoise can function between the temperatures of approximately 68 degrees and the upper 90’s.

What would happen if the tortoise gets too hot or cold? Also, they do not have long legs like we do, so they are not able to elevate their bodies up off the hot desert floor. Humans have only the feet touching but tortoises have their whole lower body close to a very hot surface.

Allow the tinfoil tortoises to sit at least 10 minutes to warm up. If the weather is too cold for the tinfoil to warm than refer to the temperature gauges attached to the tinfoil tortoises for comparison. 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.

Ask them why certain tortoises were hotter than others? Did it have to do with the area they were in? 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? Perhaps the type and condition of forage, water availability, and physiological status of the tortoise.

10 minutes – Thermometer activity

2nd through 5th

Hold up the large laminated thermometers and discuss with the students the different temperatures represented. One thermometer will indicate 40 degrees and one will indicate around 100 degrees. What would the tortoise be doing at a consistent temperature of 40 degrees in December (brumation) and what would they most likely be doing at a consistent temperature of 100 degrees or more in July (aestivation)? What about a temperature that was about 70 degrees (very sluggish), 85 degrees (most active), and what about 95 degrees (beginning to overheat – where’s the shade)? If the tortoise, due

to absence of shade or not locating a burrow, gets too hot they can panic and speed up, moving quickly. Then they could die from overheating.

15 minutes - Jeopardy (4th – 5th grades)

Set these questions up in categories and have each group of 3-5 students try to answer the questions together. Then all groups will come together and compare answers – each question is worth points. The group with the most points wins “Jeopardy.”

Answers

Questions

What is/are

Body

The tortoise digs its burrow with these
 Tortoise has 13 of these on the carapace
 Used to flip other males over
 Protective shell underneath the tortoise
 Protective shell forming back of tortoise

Nails/ front legs 100
 Large Scutes 200
 Gular Horn 300
 Plastron 400
 Carapace 500

Life History

Season Mojave Max will first appear
 Season baby tortoise hatches
 Life span of a tortoise
 Classification of animal discussed today that does not have an internal body temperature control
 The legal status of the Desert Tortoise

Spring 100
 Late summer 200
 60-80 years 300
 Reptile 400
 Threatened species 500

Places

The Desert Tortoise is this state’s symbol
 The desert we share with the tortoise
 The shelter a tortoise makes
 Area tortoise spends most of the day
 Where you can visit Mojave Max

Nevada 100
 Mojave Desert 200
 Burrow 300
 Underground 400
 Red Rock Canyon 500

Miscellaneous

Name of a baby tortoise
 What you do if you see a wild tortoise
 The Tortoise eat these exclusively

Hatchling 100
 Leave it alone 200
 Plants 300

Sleep state reptile enters during cold of winter	Brumation	400
Sleep state animal enters during hottest and driest part of summer	Aestivation	500

2 minutes - Tortoise Pledge*

1st through 5th

At the end have the students recite the tortoise pledge. Distribute pledge cards to the teacher and explain he/she will pass them out later. Have everyone hold up his or her right hand (you may have to show them which hand) and repeat after you. They are now official tortoise patrol members.

5 minutes - Conclusion *

Summarize adaptations and why brumation is so important. What can students do to protect the habitat of the desert tortoise.? Tread lightly, stay on approved roads

What would they do if they saw a tortoise in the wild? LEAVE IT ALONE. If it is injured or in the middle of a busy highway, stop safely, approaching from the front - move the tortoise gently several steps to the side of the road in the direction it is heading and if possible place it under a shrub/shade - keeping the plastron level to the ground.

What would they do if they see a tortoise in the city? DON'T RETURN IT TO THE WILD. Collect it safely, take it home, put it indoors in a cool place and immediately call the Tortoise Pick-up Service, 593-9027. The tortoise must be turned in by law. Do not release it in the desert, give it away, or keep it.

Pre-site activity

Add to website/Interact

1. Who Lives Here? from "Desert Tortoise Study Kit and Curriculum" Unit 2, page 22. Grades 1-2.
2. Reptile Advantage from "Desert Tortoise Study Kit and Curriculum" Unit three, page 4. Grades 1-3.
3. Desert Adaptation from "Desert Tortoise Study Kit and Curriculum" Unit one, page 30. Grades 3-6.
4. Adaptation Match from "Desert Tortoise Study Kit and Curriculum" Unit one, page 33. Grades 4-6

5. Desert Web of Life from “Desert Tortoise Study Kit and Curriculum” Unit two, page 27. Grades 6-8.

Post-site activity

Add to website/Interact

1. Hand out picture of tortoise to be colored. Grades 1-3.
2. Hand out tortoise word search. Grades 1-6
3. Desert Tortoise Folk Tales from “Desert Tortoise Study Kit and Curriculum” Unit three, page 8. Grades 4-6.
4. Tortoise Ranges from “Desert Tortoise Study Kit and Curriculum” Unit two, page 18. Grades 7-12.
5. Have students measure school yard and determine how many wild tortoises could survive in this space

More Ideas

Check out our website www.mojavemax.com

Tortoise Adoption – call 739-7113

Tortoise Group (Developing a Habitat) – 739-8043

Desert Tortoise as your Science Fair Project

Use your school website to display tortoise projects, stories, pictures

Some Schools with Desert Tortoise Habitats

Martha P. King Elementary– Boulder City

Booker Elementary