

Florissant Fossil Beds

Florissant Fossil Beds
National Monument
Colorado

National Park Service
U.S. Department of the Interior



© ELIOT COHEN

Below Your Boots THE PAST IS PRESENT

Palaeovespa was a wasp of ancient times. Its form has changed little in 34 million years. You'd recognize its relative at a picnic today.

Fossil insect sites are far more rare than fossil plant sites—which adds to the global significance of the Florissant Fossil Beds.



Palaeovespa
NPS

To leave a record of our experience is a very human desire. Early humans painted cave walls and etched in rock the events of their lives. In Colorado some of these historic stories in stone date back 4,000 years. But the picture-perfect wasp (*left*) records events even 10,000 times older than that. Here, beneath pine covered hills and grassy meadows in south central Colorado, lies one of the world's richest fossil deposits. Remnants of an ancient world lie just below your boots.

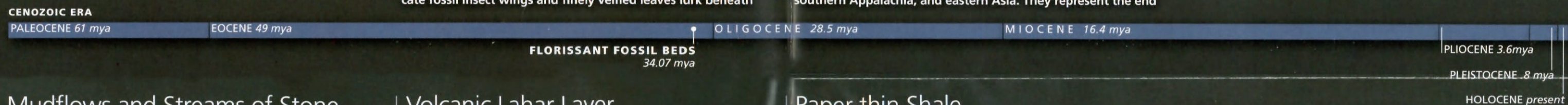
Florissant Fossil Beds National Monument has yielded over 50,000 museum specimens from fossils of over 1,700 species—1,500 insects, 150 plants, and one of the world's only known fossil records of the tsetse fly, now found only in equatorial Africa. Here, no big bones stick out of the ground, but delicate fossil insect wings and finely veined leaves lurk beneath

your feet, deep time's secrets locked in paper-thin shale. This world-class snapshot records Eocene Epoch life here 34 million years ago (mya).

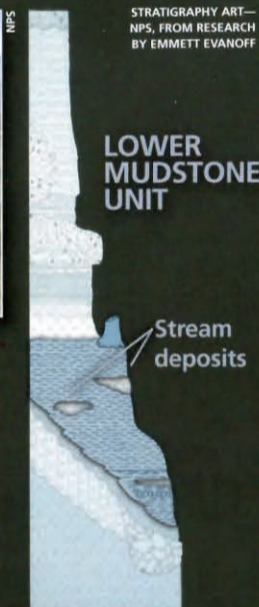
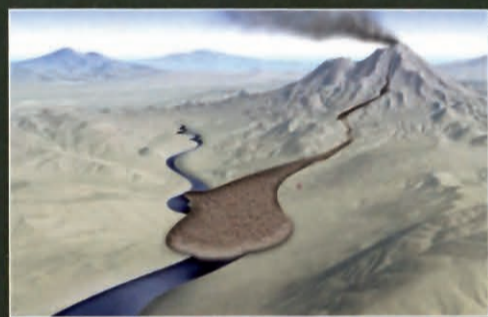
WHAT WAS THE EOCENE? Keep in mind: here didn't look like here 34 mya, and what was here was vastly different. Redwood trees in Colorado, you ask? Similar redwoods now grow only in a thin belt on the California and Oregon coasts but exist here as fossil stumps, many still beneath the valley floor. No doubt the tsetse fly thrived because here was warm-temperate then, not today's cool-temperate highlands. In the Eocene Epoch—55 mya to 33.8 mya (*top globe below*)—warm-temperate forest reached the Arctic. And these fossil plant communities are much like today's plant communities in northeast Mexico, southern Texas, southern Appalachia, and eastern Asia. They represent the end

of the Eocene (*timescale below*), with global climate set to cool dramatically over millions of years. For planetary life this would be the biggest event since the extinction of dinosaurs 65 mya.

STRATIGRAPHY In 1669 the Danish geologist Nicholas Steno described how younger rock layers—strata—usually lie over older rock layers. Stratigraphy is the study of rock layers and layering and can show sequences of events like volcanoes or how lakes come and go over time. Three diagrams below show these fossil-bearing layers, which vary by how their rock was formed. Shale formed from very fine volcanic ash and diatoms (microscopic algae) settling to a lake bottom, which cemented our wasp's great legacy.



