

Florissant Fossil Beds

Official Map and Guide

National Monument
Colorado

National Park Service
U.S. Department of the Interior



Rich Buzzelli

Today Florissant Fossil Beds National Monument is a wonderland of meadows, forests, and wildflowers. Noting this brilliance, an early settler from Missouri gave this area his hometown's name since it means "flowering" in French. Yet 35 million years ago a description would tell another tale. Lake Florissant, stretching 15 miles through an ancient forested valley, dominates the scene. Lush ferns and shrubs thrive under towering redwoods, cedars, pines, and a colorful mixed hardwood forest of maples, hickories, and oaks. In this warm, humid climate, thousands upon thousands of insects crawl, fly, and buzz about. Fish, mollusks, birds, and mammals inhabit the lake and its shores.

Nearby, a volcano rumbles. In the past, volcanic mudflows blanketed parts of the forest surrounding Lake Florissant, killing entire trees. Now, as the volcano again erupts violently, the devastation is widespread. The exploding volcano showers the countryside with millions of tons of ash, dust, and pumice. Caught in this deadly cloud, insects, leaves, fish—anything that cannot escape—die, and many fall to the lake bottom, where they are buried. These eruptions occur again and again for perhaps as long as 700,000 years. Each time, fragments of life are trapped in a layer of volcanic sediments at the bottom of the lake. Eventually these sediments become a finely layered shale and transform the buried plant and animal life into fossils.

Today Florissant Fossil Beds National Monument preserves this site. The fossil beds are internationally renowned for the variety and number of fossils—particularly of insects and plants—they have yielded since their discovery in the late 1800s. Paleontologists have collected more than 60,000 specimens for museums and universities around the world. These fossils reveal, in remarkable detail, what life of so long ago was like. Ever so fragile and tiny a creature as a butterfly may be preserved as a fossil that clearly shows its antennae, legs, hairs, and the pattern of its wings. Massive petrified redwood stumps are evidence that an-

cient life here had its giants, too. Yet, little remains of other ancient Lake Florissant life. Fossil bones, teeth, shells, and feather impressions reveal the existence of mollusks, fish, birds, opossums, mesohippus (an ancestor of the modern horse), and oreodonts (extinct pig-like animals). But unless a mammal or bird actually died in or near the lake its chances of preservation were very slim. Future scientific explorations promise to unearth more of Florissant's "buried treasures."

Fossils of Ancient Lake Florissant

Fossil photographs are not in relative scale.

Beech leaf
Fagopsis longifolia

Pine cone *Pinus*

Peabody Museum of Natural History, Yale University

Sequoia cones *Sequoia affinis*
Dennis Henry

Petrified sequoia stumps *Sequoia affinis*
Dennis Henry

Butterfly *Prodryas persephone*

Wasp
Paleovespa florissantentia

Caterpillar *Phylledestes vorax*

Wolf spider *Lycosidae*

The rich deposits discovered at Florissant Fossil Beds give us an unusually detailed look at life in an ancient North America. These impressions of prehistoric plants and animals are relatively young in geologic terms. The Florissant fossils hint at what life may have been like about 35 million years ago during the Oligocene Epoch; approximately 30 million years after the age of dinosaurs and at least 33 million years before humans appeared. Today most of Floris-

sant's fossils are exhibited and studied at various museums and universities. A small number are displayed in the park visitor center. Others, unfortunately, have been taken as private souvenirs over the years; what valuable information they might have provided cannot be known, for each fossil is an irreplaceable piece in the puzzle of the past. Fortunately millions of the fossils in yet undisturbed portions of the fossil beds are now protected by the park.

Fossil Plants Fossils of an incredibly diverse mix of more than 100 species of trees and other plants have been discovered at Florissant. Most commonly fossil leaves are found, but fossil twigs, seeds, cones, flowers, and pollen grains also occur. Like the insects, plant fragments have usually been preserved as lifesize, color-enhanced impressions. A quite different type of plant fossil found at Florissant consists of massive petrified stumps of redwoods and other

trees. They stand today where they were buried by volcanic mudflows millions of years ago. The stumps turned to stone as minerals seeped into the wood and gradually crystallized within living tissue. The fossil record suggests that the ancient forest was not like any now in Colorado. In it grew many trees and shrubs whose closest living relatives are now found in widely scattered places such as the southeastern United States, Mexico, China, and South America.

