

“A FOSSIL EXHIBIT IN EVERY TOWN”: ONE GOAL OF THE NORTH DAKOTA GEOLOGICAL SURVEY FOSSIL RESOURCE MANAGEMENT PROGRAM

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In 1989, two laws were passed in North Dakota that enhanced the North Dakota Geological Survey's ability to manage North Dakota's fossil resources. These laws were enacted because there was legislative concern and concern by Governor George Sinner that North Dakota was losing its fossil resources to out-of-state collectors. In fact, fossil collectors have been removing fossils from North Dakota since the mid-1800's. The North Dakota Paleontological Resource Protection Act (NDCC 54-17.3) gives the North Dakota Industrial Commission, acting through the office of the State Geologist, the responsibility to manage and protect fossil resources on lands owned by the State of North Dakota and its political subdivisions. North Dakota Century Code 54-17.4 created a State Fossil Collection by directing the North Dakota Geological Survey to operate and maintain a public repository for fossils. In 1990, the Geological Survey entered into a formal agreement with the State Historical Society of North Dakota to allow the State Fossil Collection to be developed in the North Dakota Heritage Center, headquarters of the State Historical Society and State Museum. Through this agreement, space is allocated to the Geological Survey in the Heritage Center for the State Fossil Collection, a laboratory for fossil preparation, and offices for the NDGS paleontology laboratory specialist and me. In exchange, the State Historical Society and Geological Survey collaborate in developing North Dakota prehistoric life exhibits at the Heritage Center, the Pembina State Museum,

and the Missouri-Yellowstone Confluence Interpretive Center, all administered by the State Historical Society.

Since 1990, the State Fossil Collection has grown dramatically as a result of collecting efforts of the NDGS and because of donations to the collection by the public and non-resident scientists. Expansion of the collection into a larger area in the Heritage Center was necessary and in 2000 a newly renovated area became the NDGS Johnsrud Paleontology Laboratory. The laboratory was named in honor of the Clarence Johnsrud family of Trenton and Williston who provided funding for renovation of the new laboratory and because of Clarence's donation of a spectacular collection of 60 million year old leaf fossils.

The development of a State Fossil Collection has allowed us to establish fossil exhibits at the State museums and at many local museums, visitors centers, interpretive centers, and government office display areas. The intent of these fossil exhibits is to provide information about North Dakota's prehistoric life and to interpret the fascinating story of the progression of life in North Dakota for the public, educators, students, and visitors to the State. This article is meant as a guide to places in North Dakota where the North Dakota Geological Survey has had a role in developing fossil exhibits and where one can go to see exhibits of North Dakota fossils (Figure 1). This summary also briefly describes the kinds of fossils on display at each facility.

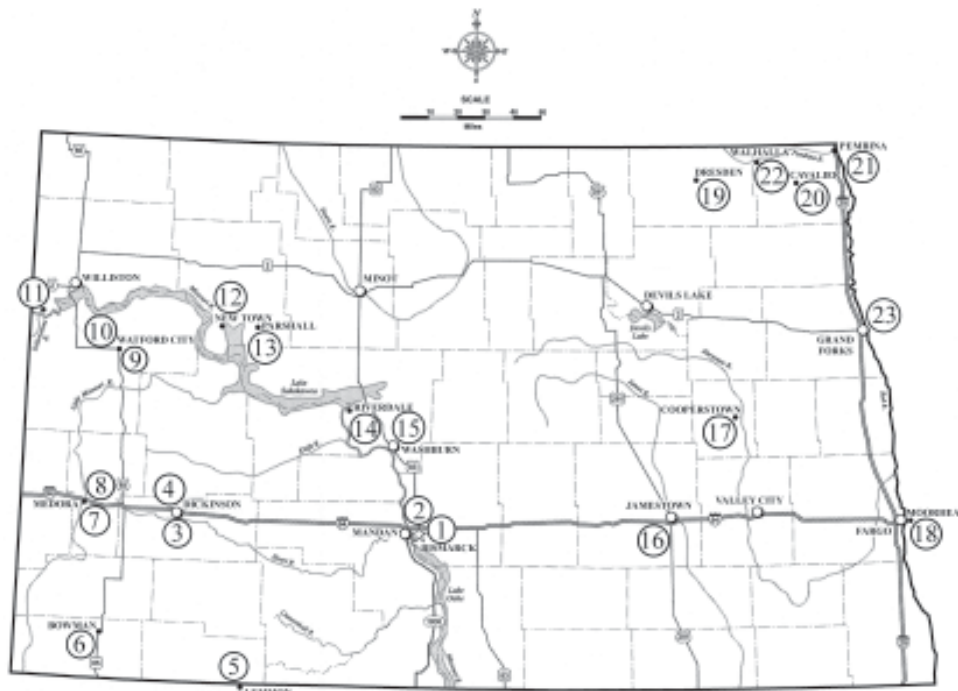


Figure 1. Map of North Dakota showing location of fossil exhibits.

