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Sonoran Institute

The Desert Discoveries and Desert Communities Environmental Education programs are a culmination of efforts by numerous National Park Service (NPS) employees at Saguaro National Park. Major contributions and support were also provided by many NPS Volunteers in Parks (VIP'S) without whom this program would not exist.

This guide incorporates program activities from Juntos: Maestros y Niños del Desierto. Juntos was originally developed in cooperation with teachers from the U.S., Mexico and the Tohono O'odham Nation by the Environmental Education Exchange for Organ Pipe Cactus National Monument and the surrounding tri-cultural region. Juntos provides an outstanding variety of pre-visit and post-visit activities for teachers and students to enhance their understanding and enjoyment of the Sonoran Desert and its peoples.

We extend our thanks to all who have made contributions to the environmental education programs at Saguaro National Park.

Juntos Materials Developed and Adapted for the National Park Service by:



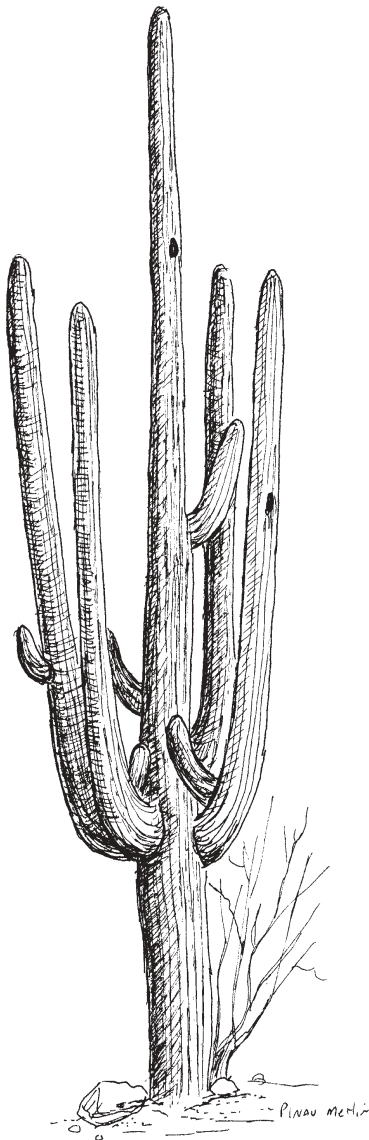
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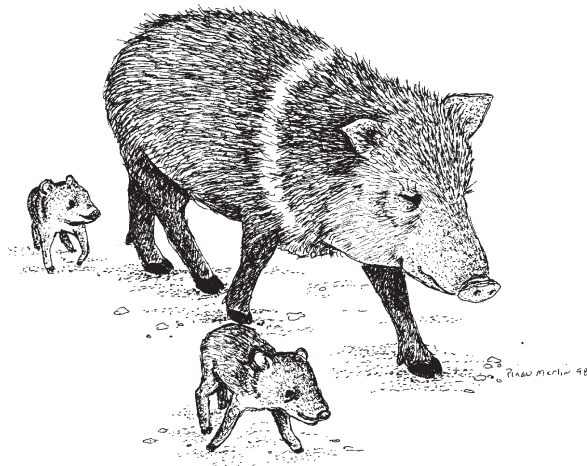
Introduction to the Guide

Welcome to Saguaro National Park's Teacher's Guide. This Guide was developed specifically for you, the teacher planning a field trip to either district of the park. The Introduction section of the Guide offers general background information about the plants, animals and people of the Sonoran Desert and Saguaro National Park. At the end of the Introduction section are several pages of suggested readings as well as a listing of other environmental education resources. Following sections provide a variety of hands-on activities which may be conducted before and after your visit to Saguaro National Park.



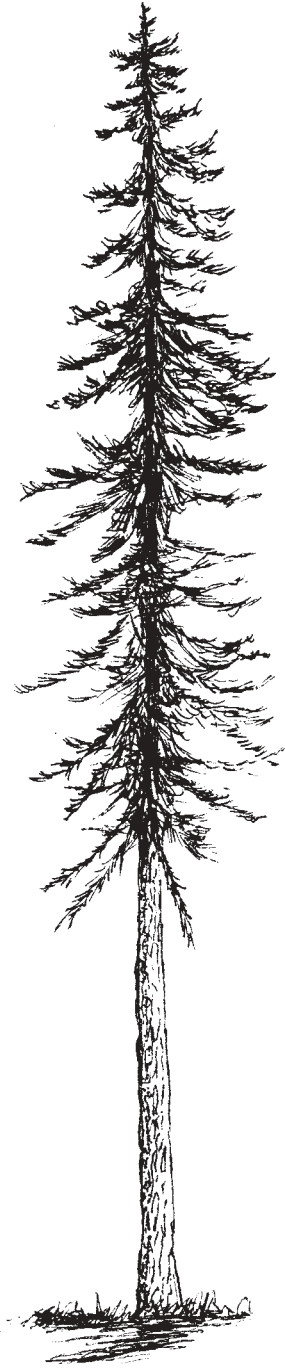
The Desert Communities program brings together environmental education materials developed at both Saguaro National Park (SNP) and at Organ Pipe Cactus National Monument (OPCNM). The introduction section was adapted from an earlier version of SNP's Teacher's Guide. The accompanying nine classroom activities were incorporated from *Juntos: Maestros y Niños del Desierto*, which is a tri-cultural environmental education program first developed at OPCNM. The activities do not necessarily need to be conducted in the order found in the Guide but have been arranged in that fashion to provide a logical progression of learning for your students. You are encouraged to review the Guide and its contents to assist you in preparing a unit on the Sonoran Desert.

We hope these materials will provide you and your students with a depth of information and activity options that will greatly enhance your study of the Sonoran Desert and its peoples.



Desert Communities

Theme, Goals, and Objectives



Theme

Saguaro National Park offers children the opportunity to learn about the diverse natural and cultural history of the Sonoran Desert through activities, games and exploration.

Goals

To provide a hands-on, curriculum-based program which will instill in students an awareness of the diversity of the Sonoran Desert and a sense of appreciation for nature.

To introduce students to Saguaro National Park and the mission of the National Park Service.

To impart a sense of stewardship toward the natural environment leading to a desire to preserve natural areas for future generations.

To create an awareness in students that resource issues have an impact on their lives, and to understand the role that the National Park Service plays in addressing and managing these issues.

Objectives

Students will be able to identify at least four of the more conspicuous plants that live in the Sonoran Desert.

Students will be able to describe the concept of adaptation and name at least three different adaptations that desert plants or animals use to survive in the Sonoran Desert.

Students will be able to explain at least two interrelationships between desert plants and animals.

Students will be able to list two wild foods the Hohokam gathered, two crops they farmed and two animals they hunted.

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Park Rules and Safety

To help preserve the natural beauty and the historic and scientific values of the park, and to protect students during their visit, the following regulations and safety messages must be adhered to. Please discuss the following rules and safety precautions with your students and chaperones before arriving at the park.