Fossil Insects Insects are rarely preserved as fossils because they are so fragile. But the volcanic ash mixture that fell on Lake Florissant was finer than talcum powder and ideal for the delicate job of preservation. Thousands of insect fossils have been recovered from the fine-grained, fossil-bearing shales. An amazing number of insect species—more than 1,100—have been identified. The insects are usually preserved as exquisitely detailed impressions

in the shale, colored brown or black by a thin residue of organic matter—all that remains of the actual living thing. Some insects look perfect, other are crushed, and some are just parts: a delicate wing, a headless body. The fossils indicate that insects 35 million years ago were much like those today. However, many types that once lived at Lake Florissant no longer inhabit Colorado. Some like the tsetse fly, are gone from North America. Others are wholly extinct.

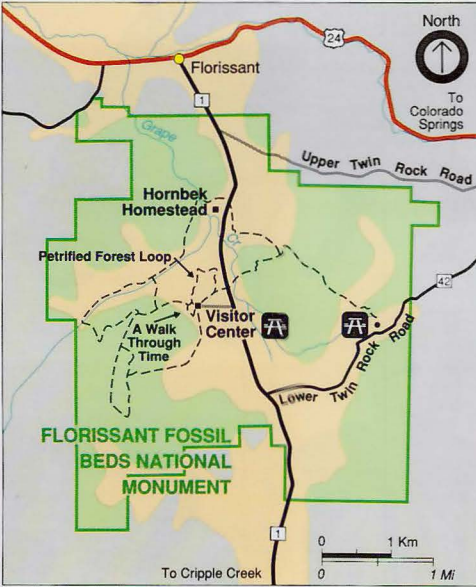
The Park Today

Florissant Fossil Beds National Monument is today a land of rolling hills and meadows with forests of ponderosa pine, spruce, fir, and aspen. It is in the highcountry of the Rocky Mountains west of Pike's Peak. Obvious signs of the ancient scene are scant. Surface exposures of the paper-thin, light-gray fossil-bearing shales occur in only a few spots and easily erode. Fossils are best seen in the visitor center exhibits and on two interpretive trails. In today's cooler, drier climate pronghorn antelope, elk, deer, porcupines, and golden eagles live, as do insects of all kinds. Florissant is French for flowering, and meadow and wildflowers offer excellent opportunities for photography and enjoying nature throughout the summer.

What to See and Do

Visitor Center The visitor center serves as a museum and information center. Fossils and other exhibits are on display and books and brochures are available. Schedules of talks and other special activities are posted. Park programs and your own imagination will help you discover the present and bring the past to life. A picnic area is nearby. The park offers environmental education programs for school groups; please call for details. The center is open daily except on winter holidays. For information, write: Superintendent, Floris-

- Picnic area
- Unpaved road
- Trail
- Ancient Lake Florissant



Hornbek homestead

sant Fossil Beds National Monument, Box 185, Florissant, CO 80816; or call 719-748-3253.

Trails The park has more than 10 miles of trails. On **A Walk through Time**, a 1/2-mile loop trail, you can see the fossil-bearing shales and petrified stumps. The 1-mile **Petrified Forest Loop** leads to several petrified stumps, including Big Stump, the remains of a

The Hornbek Homestead The 1878 Hornbek Homestead recalls the life of early pioneers. Many were drawn to the re-

gion by gold, but Adeline Hornbek and her children—like many others—came to farm and ranch. The historic site includes the original cabin and a reconstructed barn, carriage shed, and root cellar.

Other Activities In the winter, crosscountry skiing and snowshoeing are permitted. Picnicking and horseback riding are enjoyed year round. Contact a ranger for information.

