

FUN ACTIVITIES & EXPERIMENTS THAT GET KIDS OUTDOORS



BACKYARD

SCIENCE &

DISCOVERY

WORKBOOK

SOUTHWEST



GEORGE OXFORD MILLER

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SOUTHWEST

ADVENTURE PUBLICATIONS

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ABOUT THIS BOOK

The Southwest is more than a collection of states in the bottom-left corner of the map, and no one definition can describe its many features. We have an incredible mix of nature, peoples, and cultures unlike anywhere else in the world. One of our most interesting features is our mix of Native Americans, who have lived here for thousands of years, and Hispanics, Anglos, and hundreds of other peoples from around the world. But most of all, we're famous for our outdoors. People travel from around the world to see our spectacular deserts, canyons, and mountains. Fortunately, we live here all the time and just have to go out into our backyards or nearby parks to experience the mysteries and magic of nature.

As a nature photographer, environmental journalist, and botanist, I've lived in, written about, and explored the Southwest almost all of my life. I backpacked with my children before they could walk, camped with them, and enjoyed the sense of discovery with them as we hiked wilderness trails. I believe kids (and adults) need to identify with the outdoors and learn to love the wonders of nature.

This book features **more than 20 hands-on science projects**, such as raising native caterpillars, making mushroom spore prints, and attracting moths and other insects with an ultraviolet light; **more than 20 simple, fun introductions** to the region's habitats, birds, seasons, and rocks and minerals; and more than **15 fun activities** to help you make hypotheses, observe nature, and learn about the world around you.

That's really the fun part: you really never know what you're going to find on any given day. It's a little like a treasure hunt, and if you keep good records and share what you find, your observations can even help scientists learn more about the world (or help you start a career as a scientist).

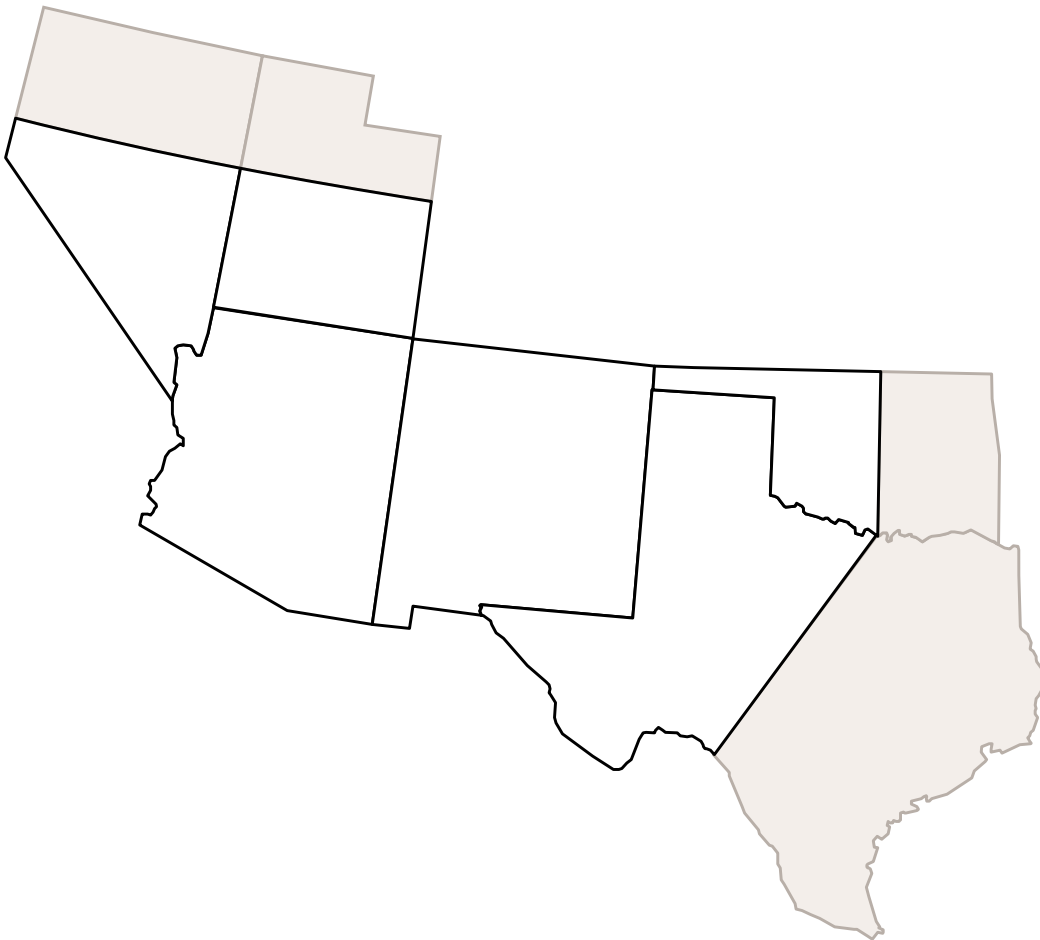
So get outside, have fun, and share your discoveries!

