Miscellaneous Map 37
2004

PREHISTORIC LIFE OF NORTH DAKOTA

by

John W. Hoganson and Brett Woodward

North Dakota Geological Survey
Edward C. Murphy, Acting State Geologist

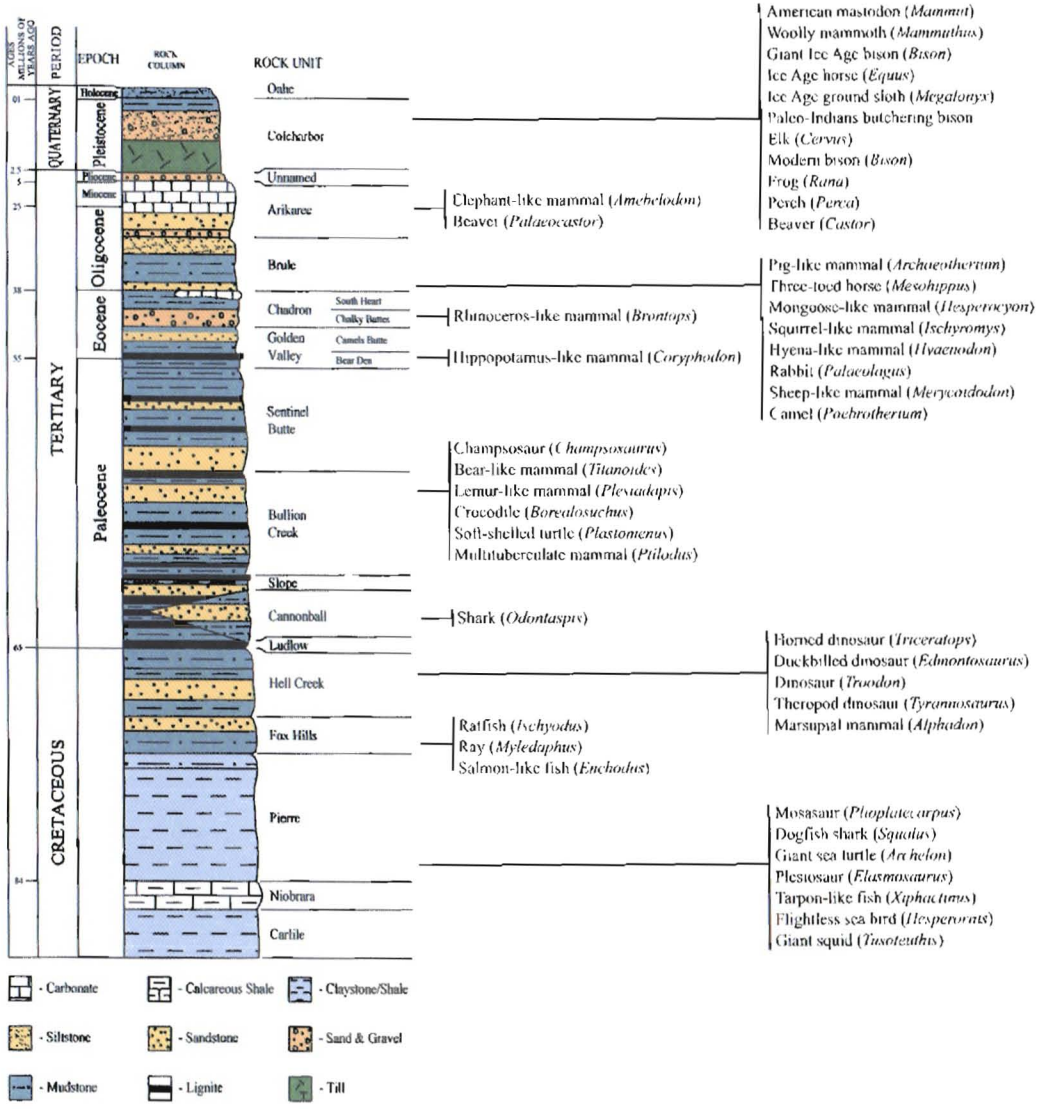
Introduction to North Dakota Prehistoric Life

The history of life in North Dakota is a fascinating story. That history is being deciphered through the study of fossils, the remains of plants and animals buried in the Earth. Fossils indicate the kinds of plants and animals that inhabited North Dakota at different times in the geologic past and document the progression of life through time. They also provide information about North Dakota's past climates and environments. Fossils of all the animals illustrated on the other side of this page have been found in North Dakota approximately where shown on the geologic map. The following are highlights of North Dakota's prehistoric life story.

The oldest rocks exposed in North Dakota are about 90 million years old. From about 90 million years ago until about 70 million years ago North Dakota was covered by shallow, warm oceans that connected the Gulf of Mexico to the Arctic Ocean. The fossilized remains of the animals that lived in these oceans include marine reptiles (mosasaurs, plesiosaurs, turtles); sharks, rays, ratfish, and other fish; and invertebrates including squids, crabs, snails, clams, and cephalopods. These fossils are entombed in sediments, now turned into rock, that accumulated at the bottom of the oceans. By about 65 million years ago these oceans receded and a huge delta developed in western North Dakota. This delta provided habitats for dinosaurs, including *Triceratops* and *Tyrannosaurus rex*, rodent-size mammals, freshwater snails and clams, and exotic plants. Their remains are found in the Hell Creek Formation. The last ocean, named the Cannonball Sea, to cover parts of North Dakota disappeared by about 60 million years ago. Sharks, stingrays, ratfish, other fish and invertebrates, including lobsters, crabs, snails, and clams lived in that ocean. Fossils of these animals have been recovered from the Cannonball Formation. North Dakota's state fossil, *Teredo*-bored petrified wood, which was driftwood bored into by shipworms floating along the shore of the Cannonball Sea, is also found in these rocks.