Mudflows and Streams of Stone



A massive volcanic area—the Guffey Volcanic complex—existed 15 miles to the southwest 34 mya. The eruptions mixed ash, water, and possibly snow to create massive mudflows called lahars. They covered today's Florissant. The volcanic sediments broke down to soil, in which forests grew. Streams flowed in the forests. Mammals of the forest died near the streams, became buried in stream deposits, and were fossilized. The stream deposits were covered by more mudflows.

FLORISSANT ROCK LAYERS
Volcanic mudflows and stream deposits make up the lower mudstone unit. Mammal fossils are found in stream deposits.

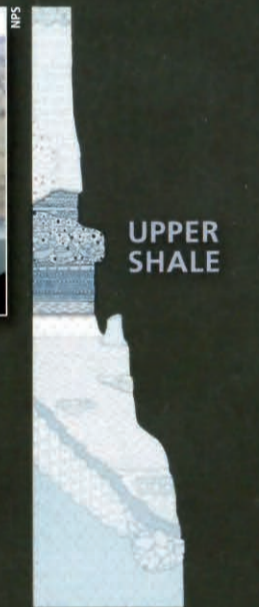
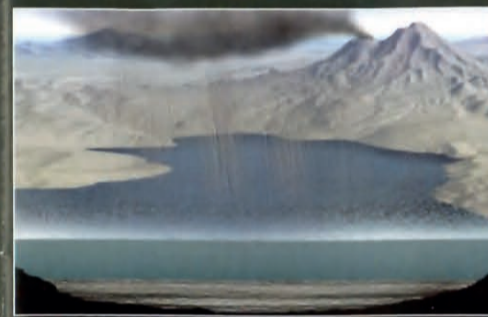
Volcanic Lahar Layer



Powerful, destructive, and creative, lahars are mudflows from the slopes of volcanoes. They can move 150 mph down the slopes and carry car-sized boulders. A lahar from the Guffey volcano (*above*) entombed ancient redwood trees in up to 15 feet of mud and volcanic debris. Eventually the parts of trees encased in mud would become petrified (*below*). A later Guffey lahar dammed a stream, creating Lake Florissant. In its bottom sediments many insect, leaf, and fish fossils began to form.

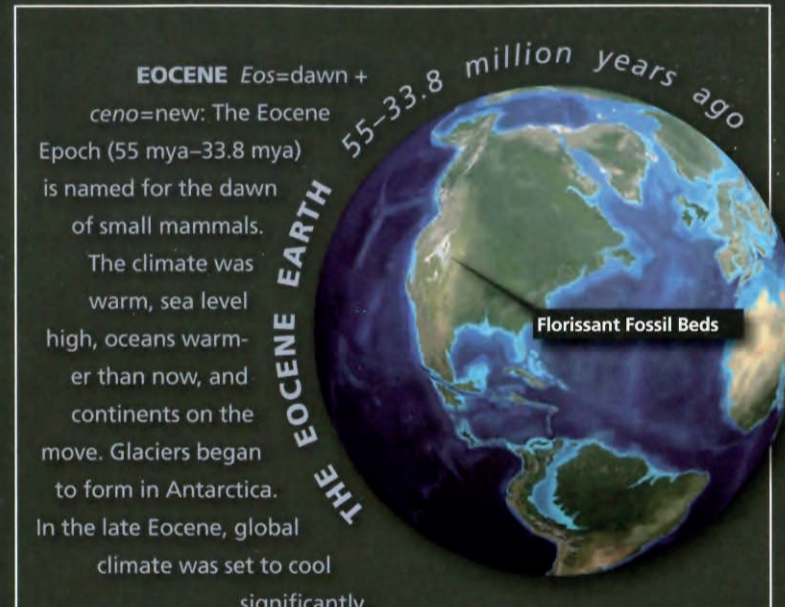
FLORISSANT ROCK LAYERS
The lahar was a volcanic mudflow. It buried an ancient redwood forest. The petrified stumps are found in this layer.