Mission of the National Park Service

The mission of the National Park Service clearly states that we are to protect and preserve Saguaro National Park, yet at the same time provide for the enjoyment of all people. Without the help of all visitors, this is an impossible task. Please do your part to help preserve this unique desert ecosystem.

- ◆ Collecting plants, rocks, feathers and other objects is prohibited in Saguaro National Park. Please leave everything for others to enjoy.
- ◆ Feeding or disturbing wildlife is prohibited. This is for your protection as well as theirs. Wild animals should always be treated with respect.
- ◆ Be aware of your surroundings. Saguaro National Park is home to several species of venomous animals. Be careful not to put your hands or feet where your eyes have not been.
- ◆ Trash cans are available at all trailheads and picnic areas. Please dispose of trash in an appropriate receptacle.
- ◆ Defacing or injuring plants or animals is strictly prohibited.
- ◆ Stay on the trail, walk behind your program leader and in front of the chaperone. Don't get lost, always stay with your group.
- ◆ Walk slowly on the trail, do not run.
- ◆ Most desert plants have spines or thorns that can inflict painful wounds; be careful when examining cacti or other plants.

In Case of Emergency

Please leave the appropriate visitor center phone number and address with your school in case they need to contact you or one of your students.

Saguaro National Park (EAST)
3693 South Old Spanish Trail
Tucson, AZ 85730
(520) 733-5153

Saguaro National Park (WEST)
2700 North Kinney Road
Tucson, AZ 85743
(520) 733-5158

Tips for an Enjoyable & Educational Experience

Field Trip Preparation

Your visit to Saguaro National Park will be a success if you prepare your students through classroom lessons and activities and do your best to follow these guidelines.

Groups - Divide one class into four groups. If combining two classes, divide each class in half for a total of four groups.

Name Tags - Have visible name tags on each student's outer garment, in large bold print. Please wear a name tag that identifies yourself as the "Teacher". Parents should also wear name tags that say "Parent".

Chaperones - We require one adult for every ten children to handle discipline problems if they occur. Adults are asked not to use tobacco products during the program.

Behavior - Remind students that they are going to be in an "outdoor classroom" and we expect them to behave. Students are encouraged to ask questions while on their field trip.

Clothing - Students and adults should wear comfortable walking shoes. Open-toed shoes are not permitted. Weather in the desert can be very unpredictable. Consider bringing jackets, hats, sunglasses and sunscreen.

Water - Adults and students should carry water. Canteens and plastic water bottles work well. Do not use glass containers. Drinking water is not available at either program site.

Photography - Teachers or students may wish to bring along a disposable camera to record the field trip. You can use these photos to create a great display back in the classroom.

Lunch - Have students bring sack lunches and enjoy a picnic after your program. Trash cans and restrooms are available at the picnic areas, however, drinking water is not available.



National Park Service



In the 19th century, most Americans viewed nature as something to be subdued and conquered. Most people did not feel that preserving natural areas in public ownership was necessary or desirable. Many people felt that America's natural resources and wild areas were inexhaustible. However, as wilderness areas began to disappear and America's cultural history began fading away, some citizens saw a need to protect the most outstanding examples of our nation's heritage.

George Catlin, noted painter of the American Indian, first expressed the national park idea. In 1832, on a trip to the Dakotas, Catlin became concerned about the effects of westward expansion on Native American civilization, wildlife and wilderness. Soon after his trip he wrote that someday he wished this whole ecosystem might fall under "some great protecting policy of the government preserved ... in a magnificent park ... a nation's park, containing man and beast, in all wilderness and freshness of their nature's beauty."

In 1864 the Federal Government moved to protect a grand natural landscape when it granted Yosemite Valley and the Mariposa Big Tree Grove to the state of California to be "held for public use, resort and recreation ... inalienable for all time." In 1872, eight years later, Congress reserved the spectacular area of Yellowstone in Montana and Wyoming as a "public park or pleasuring ground for the benefit and enjoyment of the people." If the territories of Montana and Wyoming had been states at that time, Yellowstone probably would have been turned over to them, just as Yosemite had been given to California. Instead, it remained under the Department of Interior as Yellowstone National Park, the world's first national park.

Four more national parks were created in the 1890s; Sequoia, General Grant (now Kings Canyon), Yosemite and Mount Rainier. Even though these national parks were established under the Department of Interior, there were no funds to manage them. The task of developing and protecting these treasures fell to the Secretary of War.

After the turn of the century, concern about looting and destruction of Native American ruins and artifacts in the Southwest inspired a new category of protected areas. In 1906 Congress authorized the Antiquities Act. This act allowed the President of the United States to proclaim features of historic and scientific interest as national monuments. President Theodore Roosevelt proclaimed Devils Tower National Monument in Wyoming as the first. Future national monuments would range from cliff dwellings such as Montezuma Castle in Arizona to large natural features like Death Valley in California.

By 1916 the Department of Interior had jurisdiction over 14 national parks and 21 national monuments, but all were without effective protection or administration. In that year, congress created a new bureau within the Department of the Interior, the National Park Service. The National Park Service was created to administer these park areas with the following mission: "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as to leave them unimpaired for the enjoyment of future generations."

Since its establishment in 1916, the National Park Service has grown to include more than 380 significant natural, cultural and historic areas in the United States.

The employees of the National Park Service are just as dedicated to our original mission today as we were back in 1916. By preserving America's special places, the National Park Service has helped maintain the history, culture and beauty that is unique to the United States.

A National Park Service map is enclosed for use in the classroom.



Saguaro National Park



Saguaro National Monument was established in 1933 by President Herbert Hoover. The original legislation creating the monument included an area at the base of the Rincon Mountains where the saguaro cactus grew, as well as a large part of the Rincon Mountains themselves. The Rincon Mountain District encompasses an area of over 66,000 acres and includes 6 different biotic zones. These distinct biotic zones are: desert scrub, desert grassland, oak woodland, oak-pine woodland, pine woodland and mixed conifer forests.

In 1961, President John Kennedy expanded Saguaro National Monument to include a portion of the Tucson Mountains on the west side of town. The Tucson Mountain District encompasses an area of over 24,000 acres and contains an incredibly dense concentration of saguaro cacti.

In that things in nature are constantly changing, so too has Saguaro National Monument. On October 14, 1994, President Bill Clinton signed a piece of legislation which changed Saguaro from a National Monument to a National Park. The difference between a monument and a park is as follows: The President of the United States was given power to establish national monuments with the passage of the Antiquities Act of 1906. If the President signs a piece of legislation requesting the establishment of a monument, it is immediately created. To establish a new national park, or re-designate a monument to a park, the legislation must pass through Congress before going to the President for signature.

For more detailed information about Saguaro National Park, please refer to the park map and guide enclosed with this Guide or visit the National Park Service home page at www.nps.gov. If you would like to go directly to Saguaro National Park's home page, use www.nps.gov/sagu.