North Dakota Heritage Center - State Museum, Bismarck

For the past 14 years, the NDGS and State Historical Society of North Dakota have been working toward completion of a series of fossil exhibits in the North Dakota Heritage Center that trace the history of life in North Dakota from about 90 million years ago to the present (Figure 1.1; Figure 2). The space within the Heritage Center that is devoted to these fossil exhibits is called the "Corridor of Time." These exhibits are meant to provide a prehistoric background and setting for the appearance of humans in North Dakota, which occurred about 11,000 years ago. The remainder of the Heritage Center is devoted to interpretation of the human history of the state.



Figure 2. North Dakota Heritage Center, Bismarck.

The following exhibits have been completed in the "Corridor of Time." Suspended from the ceiling is the 23 foot long skeleton of a mosasaur called *Plioplatecarpus* (Figure 3). This marine lizard lived in the Pierre Sea that covered North Dakota during the Cretaceous about 75 million years ago (see my NDGS Newsletter articles, v. 23, no. 2&3, 1996; Winter, 2000). This fossil was found in Griggs County and a cast of its skull is on exhibit in the Griggs County Museum, Cooperstown. The "Corridor of Time" Cretaceous marine exhibit also includes the remains of the flightless sea bird, *Hesperornis*, sharks, rays, other fish, crabs, snails, clams, and cephalopods.



Figure 3. *Plioplatecarpus*.

A skull of the plant eating dinosaur, *Triceratops*, that inhabited the Hell Creek Delta which

occupied western North Dakota during the Late Cretaceous, about 65 million years ago, recovered from U. S. Forest Service administered land, is also in the "Corridor of Time." (See my NDGS Newsletter article Spring, 1997.)

About 60 million years ago North Dakota's climate was subtropical and the State was covered by swamps and forests. Skeletons of the crocodile-like *Champsosaurus* and soft shell turtle, *Plastomenus* (see my NDGS Newsletter article, Fall 1995), and shells of freshwater clams and snails that inhabited North Dakota at that time are exhibited. A variety of beautifully preserved leaf fossils collected and donated by the late Clarence Johnsrud of Trenton are the remains of exotic plants that grew in these western North Dakota forests (see my NDGS Newsletter article, Summer, 2000).

Huge mammals lived in North Dakota at the end of the last Ice Age just a few thousand years ago. The skeleton of the Highgate Mastodon, one of the Ice Age elephants, and teeth of woolly mammoths are popular displays in the entrance to the First People exhibit (Figure 4) (see my NDGS Newsletter article,

December, 1991). The skull of the giant Ice Age bison, *Bison latifrons*, with a horn span of seven feet, is also in that exhibit (Figure 5) (see my NDGS Newsletter article, v. 29, no. 2). A beautifully preserved wolf-dog skeleton recovered from a 2,300 year old archeological site is also on display.



Figure 4. The Highgate Mastodon.



Figure 5. Skull of *Bison latifrons*.

Industrial Commission - North Dakota Geological Survey and Oil and Gas Division headquarters, Bismarck

In 2001, the North Dakota Geological Survey and Oil and Gas Division of the Industrial Commission moved into a new office building in Bismarck (Figure 1.2; Figure 6). A foyer outside the receptionist's office contains geological and paleontological displays. Visitors are greeted by the 65 million year old skull of the three-horned dinosaur, *Triceratops*, recovered from U. S. Forest Service-Dakota Prairie Grasslands administered land in the Little Missouri National Grassland, Slope County (Figure 7). Other North Dakota fossils in the foyer exhibit area are: jaws and skulls of 30 million year old horses, rhinoceroses, oreodonts, and other mammals; a 35 million year old fish skeleton; a claw from an Ice Age ground sloth; and a woolly mammoth tooth; 75 million year old shark, ray, and other fish teeth and crabs, clams, and snails from the same age; and a variety of 60 million year old leaf fossils.