Nearby Visitor Services Lodging, restaurants, gasoline, and groceries are available in the town of Florissant, 2 miles north. Colorado Springs, with the range of facilities of a modern metropolitan area, is 30 miles east and easily reached on U.S. 24. Public and private campgrounds are nearby.

To Protect and Preserve

For 50 years, scientists and other concerned citizens campaigned for the creation of a park area to protect the fossil beds from private exploitation and real estate development. Finally in 1969, the national monument was established. In the words of one paleontologist, "an irreplaceable loss" was prevented. Today Florissant Fossil Beds National Monument is one of more than 360 parks of the National Park System that represent important examples of our country's natural and cultural inheritance.

Please help us protect this portion of our national heritage. Most importantly **do not collect or damage any fossils or other natural or historical resource.** • Build fires only in the grates provided in the picnic area.

• Keep vehicles on roadways. • Do not take pets on trails. • Hunting or camping within the park is prohibited.

For Your Safety Ticks can carry Rocky Mountain spotted fever and other diseases. Flea bites can cause bubonic plague. Protect yourself from flea and tick bites. • Do not feed park animals. • Keep an eye on the sky; if a thunderstorm threatens, get inside before lightning strikes. • The altitude here is 8,500 feet, so pace yourself. • In winter dress in warm layers to keep dry and to prevent hypothermia.

Collections Near and Far



Samuel Scudder
Museum of Comparative Zoology,
Harvard University

Since discovery of the Florissant Fossil Beds in 1873, paleontologists have brought their simple tools to these rolling hills and open meadows to carefully collect fossils. Today these specimens are to be found in more than 20 museums and universities around the

world from Denver to London. Perhaps the most extraordinary collection is at Harvard University's Museum of Comparative Zoology. The 25,000 fossil insects in this collection were discovered by one of the first and foremost paleontologists of Florissant fame—Samuel Scudder (left). In the late 1800s, while his contemporaries were searching for and squabbling over the bones of dinosaurs and prehistoric mammals, Scudder led expeditions to the deposits at Florissant. He collected all types of fossils, but the delicate insects were his consuming passion. He painstakingly identified and described thousands. Later Professors T.D.A. Cockerell of the University of Colorado at Boulder and Harry MacGinitie of the University of California at

Berkeley retrieved and studied hundreds more insect and plant fossils. Florissant fossils collected in this scientific exploration can be seen at these (and other) institutions: the Denver Museum of Natural History, the Smithsonian Museum of Natural History, Washington, D.C.; the American Museum of Natural History, New York City; and the British Museum, London.

The Age of Mammals

Life in the Cenozoic Era—the Last 65 Million Years

From simple beginnings, endless numbers and countless varieties of life forms have evolved and populated the Earth. For 140 million years prior to the Cenozoic Era, dinosaurs held dominion over the land. Mammals existed, too, but they were small and not particularly abundant. As the dinosaurs perished, the mammals took center stage. Even as mammals increased in numbers and diversity, so, too, did the birds, reptiles, fish, insects, trees, grasses, and other forms of life. The fossil record gives us a fascinating glimpse into the Cenozoic Era. Without fossils, we would have no way of knowing that ancient animals and plants were any different from today's. With fossils, we discover that an extraordinary procession of creatures lived in North America and around the world. Species changed as the epochs of the Cenozoic Era passed. Those that could tolerate the changes in

the environment survived; those that could not were doomed to extinction. The fossil record reveals the story of both. Yet, the study of fossil remains—paleontology—raises many questions. Paleontologists look beyond the fossils and ask new questions about the types of environments these plants and animals lived in and how they adapted to climatic changes. These scientists study how different groups of plants and animals interrelate, and how they have changed through time. Fossils are studied in the context in which they were found and as one element among a community of organisms. Every fossil can serve as a key to unlock knowledge, and the National Park Service is especially concerned with the protection of these keys as the questions unfold. As the Cenozoic Era continues today, scientists estimate that up to 30 million species of animals and plants inhabit the

Earth now, a mere fraction of all the forms of life that have ever existed. Scientists believe that about 100 species will become extinct every day, a rate much faster than at other times in Earth's history. The pollution of the air and water, the destruction of forests, grasslands, and other ecosystems, and other adverse changes to the Earth's environment challenge life's very ability to survive. One Finnish scientist, Björn Kurten, put it this way: "Looking back on the long panorama of Cenozoic life, I think we ought to sense the richness and beauty of life that is possible on this Earth of ours. . . . And we should also realize that man, who is now planning for his own or the next generation, must begin to plan . . . for the geological time that is ahead. . . . It may stretch as far into the future as time behind us extends into the past."