George Oxford Miller

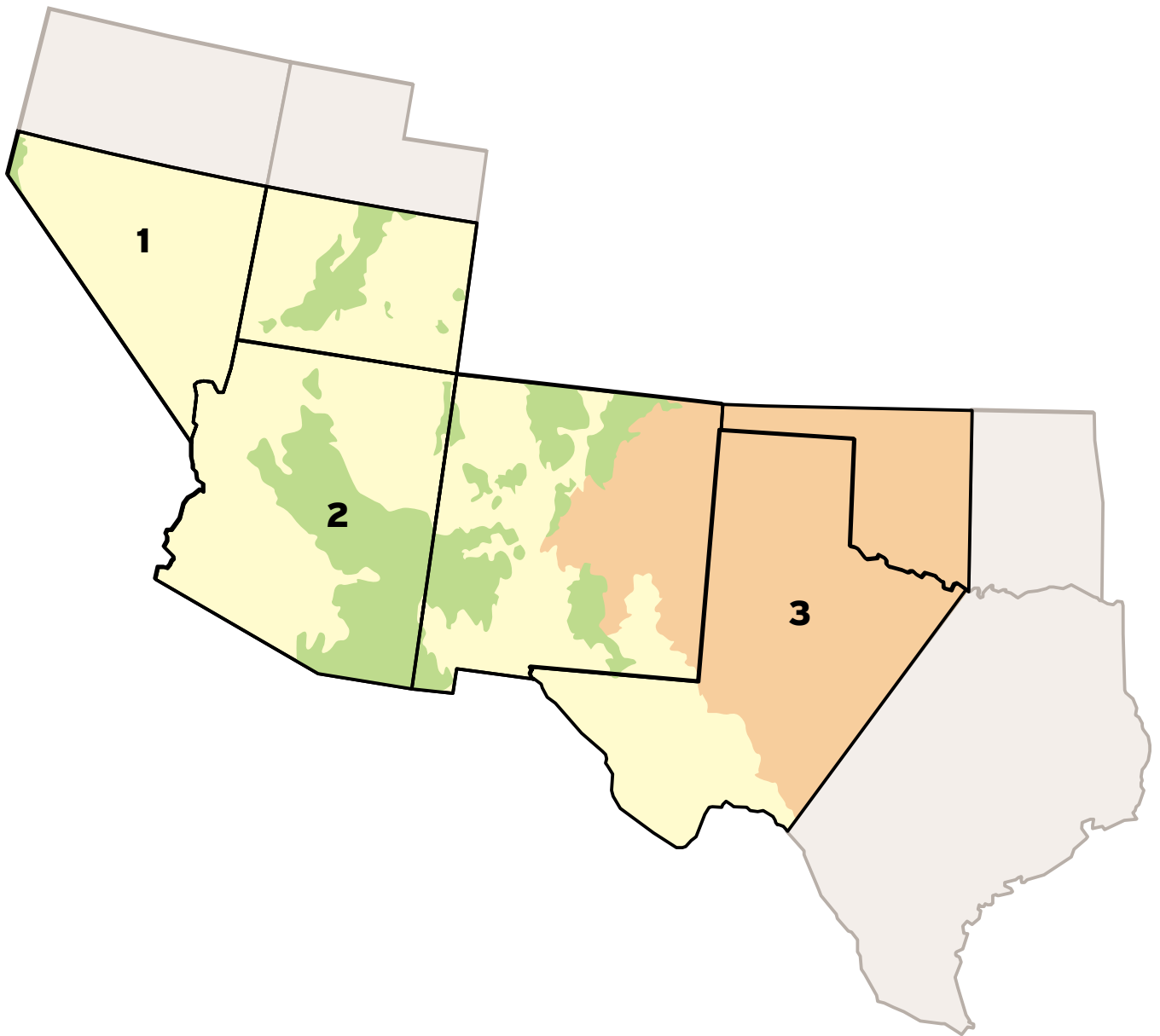
GEOGRAPHY OF THE SOUTHWEST

Spanning two full states and portions of four others, the Southwest includes deserts, mountains, mesas, and grasslands. Practice your geography and label the states above. Bonus points if you can name the state capitals of each one.

