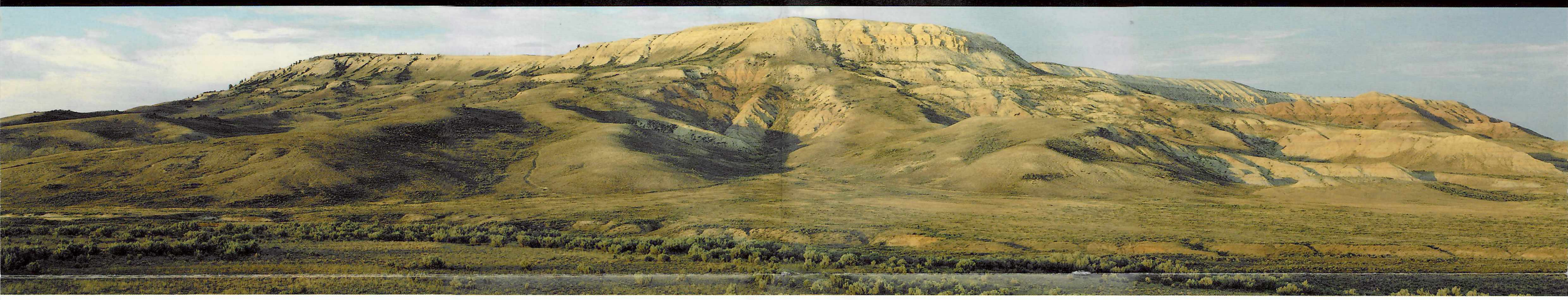
Fossil Butte

Fossil Butte National Monument
Wyoming

National Park Service
U.S. Department of the Interior



NPS

Fifty-two million years ago, three great lakes covered areas of present-day Wyoming, Utah, and Colorado—Lakes Gosiute and Uinta, and Fossil Lake, the smallest. The sediments they left behind created the limestone, mudstone, and volcanic ash layers of the Green River Formation. These rock layers preserve many remarkable fossils of plant and animal life in the Eocene Epoch of geological time.

Some fossils come from Fossil Butte (*above*), the flat-topped rock that rises above the valley floor. Congress designated it a national monument in 1972. Its detailed fossil record shows a broad spectrum of species—plants, snails, crustaceans, spiders, millipedes, insects, reptiles, birds, mammals, and over 20 kinds of fish. The fossils tell a story of ancient life and a different landscape.

Since the mid-1800s paleontologists and others have unearthed millions of specimens from Fossil Lake's sediments. Billions more lie buried in the butte and surrounding ridges, protected and preserved for future study.

Fossil Lake, 60 miles long and 40 miles wide, nestled among mountains in a lush forest. Willows, beeches, oaks, palms, maples, and ferns grew on the lower slopes, and spruce and fir on the cool mountainsides. The habitat supported many animal species that lived in and around the warm lake waters. Fish swam in the tributaries, shallows, and deep waters of the lake. Gars, paddlefish, bowfins, and stingrays survive elsewhere today, as do herring, perch, and mooneyes. The lake shore bustled with crocodilians; primates and dog-sized horses roamed the land; birds and bats took to the air.

Fossils of Ancient Fossil Lake

Figures refer to maximum size of fossils found in Fossil Lake.