Figure 6. NDGS and Oil & Gas Division office building, Bismarck.



Figure 7. *Triceratops* skull.

Dakota Dinosaur Museum, Dickinson

Although the NDGS has not had much involvement with the Dakota Dinosaur Museum (Figure 1.3; Figure 8), fossils collected from U. S. Forest Service administered land in North Dakota on display in the museum are cataloged in the NDGS State Fossil Collection. The most spectacular of these fossils is the nearly complete skeleton of the three-horned dinosaur

Triceratops. This is one of the most complete *Triceratops* skeletons ever found. The Dakota Dinosaur Museum features full scale models of several of the well known dinosaurs.



Figure 8. Dakota Dinosaur Museum, Dickinson.

Dakota Prairie Grasslands, Medora Ranger District Office, Dickinson

Sixty million year old crocodile remains from the famous Wannagan Creek fossil site on U.S. Forest Service administered land near Medora are featured in this small exhibit in the Medora Ranger District Office in Dickinson (Figure 1.4). Most of the fossils in the exhibit were provided by the Science Museum of Minnesota which collected the Wannagan Creek site for many years, although the NDGS provided fossils of the soft-shelled turtle, *Plastomenus*, for the exhibit.

Dakota Prairie Grasslands, Grand River Ranger District Office, Lemmon, SD

The dinosaur fossil-bearing Hell Creek Formation is exposed in some areas of the Grand River Ranger District near Lemmon, South Dakota (Figure 1.5). Sixty-five million year old dinosaur fossils, including the leg bone of a duckbilled dinosaur and a tooth of *Tyrannosaurus rex*, are exhibited in the receptionist's area of the district office in Lemmon. Fossils found with the dinosaur remains, including petrified pine cones, are also displayed.

Dakota Prairie Grasslands, McKenzie Ranger District Office, Watford City

For many years the NDGS has been doing field surveys with the U. S. Forest Service to identify fossil resources and map fossil sites on Forest Service administered land in North Dakota. During these surveys we have discovered many significant fossil sites and specimens on the Little Missouri National Grasslands. Several of these 60 million year old fossils are exhibited in the lobby of the McKenzie Ranger District Office in Watford City (Figure 1.9). The display includes the skull of the crocodile, *Borealosuchus*; freshwater fish, snail, and clam remains; and leaf fossils.

Pioneer Trails Regional Museum, Bowman

The North Dakota Geological Survey has had the pleasure of working with the Pioneer Trails Museum in Bowman (Figure 1.6; Figure 9) since the museum's inception, in their efforts to develop fossil collections and exhibits. The well presented fossil exhibits in the museum have been created by the museum staff with little involvement, other than encouragement, from the NDGS. The exhibit includes the remains of several kinds of dinosaurs including *Triceratops*, *Tyrannosaurus rex*, and duckbilled dinosaurs recovered from the Hell Creek Formation near Marmarth. A variety of other vertebrate and leaf fossils from the Hell Creek Formation are also displayed. The museum also features a variety of mammal fossils, mostly skulls, including oreodonts, giant pigs, insectivores and others collected from 30 million year old rocks exposed in Slope County.



Figure 9. The Pioneer Trails Regional Museum, Bowman.

Theodore Roosevelt National Park Visitors Center, Medora

In 1997, we conducted a paleontological inventory of Theodore Roosevelt National Park. During that study several important and well preserved fossils were recovered from 60 million year old rocks exposed in the park (see my NDGS Newsletter article, Spring 1997). Several of these fossils are on exhibit in the Theodore Roosevelt National Park visitors' center museum in Medora (Figure 1.7; Figure 10). The display includes a restored skeleton of a crocodile-like animal called *Champsosaurus* (Figure 11), the shell of the snapping turtle, *Protochelydra* with crocodile bite marks, crocodile and fish remains, freshwater snail and clam shells, and a leaf fossil.



Figure 10. Theodore Roosevelt National Park visitors center, Medora (Photo by Bruce Kaye).



Figure 11. Skeleton of *Champsosaurus* (Photo by Bruce Kaye).