Fossils in the Parks
The illustrations below are just a sampling of the plants and animals found in the Cenozoic Era. They are based on fossils found at National Park System sites, whose addresses are: Agate Fossil Beds NM, P.O. Box 27, Gering, NE 69341; Badlands NP, P.O. Box 6, Interior, SD 57750; Florissant Fossil Beds NM, P.O. Box 185, Florissant, CO 80816; Fossil Butte NM, P.O. Box 592, Kemmerer, WY 83101; and Hagerman Fossil Beds NM, 963 Blue Lakes Blvd., Suite 1, Twin Falls, ID 83251.



The North American Scene

Paleocene

Began 65 million years ago

The Paleocene Epoch began after the extinction of the dinosaurs. Mammals that had lived in the shadows of dinosaurs for millions of years eventually evolved into a vast number of different forms to fill the newly vacant environmental niches. Many early mammal "designs" of this time would soon become extinct; others would survive and then evolve into other forms. The variety of birds, other animals, and plants increased, and species became more specialized. Although dinosaurs were gone, reptiles lived on in the form of crocodiles, lizards, and snakes.



At the beginning of the Paleocene, most mammals were tiny like this rodent-like multituberculata. With time, mammals grew in size, number, and diversity.

Palm trees and crocodiles thrived in the subtropical forests of the Paleocene and much of the Eocene. Fossil Butte NM



Eocene

Began 58 million years ago

In the Eocene Epoch, mammals emerged as the dominant land animals. In addition, they took to the air and the sea. The increase in the diversity of mammals that had begun in the Paleocene continued at a rapid pace. There were many variations in life forms. For example, some of the earliest giant forms of mammals arose in the

Many freshwater fish swam in North American lakes of the Eocene. Gars (bottom), herring (middle), and perch (top), are

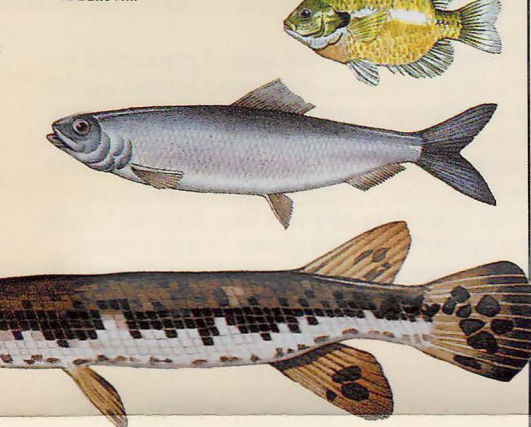
Eocene. Some were successful, some not. Although the fossil record reveals that many mammals were quite unlike anything we can see today, increasingly there were many forest plants, freshwater fish, and insects that were much like those of today.

similar in appearance to these Eocene fish. Fossil Butte NM

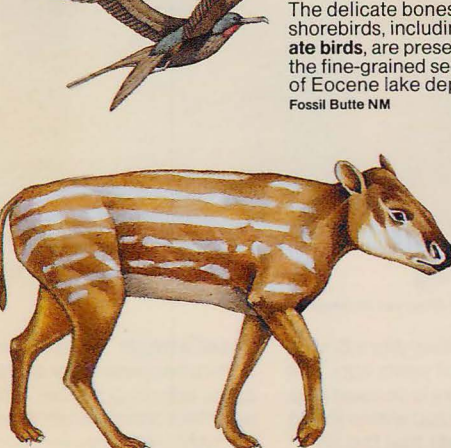
An explosion in the varieties of flowering plants just before, during, and after the Eocene Epoch would populate the land with all sorts of new species of trees, shrubs, and smaller plants. Cattails grew in the shallow water along the edges of Eocene freshwater lakes. Fossil Butte NM