Paper-thin Shale



Fragile paper-thin shale formed on the bottom of Lake Florissant and preserved delicate fossils. The shale formed from repeated microlayers of clay and volcanic ash—finer than talcum powder—overlain by films of the skeletons of dead diatoms. Sticky surface mats of the dead algae trapped insects and leaves, then sank. The shale's delicate, fine-grained layers preserve tiny features in great detail. Many Florissant fossils look like realistic paintings or exquisite drawings.

FLORISSANT ROCK LAYERS
Many, many repeated layers of clay and ash and filmy mats of diatoms formed the thin shale creating intricate insect and leaf fossils.



34 MYA
a different world

Florissant Fossil Beds may give clues about how an ecosystem responds to climate change. Soon after fossil beds formed here 34 mya, just as the Eocene gave way to the Oligocene, Earth's climate cooled rapidly, by geologic measures. Where relatives of fossil plants and insects now live may show response to changing climate. We can compare this fossil site to others formed after the climate cooled. Something "as old as a fossil" can be relevant and full of information today.

MAPS—© RONALD C. BLAKEY / NAU GEOLOGY



Lower jaw of primitive horse *Mesohippus*
UCM 65951

Undescribed shorebird
DMNS 50768

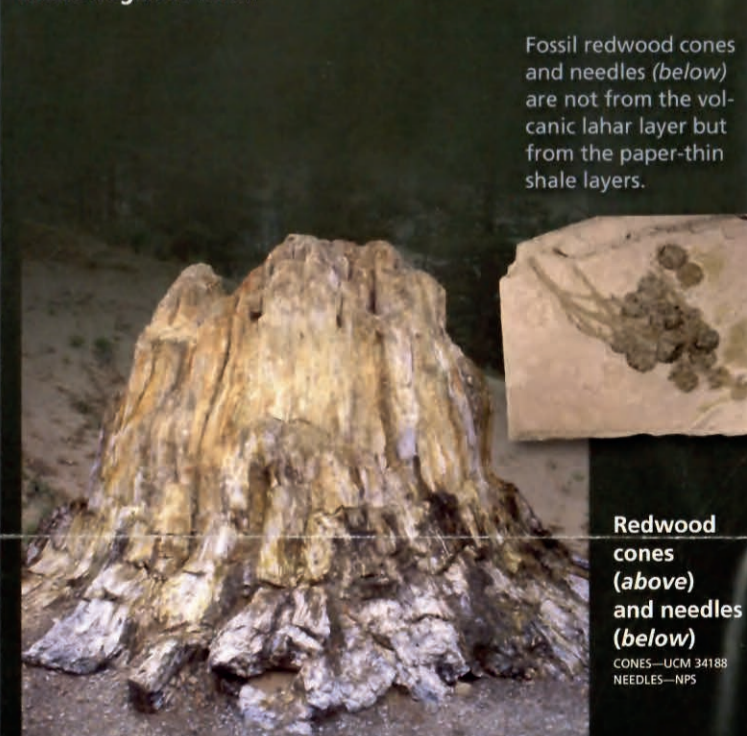
This bird (*above*), from a nearby private fossil site, is from a shale layer below the lower mudstone unit.

Shrew *Domnina thompsoni*
MARIE WORLEY-GEORG



What ancient mammal's jaw might fit on a straight pin? A shrew's. Its teeth say "meat eater," or at least "tearing" as opposed to "grazing." (*Enlarged to show detail.*)

About the size of a collie, *Mesohippus* had three toes, not hooves. Its front teeth stripped plants.



Fossil redwood cones and needles (*below*) are not from the volcanic lahar layer but from the paper-thin shale layers.

Redwood cones (*above*) and needles (*below*)
CONES—UCM 34188
NEEDLES—NPS

Fossil redwood (*Sequoia affinis*) stump
© ELIOT COHEN

How many redwoods were petrified here? We don't know. Collectors took remnants of many over 100 years ago. The redwood grove lived in the valley bottom. Dissolved silica in the groundwater petrified the trees. The stump above was over 12 feet in diameter. Some hardwoods were petrified, too.