Huge swamps occupied western North Dakota from about 60 million to 50 million years ago when North Dakota's climate was subtropical, similar to Florida's climate today. Dawn redwood, bald cypress, *Ginkgo*, *Magnolia*, palm and many other exotic plants grew in these swampy lowlands and formed extensive forests. The swamps were inhabited by crocodiles, alligators, turtles, mammals, clams, and snails. The Bullion Creek and Sentinel Butte Formations contain fossils of these plants and animals. By about 35 million years ago these swamplands gave way to savanna habitats as a result of climate cooling and drying. These savannas were inhabited by ancestral horses, camels, rhinoceroses, sheep-like mammals, rodents, rabbits, giant pigs, ancestral dogs, and saber-tooth cats. Their remains are found in the Chadron and Brule Formations. Climate cooling continued and culminated in the Great Ice Age that began about 1.6 million years ago. Woolly mammoths, mastodons, giant bison, ground sloths, and horses inhabited the steppes and spruce-aspen forests that existed in North Dakota in front of the continental glaciers. Cold-adapted insects and mollusks lived in the ponds. The grassland habitats that exist today in North Dakota became established by about 4,000 years ago as a result of climate drying and warming, and the kinds of animals and plants that exist today in North Dakota became established at about that time.

North Dakota Stratigraphy



Prehistoric Life Images

American mastodon (*Mammut*)
Woolly mammoth (*Mammuthus*)
Giant Ice Age bison (*Bison*)
Ice Age horse (*Equus*)
Ice Age ground sloth (*Megalonyx*)
Paleo-Indians butchering bison
Elk (*Cervus*)
Modern bison (*Bison*)
Frog (*Rana*)
Perch (*Perca*)
Beaver (*Castor*)

Pig-like mammal (*Archaeotherium*)
Three-toed horse (*Mesohippus*)
Mongoose-like mammal (*Hesperocyon*)
Squirrel-like mammal (*Ischyromys*)
Hyena-like mammal (*Hyaenodon*)
Rabbit (*Palaeolagus*)
Sheep-like mammal (*Merycoidodon*)
Camel (*Pochrotherium*)

Horned dinosaur (*Triceratops*)
Duckbilled dinosaur (*Edmontosaurus*)
Dinosaur (*Troodon*)
Theropod dinosaur (*Tyrannosaurus*)
Marsupial mammal (*Alphadon*)

Mosasaur (*Phosphatecarpus*)
Dogfish shark (*Squalus*)
Giant sea turtle (*Archelon*)
Plesiosaur (*Elasmosaurus*)
Tarpon-like fish (*Xiphactinus*)
Flightless sea bird (*Hesperornis*)
Giant squid (*Tusoteuthis*)

Acknowledgments: We thank the following artists and organizations for allowing us to use the prehistoric animal images. **Illinois State Museum and artist Robert G. Larson**, American mastodon (*Mammut*), **Artist Vern Erickson**, Bison (*Bison*), Elk (*Cervus*); **American Museum of Natural History and artist Charles R. Knight**, Saber-tooth cat (*Dinictis*), **Artist Dorothy S. Norton**, Ice Age horse (*Equus*), Giant Ice Age bison (*Bison*), Woolly mammoth (*Mammuthus*), **Artist Dan Varner**, Flightless sea bird (*Hesperornis*), Tarpon-like fish (*Xiphactinus*), Rhinoceros-like mammal (*Brontops*), **Artist Gene Carl Feldman**, Giant squid (*Tusoteuthis*), **Science Museum of Minnesota and artist Jerome Connolly**, Champsosaur (*Champsosaurus*), **State Historical Society of North Dakota**, Paleo-Indians butchering bison, **Artist Mark Hallett**, Giant sea turtle (*Archelon*), Dinosaur (*Tyrannosaurus*), **Marshall Editions, a member of the Quarto Group**, Plesiosaur (*Elasmosaurus*), Crocodile (*Borealosuchus*), Lemur-like mammal (*Plesiadapis*), Pig-like mammal (*Archaeotherium*), Mongoose-like mammal (*Hesperocyon*), Multituberculate mammal (*Ptilodus*), Soft-shelled turtle (*Plastomenus*), Squirrel-like mammal (*Ischyromys*), Hyena-like mammal (*Hyaenodon*), Rabbit (*Palaeolagus*), Sheep-like mammal (*Merycoidodon*), Duckbilled dinosaur (*Edmontosaurus*), Hippopotamus-like mammal (*Coryphodon*), Marsupial mammal (*Alphadon*), Salmon-like fish (*Enchodus*), Elephant-like mammal (*Amebelodon*), Beaver (*Castor*), **Artist Richard Ellis**, Grey nurse shark (*Odontaspis*), Dogfish shark (*Squalus*), **Canadian National Museum of Natural Sciences and artist Eleanor Kish**, Dinosaur (*Triceratops*); **The Natural History Museum, London, and artist Michael R. Long**, Bear-like mammal (*Titanoides*), Three-toed horse (*Mesohippus*); **Kingfisher Publications**, Beaver (*Palaeocastor*), Camel (*Pochrotherium*), **Artist John Sibbick**, Dinosaur (*Troodon*); **The Manitoba Museum, *The Natural Heritage of Manitoba: Legacy of the Ice Age*, and artist Betsy Thorsteinson**, Ice Age ground sloth (*Megalonyx*); **North Dakota Geological Survey and artist David W. Miller**, Mosasaur (*Phosphatecarpus*), **North Dakota Game and Fish Department**, Frog (*Rana*), Salamander (*Opisthotrition*), Perch (*Perca*). Geologic map modified from North Dakota Geological Survey Miscellaneous Map 28.