Above: ***Atractosteus simplex*** **(gar)** to 3 ft

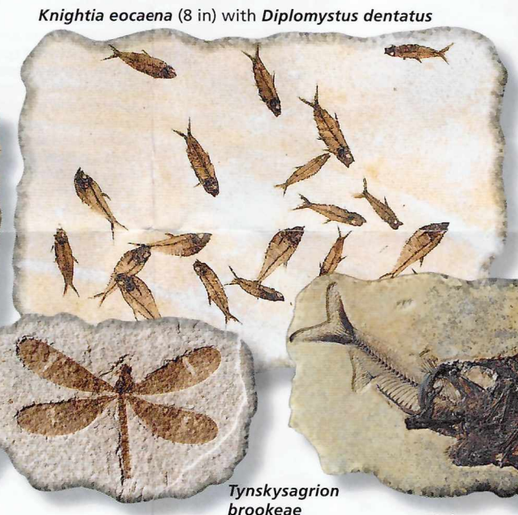


Left: ***Plastomenus thomasii*** **(turtle)** shell 6 in



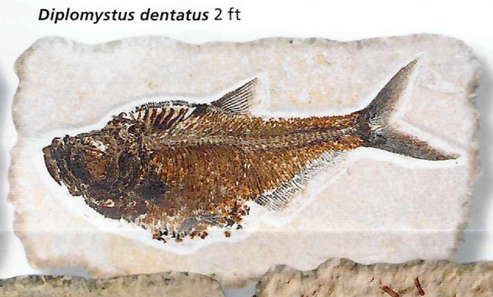
Left: **Palm frond** 9 ft
Below: ***Cockerellites liops*** 6 in





Knightia eocaena (8 in) with ***Diplomystus dentatus***

Tynskysagrion brookeae 4-in wingspan



Diplomystus dentatus 2 ft



Diplomystus dentatus with ***Knightia eocaena*** in mouth (*see sizes above*)



Procambarus primaevus **(crayfish)** 3 in



Onychonycteris finneyi **(bat)** 6 in

The unusual number, variety, and detail of freshwater fish fossils provide a window into life at Fossil Lake 52 million years ago. Millions of herring, swimming in schools, are preserved in stone. Bigger predator fish, like six-foot-long gars and four-foot-long bowfins, are less common. Most fish have complete skeletons with delicate scales and skin. Many of the over 20 species are ancestors of or related to present-day species.

Hundreds of life forms other than fish are also captured in stone. Here are the oldest complete fossil bats in the world and remarkably complete fossil snakes. Snail shells, insects, crocodilians, freshwater turtles, birds, feathers, and plant remains—leaves, seeds, stems, and flowers blown or washed into the lake—are all part of the buried story of ancient Fossil Lake.

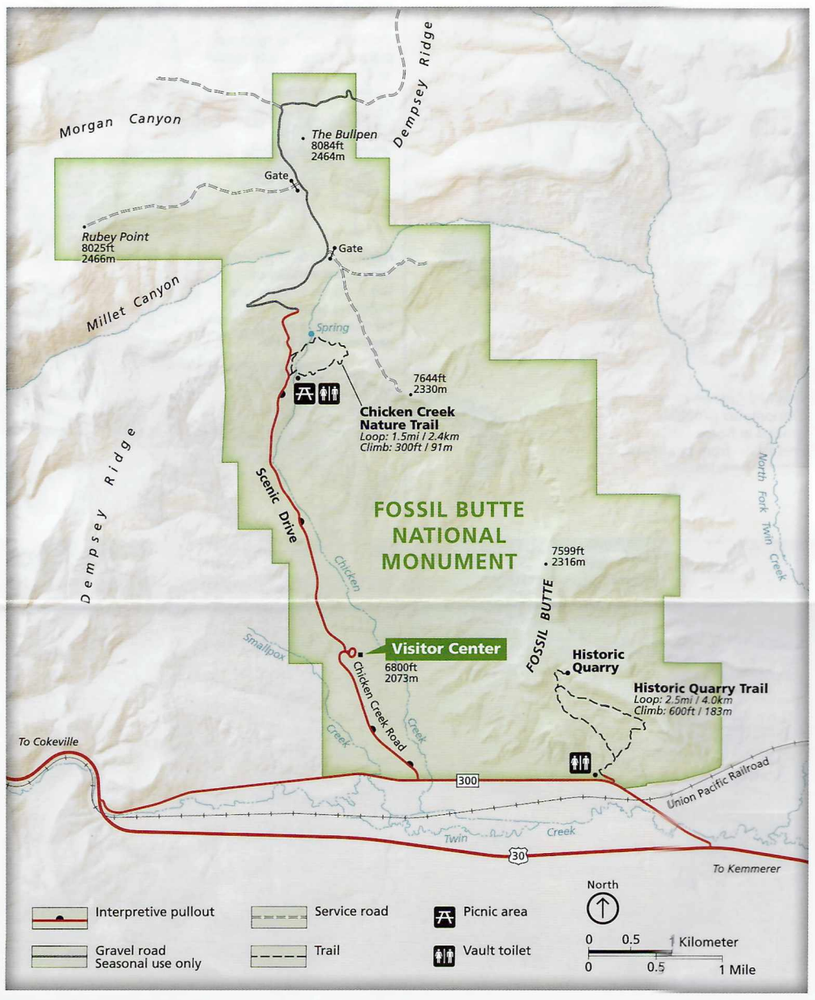
Ideal conditions in Fossil Lake led to the abundance of fossils. The lake had fresh water on top and salt water at the bottom. The fresh water was rich in dissolved limestone, which recombined into lime mud when winds stirred up the lake surface. A microbial mat formed, and the salt water prevented it from being eaten by snails. Over time thin layers of the lime mud and microbial mat preserved dead organisms that had sunk to the bottom.