Answers on page 132!



AZ	_____	OK	_____
NM	_____	TX	_____
NV	_____	UT	_____



GET TO KNOW THE SOUTHWEST'S BIOMES

The best way to get to know your state—and backyard—is by understanding the natural neighborhood it belongs to in the Southwest: its **biome**. A biome is a community of animals and plants that live in a specific kind of climate and environment.

You've probably heard of some biomes before: deserts, forests, and grasslands are examples.

The Southwest is home to three different biomes:



1. Deserts and Dry Shrublands:
Cacti, spiny plants, and sagebrush



2. Mixed Conifer Forests:
Pine, juniper, spruce, and fir trees



3. Prairie Grasslands:
Grasses, with very few shrubs or trees

QUICK QUESTION

Which **biome** do you live in?

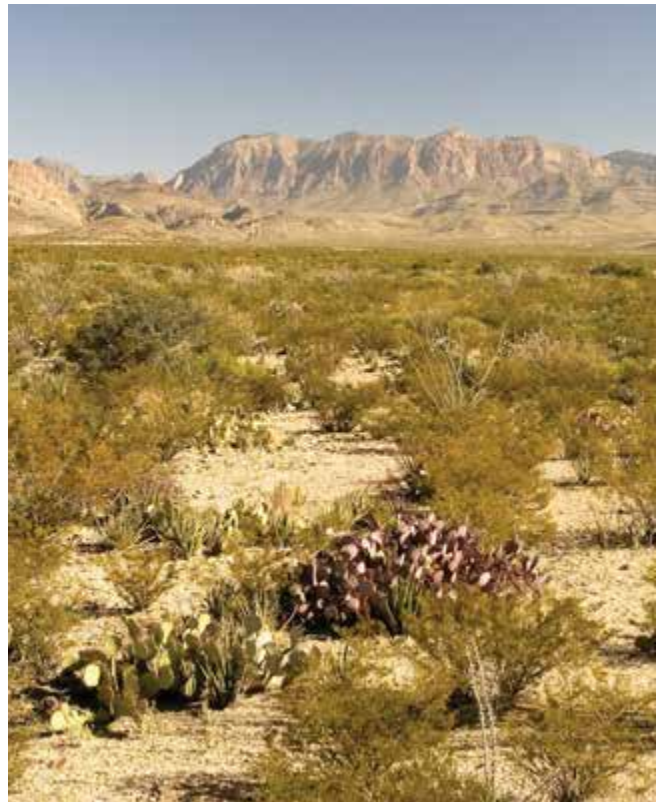


DESERTS AND DRY SHRUBLANDS BIOME

A desert has blazing-hot summers and gets too little rain for trees and other plants with big leaves, which need a lot of water to survive. Desert plants are known for their many extreme **adaptations** (physical features that help them survive harsh conditions). Cacti, the most famous desert plants, have adapted by turning their leaves into spines. A spiny cover helps shade the juicy stem, and it also protects it from thirsty animals.

Many desert bushes have tiny leaves that use very little water, and thorny limbs that discourage hungry animals from eating the leaves. Dry, low-elevation deserts have many cacti and small thorny bushes. Higher-elevation deserts are slightly cooler and wetter and have larger shrubs without thorns, like sagebrush and rabbitbrush.

Many desert flowers don't bloom until it rains, and some seeds can lie **dormant** (like sleeping) in the soil for decades. Then when a good rainy season comes, thousands of seeds **germinate** (begin growing) at the same time and can cover large areas.



QUICK QUIZ

Match the plant with its adaptation to survive hot, dry deserts.



A.

1. Flowers wait to bloom until after a big rain



B.

2. Tiny leaves that don't need much water



C.

3. All spines and no leaves



D.

4. Thorny limbs to keep animals from eating leaves

Answers on page 132!

Have you ever been to a desert? If so, which kind of plants and animals did you see there?



MIXED CONIFER FOREST BIOME

A **conifer** is a tree that has tiny male cones with pollen instead of showy flowers. The pollen blows in the wind to larger female cones, which produce the seeds. Most conifers have slender, smooth, needle-like leaves and woody cones. But junipers have slender, rough needles and juicy, berry-like cones. All conifers in the Southwest are **evergreen**, which means they don't lose their leaves, or needles, in the winter. **Deciduous** trees, like cottonwoods, maples, and aspens, lose their leaves in the winter, and they are also mixed in.