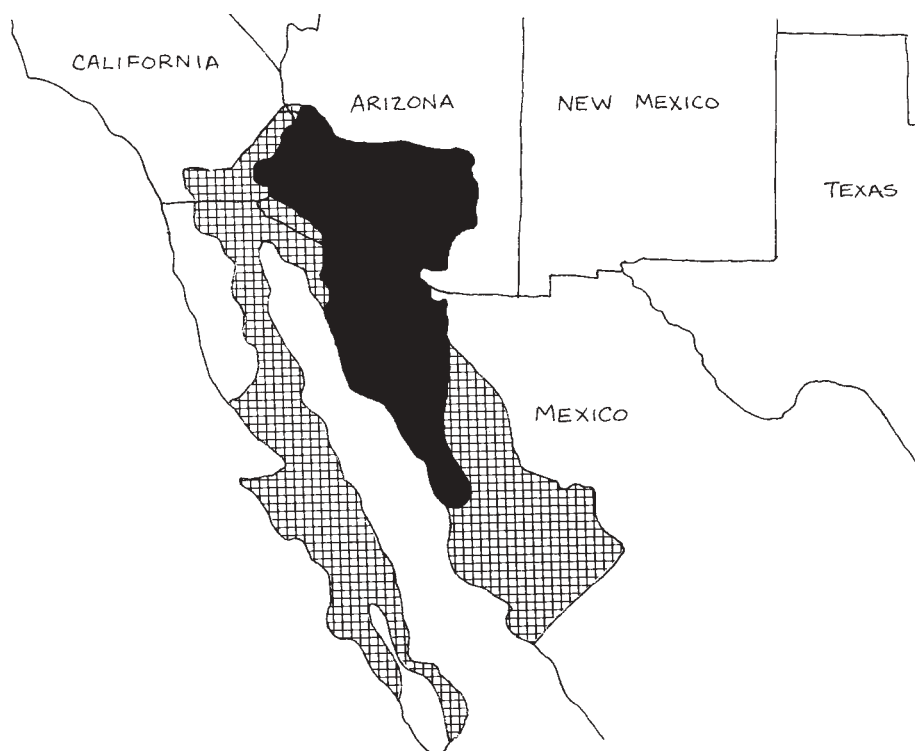
The Sonoran Desert

There are four major deserts found in North America; the Sonoran, Mojave, Great Basin and Chihuahuan. All are found in the western half of the United States, with portions of the Sonoran and Chihuahuan Deserts extending into northern Mexico. The Sonoran Desert covers nearly 120,000 square miles, about 40,000 of which are in southern Arizona.

The Sonoran Desert is often said to be the most diverse desert found in North America due to its varied and abundant vegetation. It can also be one of the hottest. Summer temperatures commonly reach 100+ degrees Fahrenheit (38 degrees Centigrade) for 90 consecutive days. Winter temperatures are normally more moderate, although freezing temperatures are not uncommon.

Rainfall comes in two distinct seasons, summer and winter. Summer monsoons are intense, fast-moving thunderstorms that often result in torrential flash floods. The monsoon season generally begins in early July and extends through August. The gentle rains of winter usually start in early December and extend through February. On average, total annual precipitation is approximately 12 inches. Although precipitation may be erratic and unreliable, the cycle of rain, separated by drought, governs life in the desert.

The Sonoran Desert is the only place in the world that the saguaro cactus grows naturally. However, they do not grow in all parts of the Sonoran Desert. The crosshatch on the map below represents the entire Sonoran Desert, while the solid black represents the range of the saguaro cactus. Another columnar cactus sometimes confused with the saguaro is the cardon. The cardon cactus grows in the Baja area of Mexico as well as parts of the mainland, the saguaro does not grow anywhere on the Baja peninsula.



Desert Animals

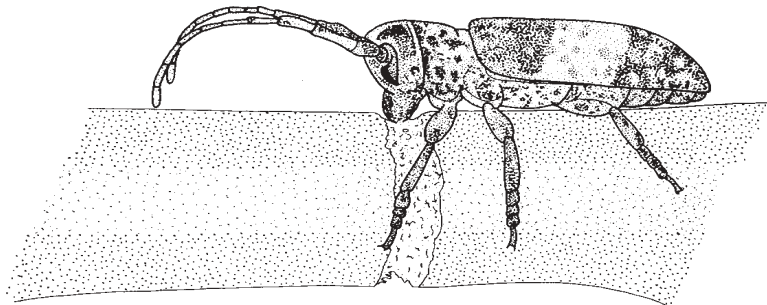
Bird species are abundant and diverse throughout the Sonoran Desert, but are particularly numerous in the upland desert community. Gambel's quail, black-throated sparrow, verdin, black-tailed gnatcatcher, roadrunner, Gila woodpecker, mourning dove, white-winged dove, cactus wren, curve-billed thrasher, canyon towhee, and house finch are all common.

Mammals in the Sonoran Desert are plentiful but not always easily seen. Many species are nocturnal, or active only at night. Animals like desert mule deer and javelina may be seen out during the day, but often restrict their movements to night, especially during the summer. The observant hiker is constantly looking for signs that animals leave behind. Burrows, scat, nests, and tracks are usually easy to find, and are often the only indication that some animals are present. Ground squirrels, desert cottontails and coyotes are the most commonly seen mammals.

Many species of reptiles and amphibians call the Sonoran Desert home. Lizards are the most commonly seen reptiles in the park with 17 species that call Saguaro National Park home. Over 25 species of snakes are found at all elevations of the park, both venomous and non-venomous. All snakes should be treated with respect when encountered. Desert tortoises live in the park as well, but since they spend most of their life hidden inside a burrow, few people ever see them. Amphibians are also present in the desert wherever and whenever water is available. Several species of toads come out during the summer monsoons to mate and lay eggs in shallow pools of water. Breeding, hatching and development of young occur in a few short weeks during the summer rainy season. The remainder of the year, these toads live underground.

Without a doubt, arthropods are the most abundant type of animals in the park. The arthropods include; insects (6 legs), spiders (8 legs), and centipedes and millipedes (one or more pair of legs per body segment). Warm, moist summer nights are a great time to see arthropods like the tarantula. The dark colored males emerge from their burrows to search for mates. As with many species of spiders, the female will kill and eat the male after mating. That is, if she can catch him. Care should always be taken when looking at spiders, because they are all venomous. Fortunately only a few spiders have extremely toxic venom like that found in the black widow or Arizona recluse. One of the many interesting insects found in the Sonoran Desert is the mesquite twig girdler (seen below). Using its strong mouthparts, the adult female girdles a small mesquite branch by gnawing the bark all the way around. She then lays several eggs in the dying portion of the branch. Later, when the larvae emerge from the eggs, they feed on the dead and decaying portion of the branch.

Pamphlets listing the mammals, amphibians, reptiles and birds found in the park are available for purchase in either visitor center.



Desert Plants

For an organism to survive in the Sonoran Desert, it must utilize some type of adaptation. In general terms, the three most common survival techniques are to endure, evade or escape unfavorable conditions.