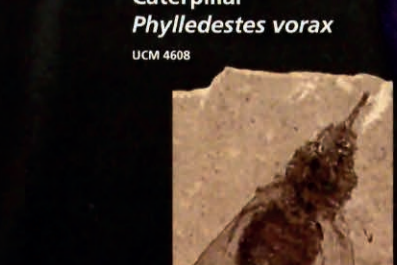
Sucker fish *Amyzon*
UCM 15377

Of Florissant's relatively few vertebrate fossils (having backbones), most are fish, and most are bottom-feeding fish (*above*). Note the fossil's complex texture. It shows each part of the sucker's backbone.

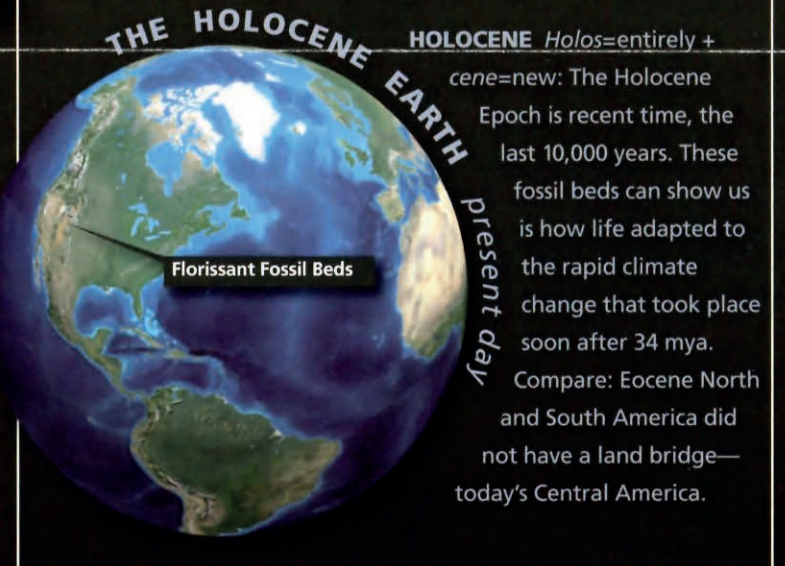
Caterpillar *Phylledestes vorax*
UCM 4608



Hydrangea blossom *Hydrangea fraxinifolia*
SMITHSONIAN INSTITUTION



Tsetse fly *Glossina oligocena*
UCM 31594



Florissant Fossil Beds date to 34 mya

Think of the history of the Earth as though it were the width of this brochure. At such a scale, humans have inhabited the planet for less time than the **thickness** of the paper.

Stone Secrets of Deep Time

Brush-footed butterfly
Prodryas persephone

UCM 8609

Damselfly
Miopodagrion optimum

UCM 8609

Flower calyx
Florissantia speirii

UCMP 3619

Maple leaf
Acer florissantii

UCMP 3827

Birch-like leaf
Paracarpinus fraterna

UCMP 198423

Snout beetle
Curculio restrictus

AMNH FL 39435A

CREDITS KEY
AMNH: AMERICAN MUSEUM OF NATURAL HISTORY
DMNH: DENVER MUSEUM OF NATURE AND SCIENCE
MCZ: MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY
NHMH: THE NATURAL HISTORY MUSEUM, LONDON
UCM: UNIVERSITY OF COLORADO MUSEUM
UCMP: UNIVERSITY OF CALIFORNIA MUSEUM OF PALEONTOLOGY
USNM: NATIONAL MUSEUM OF NATURAL HISTORY
WC: PAUL F. STEWART, WAYNESBURG COLLEGE
YPM: PEABODY MUSEUM OF NATURAL HISTORY, YALE UNIVERSITY

"We get all tangled up with the present. . . ."

Humans are curious, exploring outer space, ocean depths, and even our own genes. Untold discoveries remain here at Florissant. Beneath this valley and rolling hills lies an ancient world, a 34-million-year-old ecosystem. Remarkably, scientists can describe the ecosystem in detail—despite such deep time—because so many of its working parts survive in stone. These fossils are not for burning for fuel. These fossils are for fueling our understanding and imagination. Their diversity tells of a warm-temperate past in a place

that is now cool-temperate. They show organisms whose relatives still live here. They show others that no longer exist. Still others now exist only in other parts of the world. For example, fossils of the tsetse fly have been found here but today this fly lives only in equatorial Africa. Some secrets do remain: No fossils of reptiles or amphibians have been found here. Discovery goes on and on because of the active paleontology at Florissant Fossil Beds National Monument.