North Dakota Cowboy Hall of Fame, Medora

The NDGS is currently working with the North Dakota Cowboy Hall of Fame in Medora (Figure 1.8; Figure 12) to develop an evolution of the horse exhibit. A skeleton (cast) and actual fossils of the three-toed horse, *Mesohippus*, will be featured in this exhibit (Figure 13). The diminutive (adults were only about 18 inches tall) *Mesohippus* roamed western North Dakota about 30 million years ago. The North Dakota Cowboy Hall of Fame will officially open in 2005.



Figure 12. The North Dakota Cowboy Hall of Fame.



Figure 13. Skeleton cast of the 3-toed horse *Mesohippus*.

Long X Visitor Center, Watford City

The Long X Visitor Center in Watford City (Figure 1.10; Figure 14) is near completion and will contain displays of fossils found in the Watford City area. While excavating crocodile fossils from the 60 million year old Sentinel Butte Formation on U. S. Forest Service administered land near the North Unit of Theodore Roosevelt National Park, we discovered a huge, extremely well preserved, petrified tree stump that was still in its natural growth position. It was decided to display this unusual fossil in the new Long X Visitor Center. The stump, believed to be bald cypress, is about 9 feet in diameter at its base and weighs about 16,000 pounds (Figure 15). The stump was moved this summer, through the cooperative efforts of the city of Watford City, McKenzie County, U. S. Forest Service - Dakota Prairie Grasslands, and the NDGS, to the visitors center.

A cast of the skull of the Ice Age bison, *Bison latifrons*, will also be exhibited at the Long X Visitor Center. The original skull was discovered by Kent Pelton of Watford City and is displayed at the North Dakota Heritage Center in Bismarck.

The NDGS, ND Oil and Gas Division, and ND Petroleum Council are also developing a petroleum industry display for the Visitor Center. That display will contain cores (cylinders of rock brought up from beneath the surface while drilling), samples of different kinds of crude oil, and other oil and gas industry related objects.

The Long X Visitor Center is scheduled to open in 2004.



Figure 14. Long X Visitor Center, Watford City.



Figure 15. 60 million year old petrified tree stump.

Missouri-Yellowstone Confluence Interpretive Center, Buford

The beautifully designed Missouri-Yellowstone Confluence Interpretive Center at Buford opened in 2003 (Figure 1.11; Figure 16). This interpretive center administered, with Fort Buford, by the State Historical Society of North Dakota is situated in a historic and scenic setting on the Missouri River across from the mouth of the Yellowstone River. A display of fossil plants and animals that inhabited the confluence area at different times in the geologic past is in the interpretive center. Exhibited are 60 million year old fossils including a skull (cast) of a large crocodile called *Borealosuchus*, a tree stump that is carbonized (turned into lignite), a petrified log and pieces of polished petrified wood, leaf fossils from the Clarence Johnsrud collection, and shells of freshwater snails and clams (Figure 17). A skull (cast) of the huge Ice Age bison, *Bison latifrons*, is also displayed. These ancient bison roamed the Williston area, with woolly mammoths, about 50,000 years ago.

The interpretive center also contains a petroleum industry exhibit. This exhibit features a core from the first discovery well in North Dakota, the Clarence Inverson #1 well near Tioga. Examples of different varieties of North Dakota crude oil, and different types of drill bits used in exploration for oil and gas, are also displayed.



Figure 16. Missouri-Yellowstone Confluence Interpretive Center, Buford.



Figure 17. Fossils in the Missouri-Yellowstone Confluence Interpretive Center (Photo by Genia Hesser).

Three Affiliated Tribes Museum, New Town

A cast of the skull of the giant Ice Age bison, *Bison latifrons*, is on permanent exhibit at the Three Affiliated Tribes Museum in New Town (Figure 1.12; Figure 18). The original skull was found along the shore of Lake Sakakawea near New Town on U. S. Army Corps of Engineers administered land within the Fort Berthold Reservation. That skull is on exhibit at the Heritage Center in Bismarck.



Figure 18. Three Affiliated Tribes Museum, New Town.

Paul Broste Rock Museum, Parshall

One of the most unique and interesting museums in North Dakota, from the view point of a geologist, is the Paul Broste Rock Museum in Parshall (Figure 1.13; Figure 19). Paul Broste, who farmed near Parshall, had an inordinate fondness for rocks, minerals, and fossils. Broste amassed a huge collection over many years and built a museum out of field stone (glacial erratics) in Parshall to house the collection.