One of the first bats, the only type of mammal ever to develop the power of active flight, took to the air more than 50 million years ago. Fossil Butte NM



The delicate bones of shorebirds, including frigate birds, are preserved in the fine-grained sediment of Eocene lake deposits. Fossil Butte NM



Ancient tapirs such as Heptodon browsed not far from the shores of Fossil Lake. Unlike modern

tapirs, Heptodon had a very small snout. Fossil Butte NM

The first horse-like creatures lived in Eocene forests. They were barely bigger than today's domestic cat. Throughout the Cenozoic Era their size increased; their legs

became longer and their feet changed from many-toed to single-hoofed, for faster running. Their teeth became adapted from browsing to grazing. Just a few of the species in the evolutionary history

of horses are shown here in silhouette across this page. Fossil horses occur at many National Park System sites.



Coryphodon, with its short stocky limbs and 5-toed hoofed feet, closely resembled a tapir. The brain was very small, and in males the tusks were very large. Coryphodon lived on land not far from the shores of Fossil Lake. Fossil Butte NM

Oligocene

Began 37-34 million years ago

Scientists are now conducting research that may move the Eocene/Oligocene boundary to 34 million years ago. Such changes in geological time divisions may be an issue of debate for generations to come, leading to some ambiguity. The Oligocene Epoch was a time of transition between the earlier and later parts of the Cenozoic Era. The climate, which had been warm and moist, became cooler and drier. Subtropical forests began to give way to more temperate forests. Late in the Oligocene, savannas—grasslands broken by



Butterflies and many other insect groups evolved with the increasing numbers and variety of flowering plants and became important agents of pollination. Florissant Fossil Beds NM

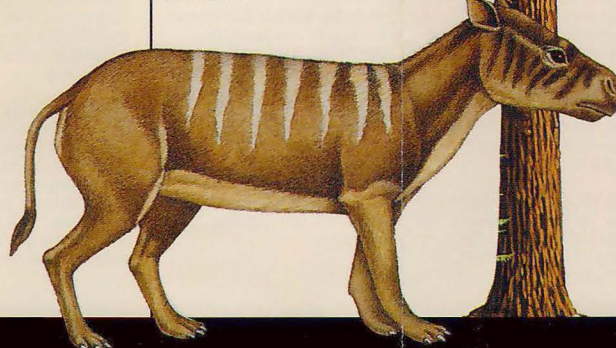


Tsetse flies occur today in tropical Africa and as fossils in the Florissant formation. Florissant Fossil Beds NM



Groves of giant redwood trees were found throughout western North America. Changes in climate were responsible for the shrinking range of the redwood forests. Florissant Fossil Beds NM

Oreodonts, a group of sheep-like animals, were successful in the Eocene and Oligocene but by the end of the Miocene had completely died out. Badlands NP



Miocene

Began 24 million years ago

The abundance of mammals reached a peak in the Miocene Epoch. The time was marked by refinements in life forms, and many animals and plants developed features recognizable in some species today. Forests and savannas persisted



One of the strangest of all mammals was Moropus, a distant relative of the horse, but with great claws on its feet. Agate Fossil Beds NM