The present is just a little flick in time between the past and the future. Things keep going on and on. . . .

Horsetail, also called scouring rush
Equisetum florissantense

UCM 8619

Cattail leaf
Typha lesquereuxii

UCMP 8443

Oak acorn
Quercus

UCMP 8443

Fagopsis male flower
Fagopsis longifolia

SMITHSONIAN INSTITUTION

THE BEECH FAMILY

Broadleaf plants were the most diverse plants here 34 million years ago (mya). A now-extinct member of the beech family, *Fagopsis longifolia*, was common. Its fossils have different plant organs attached, showing stages of the tree's reproductive cycle. This is very unusual and significant. No fossils of its wood have been found with organs attached, so its wood is a mystery.



Fagopsis fruiting head
SMITHSONIAN INSTITUTION

Fagopsis fruit wedges
SMITHSONIAN INSTITUTION

Compare this 1800s engraving of modern beech tree parts (above) to the fossilized parts (left).



Horsetail

A VARIED ENVIRONMENT

Fossilized horsetails (left) and cattails (right) probably grew near ancient Lake Florissant or near streams. By contrast, fossil oak tree leaves show that hillsides may have been drier—as they are today.



Cattail

Fir pollen suggests that cooler conifer forests may have existed on upper slopes of the nearby volcano. The fossils reveal a wide range of species in this ancient environment.

We are just in this particular little time interval, and it seems so important to us."

Harry D. MacGinitie, paleontologist

ANOTHER CONTINENT

The golden rain tree (right) is no longer native to North America. It now lives only in eastern Asia—providing a clue to how plants dispersed in the past.

Golden rain tree fossil.
Koeleruteria allenii, with modern fruit (above).

FOSSIL—UCM 34187; FRUIT—© DAVID LIEBMAN



Millipede
Parajulus cockerelli

AMNH FL 2754



Female wolf spider
Lycosa florissantii

AMNH FL 19022A



ENJOYING THE NATIONAL MONUMENT TODAY

Today's park landscape features mountain meadows and rolling hills forested with ponderosa pine, spruce, fir, and aspen. These trees stand in stark contrast to petrified giant sequoia stumps, which stand in massive contrast to the delicate insect and leaf fossils.

Fossils are best seen in the visitor center and outdoor exhibit area, and on the one-mile Petrified Forest Loop (described at right).

Enjoy the park's 14 miles of trails—pick up the free trail guide at the visitor center. Look for elk, black bears, coyotes, badgers, and Abert's squirrels. Watch for golden eagles.