Cacti are a good example of the plants that **endure** this arid climate. They have the ability to store water within their tissues. This moisture is then available to the plant during periods of drought. Other succulent plants, such as the yucca, can also store water in fleshy roots and stems. Mesquite and palo verde trees also endure the summer heat. Instead of storing water, they lose their leaves during drought or whole branches may die during periods of extreme drought.

Plants that **evade** the heat of summer become dormant or inactive during periods of drought. Some may lie dormant underground for weeks, months or even years, waiting for favorable growing conditions to return. The Ajo lily is probably one of the best known plants that uses this form of adaptation.

Some plants simply **escape** the summer heat by casting their seeds to the ground and dying. This method is most characterized by annual wildflowers. Their individual lives may be short, but the species lives on.

The **saguaro** cactus can be found throughout the lower portions of Saguaro National Park. A saguaro begins its life as a tiny seed slightly larger than the period at the end of this sentence. Before the saguaro can grow to maturity it must endure many hazards such as; being eaten or trampled by animals, being washed away by heavy floods, weeks or months of drought, intense heat, and occasional freezing. The saguaros best chance for survival comes if it is protected by a "nurse tree" like the mesquite, ironwood or palo verde. With adequate water, soil, and protection from the elements, a saguaro may live for 150 - 200 years and reach a height of 50 feet. In its lifetime, a saguaro may produce some 40 million seeds. Of these millions, only a few are likely to survive to maturity.

Another cactus that lives here, and is sometimes confused with a young saguaro, is the barrel cactus. The **fishhook barrel cactus** can be identified by its long curved spines which resemble a large fishing hook. Its pleats grow up the plant in a slight spiral fashion, unlike the saguaros which grow straight up. One of the most descriptive names given to the barrel cactus is the "compass cactus", due to its distinct, southwest lean.

There are also many types of segmented cacti found here. The Opuntia family differs from the columnar family in that the entire plant consists of many segments or pieces attached end on end. Unlike the saguaro, segmented cacti can grow from a piece that has fallen off. **Cholla** cactus are particularly efficient at this method of reproduction. Their segments dislodge easily and may stick to an animal (such as a deer) that brushes against the parent plant. If the segment falls from the deer in a favorable growing place, it may grow into a new plant. Cholla segments dislodge so easily that one only has to barely touch them to get stuck. This adaptation has earned the chain fruit cholla its common name of jumping cactus, as many people believed it "jumped" on them as they passed by.

The **prickly pear** cactus is the most common cactus found in North America. It is easily identified by its flat, round pads. The large, yellow flowers of the prickly pear appear in late spring and after pollination, mature into large, purple fruits. Both the pads and fruits are an important year-round source of food for desert animals.

Desert Plants (Cont.)

The **creosote bush** is one of the hardiest, most widely distributed plants in North American deserts. Creosote can reproduce by sprouting new plants from existing root stock. In this way, what appears to be many individual plants may actually only be one plant, with many parts. The most identifiable characteristic of creosote is its pungent, tar-like odor, which is especially noticeable after a rain. Creosote bushes are helpful in controlling erosion, as their roots catch and turn windblown sand and soil into mounds, and they are extremely abundant.

The **ocotillo** is a tall, slender plant reaching a height of 10 - 20 feet. Ocotillo generally have from 5 to 30 thorny stems growing from a central base. During much of the year the ocotillo appears dead, however, with a little rainfall the plant will be covered with brilliant green leaves. After a drought, the leaves will turn brownish/orange and fall off. This sequence may occur many times throughout the year. Homesteaders often made “living fences” by planting ocotillo stems close together.

The **jojoba** is a woody shrub that averages 2 to 10 feet in height. Its leaves are usually 1 to 2 inches in length and covered with a thick, waxy coating which helps to reduce water loss. The edges of jojoba leaves also tend to point upward toward the sky, which reduces the amount of leaf surface exposed to the sun. Jojoba plants are either male or female. Most of the year they can be distinguished by close examination. Female plants produce a nut about 1/2" long. The male plants produce an inconspicuous cluster of small, green flowers.

The three largest native trees found in the lower elevations of the park are the mesquite, ironwood and palo verde. All three of these trees are in the legume family and are well adapted for life in the desert. The **mesquite** tree has a long tap root that extends down to underground water sources. It is the dominant tree along larger washes in the east district of the park. One of the most numerous trees in the west district of the park is the **ironwood** tree, which gets its name from the density of the wood. Ironwood is so dense, it will not float in water. The **palo verde** tree is common on the hillsides of both districts of the park and can be distinguished by its pale green trunk and branches. The coloration is the result of chlorophyll within the woody tissues of the tree, which allows the tree to conduct photosynthesis in the sticks and stems of the plant as well as its leaves. In Spanish, palo verde translates into “green stick”. The palo verde is also the state tree of Arizona.

Desert Adaptations (Plants)

Since plants are unable to move, they must utilize some type of physical adaptation to survive. Listed below are a few of these specialized adaptations used by Sonoran Desert plants.

Like all green plants, the saguaro cactus must make its food through the process of photosynthesis. However, to do so requires that the pores (stomata) of the plant remain open long enough to collect an adequate amount of carbon dioxide. If these pores were open during the day, the plant would lose precious water through evaporation. Saguaro cacti, as well as a number of other succulent plants, offer a solution to the problem. They use a process by which they collect carbon dioxide at night when temperatures are lower and humidities are higher. The carbon dioxide is converted to an organic acid (primarily malic acid) and stored in large vacuoles until the following day when sunlight is present. The plant is then able to complete its process of photosynthesis.

The seeds of many wildflowers (annuals), are coated with chemical inhibitors that must dissolve before the seed can germinate. These inhibitors respond to exacting rainfall and temperatures before they will dissolve. This adaptation only allows the germination of seeds in years that provide enough water for the plant to survive and reproduce.

Desert Adaptations (Animals)

Many of the animals in the Sonoran Desert exhibit both physical and behavioral adaptations that aid in their survival. Listed below are a few of these specialized adaptations used by Sonoran Desert animals.

Animals are mobile and can escape heat by engaging in a number of tactics. They might rest in burrows or depressions under bushes during the hottest part of the day, becoming active in the cool of morning or evening. Many others simply wait for night to hunt or forage. Birds and mammals in arid climates usually have smaller body sizes, larger ears and lighter coloration than their northern counterparts. Javelina, deer, birds and many other desert animals are not capable of sweating to cool themselves off, nonetheless, they are able to release heat through their respiratory system, which is called panting. Spadefoot toads bury themselves underground and encase their body in a thin, self-made membrane to conserve moisture. They may stay dormant underground for long periods of time. When the summer rains come, the steady beat of raindrops on the soil triggers them to dig out. The adult toads only concern is to find a mate and lay eggs in one of the temporary pools of water. The eggs hatch and change into young toads in a matter of weeks to compensate for the short availability of water.