The museum was closed for many years after Broste's death but was reopened by the City of Parshall in 1998 (see my NDGS Newsletter article v. 25, no. 3, 1998). Prior to reopening, I spent several days identifying rocks, minerals, and fossils in the collection and evaluating the collection for the museum officials. We organized the collection and provided display labels for the specimens. Although there are relatively few fossils in the museum, thousands of beautiful, rare, mineral and rock specimens from around the world are displayed.



Figure 19. Broste Rock Museum, Parshall.

United States Army Corps of Engineers Headquarters, Riverdale

In 1998, Kent Pelton of Watford City discovered the nearly complete skull of the huge Ice Age bison, *Bison latifrons*, on a Lake Sakakawea beach near New Town (see my NDGS Newsletter article v. 29, no. 2, 2003). The fossil was found on land administered by the U. S. Army Corps of Engineers within the borders of the Fort Berthold Reservation, the Three Affiliated Tribes nation. A cast of this skull is displayed in the U. S. Army Corps of Engineers headquarters in Riverdale (Figure 1.14; Figure 20). The original skull was restored by the NDGS and is on exhibit in the Heritage Center in Bismarck. The U. S. Army Corps of Engineers provided funds for the restoration and to have casts made for display in other museums. Casts of this skull are also exhibited at the Three Affiliated Tribes Museum in New Town, the Missouri-Yellowstone Confluence Interpretive Center near Williston, the Long X Visitor Center in Watford City, and at the National Buffalo Museum in Jamestown.



Figure 20. The U.S. Army Corps of Engineers Headquarters, Riverdale.

McLean County Museum, Washburn

A geology exhibit, consisting of rocks, minerals, and fossils mostly found in the Washburn area, is just inside the entrance to the McLean County Museum in Washburn (Figure 1.15; Figure 21). Museum officials contacted me in 2002 to help them evaluate, organize, and renovate this exhibit (Figure 22).



Figure 21. McLean County Museum, Washburn.



Figure 22. Geology exhibit in the McLean County Museum.

National Buffalo Museum, Jamestown

A cast of the skull of the huge Ice Age bison, *Bison latifrons*, that was discovered along the shore of Lake Sakakawea is displayed in the National Buffalo Museum in Jamestown (Figure 1.16; Figure 23). The original skull is exhibited in the Heritage Center in Bismarck.



Figure 23. National Buffalo Museum, Jamestown.

Griggs County Museum, Cooperstown

A skeleton of the large marine lizard (mosasaur), *Plioplatecarpus*, was discovered in 1995 by Mike Hanson and Dennis Halvorson of Cooperstown, weathering out of the 75 million year old Pierre Shale (see my NDGS Newsletter article, v. 23, no. 2&3, 1996). The fossil was found on Beverly and Orville Tranby's farm in the Sheyenne River valley. The Tranby's and Bev's sisters (Olsons) donated the fossil to the State of North Dakota. The NDGS restored this 23 foot long skeleton and it is now suspended from the ceiling in the Heritage Center in Bismarck.

A cast of the skull of that *Plioplatecarpus* and some of the original teeth of the animal are on display at the Griggs County Museum in Cooperstown (Figure 1.17; Figure 24). Fossils found with the *Plioplatecarpus* specimen are also exhibited including: vertebrae of other mosasaurs; bones of the flightless sea bird, *Hesperornis*; shark and other fish teeth; and a variety of snail, clam, and other invertebrate fossils.

We collected the partial skeleton of the huge sea turtle, *Archelon*, from the Tranby farm site in 2004. That fossil was discovered by Peter Mack, formerly of Cooperstown about

200 feet from the location where the *Plioplatecarpus* skeleton was excavated. A cast of part of the lower jaw of that turtle is on display in the Griggs County Museum (see NDGS Newsletter article, this issue).



Figure 24. Griggs County Museum, Cooperstown.

Heritage Hjemkomst Interpretive Center, Moorhead, Minnesota

Although the Heritage Hjemkomst Interpretive Center (Figure 1.18; Figure 25) in Moorhead, Minnesota is a history museum they have, on occasion brought robotic dinosaur exhibits into the interpretive center to raise funds. On those occasions, the NDGS has provided dinosaur fossils collected from western North Dakota and in the North Dakota State Fossil Collection to accompany the animated robotic dinosaur models.