Some of the largest fish fossils come from the deep-water sediment layer, called the 18-inch layer. These fossils are composed of whitish to gray limestone alternating with brown organic material.

An equally important layer is a tan limestone that splits easily. Called the split-fish layer, it averages 6½ feet in thickness. Smaller fish, crayfish, and stingrays, all of which lived in shallow water near the lake's edge, are more common here.

While many of Fossil Lake's animals and plants probably died natural deaths, some fish died suddenly and in huge numbers. These die-offs are recorded in the Green River Formation's mass mortality layers. What killed these fish? A superbloom of red algae that released toxins? A sudden change in water temperature or salinity? All of these? Continuing research may solve the mystery.

FOSSIL PHOTOS—NPS / ARVID AASE



The Park Today

The park is a semi-arid landscape of flat-topped ridges dominated by sagebrush, other desert shrubs, and grasses. North-facing slopes have conifer groves. Aspen groves form at seeps where the Green River and Wasatch formations meet.

Green River Formation Tan sedimentary rock layers near the top of Fossil Butte and surrounding ridges preserve millions of fish and other fossils. The formation is 200 to 300 feet thick.

Wasatch Formation The red, pink, and purple formation of river sediments preserves fossils of plants, primitive horses, a rhino-sized mammal called *Coryphodon*, early primates, crocodilians, turtles, and lizards.

Plan Your Visit

Visitor Center Find 30 exhibit cases displaying more than 2,500 rocks containing over 3,000 fossils. Open year-round; check the park website for days and hours.

Picnic Area A wheelchair-accessible picnic area has tables and a restroom.

TRAILS

Historic Quarry Trail *Strenuous: 2½-mile loop.* Climb Fossil Butte to a fossil quarry worked for three years in the 1960s. Exhibits describe the geology and history of collecting.

Nature Trail *Moderate: 1½-mile loop.* This trail winds through sagebrush and aspen groves. Exhibits explain the area's natural history.

Today's Natural World Watch for mule deer, pronghorn, elk, coyotes, garter snakes, and eagles in this land of sagebrush, aspens, pines, and willows. Wildflowers bloom seasonally.

Climate Temperatures range from 90s°F in summer to subfreezing in winter. Strong afternoon winds are common.

Accessibility We strive to make facilities, services, and programs accessible to all. For information go to the visitor center, call, or check the park website.

Food, Lodging, Services Find food, lodging, campgrounds, and other services in Kemmerer. You may camp on nearby public lands but check for regulations first.

Safety and Regulations Be alert. *Remember: Safety is your responsibility.* • Wear sturdy shoes and carry plenty of water when hiking. Be aware of elevation gains and steep downhill sections. • Protect yourself from the sun and insects. • Pets must be leashed and attended. • Use caution on unpaved roads; they may be impassable if wet. • Do not feed or approach wildlife. • For firearms regulations check the park website.

Emergencies call 911

Collecting Fossils—Past and Present

In 1856 geologist Dr. John Evans collected some of the first fossil fish from the Green River Formation. Paleontologist Dr. Joseph Leidy identified the fossils and gave them scientific names.

Not all early collectors were scientists. In the 1860s Union Pacific Railroad workers discovered the Petrified Fish Cut near the Green River station in Wyoming. In 1881 the Oregon Short Line Railroad was routed near Fossil Butte, improving access to the area.

People came here for what became a life's work. Robert Lee Craig spent 40 years (1897–1937) quarrying and preparing fossils for museums and private collections throughout the world. David C. Haddenham worked here from the 1920s to the 1950s.