The nocturnal kangaroo rat is a specialist at desert living. It may go several months without drinking a single drop of free water. Kangaroo rats are able to do this by a complex chemical process that actually creates water from the digestion of its primary food, dry seeds. Additionally, kangaroo rats seal off their burrow entrances during the day to keep the temperature lower and humidity higher.

The Hohokam People

Tucson is an ancient city. Long before the Spaniards and missionaries arrived, there were Native American villages existing throughout the Tucson basin. Discovery of these ancient homes and artifacts provides evidence of the lifestyle of these early Native Americans.

Hohokam is the name given to the Native American people that lived in central and southern Arizona. The word Hohokam comes from the Pima language and means "those who have gone away". No one knows for sure when the history of the Hohokam began or where they originated, however, we do know that they lived in the Tucson Basin from 300 A.D. until around 1450 A.D. when their culture seems to have disappeared.

The Hohokam were desert farmers. They raised corn, beans, squash and cotton. Their civilization developed the greatest system of irrigation canals ever to be established prior to modern peoples. More than 1,000 miles of canals were dug over many years. Some of these canals were up to 30 feet wide and 10 feet deep. Since all of them were dug by hand, this accomplishment is widely admired. Animals were hunted and trapped to supplement the food that they grew. The Hohokam also collected the fruits of prickly pear and saguaro cactus as well as the seed pods from legume trees. The desert provided a large variety of materials for subsistence.

The Hohokam lived in pit houses, the floor of which was dug into the ground. Over this pit, a structure of wood, brush, and grass was built. Lastly, a layer of caliche was added to the outside of the structure. A main entrance and a central firepit, on which much of the cooking was done, completed the home. The villages the Hohokam people lived in had centrally located ramadas, which were used for grinding and preparing plant foods. They also built a few "great houses", like Casa Grande, located near present day Coolidge, Arizona. Archaeologists are not sure why the Hohokam built these multi-storied structures. Despite the fact that only the most basic of tools were available to the Hohokam, they made many tremendous accomplishments.

Included in daily life were tasks such as basket and pottery making and the crafting of shell jewelry. Due to their sedentary lifestyle, the culture of the Hohokam was able to develop well beyond that of any earlier people.

No one knows for sure what happened to the Hohokam. Archaeologists only have theories. They may have been driven away by drought, a lack of food or the hard life of the desert. One theory suggests that intense rains may have destroyed many of their irrigation canals, severely limiting their ability to produce food.

Some people believe that the Hohokam have not gone away at all. They believe that the Tohono O'odham are direct descendents of this great civilization.

Natural History

Crossword Puzzle Clues

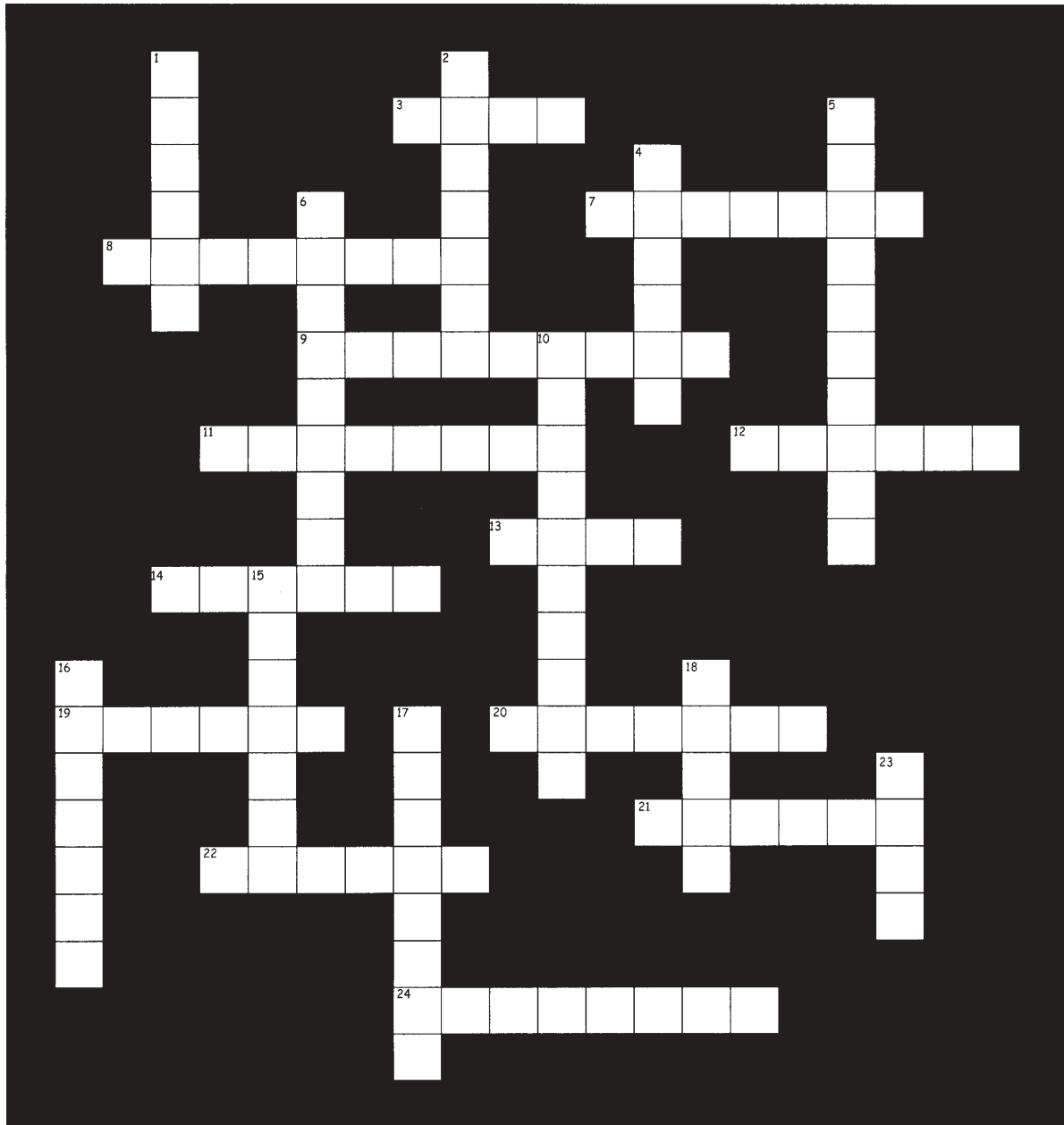
Down

1. The Sonoran _____.
2. Another name for the white-throated woodrat.
4. A warm blooded animal with hair and fur is called a _____.
5. The way an animal adjusts to survive in its environment.
6. A meat eating animal.
10. A bird that would rather run than fly.
15. _____ National Park is near Tucson, Arizona.
16. The study of living things in the environment.
17. A desert animal that carries its home on its back.
18. A place in nature that a plant or animal is best suited to live in.
23. A dry creek, sometimes having water in it.

