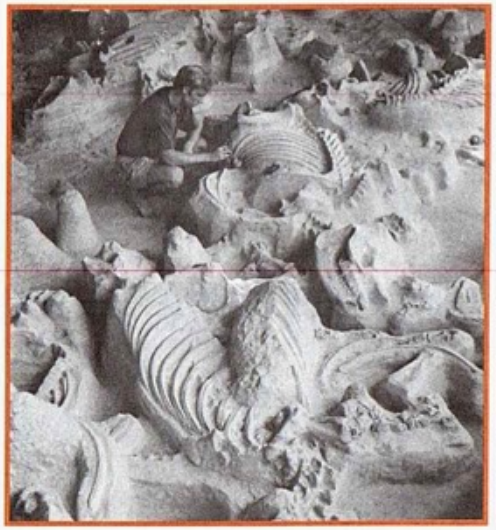
Ashfall Fossil Beds

State Historical Park

Designated a National Natural Landmark



NEBRASKA GAME & PARKS

A joint project of
Nebraska Game and Parks Commission
and the University of Nebraska State Museum
www.ashfall.unl.edu / OutdoorNebraska.org

Nearly 12 million years ago, hundreds of rhinos, three-toed horses, camels, and other animals died and were buried by volcanic ash around the edges of a watering hole in what is now northeast Nebraska. Still locked in their death poses, the amazingly well-preserved skeletons of these prehistoric beasts lay undisturbed, wrapped in a blanket of jagged glassy particles, until the 1970s when scientific study of the fossilized remains began.

Located 6 miles north of U.S. 20 between Royal and Orchard in northern Antelope County, Ashfall Fossil Beds State Historical Park is a joint project of the Nebraska Game and Parks Commission and the University of Nebraska State Museum. The park offers a fascinating and educational experience for the entire family – a chance to step back in time and see what Nebraska wildlife was like long before modern man ventured onto the Great Plains.

Visitors are invited to watch the ongoing excavation of this unique "time capsule." An 18,000 square foot Rhino Barn protects part of the deposit, where skeletons are uncovered and displayed exactly where they are found. Walkways give visitors a close-up view as paleontologists carefully brush away the volcanic ash from the massive skulls of native American rhinos and the delicate side hooves of tiny ancestral horses.

The Ashfall site is of national importance and has been featured on the PBS series NOVA, Discovery channel's "Super Volcanoes," in Bill Bryson's Short History of Nearly Everything," National Geographic magazine, Ranger Rick magazine, and in newspapers worldwide.





About Your Visit

Your first stop should be the Visitor Center to see the interpretive displays and the working fossil preparation laboratory. You are invited to ask the paleontologists about their work. Educational programs are presented on a regular basis. From the Visitor Center, it is a short stroll to the Rhino Barn, where new discoveries continue to be unearthed.

Ashfall is situated on 360 acres of rugged rangeland in the scenic Verdigre Creek valley. A nature trail is available to help interpret the geology and flora and fauna of the area. Picnicking is permitted in the park, and campers can use nearby Grove Lake Wildlife Management Area near Royal and Niobrara State Park for lodging and camping.

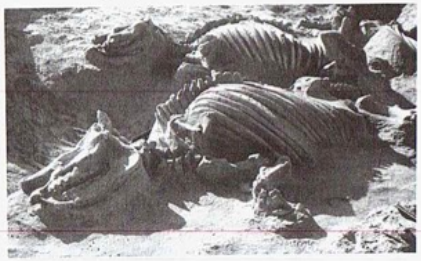
Please do not smoke in the buildings or on the trails. Pets are permitted, but they must be kept on a leash. Collecting fossils or other specimens on the park grounds is strictly prohibited. (If every visitor took a "souvenir," one of Nebraska's natural historic treasures would soon be gone forever.)

Preservation of Ashfall now and for future generations is made possible by the generosity of the Nebraska Game and Parks Foundation, which purchased the land in 1986, the Burlington Northern Foundation, and Hubbard Family Foundation which supplied grants for construction of facilities. Paleontologists and interpretive staff at the site are provided by the University of Nebraska State Museum. The Nebraska Game and Parks Commission oversees and provides overall maintenance to the facility.

The Ashfall Story

In 1971, heavy spring rains eroded a deep gully at the edge of Melvin Colson's cornfield. Later that year, paleontologist Mike Voorhies happened to find the skull of a complete baby rhino protruding from the side of the gully. It lay near the bottom of a newly-exposed bed of sparkling gray ash and turned out to be the first of more than 100 rhino skeletons excavated by University of Nebraska State Museum crews at what became known as the Ashfall Site.