Coniferous forests begin at an elevation of about 6,000 feet in the mountains of the Southwest with small piñon pines with little cones and junipers with blue-gray berries. Tall Ponderosa Pines, spruce, and firs with large cones grow at higher elevations that receive lots of snow.

QUICK QUIZ

Many different kinds of trees grow in mixed conifer forests. Can you match these leaves with their trees?



A.

1. Gambel Oak



B.

2. Spruce



C.

3. Piñon Pine



D.

4. Aspen

Answers on page 132!

1. Make a list of the evergreen trees near you.

2. What deciduous trees are nearby?



PRAIRIE GRASSLANDS BIOME

The Shortgrass Prairie, found in parts of New Mexico, Texas, and Oklahoma, covers much of the eastern portion of the Southwest. Grasses that can survive the dry summers and harsh winters blanket the prairies, rolling plains, and flat-topped hills. Before European settlers arrived, American Bison were the **keystone species** (the most important species that influenced all the others). Vast herds grazed the prairie, along with Pronghorn, deer, and Elk. Prairie dogs, seed-eating birds like prairie chickens and quail, and reptiles like horned lizards and rattlesnakes thrived. Wolves, Grizzly Bears, Coyotes, and hawks were the main **predators** (animals that eat other animals).

As settlers moved west, they turned the rich prairies into huge ranches and farmland. Then the richest oil and gas deposits in North America were discovered, and much of the prairie was turned into oil fields. Today, many of the animals and plants that depended on the grasslands have been greatly reduced in number or **extirpated**.



QUICK QUIZ

In the sentence, "... many of the animals and plants that depended on the grasslands have been greatly reduced in number or **extirpated**," the word extirpated means:

- A. saved or protected
- B. moved to another area
- C. wiped out from their original range
- D. all been sent to zoos



Answer on page 132!

What other animals in your state are endangered or have been extirpated?



THEN VS. NOW

Before cattle and timber cutting arrived in the Southwest, grass was one of the main features of the desert shrublands, prairie grasslands, and mixed forest biomes. Cattle **overgrazed** (ate too much of) the grasses, and too many trees in the forests were cut. Removing the plants covering the ground allowed wind and water to **erode** (blow and wash away) the top layers of soil. Eventually, the shallow soil on the surface dried out. The only moisture left was deeper underground. Shallow-rooted grasses couldn't compete for moisture with deep-rooted shrubs like mesquite, and grasslands became shrublands. Now very few healthy grasslands are left. Grazing animals like deer, pronghorns, and elk, as well as birds and mice that eat grass seeds, can't survive. Without grass to keep the rain from washing away instead of soaking in, many springs that animals depended on have dried up.



Another big change in the Southwest came with the growth of large cities like Las Vegas, Phoenix, Albuquerque, and El Paso, as well as smaller towns across the region. Farms irrigated thousands of acres to grow food for the people. The large amount of water used by cities and farms caused springs and rivers to dry up. The loss of so much **natural habitat** (areas not changed by humans) caused many animals to become rare or to disappear.

QUICK QUIZ

Which animals used to be common in large parts of the Southwest but are now rare or absent altogether?

- A. Pronghorns
- B. Desert Bighorn Sheep
- C. Thick-Billed Parrots
- D. Pupfish in desert springs
- E. All of them

Answer on page 132!



STATE SYMBOLS

Another good way to get to know the region is by learning your state's official symbols. From the state bird and flower, which you might know already, to lesser-known categories, such as state amphibian, gemstone, or **fossil**, these iconic plants, animals, and materials are usually selected because they have a long history with the state. Of course, not every state has symbols for the same categories—some states even have a state soil! Some have many, while others have only a handful. Still, they are a good way to learn about your state and what makes it special.

QUICK QUIZ

You wouldn't want to pick up or even touch some state reptiles or insects. Which of the following have venomous bites or painful stings?

- A. Ridge-Nosed Rattlesnake (state reptile of Arizona)
- B. Tarantula Hawk (state insect of New Mexico)
- C. Gila Monster (state reptile of Utah)
- D. European Honeybee (state insect of Utah)
- E. All of them

Answer on page 132!