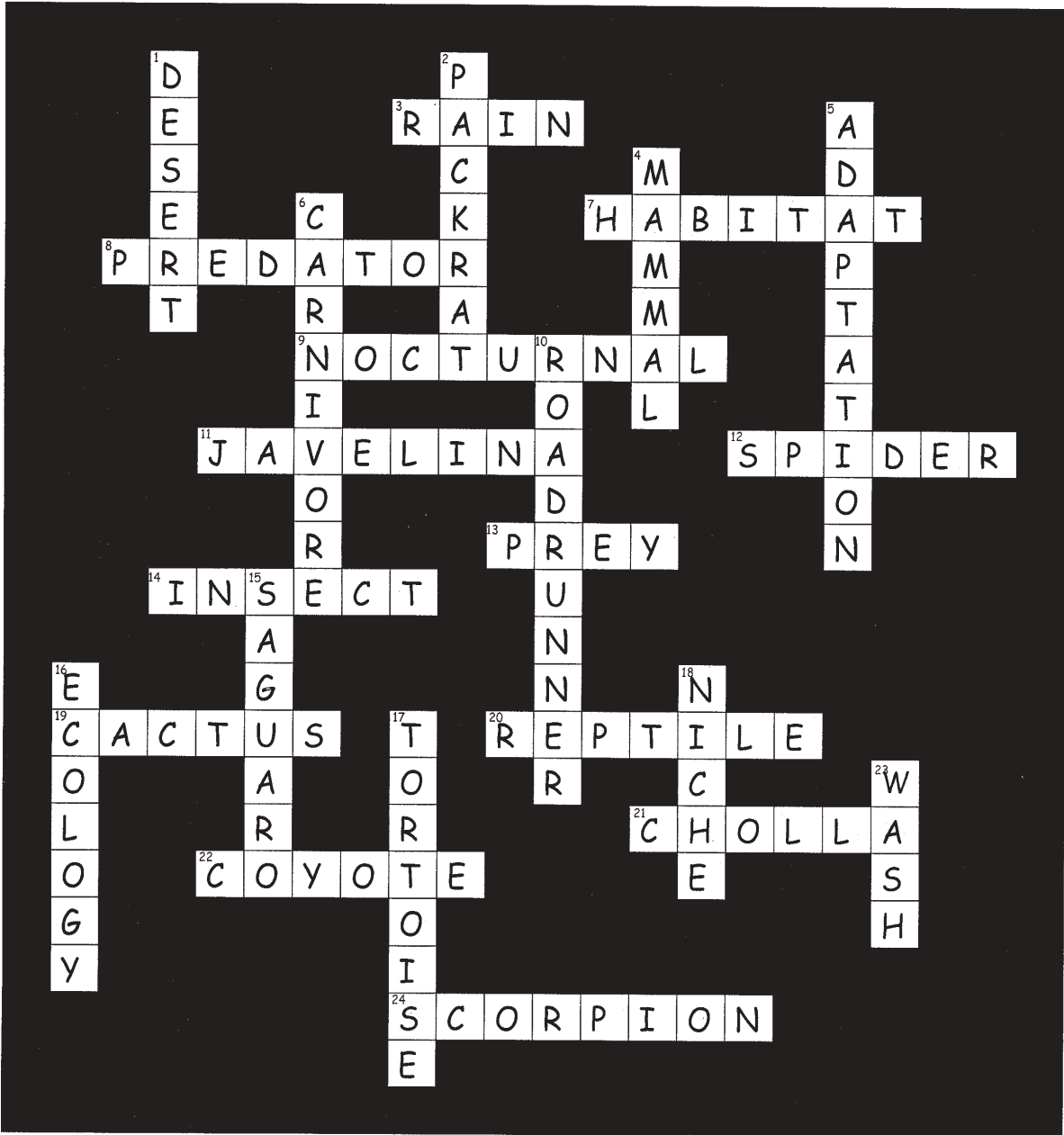
Across

3. The Sonoran Desert receives 10-12" of _____ per year.
7. An area in which an organism is adapted to live.
8. An animal that preys on other animals.
9. A _____ animal hunts at night.
11. A desert animal that looks like a pig.
12. A _____ has eight legs.
13. An animal that is hunted and eaten by other animals.
14. An arthropod with six legs.
19. A type of desert plant that has spines.
20. A cold blooded animal with scales.
21. Jumping _____.
22. A desert mammal that looks like a dog.
24. An arachnid that has a stinger on its tail.

