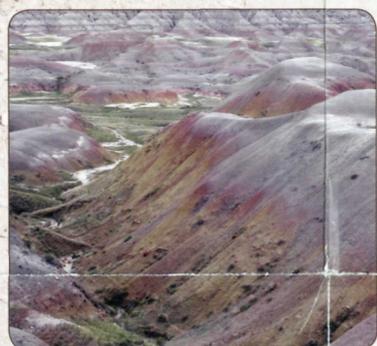


# FOSSILS OF THE NATIONAL PARKS



## SELECTED NATIONAL PARKS AND MONUMENTS WITH FOSSILS

- AGATE FOSSIL BEDS NATIONAL MONUMENT, NEBRASKA
- ARCHES NATIONAL PARK, UTAH
- BADLANDS NATIONAL PARK, SOUTH DAKOTA
- BERING LAND BRIDGE NATIONAL PRESERVE, ALASKA
- BIG BEND NATIONAL PARK, TEXAS
- CARLSBAD CAVERNS NATIONAL PARK, NEW MEXICO
- CHANNEL ISLANDS NATIONAL PARK, CALIFORNIA
- CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK, MARYLAND, WEST VIRGINIA, AND DISTRICT OF COLUMBIA
- CHICKASAW NATIONAL RECREATION AREA, OKLAHOMA
- DEATH VALLEY NATIONAL PARK, CALIFORNIA AND NEVADA
- DELAWARE WATER GAP NATIONAL RECREATION AREA, PENNSYLVANIA AND NEW JERSEY
- DINOSAUR NATIONAL MONUMENT, UTAH AND COLORADO
- FLORISSANT FOSSIL BEDS NATIONAL MONUMENT, COLORADO
- FOSSIL BUTTE NATIONAL MONUMENT, WYOMING
- GLACIER NATIONAL PARK, MONTANA
- GLEN CANYON NATIONAL RECREATION AREA, UTAH AND ARIZONA
- GRAND CANYON-PARASHANT NATIONAL MONUMENT, ARIZONA
- GUADALUPE MOUNTAINS NATIONAL PARK, TEXAS
- HAGERMAN FOSSIL BEDS NATIONAL MONUMENT, IDAHO
- JOHN DAY FOSSIL BEDS NATIONAL MONUMENT, OREGON
- JOSHUA TREE NATIONAL PARK, CALIFORNIA
- LINCOLN MEMORIAL, DISTRICT OF COLUMBIA
- MAMMOTH CAVE NATIONAL PARK, KENTUCKY
- NEW RIVER GORGE NATIONAL RIVER, WEST VIRGINIA
- OREGON CAVES NATIONAL MONUMENT, OREGON
- PETRIFIED FOREST NATIONAL PARK, ARIZONA
- TALLGRASS PRAIRIE NATIONAL PRESERVE, KANSAS
- VALLEY FORGE NATIONAL HISTORICAL PARK, PENNSYLVANIA
- VICKSBURG NATIONAL MILITARY PARK, MISSISSIPPI
- YELLOWSTONE NATIONAL PARK, WYOMING, MONTANA, AND IDAHO
- YUKON-CHARLEY RIVERS NATIONAL PRESERVE, ALASKA
- ZION NATIONAL PARK, UTAH

# FOSSILS OF THE NATIONAL PARKS

The National Park Service conserves a great diversity of ancient life preserved as fossils. Collectively, fossils discovered in parks span geologic time from primitive algae found high in the mountains of Glacier National Park, Montana, to the remains of ice-age animals known from caves in the Grand Canyon, Arizona. Fossils are found in national park areas from coast to coast, from Texas to the tundra of Alaska, and from the Caribbean to the south Pacific islands. Parks provide visitors with opportunities to observe fossils in a natural state, within rocks, and to learn about ancient animals, plants, and the ecosystems they inhabited.

## Learning Activity: DIGGING FOR FOSSILS

Grade Level: K-8

### OBJECTIVE

Learn the steps of a paleontology dig, uncover a buried “fossil” using appropriate tools, and piece it back together to understand its natural history.

### BACKGROUND

Paleontologists often find fossils in remote regions. Once discovered, fossils must be carefully prepared for transport back to the laboratory. To learn about the fossil and its environment, paleontologists take detailed measurements, photographs, and notes during excavation. They use imagination and deductive reasoning to put the pieces back together.

