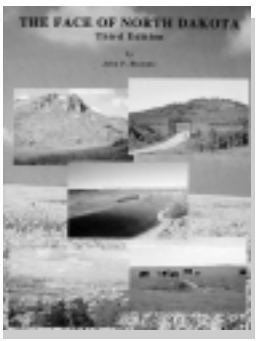
New Publications



The Face of North Dakota *(Educational Series 26, 2000, 210 p., 1 plate)* by John P. Bluemle.

This 210-page report describes the geology of North Dakota in language suitable for non-geologists. The book is intended to serve as supplementary reading for students in high school and college geology courses, but it should also be valuable to North Dakotans who simply want to know more about our state's geology. It should also help educators and researchers in other disciplines--botany, soils, archaeology, and others--who often need background information about geology. Professional geologists new to the state may find the book useful as an introduction to North Dakota geology.

A first edition of *The Face of North Dakota* was published in 1977 and a revised edition in 1991. This third edition is revised substantially from the earlier versions. It includes both an index and glossary, which the earlier editions did not have. In addition to a revised text throughout much of the publication, *The Face of North Dakota* includes new sections on geologic hazards in the state, with discussions of flooding, landslides, and other kinds of unstable ground. It also includes a considerably revised and expanded treatment of the recent geologic history, including a discussion of plant and animal history since the Ice Age. The discussion of North Dakota's mineral resources is also much more complete than in earlier versions of the publication.

To quote from *The Face of North Dakota* directly, "The landscape is where almost all human activity takes place. Learning to live in harmony with it is essential. If we understand its building blocks—the bedrock, glacial materials, soil, water, and air—and their inherent relationships, we will be better able to protect its past and future heritage." The publication recognizes that "Humankind itself has, in fact, become a geologic force" for change on a "dynamic, always changing" landscape. "North Dakotans...farm the fields, drink the water, build our homes and businesses, pump the oil and gas, mine the coal and sand and gravel, bury the wastes, and play in the parks. The land is the physical basis for all we are. City people depend on it and on its complex parts just as much as do rural people... Our past and our future are both rooted in our land, and in its ability to work for us and with us. If we understand the geological history and natural processes that shaped that land, we can apply that knowledge to conserve and renew it." (All quotations from Epilogue, *The Face of North Dakota*, p. 177).

The Face of North Dakota includes a new colored geologic map of the state, drawn at a scale of 1:1,000,000 (about 16 miles to the inch). The publication can be obtained from the North Dakota Geological Survey for $6.00.

Oil Exploration and Development in the North Dakota Williston Basin: 1998 - 1999 Update *(Miscellaneous Series 88, 2000, 30 p.)* by Thomas J. Heck.

This 30-page report includes a short historical review of the 1980s and 1990s, but focuses on events during the two-year period, 1998-1999. It includes a description of new oil and gas discoveries made in North Dakota that drew the attention of oil companies from many different parts of North America. A summary of drilling and production statistics for each of the years 1998 and 1999 is included, as well as an analysis of activity each year. Information about wildcat wells drilled, discoveries, unitized fields, production, numbers of horizontally drilled wells and other data are included.

The 1980s and 1990s saw many changes in North Dakota's oil industry. The 1980s began with activity in the domestic oil industry reaching record highs in the early 1980s in response to the Arab oil embargo and rapid price increases during the late 1970s. Record high crude oil prices were reached during the early 1980s, but prices began to decline in the mid-1980s. Exploration, which had increased in North Dakota during the 1970s, began to decrease in response to lower prices during the early 1980s. Many people thought that prices had hit bottom in 1985, but overproduction by OPEC caused oil prices to fall even further in 1986.

Between 1986 and 1998, oil prices fluctuated between $12 and $22 per barrel. North Dakota's oil industry had

adjusted to the level of price uncertainty that this price range brought, but in 1998 oil prices began to drop even lower. Crude oil prices fell below $10/barrel during early 1999. In response to the low prices, many wells were shut in, and new drilling nearly stopped. Despite the fact that oil prices during the last part of 1999 rose to their highest levels since 1991, the number of wells drilled during the year remained the lowest since 1951, the year oil was discovered in North Dakota. Thus, the 1990s ended with rising oil prices, but little drilling. With oil and gas prices now up substantially, drilling activity has risen sharply in North Dakota.

Miscellaneous Series 88 is available from the North Dakota Geological Survey for $4.00.

Recent Fluvial History and Environmental Change of Some Ephemeral Streams in the Little Missouri Badlands of Southwestern North Dakota

(*Report of Investigations 101, 2001, 53 p.*) by Mark A. Gonzalez.

This report contains information on the causes, timing, extent, and rates of recent channel erosion in the Little Missouri Badlands. Ephemeral streams are generally dry and convey water for only a few days each year, typically during and immediately after a large summer thunderstorm or during the spring thaw. Despite the infrequency of flow, the channels of these streams are highly sensitive to environmental changes, such as changes in climate or land use.

Many of the streams in the Little Missouri Badlands have made adjustments to environmental changes in the past few hundred years. These adjustments were not necessarily related to the introduction of livestock, as had been previously thought. Rather, ephemeral streams clearly began to undergo a cycle of erosion with formation of deep channels, called arroyos, during the 1860s and 1870s. This period of erosion coincided with the most severe drought in the area during the past 480 years. The erosion also predated the start of large-scale livestock operations in the Little Missouri Badlands. Extensive grazing began in the area in 1881 when the Northern Pacific Railroad laid tracks to Medora, the historic cow town on the east bank of the Little Missouri River.