Natural History Crossword Puzzle



Natural History Crossword Puzzle - Answers



Cultural History

Crossword Puzzle Clues

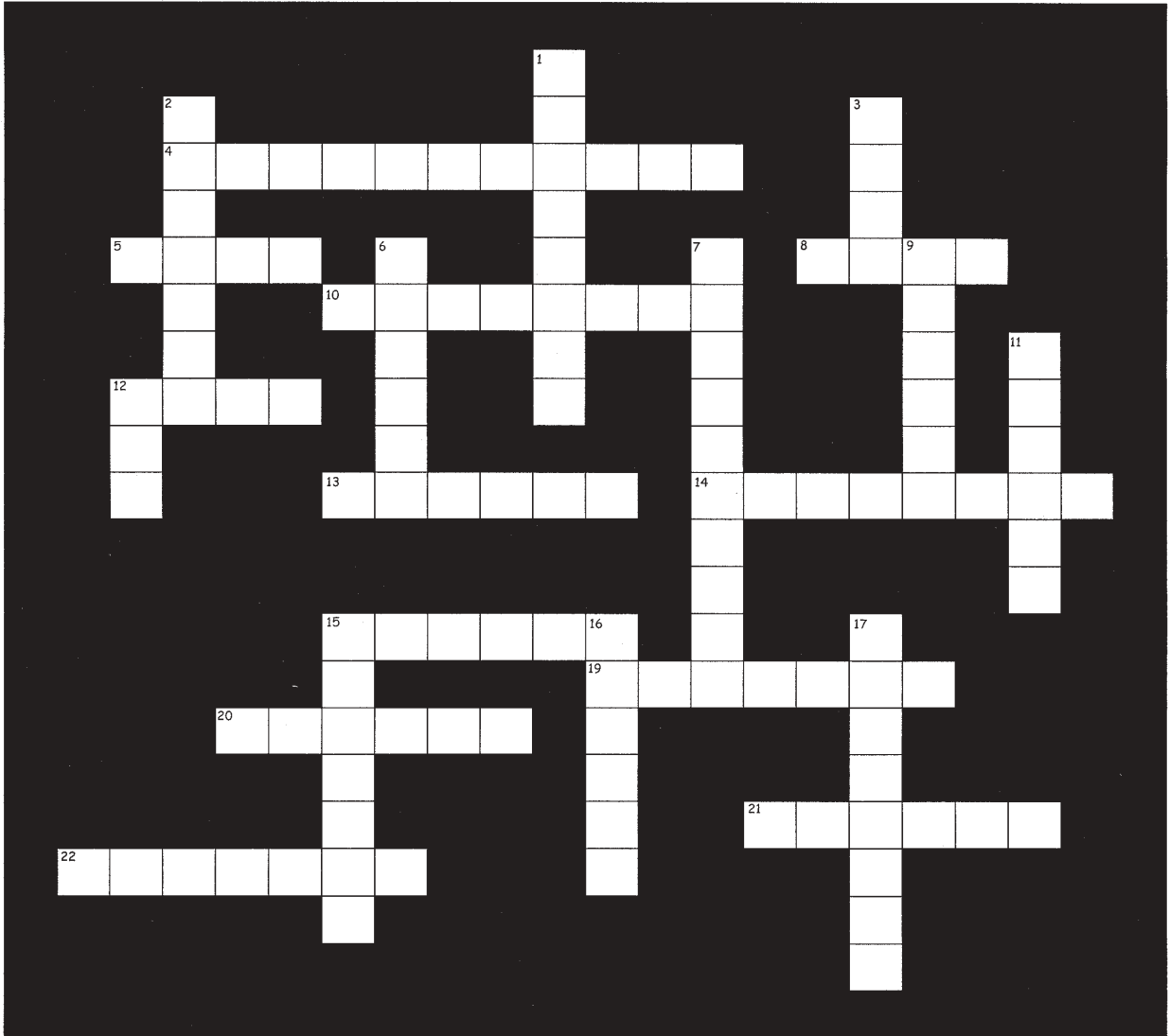
DOWN

1. A dwelling dug partially into the ground and framed with wood.
2. The hard soil of the Tucson basin.
3. A stone held in the hand which was used to grind corn.
6. The name of the country located south of Arizona is _____.
7. A design created by pecking into the surface of a rock with another rock.
9. A free standing sun shade and the center of a Hohokam family's living area.
11. The Hohokam built over 1,000 miles of _____ to irrigate their crops.
12. The only domestic animal of the Hohokam.
15. Vessels which are made from clay.
16. A name for broken pieces of pottery.
17. The art of making vessels from plant fibers like yucca and beargrass.

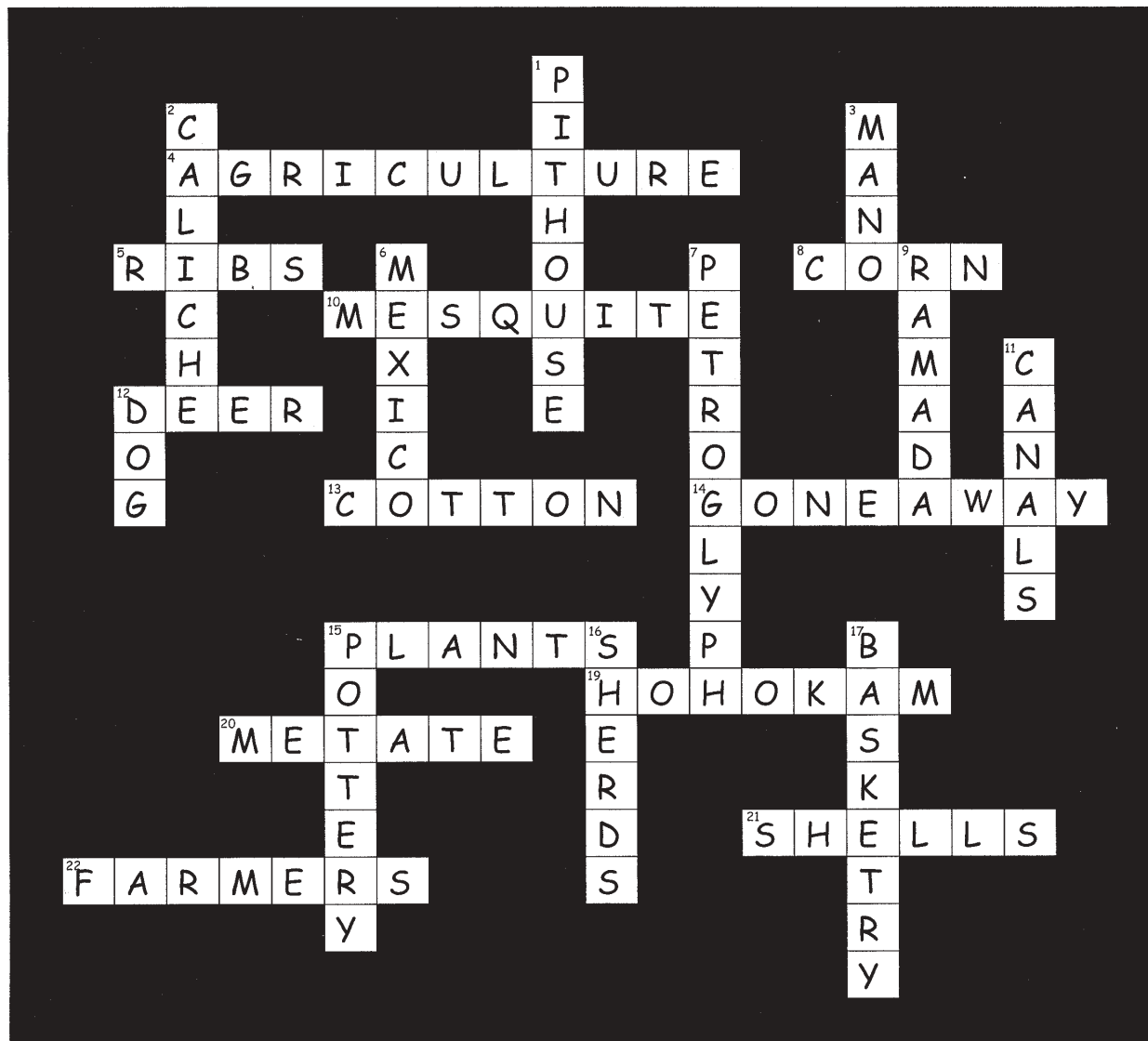
ACROSS

4. The cultivation of soil and the production of crops.
5. The part of the saguaro used for making roofs on ramadas.
8. The main crop grown by the Hohokam.
10. A desert tree whose beans can be ground into flour.
12. One of the more important sources of meat for the Hohokam.
13. Hohokam clothing was made from animal hides and _____.
14. What Hohokam means when translated into english. (two words)
15. The Hohokam diet consisted mainly of _____, not meat.
19. Native Americans who lived in the Tucson basin from about 300 A.D. to 1450 A.D.
20. A grinding surface which is made of stone.
21. The Hohokam traded pottery and other goods for _____, which they made into jewelry.
22. The Hohokam were not only hunters and gatherers, they were also _____.

Cultural History Crossword Puzzle



Cultural History Crossword Puzzle - Answers



Suggested Book List

REFERENCE BOOKS

Sonoran Desert
Christopher Helms
KC Publications, Inc.