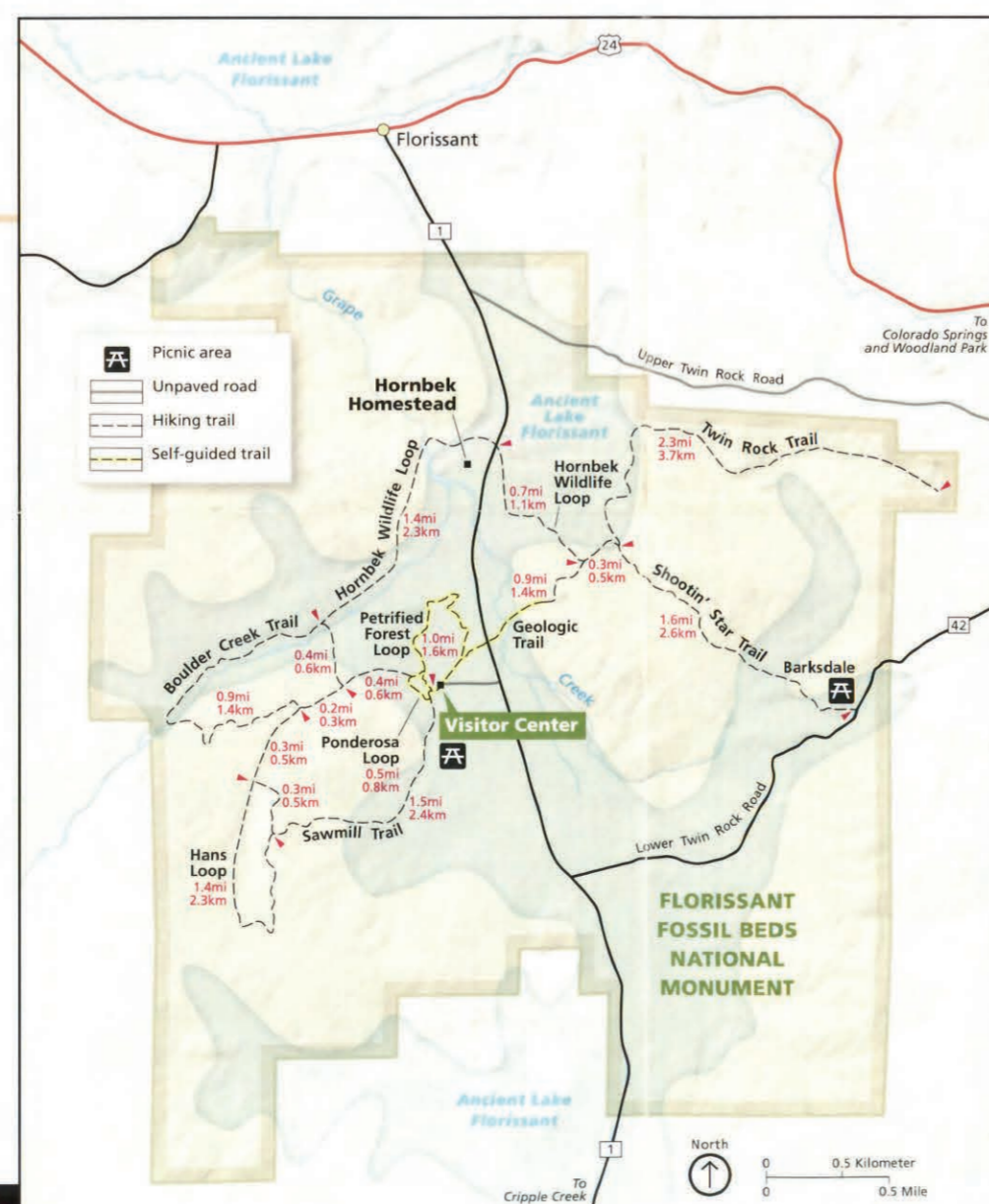
The visitor center is open daily except Thanksgiving, December 25, and January 1. Stop by to see the exhibits and find out about ranger-led programs and hikes, and the Junior Ranger program.

SELF-GUIDING TRAILS

Ponderosa Loop (½ mile) Easy; wheelchair-accessible. Starts behind the visitor center outdoor exhibit area. Walk through the fragrant forest.

Geologic Trail (1 mile) Moderate. View exhibits about geology as you cross the ancient lake bed and pass remnants of a massive volcanic flow.

Petrified Forest Loop (1 mile) Easy. Walk this trail to see a fossil excavation site and massive fossilized tree stumps. Look for the Big Stump; it is about 12 feet in diameter and 38 feet in circumference.



SERVICES The town of Florissant has gasoline and food. Campgrounds are nearby. Woodland Park has lodging.

PROTECT YOUR PARK Pets must be leashed; they are allowed only in designated areas. • Federal law protects all natural and cultural features including rocks, plants, and fossils. • ATVs, snowmobiles, and bikes are prohibited. • Do not feed, approach, or disturb wildlife. • No camping or campfires. • Firearms regulations are on the park website.

PROTECT YOURSELF Pace yourself, drink lots of water, and use sunscreen. • Seek shelter during thunder storms; lightning is common.

ACCESSIBILITY We strive to make our facilities, services, and programs accessible to all. For information go to the visitor center, ask a ranger, or check the park website.

Indian paintbrush

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More Information
FLORISSANT FOSSIL BEDS
NATIONAL MONUMENT
PO Box 185, Florissant, CO 80816
719-748-3253
www.nps.gov/flfo

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Florissant Fossil Beds National Monument is one of over 400 parks in the National Park System. To learn more about parks, visit www.nps.gov.

National Park Foundation
Join the park community.
www.nationalparks.org

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