### MATERIALS

- Per student or small group
- 15 Wooden craft sticks
  - Dinosaur pictures or models
  - Small shovel, brush, or hammer
  - Adhesive tape and markers
  - Shoe box and sand
  - Paper and pen or pencil
  - Ruler

### PROCEDURES

1. Lay 12 sticks side-by-side on a table. Tape them together at the top and bottom. Draw a picture of a dinosaur on the non-taped side of the sticks, so each stick contains a piece of the drawing.
2. Remove tape and jumble the sticks. Practice putting your fossil puzzle back together.
3. Write a one-page natural history of your fossil. Is it a carnivore, does it swim, does it walk upright? Theories about your fossil should come from clues in your picture.
4. Remove three random sticks from your fossil puzzle, and replace them with blank sticks. Put sand in a shoebox, spread out fossil pieces, and bury them. Wet the sand slightly.
5. Switch boxes with another group. Carefully dig one inch of sand at a time. Take notes on sand color, texture, and grain size. Sketch the arrangement of sticks as you find them (older students can graph and sketch the dig site once every inch).
6. Carefully remove the sticks from the sand and lay them on a table. Try to piece the drawing together. Draw in what you think is missing, then compare to the original drawing.

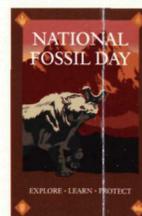
### DISCUSSION

Do you think paleontologists find fossils that are complete? How do paleontologists fill in the gaps in a fossil? Would the kind of rock that a fossil was found in be important?

Adapted from Geodetective. For more, see: [www.nps.gov/brc/forteachers/geodetective.htm](http://www.nps.gov/brc/forteachers/geodetective.htm).

For Teachers—NPS America’s classroom: [www.nps.gov/teachers/index.htm](http://www.nps.gov/teachers/index.htm)

### CELEBRATE NATIONAL FOSSIL DAY!



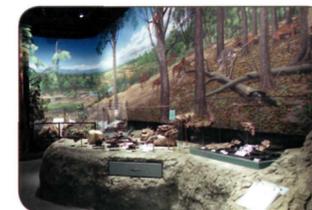
The National Park Service and the American Geosciences Institute host the National Fossil Day celebration each October during Earth Science Week. National Fossil Day is an opportunity to promote public awareness and stewardship of fossils, and to foster a greater appreciation of their scientific and educational value. Activities are hosted through partnerships with more than 270 agencies, professional organizations, museums and universities, and other groups nationwide. For information including events in your area, see <http://go.nps.gov/nfd>

fossils have been discovered at Chickasaw National Recreation Area, New River Gorge National River, Yukon-Charley Rivers National Preserve and many other national parks.

**THE MESOZOIC ERA (251 TO 65.5 MILLION YEARS AGO)** was the “Age of Reptiles.” Dinosaurs, crocodiles, and pterosaurs ruled the land and air. As climate changed, sea levels rose worldwide and seas expanded across the center of North America. Large marine reptiles such as plesiosaurs, along with the coiled-shell ammonites, flourished in these seas. Common Mesozoic fossils include dinosaur bones and teeth and diverse plant fossils. Big Bend National Park, Petrified Forest National Park, Dinosaur National Monument, and several other parks preserve Mesozoic fossils.

**THE CENOZOIC ERA (65.5 MILLION YEARS AGO THROUGH TODAY)** is the “Age of Mammals.” Birds and mammals rose in prominence after the extinction of giant reptiles. Common Cenozoic fossils include cat-like carnivores and early horses, as well as ice-age fossils like woolly mammoths. Caves can preserve the remains of ice-age animals that died in them or were transported there after death. Badlands National Park, Agate Fossil Beds, Florissant Fossil Beds, Fossil Butte, Hagerman Fossil Beds, and John Day Fossil Beds national monuments, and many more parks preserve Cenozoic fossils.

### NATIONAL PARK SERVICE STEWARDSHIP OF FOSSILS



At least 243 National Park Service areas preserve fossils (see map). At a national park, you can stand in the exact spot where a fossil tree was rooted or where a fossil animal walked millions of years ago. Some parks also preserve fossils in building stones or in association with American Indian artifacts.

Since 1916, The Organic Act has directed parks to “conserve the scenery” and natural objects, including fossils. In 2009, the Paleontological Resources Preservation Act was signed into law, requiring parks to manage and protect fossils for scientific and educational values.