All About Saguaros
Carle Hodge
Arizona Highways

*Saguaro: A View of Saguaro National Monument
and the Tucson Basin*
Gary Paul Nabhan
Southwest Parks and Monuments Association

House in the Sun
George Olin
Southwest Parks and Monuments Association

Discovering the Desert
William McGinnies
University of Arizona Press

Desert Plants - Rincon Mountains
Bowers and McLaughlin
University of Arizona Press

Desert Plants - Tucson Mountains
Rondeau, Van Devender et al
University of Arizona Press

Lets Explore the Desert - Family Go Guide
Evans
Arizona Sonora Desert Museum

Wildlife of the North American Deserts
Cornett
Nature Trails Press

Venomous Animals of Arizona
Smith
The Arizona Board of Regents

The Life of the Desert
Ann and Myron Sutton
McGraw Hill

Those Who Came Before
Robert and Florence Lister
Southwest Parks and Monuments Association

Hohokam Indians of the Tucson Basin
Georgonis and Reinhard
University of Arizona Press

Southwestern Indian Tribes
Tom Bahti
KC Publications, Inc.

Gathering the Desert
Gary Paul Nabhan
University of Arizona Press

Messages in Stone
Wm. Michael Stokes
Wm. Lee Stokes
Starstone Publishing

Indian Rock Art of the Southwest
Polly Schaafsma
University of New Mexico Press

Learning About Insects of the Southwest
Floyd Werner and Carl Olson
Fischer Books

Field Guide to the Plants of Arizona
Anne Orth Epple
LewAnn Publishing Company

Southern Arizona Nature Almanac
Roseann and Jonathan Hanson
Pruett Publishing Company

A Field Guide to Desert Holes
Pinau Merlin
Arizona Sonora Desert Museum

A Natural History of the Sonoran Desert
Arizona Sonora Desert Museum
University of California Press

Suggested Book List (con't)

CHILDREN'S BOOKS

Easy Field Guides of Arizona

Mammals, Birds, Trees, Snakes, Insects, Cactus, & Petroglyphs
Primer Publishers

Desert Giant; The World of the Saguaro Cactus

Barbara Bash
Little, Brown and Company

The 100 Year Old Cactus

Anita Holmes
Four Winds Press

The Desert is Theirs

Byrd Baylor
MacMillian Publishing Company

Desert Voices

Byrd Baylor
MacMillian Publishing Company

Cactus Hotel

Brenda Z. Guiberson
Henry Holt and Company, Inc.

I'm in Charge of Celebrations

Byrd Baylor
MacMillian Publishing Company

When Clay Sings

Byrd Baylor
MacMillian Publishing Company

Creatures of the Desert World

National Geographic Society
(Pop-up book)

Don't Call Me Pig! A Javelina Story

Conrad P. Stora
Resort Gifts Unlimited, Inc.

The Three Little Javelinas

Susan Lowell
Northland Publishing

One Small Square - Cactus Desert

Donald M. Silver
Learning Triangle Press

Habitats - Saguaro Cactus

Paul and Shirley Berquist
Children's Press

Cactus Cafe - A Story of the Sonoran Desert

Kathleen Weidner Zoehfeld
Trudy Corporation

BOOKS WITH NATIVE AMERICAN MYTHS/STORIES

A Pima Remembers

George Webb
University of Arizona Press

By the Prophet of the Earth

L.S.M. Curtain
University of Arizona Press

The Papago and Pima Indians of Arizona

Ruth Underhill
Filter Press

Sing Down the Rain

Judi Moreillon
Kiva Publishing Inc.

BOOKS WITH MEXICAN AMERICAN MYTHS/STORIES

Elena and the Coin

Laura Orabone
Center for Desert Archeology

Vocabulary List

Adaptation - Any characteristic which helps an organism survive in its environment.

Caliche - A type of desert soil with a high percentage of calcium.

Camouflage - Blending in with the surrounding landscape using color and patterns.

Carnivore - An animal that eats meat.

Chlorophyll - The green matter inside plants that is essential for photosynthesis to occur.

Community - A group of plants and animals living in the same environment.

Conservation - The wise use or preservation of natural resources.

Consumer - Any organism that uses, rather than produces food.

Decomposer - An organism that breaks down the substance of dead organisms.

Desert - An area that, on average, receives less than 10 inches of rain per year.

Ecology - The study of the relationships between living things and their environment.

Ecosystem - A system formed by the interaction of a community of organisms with their environment.

Environment - All the influences which affect a living thing.

Evaporate - To change from a liquid to a vapor.

Food Chain - A transfer of food energy from one organism to another.

Food Web - A group of interdependent food chains.

Habitat - A specific area in which an organism has adapted to live.

Herbivore - An animal that eats plants.

Hohokam - Native Americans that lived in the Tucson basin from approximately 300 A.D. to 1450 A.D.

Interdependence - The reliance of organisms on each other for survival.

Irrigation - To supply land with water by means of ditches.

Mano - A grinding stone held in the hand.

Metate - A grinding surface made out of stone.

National Park Service - A Federal agency that protects and preserves places of cultural, historical, or natural significance throughout the United States.

Niche - A place in nature that a plant or animal is best suited to live.

Nocturnal - Animals that are active at night.

Nurse Plant - A plant that shades and protects another plant.

Organism - Any plant or animal life form.

Omnivore - An animal that eats both plants and animals.

Petroglyph - A human-made design created by abrading the surface of a rock.

Photosynthesis - The process by which green plants make their food.

Pit House - A dwelling which has a wood frame and a cover made of mud.

Predator - An animal that hunts and eats other animals.

Prey - Animals that are eaten by other animals.

Wash - Low lying sandy or rocky area which floods during rainy seasons and is dry the rest of the year.

Environmental Education Resources

The following organizations are actively involved in environmental education and can supply excellent resource materials, programs and workshops. For more detailed information on organizations that provide environmental education opportunities, consult the Tucson Basin Environmental Education Guide. Call the Environmental Education Exchange at (520) 670-1442 to obtain a copy of this guide.

Oracle Center for Environmental Education

P.O. Box 700
Oracle, AZ 85623
(520) 896-2425

Arizona Sonora Desert Museum

2021 North Kinney Road
Tucson, AZ 85743
(520) 883-1380

National Audubon Society

700 Broadway
New York, NY 10003-9501
(212) 979-3000

The Environmental Education Exchange

P.O. Box 2630
Tucson, AZ 85702-2630
(520) 670-1442

International Wildlife Museum

4800 West Gates Pass Road
Tucson, AZ 85745
(520) 629-0100

Tucson Audubon Society

300 East University Blvd. #120
Tucson, AZ 85705
(520) 629-0510

Arizona Game and Fish Department

555 North Greasewood Dr.
Tucson, AZ 85745-3612
(520) 628-5376

Camp Cooper (Tucson Unified School District)

P.O. Box 40400
Tucson, AZ 85717
(520) 743-7422

Saguaro National Park (West)

2700 North Kinney Road
Tucson, AZ 85743
(520) 733-5158

Saguaro National Park (East)

3693 Old Spanish Trail
Tucson, AZ 85730
(520) 733-5153