ARIZONA



Cactus Wren

Bird



**White Blossom
of the Saguaro**

Flower



Ringtail

Mammal



**Arizona Ridge-
Nosed Rattlesnake**

Reptile



**Two-Tailed
Swallowtail**

Butterfly



Palo Verde

Tree



Turquoise

Gem

STATE SYMBOLS

NEW MEXICO



Roadrunner

Bird



Yucca

Flower



**New Mexico
Black Bear**

Animal



**New Mexico
Whiptail Lizard**

Reptile



**Tarantula Hawk
Wasp**

Insect



Turquoise

Gem



Sandia Hairstreak

Butterfly

NEVADA



Mountain Bluebird
Bird



Sagebrush
Flower



Desert Bighorn Sheep
Animal



Vivid Dancer Damselfly
Insect



Desert Tortoise
Reptile



Bristlecone Pine
Tree



Single-Leaf Piñon
Tree



Turquoise
Gem

STATE SYMBOLS

OKLAHOMA



**Scissor-Tailed
Flycatcher**

Bird



Indian Blanket

Flower



Bison

Animal



Black Swallowtail

Butterfly



Collared Lizard

Reptile



Redbud

Tree

TEXAS



Mockingbird

Bird



Bluebonnet

Flower



Texas Longhorn

Large Mammal



Armadillo

Small Mammal



Monarch Butterfly

Insect



Texas Horned Lizard

Reptile



Pecan

Tree



Texas Blue Topaz

Gem

STATE SYMBOLS

UTAH



California Gull

Bird



Sego Lily

Flower



**Rocky Mountain
Elk**

Animal



**European
Honeybee**

Insect



Gila Monster

Reptile



Quaking Aspen

Tree



Topaz

Gem

Petroglyphs on Newspaper Rock, dating back up to 2,000 years, are examples of ancient symbols carved by early peoples.



INTRODUCED VS. INVASIVE

Over the course of settlement of the Southwest, many plants and animals were **introduced** to the region. Some of these, such as apples, peaches, and tomatoes, were introduced on purpose; they are **nonnative** but haven't been a problem. Others that were introduced on purpose or accidentally spread quickly, often finding an environment with few predators or natural checks on their population. These species then became **invasive**, spreading uncontrollably and hurting **native** animals and plants.

A few familiar, but invasive, species:



Tumbleweed



Puncture Vine



Musk Thistle



European Starling



House Sparrow



Pigeon

QUICK QUIZ

Which of the following animals is an introduced species in the Southwest?



A. Mountain Lion



B. Jackrabbit



C. Coyote



D. Cow

Answer on page 132!

Can you think of other introduced species in your area?

Hint: Most farm animals aren't from here! The same is true for many weeds.



GET TO KNOW

YOUR WEATHER

You know it really gets hot in the summer, but what's the hottest temperature you can remember? One hundred degrees, maybe 110? Higher? What do you think is the highest temperature recorded anywhere in your state? (Note: It may not have reached this temperature where you live, but it did happen somewhere in your state.)

MAKE A GUESS

1. Highest maximum temperature ever in my state?

2. OK, and you've felt cold, too, maybe shivering at the bus stop or walking to school. So what do you think the coldest temperature recorded anywhere in your state is?

3. And do you like making a snowman or having snowball fights? Or how about sledding down slopes or snowshoeing? Me too. The Southwest has low



deserts with warm winters and no snow, but the forests and mountains get lots of snow. What do you think the record is for the deepest snow on the ground anywhere in your state? A foot? Two? More?

A FEW SOUTHWEST WEATHER RECORDS

STATE NAME	HIGHEST TEMP (F)	LOWEST TEMP (F)	DEEPEST SNOW (IN)
Arizona	128° (1994)	-40° (1971)	91" (1967)
Nevada	125° (1994)	-50° (1937)	271" (1911)
New Mexico	122° (1994)	-50° (1951)	96" (1941)
Oklahoma	120° (1936)	-31° (2011)	36" (1971)
Texas	120° (1936, 1994)	-23° (1899, 1933)	33" (1956)
Utah	117° (1985)	-50° (1913)	179" (1958)

Data: [ncdc.noaa.gov/extremes/scec/records](https://www.ndbc.noaa.gov/extremes/scec/records)



IS THE SUN SETTING EARLIER?!

In winter, you've probably noticed how it gets darker earlier. That happens because the Earth is tilted on its axis, so certain parts of the planet get more daylight in some seasons than in others. If you've traveled to the north of where you live, you've probably noticed that the amount of daylight varies with **latitude** (how far north or south you are from the **equator**).

MAKE A HYPOTHESIS

1. Which month do you think has the shortest day of the year in the Southwest?

2. Which month has the longest day of the year in the Southwest?

3. On the shortest day of the year where you live, what time is sunset?

RECORD YOUR ACTIVITIES, DISCOVERIES & FINDS HERE

If you find something neat, make a sketch to the right to help you remember details so you can compare your drawing to a field guide or another reference later.