Fossils quarried here are exhibited in museums across the United States, including the Field Museum, Chicago; the American Museum of Natural History, New York; and the National Museum of Natural History, Smithsonian Institution, Washington, DC.

You may collect outside the park for a fee in some commercial fossil quarries on state and private land. Less common fossils on state land are curated at the Wyoming Geological Survey for study.

You may collect within Fossil Butte National Monument only by special permit for a research project that advances scientific understanding of Fossil Lake.

Stewardship

Fossil Butte National Monument was established to protect the fossils and geologic features within its boundary. Do not take, disturb, or damage any fossil; if you find a fossil, leave it in place and report it to a ranger.

Federal laws protect all natural and cultural features in the park. Violators will be prosecuted.





Thamnophis elegans vagrans **(garter snake)**
© WILLIAM FLAXINGTON

One of three snake fossils from the Green River Formation
© RON WOLF

More Information
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www.nps.gov/fobu

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GPO:2025—431-026/84222 Last updated 2022

Life in Ancient America

Before the Cenozoic Era, which continues today, dinosaurs held dominion over the land. Mammals also existed, but they were small and less abundant. When the dinosaurs perished, the mammals took center stage. The numbers and species of mammals increased, as did those of birds, reptiles, fish, insects, trees, grasses, and other life forms.

But the 30 million species that now populate Earth are a mere fraction of the life forms that have ever existed. As human actions continue to alter the composition of Earth's atmosphere, with effects on ecosystems and habitat, about 100 species will become extinct every day.

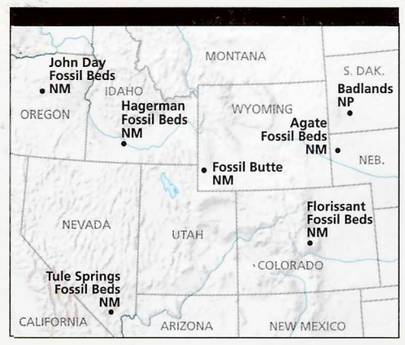
The fossil record locked within the Green River and Wasatch formations is a rich trove of information about the extinct plants and animals of the Cenozoic Era. Through the study of fossils, we can see similarities and differences between today's species and their habitats, and those of over 50 million years ago.

For example, birds, which are avian dinosaurs, continued to evolve after the event that caused the extinction of the non-avian dinosaurs. Today birds retain their ancestors' scaled legs and feet and their skeletal structure.

Across the Cenozoic Era, species have evolved, migrated, or become extinct as their environment changed. Fossil Butte National Monument and other parks (*right*) preserve rich fossil records that enable paleontologists to raise and answer questions about physical, chemical, and biological changes in our own epoch on Earth.

Fossil Butte's arid climate today cannot support the gars, paddlefish, bowfins, and stingrays, or the crocodilians, turtles, and primates preserved as fossils from millions of years ago. But fossils can tell us how their world looked.

You can see Cenozoic Era fossils at these national parks (NP) and national monuments (NM).



Paleocene
Began 65 million years ago

The Paleocene Epoch began after dinosaurs became extinct. Mammals that had lived in their shadows for millions of years eventually evolved into a vast number of different forms to fill these newly vacated environmental niches. Many forms of these early mammals would soon become extinct. Others would survive to evolve into other forms.

The variety of other animals and plants also increased, and species became more specialized. Although dinosaurs were gone, birds continued to flourish, and reptiles lived on as turtles, crocodiles, lizards, and snakes.

As the Paleocene began, most mammals were tiny, like this rodent-like **multituberculate**. With time mammals grew in size, number, and diversity.



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



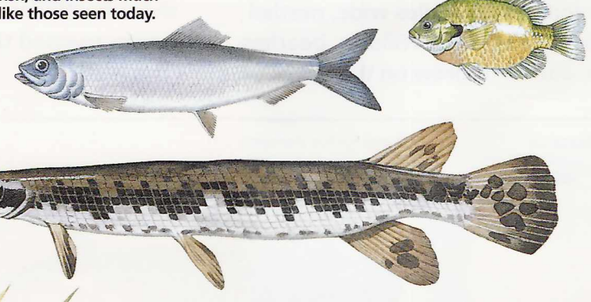


EOCENE
Began 55 million years ago

In the Eocene Epoch mammals emerged as the dominant land animals. They also took to the air and the sea. The increasing diversity of mammals begun in the Paleocene continued at a rapid pace in the Eocene. The many variations included some of the earliest giant mammals. Some were successful, some not. The fossil record reveals many mammals quite unlike anything seen today. Increasingly, however, there were forest plants, freshwater fish, and insects much like those seen today.