It is not known whether more recent channel adjustments are related to livestock operations or to the after effects of the drought of the 1860s and 1870s, along with later climate changes. Some twentieth-century erosion, especially in the 1930s and 1950s, apparently coincides with regional droughts. More recently, in the 1980s and 1990s, some streams have cut deep channels in areas affected by road construction activities and the installation of new bridges.

The study demonstrates that not only did stream erosion occur at different times and was due to different causes along different stretches of channels, but also that some parts of the stream systems adjusted to environmental changes by filling in with sediment. Generally, channel cutting occurred along upstream reaches, whereas channel filling, resulting from rapid accumulation of sediment, occurred along downstream reaches over the past 130 to 230 years. This finding is important because it illustrates that parts of a stream system can fill with sediment at the same time that other parts are eroding. Efforts to combat one process in one part of the stream system may be ineffective along the entire stream system. The techniques used in the study provide ways to identify parts of stream systems that are behaving differently, and hence require different management strategies. Land managers and construction engineers need to recognize the differences between stream reaches that are actively eroding and cutting deeper channels and those that are filling in with excess sediment.

Report of Investigation 101 is available from the North Dakota Geological Survey for $5.00.

The 50th Anniversary of the Discovery of Oil in North Dakota

(Miscellaneous Series 89, 2001, 58 pages) by John P. Bluemle

This 58-page report consists of a variety of writings and anecdotes, many of them dating to about the time the Clarence Iverson #1 Well was drilled in 1951 and 1952. It is not an exhaustive history of oil and gas in North Dakota. Rather, it brings together some ideas and reflects on some of the changes that have taken place over the past fifty years. The report also provides some suggestions about what can be expected in the future.

Miscellaneous Series 89 is available from the North Dakota Geological Survey for $3.00.

Geologic Explorer's Guide to the Sheyenne National Grassland (Educational Series No. 27, 2001, 13 p., 1 plate) by Ann M.K. Fritz

The Sheyenne National Grassland contains some of the most intriguing geology in eastern North Dakota. A recent NDGS publication by Ann Fritz describes the geologic formation and major landforms of the Grassland. Fritz begins her report with an overview of the regional geology of the Sheyenne Delta region, including the geologic history of the Red River valley, beginning 10,000 to 15,000 years ago when glacial ice reached its maximum extent in eastern North Dakota during Late Wisconsinan time. This part of the report describes the position of glacial ice, the formation of ice-marginal meltwater streams, such as the Sheyenne River, the formation of Glacial Lake Agassiz, once the largest lake in the world, covering an area over 366,000 square miles (in comparison, Lake Superior is only 32,700 square miles), and the formation of the so-called Sheyenne Delta. She describes how lake levels changed during the disintegration of the continental ice sheets, and how water in Glacial Lake Agassiz flowed out different outlets at various times in the past 15,000 years.

In the second part of the Explorer's Guide, Fritz describes the principal landforms of the Sheyenne Delta region. She describes the formation of eolian (i.e. wind-formed) landforms, such as parabolic dunes, and fluvial (i.e., river-formed) landforms, such as meander loops, flood plains, point bars, meander necks, oxbow lakes, and meander scars. The Guide is generously illustrated and written in general terms suitable for grade-school students and the general public.

The report includes a geologic map (1:90,000 scale) of the Sheyenne National Grassland. The next time you visit the Sheyenne National Grassland, bring along a copy of Fritz' report, study the geologic map of the area, and transform your mind back 10,000 years to imagine the evolution of this fascinating part of North Dakota.

Educational Series No. 27 is available from the North Dakota Geological Survey for $5.00. Also, visitors to the Sheyenne National Grassland can purchase the report at the District Ranger Office (telephone number 701-683-4342) in Lisbon, North Dakota.

Geology of Dunn County (Bulletin 68, Part 1, 36 p.) by Edward C. Murphy

The Dunn County bulletin is the last in a series of county-wide studies of surface geology in North Dakota. The 36-page report includes line drawings and photographs of interesting geologic features in the County such as the Killdeer Mountains. Included in the report is a color, 1:125,000-scale geologic map of the County. The most prevalent geologic hazards in this area are landslides. Over 700 landslides were mapped in badlands topography in northern Dunn County.

Bulletin No. 68–Part 1 Free

Outside Publications

Bluemle, J.P., Sabel, J.M., and Karlen, W., 2001, *Rate and Magnitude of Past Global Climate Changes*: *In* L.C. Gerhard, W.E. Harrison, and B.M. Hanson, eds., Geological Perspectives of Global Climate Change, American Association of Petroleum Geologists 53:193-211.

Gonzalez, M. A., 2001, *Recent Formation of Arroyos in the Little Missouri Badlands of southwestern North Dakota*: Geomorphology 38:63-84.

Tom Heck contributed information on the potential gas supply in the Williston Basin to: Potential Gas Committee, *Potential Supply of Natural Gas in the United States*, Potential Gas Agency, Colorado School of Mines, December 31, 2000.