RECOMMENDED READING

Daniels, Jaret C. *Backyard Bugs: An Identification Guide to Common Insects, Spiders, and more.* Cambridge, MN: Adventure Publications, 2017.

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Poppele, Jonathan. *Night Sky: A Field Guide to the Constellations.* Cambridge, MN: Adventure Publications, 2009.

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Tekiela, Stan. *The Kid's Guide to Birds of Texas: Fun Facts, Activities and 90 Cool Birds.* Cambridge, MN: Adventure Publications, 2020.

GLOSSARY

Adaptations The features of a plant or animal that help it thrive where it lives from generation to generation.

Bio-blitz An organized count of plants and animals carried on for a set time period in a specific place.

Biome A community of animals and plants that live in a specific kind of climate and environment.

Biodiversity The number of different kinds, or species, of living things that live in an area.

Chemical element One of the 92 naturally occurring chemicals, such as oxygen, carbon, etc., that make up all matter on Earth.

Commodities Farm products, such as corn and soybeans, that are sold worldwide.

Conifer A tree that produces seeds in cones, such as pine, fir, and spruce trees.

Deciduous A tree that loses its leaves in the winter.

Dormant A sleep-like state when a plant or animal is not active.

Equator The midpoint on the earth's surface between the North and South Poles; the days and nights are always equal in length, and the latitude measurement is 0.

Erode To wear away, often slowly by wind, rain, and freezing over thousands of years.

Evergreen A tree that doesn't lose its leaves and stays green all winter.

Extirpated Animals and plants that have been wiped out from their original habitat.

Fossil The preserved remains, remnant, imprint, or trace of a plant or animal from a past geologic age, such as a bone, tooth, footprint, petrified wood, or leaf imprint.

GLOSSARY

Genus Name Because there are so many different plants and animals and other life forms, scientists give every organism a unique name, usually derived from Latin/Greek. This scientific name has two parts: a genus, which is like an organism's last name, and which it shares with other related organisms, and its species name, which is like its first name.

So if you want to talk to a scientist about the American Robin, *Turdus migratorius* is the name that scientists would recognize all around the world. (And really, that's its real scientific name.)

Germinate When a seed sprouts and begins to grow.

Introduced An animal or plant that was brought to an area (example: cows in the U.S.).

Invasive An introduced species that outcompetes native animals and plants, harming the ecosystem.

Keystone species A plant or animal that many other plants and animals depend on to survive.

Killing frost When temperatures reach about 28 degrees, cold enough to freeze the water in most plants and kill them.

Latitude How far north or south a person or place is from the equator; the equator is at a latitude of 0 degrees; the North Pole is 90 degrees north.

Mineral A chemical combination of two or more elements; individual elements (such as copper and gold) are considered minerals as well.

Mohs Hardness Scale The relative scale of mineral hardness, from softest (talc) to diamond (10).

Mutualistic A relationship between two organisms where each one gets something of value or benefit.

Mycelia The thread-like filaments of fungi that connect to the roots of plants.

Native An animal, plant, or organism found naturally in an area.

Natural habitat An area where the plants and animals have not been disturbed by human activities.

Nonnative An animal, plant, or organism not naturally found in an area; note that not all nonnative animals are invasive.

Northern hemisphere The part of the Earth north of the equator.

Orion constellation A group of stars named because of its shape after a hunter in ancient Greek mythology.

Overgrazed When cows eat too much grass in an area so the native plants cannot survive.

Phenology The study of the seasons and other natural cycles over time.

Pleiades A cluster of seven dim stars barely visible with the unaided eye.

Predators Animals that eat other animals.

Rock A combination of two or more minerals.

Saprobies Mushrooms that feed on dead or dying material (often wood or plant parts).

Scientific name See Genus.

Solstice, summer The longest day of the year when the Earth is pointed most directly at the sun; in the northern hemisphere it occurs June 20-21.

Solstice, winter The shortest day of the year when the Earth is pointed most directly away from the sun; in the northern hemisphere it occurs December 20-21.

Species name See Genus.

Toxic Poisonous.