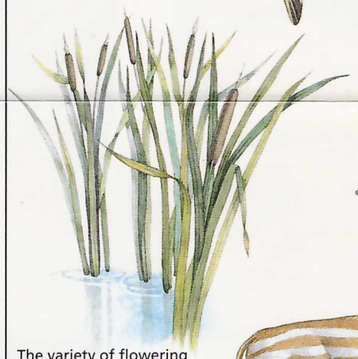
Bats, the only type of mammal ever to develop the power of active flight, took to the air more than 52 million years ago.
Fossil Butte NM



Many freshwater fish lived in North American lakes during the Eocene Epoch. **Gars** (*bottom*), **herring** (*middle*), and **sunfish** (*top*) are similar in appearance to those Eocene fish.
Fossil Butte NM

Groves of giant **redwood** trees once grew throughout western North America. Changes in climate were responsible for their shrinking range.
Florissant Fossil Beds NM





The variety of flowering plants exploded just before, during, and after the Eocene. They would populate the land with all sorts of new species of trees, shrubs, and smaller plants. **Cattails** grew in the shallows of Eocene freshwater lake edges.
Fossil Butte NM

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





Butterflies and many other insect groups co-evolved throughout the Cenozoic with the increasing variety of flowering plants. These insects became important agents of pollination.
Florissant Fossil Beds NM



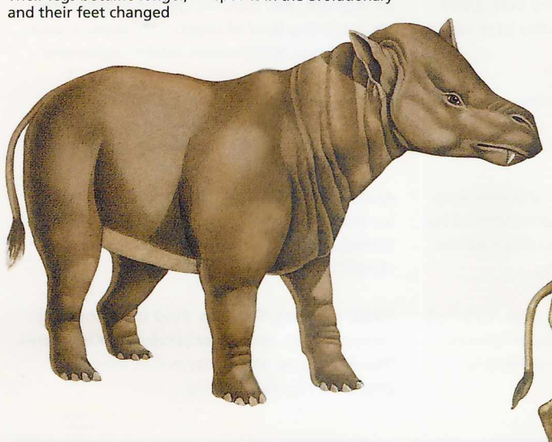
Ancient tapirs such as ***Heptodon*** browsed near the shores of Fossil Lake in what is now western Wyoming. Unlike modern tapirs, *Heptodon* had a very small snout.
Fossil Butte NM



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



Living in Eocene forests, the first **horse-like** animals 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 evolved from being adapted for browsing to being adapted for grazing. Just a few of the species in the evolutionary history of horses are shown here in silhouette across this chart. Fossil horses occur at many sites in the National Park System.



Coryphodon had short, stocky limbs and five-toed, hoofed feet, closely resembling the tapir. Its brain was very small. The males had large tusks. *Coryphodon* also lived on land not far from the shores of Fossil Lake.
Fossil Butte NM

(Park names following captions indicate where fossils were found.)

Oligocene
Began 34 million years ago

The Oligocene Epoch was a time of transition between the earlier and later Cenozoic Era. The once warm and moist climate became cooler and drier. Subtropical forests gave way to more temperate forests.

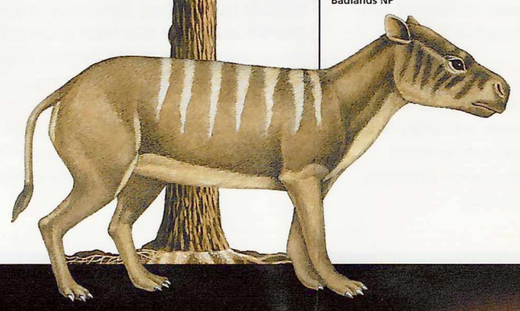
Late in the Oligocene, savannas—grasslands broken by scattered woodlands—appeared. These changes caused mammals, insects, and other animals to keep trending toward specialization. Some adapted to the diminishing forests by becoming grazers. Early types of mammals continued to die out as more modern groups—dogs, cats, horses, pigs, camels, and rodents—rose to new prominence.