Fossils are irreplaceable! Fossils are non-renewable—we are not making any more *Tyrannosaurus rex* fossils. Park staff and paleontologists work together to maintain fossils for scientific study and public education. It is exciting to find a fossil, but important to protect it. If you find a fossil in a park, leave the fossil where it is, take a photo, and share your discovery with a park ranger. Removing fossils from the sites where they were found will result in most of the interesting and valuable information about those fossils being lost forever. For more information about fossils in national parks, please visit <http://nature.nps.gov/geology/paleontology/>.

### WHAT IS A FOSSIL?



A fossil is any evidence of past life preserved in a geologic context, such as within rock or sediment. There are two main types of fossils—body fossils, which are the physical remains of an organism such as the shell of an oyster or the teeth of a saber-tooth cat, and trace fossils, which are evidence of an ancient organism’s activity or behavior, such as a dinosaur’s footprints or an insect’s burrow.

Most fossils are found in sedimentary rocks, which are formed out of sand, silt, and other sediment that becomes compacted and cemented together over time. Understanding how these rocks formed and the ancient environments they represent allows geologists to decipher Earth’s record of evolving life on an ever-changing planet.

### WHAT IS A PALEONTOLOGIST?



**PALEONTOLOGISTS** are scientists who study fossils to understand past animals and plants, ancient ecosystems, and climate change. Paleontologists discover fossils in the field, record where they were found, and sometimes bring them back to the lab for identification and description. Using fossils as clues, paleontologists piece together stories from Earth’s history of changing life, landscapes, and climate.

### FOSSILS THROUGH GEOLOGIC TIME

**THE GEOLOGIC TIME SCALE** is a way of organizing Earth’s 4.6 billion-year history. The time scale is divided into four large periods of time—the Precambrian, Paleozoic Era, Mesozoic Era, and Cenozoic Era. National parks preserve fossils from each of these time blocks.

**THE PRECAMBRIAN (PRIOR TO 542 MILLION YEARS AGO)** was the “Age of Early Life.” Soft-bodied creatures like worms and jellyfish lived in the world’s oceans. The land remained barren. Common Precambrian fossils include mats of algae called stromatolites, microorganisms, and simple animals. Death Valley, Glacier, and Grand Canyon national parks, and several others, preserve Precambrian fossils.

**THE PALEOZOIC ERA (542 TO 251 MILLION YEARS AGO)** was the “Age of Fishes.” Fish diversified and marine organisms were very abundant. Common Paleozoic fossils include trilobites and cephalopods such as squid, as well as insects and ferns. The greatest mass extinction in Earth’s history ended this era. Paleozoic



### FOSSILS, FOSSIL FUELS AND CLIMATE CHANGE



Our society relies heavily on fossil fuels such as coal, oil, and natural gas. These organic materials started as prehistoric plants and animals. Millions of years of decay in swamps and wetlands under heat and pressure result in these “fossil fuels.” Burning fossil fuels releases greenhouse gases, trapping additional heat in the atmosphere, causing changes in climate. Throughout Earth’s history, natural changes in climate have occurred. Today’s warming is likely not natural. Fossils provide a record of how organisms responded to past climate changes. When

climate changed outside of their “comfort zone,” plants and animals moved to areas with more favorable climate, adapted to the changes, or went extinct. All living things—including humans—will face these same options as climate changes. For more information about how national parks are responding to climate change and what YOU can do to help, see [www.nature.nps.gov/climatechange/](http://www.nature.nps.gov/climatechange/).

CREDITS: Project: Jason Betzner, Geoff Camphire (AGI), Erica Clites, Jason Kenworthy, Vince Santucci, Jim Wood (NPS); Design: Angela Terry; Front images (left to right, down): National Park Service Photo, Courtesy Dave Krueger; National Park Service Photo; Photo Courtesy GeoCorps™ America; National Park Service Photo; National Park Service Photo, Courtesy Vince Santucci; National Park Service Photo, Courtesy T. Scott Williams; National Park Service Photo, Courtesy Jason Kenworthy; Photo Courtesy GeoCorps™ America; National Park Service Photo; National Park Service Photo, Courtesy Marcia Fagnant; National Park Service Photo; National Park Service Photo, Courtesy Arvid Aase; Back images (left to right, down): National Park Service Graphic; National Park Service Photo; National Fossil Day Logo, Courtesy National Park Service; Copyright © Michael Collier, Image source: Earth Science World Image Bank [www.earthscienceworld.org/images](http://www.earthscienceworld.org/images); Photo Courtesy GeoCorps™ America; National Park Service Photo.