QUICK QUIZ ANSWERS

Page 5: Arizona, Phoenix; New Mexico, Santa Fe; Nevada, Carson City; Oklahoma, Oklahoma City; Texas, Austin; Utah, Salt Lake City

Page 9: A-4, B-3, C-2, D-1

Page 11: A. Piñon Pine, B. Aspen, C. Gambel Oak, D. Spruce

Page 13: Answer C, wiped out from their original range

Page 15: Answer E, All of them

Page 16: Answer E, All of them

Page 25: Answer D, Cow

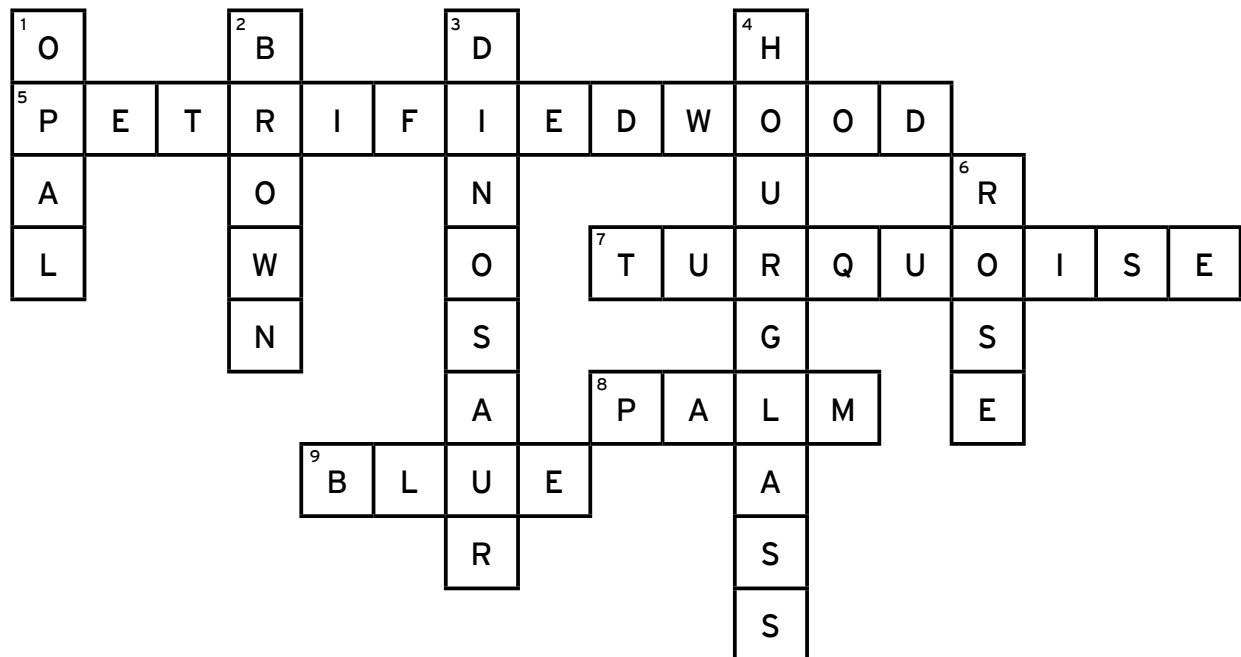
Page 45: Answer E, All of the above.