Figure 25. Heritage Hjemkomst Interpretive Center, Moorhead, Minnesota.

University of North Dakota, Department of Geology and Geological Engineering, Leonard Hall, Grand Forks

On occasion, the NDGS has collaborated with the Department of Geology and Geological Engineering on developing exhibits in the exhibit area of Leonard Hall at the University of North Dakota in Grand Forks (Figure 1.23; Figure 26). Currently, an exhibit resulting from a project between the NDGS and Department of Geology and Geological Engineering on the stratigraphy and paleontology of the White River Group and Arikaree Formation is displayed.

Fossil exhibits in Leonard Hall developed by the Department of Geology and Geological Engineering include

one of the most complete skulls ever found of *Triceratops*, the three-horned dinosaur (Figure 27); several fossil fishes from Wyoming; 60 million year old leaf fossils collected by Clarence Johnsrud from a site near Trenton; a Sentinel Butte Formation rock slab containing bird fossil tracks; and an exhibit of miscellaneous fossils from North Dakota.



Figure 26. Leonard Hall, UND Campus, Grand Forks.



Figure 27. *Triceratops* skull in Leonard Hall (Photo by Chuck Kimmerle).

Icelandic State Park Pioneer Heritage Center, Cavalier and Cavalier County Museum, Dresden

In 1991, Lorita and Ralph Werven from Cavalier discovered an important fossil site on State of North Dakota land administered by the North Dakota Parks and Recreation Department in the Pembina Gorge area near Walhalla. Since that time, we have conducted several excavations at this 80 million year old Pierre Shale site. Most of North Dakota was covered by a shallow ocean called the Pierre Sea during the Cretaceous 80 million years ago. Fossils of animals that lived in that sea and have been recovered at the Pembina Gorge site include: shark teeth and other fish remains, mosasaur (marine reptile) and plesiosaur (marine reptile) bones and teeth, sea bird bones, and remains of invertebrate

animals including a giant squid. Several of these fossils are exhibited at the Icelandic State Park Pioneer Heritage Center in Cavalier (Figure 1.20; Figure 28) and at the Cavalier County Museum in Dresden, a former Catholic church constructed of field stones (glacial erratics)(Figure 1.19; Figure 29).



Figure 28. Icelandic State Park Pioneer Heritage Center, Cavalier.



Figure 29. Cavalier County Museum, Dresden.

Walhalla Museum of Natural History, Walhalla

The City of Walhalla began developing a natural history museum (Figure 1.22; Figure 30) in 2003, and the NDGS has been assisting them in establishing fossil exhibits. Many fossils from the 80 million year old Pierre Shale site in the Pembina Gorge are displayed in the Walhalla Museum of Natural History including: vertebrae and teeth of the marine reptile (mosasaur), *Plioplatecarpus*; a partial skeleton of the salmon-like fish, *Enchodus*; and bones of the flightless sea bird, *Hesperornis*. A skull (cast) and original horn of the three-horned dinosaur, *Triceratops*; a duckbilled dinosaur humerus; and several other fossils from the NDGS State Fossil Collection are temporarily on loan to the museum. Other Pierre Shale fossils including plesiosaur (marine reptile) bones and a large squid fossil are on loan from the Morden Museum in Morden, Manitoba. The exhibit includes many fossils, such as trilobites, ammonites, a woolly mammoth tooth, and 400 million year old marine snail shells that have been collected by local residents.



Figure 30. The Walhalla Museum of Natural History, Walhalla.

Pembina State Museum, Pembina

The mission of the Pembina State Museum in Pembina (Figure 1.21; Figure 31) is to interpret the history and prehistory of the northeastern part of North Dakota. The Pierre Sea covered that part of the state 80 million years ago and fossils of creatures that lived in that sea including the skull (cast) of the marine lizard, *Platecarpus*; shark teeth; teeth and bones of other fish such as the salmon-like *Enchodus*; bones of the flightless sea bird, *Hesperornis*; and fossils of invertebrate animals (snails, clams, and crabs) are exhibited. A tooth of a woolly mammoth, *Mammuthus*, is also displayed in the museum.



Figure 31. State Museum, Pembina.

I encourage you to visit these museums, visitors' centers, interpretive centers, and office building lobbies to view these fossil, the most ancient objects of North Dakota's natural heritage, and to learn about North Dakota's interesting prehistoric past.