Ekgmowechashala marked the end of the original primate lineage in North America. A small lemur-like primate, it may have used large skin folds to glide from tree to tree. Its name means "little cat man" in Lakota, which the discoverer understood to be their name for monkey.
John Day Fossil Beds NM

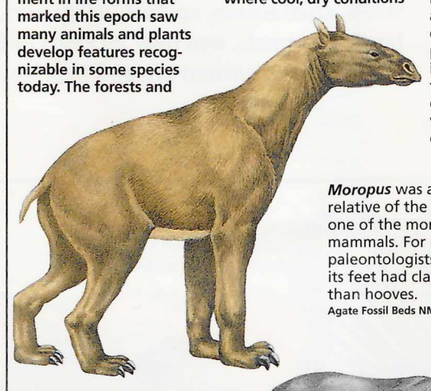


Oreodonts, a group of sheep-like animals, were successful in the Eocene and Oligocene. By the end of the Miocene they had completely died out.
Badlands NP



Miocene
Began 23 million years ago

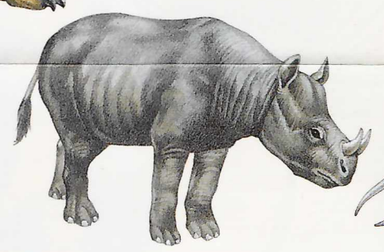
The abundance of mammals peaked in the Miocene Epoch. The refinement in life forms that marked this epoch saw many animals and plants develop features recognizable in some species today. The forests and savannas persisted in some parts of North America. Treeless plains expanded where cool, dry conditions prevailed. Many mammals adapted for prairie life by becoming grazers, runners, or burrowers. Large and small carnivores evolved to prey on these plains-dwellers. Great intercontinental migrations took place throughout the Miocene, with various animals entering or leaving North America.



Moropus was a distant relative of the horse and one of the more puzzling mammals. For many years paleontologists thought its feet had claws rather than hooves.
Agate Fossil Beds NM

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

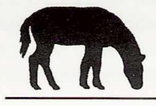


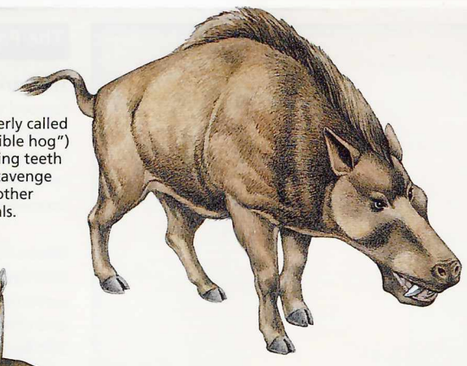


Rhinos were varied and abundant during most of the Cenozoic Era. Around the world they ranged in size from the three-foot-tall North American species ***Menoceras*** (*above*) to a giant Asian species, the largest land mammal yet found in the fossil record.
Agate Fossil Beds NM



Daphoenodon was carnivorous. It differed from the earliest true dogs of the Oligocene Epoch. Its so-called "beardog" family eventually went extinct.
Agate Fossil Beds NM





Daeodon (formerly called ***Dinohyus***, "terrible hog") had bone-crushing teeth enabling it to scavenge the remains of other grassland animals.
Agate Fossil Beds NM

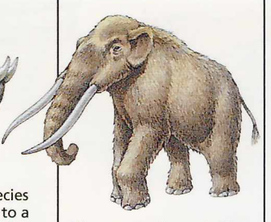


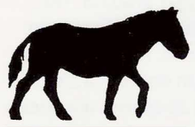
The tiny gazelle-camel ***Stenomylus*** probably grazed in herds for protection from predators.
Agate Fossil Beds NM

Pliocene
Began 5 million years ago

Most 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 of dry, open grassland environments has been found in the Pliocene. Toward the end of this epoch 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.