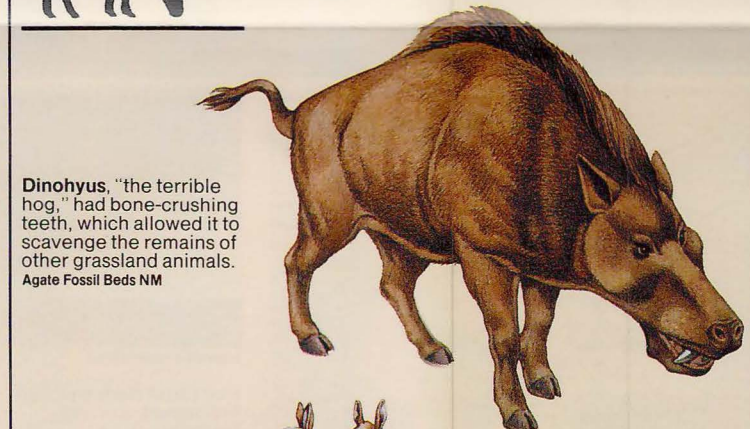
Rhinos, varied and abundant during most of the Cenozoic Era, ranged in size around the world from the 3-foot tall North American species Menoceras (shown here) to a giant Asian species that is the largest land mammal yet found in the fossil record. Agate Fossil Beds NM

Lacking other defenses, some larger rodents, like the dry-land beaver Palaeocastor, lived in colonies beneath the High Plains of North America. Their burrows remain as trace fossils. Agate Fossil Beds NM



The earliest true dogs of the Oligocene Epoch evolved into carnivores such as Daphoenodon, a

hunter with characteristics common to both dogs and bears. Agate Fossil Beds NM



Dinohyus, "the terrible hog," had bone-crushing teeth, which allowed it to scavenge the remains of other grassland animals. Agate Fossil Beds NM

The tiny gazelle-camel Stenomylus probably grazed in herds for protection against predators. Agate Fossil Beds NM

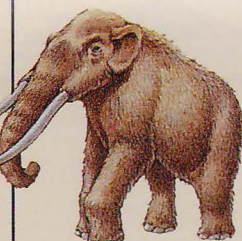


Pliocene

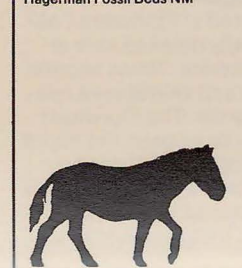
Began 5 million years ago

Most of the life-forms of the Pliocene Epoch would have been recognizable to us today. Many individual species were different, but distinguishing characteristics of various animal and plant groups were present. Evidence of wet meadows and dry open grassland environments have been found in the Pliocene. Toward the end of this period grasslands spread across much of North America, brought on by an ever cooler, ever drier climate. Horses and other hoofed mammals and the powerful, intelligent predators that preyed on them continued to prosper.

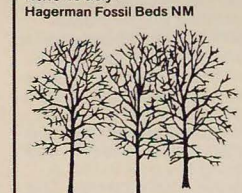
Mastodons migrated to North America during the Pliocene. They were later joined in the early Pleistocene by another



elephant group called mammoths. By the late Pleistocene, both mammoths and mastodons had become extinct, possibly due to climatic changes or hunting by paleoindians. Hagerman Fossil Beds NM



Willow, alder, birch and elm grew on the ancient river plains of the Pliocene. These same plants are found in riparian habitats today. Hagerman Fossil Beds NM



Horses such as this early zebra-like version of the modern-day horse were superbly adapted to life on the grassy plains. Hagerman Fossil Beds NM

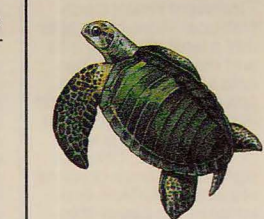
Quaternary

Began 2 million years ago

The Quaternary Period, in which we live today, is characterized by dramatic changes. The Pleistocene Epoch, a time when glaciers covered much of North America, started with widespread migrations of mammals and ended with massive extinctions. The oldest record of human occupation in North America is around 12,000 years ago. In the time that human beings have inhabited North America, we have had a profound effect on its other animals and plants. Will we preserve the diversity of life so richly celebrated in the Cenozoic?



Endangered species today include the loon (top), timber wolf (middle), and Kemp's ridley sea turtle (bottom). The National Park Service is among the many public and private agencies entrusted with helping to protect these animals and to preserve the diversity of life throughout North America.



Illustrations by Karen Barnes are based on fossil reconstructions found in R.J.G. Savage and M.R. Long's Mammal Evolution: An Illustrated Guide, New York: Facts on File Publications, 1986.

The drawings are not to scale.