This wasn't the first time fossils had been found on the Colson farm. Long before the ash bed and its trove of skeletons were exposed to view, scattered bones had been collected from a bed of sandstone, which forms a ledge beneath the ash bed. As early as the 1920s, local youngsters found bone fragments on the rocky hillsides. Then, in 1953, Donald Peterson found a partial rhino skull in the sandstone and reported it to the Museum. This important specimen is now on display in the Visitor Center at the park.



The isolated skull found by Mr. Peterson is a good example of the sort of fossil that have made Nebraska's Niobrara River valley famous in the world of paleontology. For more than a 100 years, bone hunters have searched the sandstone walls of the Niobrara and its tributaries for remains of ancient mammals. This area contains North America's most complete record of the 20-million-year history of grassland animals.

A Prairie Pompeii

Even by Niobrara valley standards, preservation of the skeletons in the ash bed is exceptional. Most fossils found elsewhere are incomplete – a jaw here, a leg bone there. That's because natural decay and scavengers tend to break up and scatter skeletons soon after an animal dies.

It is extremely rare for whole herds of animals to die and be buried so quickly that their carcasses remain largely intact, as has happened at Ashfall. In the ash bed, some rhinos were literally buried in their tracks, with their last footprints clearly visible. Some females have calves next to them, while others have unborn young inside. Many contain the fossilized remains of their last mouthful of grass.

If a time machine were to transport you back 12 million years, you would find a Nebraska covered with sub-tropical grasses and patches of jungle. Discoveries at Ashfall give a detailed picture of what you'd see on such an imaginary safari. Only a fraction of the site has been excavated, so much remains to be learned. However, it is clear that before the catastrophic ashfall occurred, the area was inhabited by a rich variety of life reminiscent of modern East African savannas. More than 50 species of animals and plants have been identified from fossils collected just below the ash bed.

Disaster Strikes

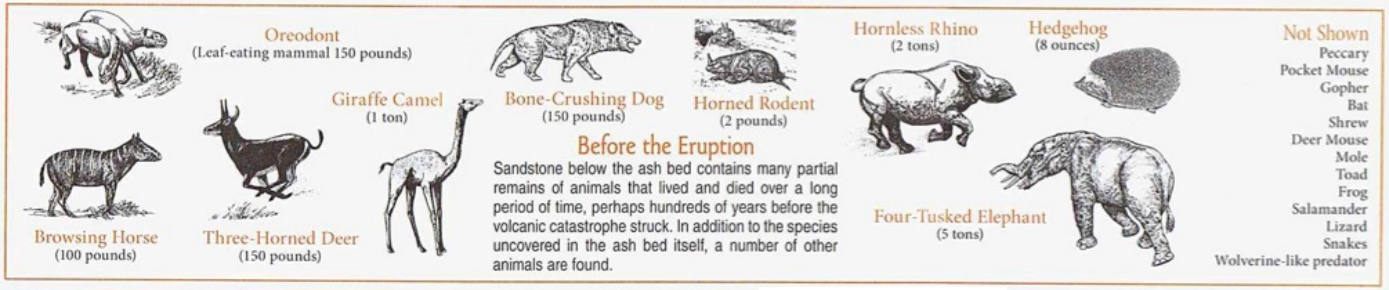
Sweeping across the plains like a gray blizzard, the sudden fall of volcanic ash must have devastated the landscape. Confused and choking, the animals began to die. Scientists have shown that the ash that killed and eventually buried the animals at the park blew eastward from a huge volcanic eruption in what is now southwestern Idaho. Part of the great cloud of abrasive dust settled out to a foot or so deep over much of northern Nebraska, then it began to blow around like fresh snow. Eventually the high ground was blown free of ash, but low-lying areas like the marshy pond at the Ashfall site were filled to depths of eight feet or more.

Like detectives at the scene of a crime, paleontologists are trying to discover exactly what happened at the Ashfall site by studying the arrangement of the bodies of the victims. At the very bottom of the ash bed are small creatures such as pond turtles, birds, musk deer, and small carnivores, which probably died almost immediately. Just above these remains in the ash are skeletons of horses and camels that died next. Many of these early victims were chewed on by scavengers or were crushed and trampled by larger animals that survived longer. Finally, above the horse and camel skeletons are the rhinos. Along with occasional giant tortoises, they were the last to die.