Mammut was a type of mastodon that migrated to North America in the Pliocene. In the early Pleistocene another elephant group called mammoths joined the mastodons. By the late Pleistocene mastodons and mammoths both became extinct, possibly because of climatic changes or hunting by early people.
Hagerman Fossil Beds NM

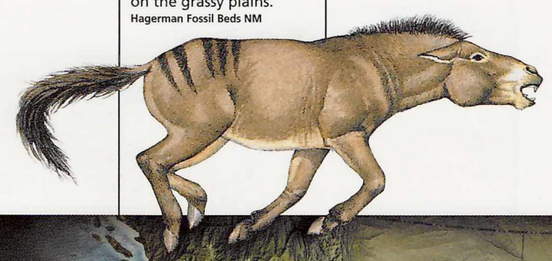




Willow, alder, birch, and elm grew on the ancient river plains of the Pliocene. These same plants grow along streams and rivers today.
Hagerman Fossil Beds NM



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



Pleistocene
Began 2 million years ago

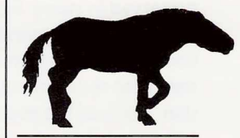
The Pleistocene Epoch began with widespread migrations of mammals and ended with massive extinctions. It was also a time when glaciers repeatedly covered much of North America.

Humans have lived in North America for many thousands of years. In this relatively short period in Earth's history, we have had a profound effect on the plants and other animals here. Do we have a responsibility to try to limit our effects on other species, or are humans simply a natural agent of extinction?



Today many species, like loons (*above*), are declining. The gray wolf (*middle*) is at risk in some states. The Kemp's ridley sea turtle (*bottom*) and other sea turtles are endangered. The National Park Service is one of many public agencies and private organizations entrusted with preserving the diversity of life in North America.







TREE ILLUSTRATION—NPS / JOHN DAWSON; ALL OTHER ILLUSTRATIONS—NPS / KAREN BARNES. SOME DEPICTIONS OF SPECIES FOLLOW FOSSIL RECONSTRUCTIONS AS REPRESENTED IN R.J.G. SAVAGE AND M.R. LONG'S *MAMMAL EVOLUTION: AN ILLUSTRATED GUIDE*, NEW YORK: FACTS ON FILE PUBLICATIONS, 1986. *Illustrations are not to scale.*

Learning from Fossil Lake

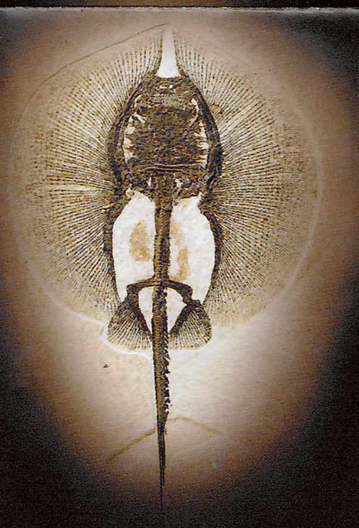
The lakes that covered much of Utah, Wyoming, and Colorado in past epochs of the Cenozoic Era (*map, right*) are gone now. Through the fossil record preserved in the Green River Formation (rich in fish and plants) and the Wasatch Formation (rich in mammals), we can learn about life forms in past epochs. We can see how climate change can challenge life's very ability to survive. The warm water, marshes, and wetlands nurtured and supported many species that cannot survive here in today's semi-arid desert.

Because the site of the Cenozoic Era lake and its fossils will be forever protected, future generations of people can continue to discover the past at Fossil Butte National Monument.

"Looking back on the long panorama of Cenozoic life," Finnish scientist Björn Kurten has said, "we ought to sense the richness and beauty of life that is possible on this Earth of ours." It is no longer enough to plan for the next generation or two, Kurten suggests. We should plan "for the geological time ahead. ... It may stretch as far into the future as time behind us extends into the past."



Borealosuchus wilsoni (crocodilian)
JAMES ST. JOHN



Heliobatis radians (stingray)
© RON WOLF



Bechleja rostrata (prawn)
© RON WOLF



Ceratophyllum muricatum (hornworts)
© RON WOLF



The semi-arid landscape of present-day Wyoming, Utah, and Colorado was waterfront property in the Eocene Epoch.
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