Page 86: 1. Flower Fly 2. Honeybee 3. Spotted Tylosis
Longhorn Beetle

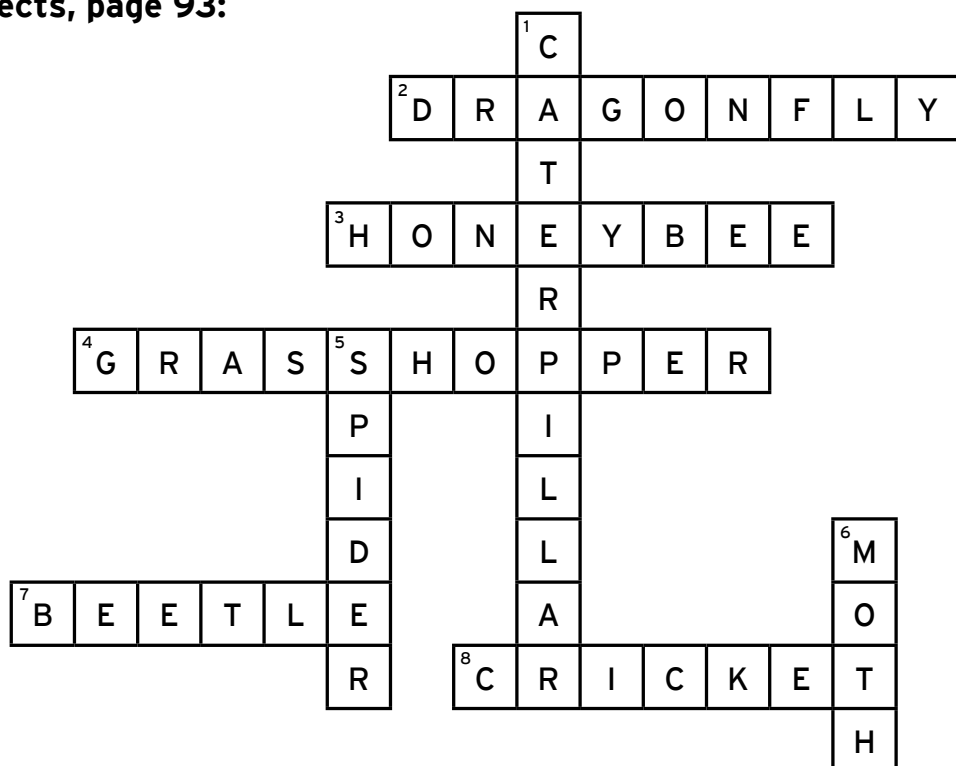
Page 113: Answer E, All of the above

CROSSWORD ANSWERS

Geology & Gemstones, page Page 76:



Bugs & Insects, page 93:



ABOUT THE AUTHOR



George Miller is a writer, nature photographer, and travel journalist with a MS in Zoology and Botany from the University of Texas, Austin. He wrote the award-winning books *Landscaping with Native Plants of Texas*, *Landscaping with Native Plants of the Southwest*, and *Landscaping with Native Plants of Southern California*. He also wrote *Native Plant Gardening for Birds, Bees, & Butterflies: Southwest* and *A Field Guide to Wildflowers, Trees, and Shrubs of Texas*. While living in Austin, he worked as an interpretive naturalist for the Austin Nature Center, designing and teaching middle school classes on wildlife and day camp programs. He lives in Albuquerque, NM, and is active in the Native Plant Society of New Mexico. His website WildflowersNM.com covers more than 600 species of Southwest wildflowers with descriptions, identification tips, and photos.

ACKNOWLEDGMENTS

On our many trips of discovery in the outdoors, my son and daughter, Koda and Heather, helped me see the mysteries and magic of nature with fresh eyes.

DEDICATION

This is dedicated to my grandchildren, Colvin, Holden, and Armstrong, that they will learn to love the boundless and amazing riches of the natural world.

PHOTO CREDITS

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Back cover: **Svetlana Foote**: monarch caterpillar

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Brett Ortler: 79 (house fly & house fly), 81 (leaf-hopper), 97 (bracket fungi), 101 (all), 102 (all), 107, 114; **NASA, ESA and AURA/Caltech**: 105; **Fallon Venable**: 99, 120, 121, 122, 123, 124, 125, 126, 127 (Background Illustrations).

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SAFETY NOTE

Nature is wonderful and amazing, and it's certainly nothing to be afraid of, especially if you use common sense and take precautions. This guide is intended for backyards and green spaces in the Southwest. These places should be pretty safe by definition, but make sure to have an adult with you when you're outside to supervise the activities in this book. And when you're outside, don't reach where you can't see, and be aware of potentially dangerous animals like bees, wasps, ticks, venomous spiders or snakes, and bothersome plants such as Poison Ivy.

There really aren't all that many dangerous creatures or plants, but if you know they can be found in your area, or if you have allergies (to bees or Poison Ivy, for instance), it's important to simply be aware that they may be out there. The best way to stay safe is to keep your distance from wild animals, avoid handling wildlife, and take photos or draw sketches instead. Also, wear gloves, the right clothing for the weather, and sunscreen (as needed), and pay attention to the weather and any potentially unsafe surroundings. **Remember:** You're responsible for your safety.

An especially important note: Don't use this book to help you identify which wild plants, berries, fruits, or mushrooms are safe to eat. Please leave the berries, fruits, and mushrooms you find for the birds, critters, and the bugs. Instead, get your snacks from the fridge!

Edited by Brett Ortler

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**Backyard Nature and Science Workbook: Southwest
Fun Activities and Experiments that Get Kids Outdoors**

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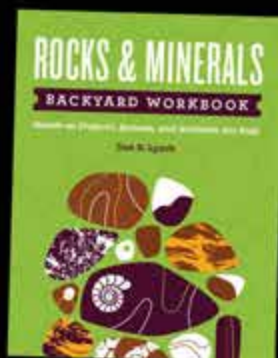
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