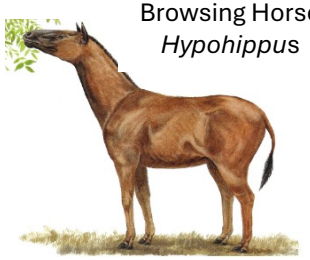
Elusive Predators

As excavation of the site continues, hopes are high that a skeleton of one of the large extinct predators, like a sabertooth cat or bear-dog, will be found. Bite marks on bones already collected and even fossilized droppings full of chewed bone give proof that big meat-eaters were close at hand. Perhaps you will be on hand when a park paleontologist brushes ash from the gleaming saber of a great rhino-killing cat, exposing it to the sunlight for the first time in nearly 12 million years!

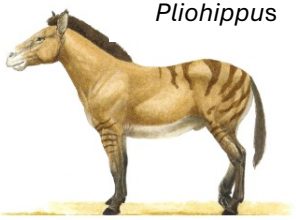




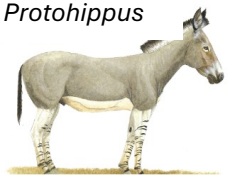
Browsing Horse
Hypohippus



Stout one-toed Horse
Pliohippus



Slender, grass-clipping horse
Protohippus



Small three-toed horse
Pseudohipparion

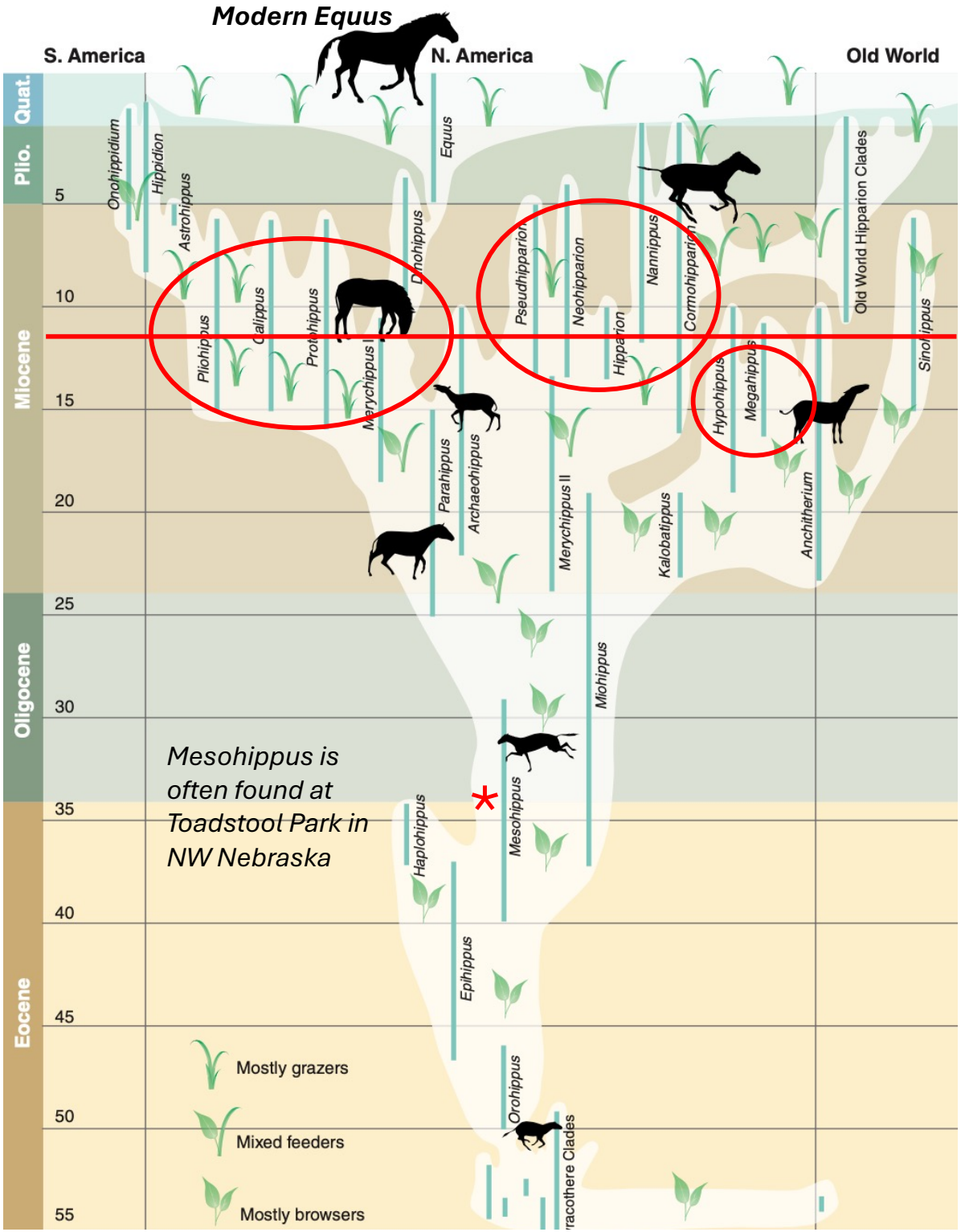


Slender three-toed horse
Neohipparion



Sturdy three-toed horse
Cormohipparion



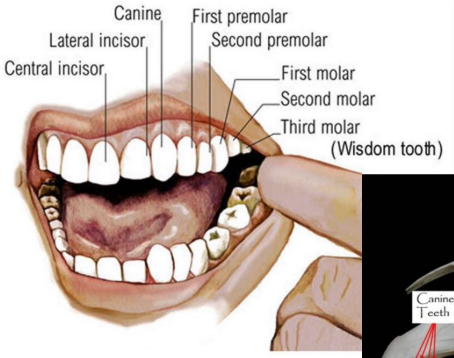


The Ash Fall horses represent three tribes of horses at their peak diversity:

1) *Hypohippus* is the last species in an old lineage of strict browsers going back to *Mesohippus*
2) *Pseudohipparion, Neohipparian, & Comohipparian* are from a 3-toed tribe
3) *Protohippus & Pliohippus* are from a younger one-toed tribe that will lead to Equus

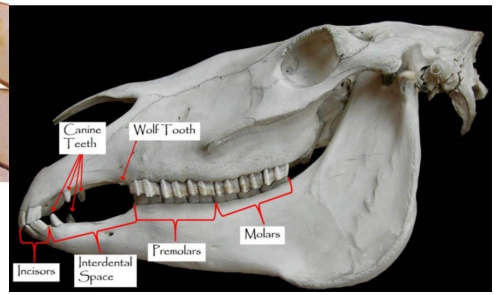
Fossil Horses--Evidence for Evolution
Bruce J. MacFadden
Science **307**, 1728 (2005);

Georges Cuvier (1769-1832) –
"Show me your teeth and I'll tell you who you are"



Adaptations of grazers:
*specialized grinding molars
*speed & mobility
*long limbs
*herd behavior
*specialized digestion

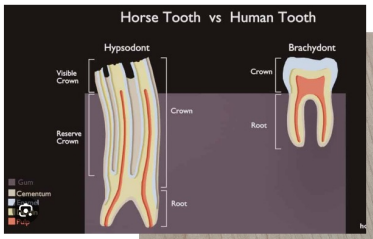
horse





Jay Matternes mural, Smithsonian

Crowns of 2nd and 3rd molars of elk (*browser*) & bison (*grazer*)



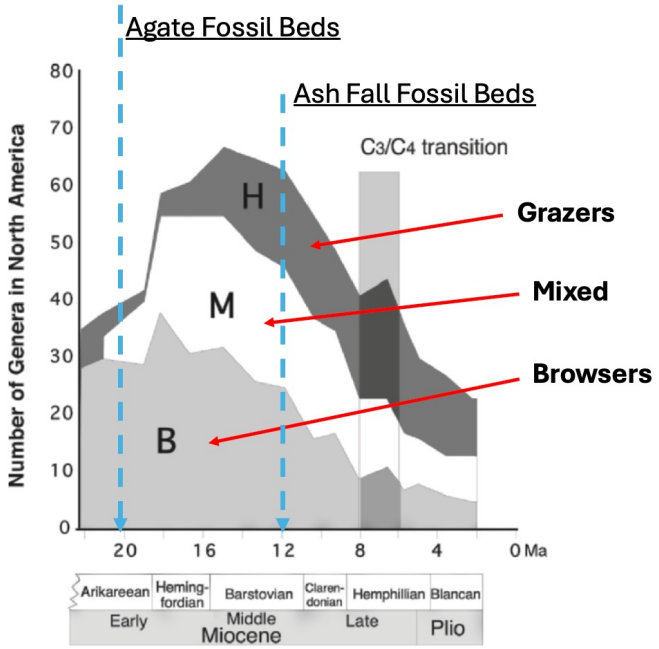


Fig. 2.4 Continent-wide generic diversity of ungulates in North America. *H* = hypsodont (i.e., probable grazers or mixed feeders in open habitats); *M* = mesodont (somewhat hypsodont; i.e., probable mixed feeders in open or closed habitats); *B* = brachydont (i.e., probable browsers). Modified from Janis et al. 2004