



1972

Annotated bibliography of the geology of North Dakota, 1806-1959

Mary Woods Scott
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ANNOTATED BIBLIOGRAPHY OF THE
GEOLOGY OF NORTH DAKOTA, 1806 - 1959

by

Mary Woods Scott

Bachelor of Science, Muskingum College 1965

A Thesis

Submitted to the Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

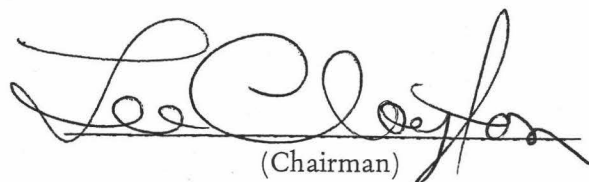
Master of Science

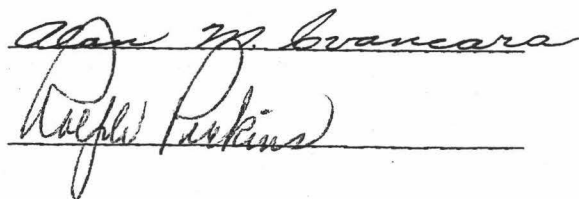
Grand Forks, North Dakota

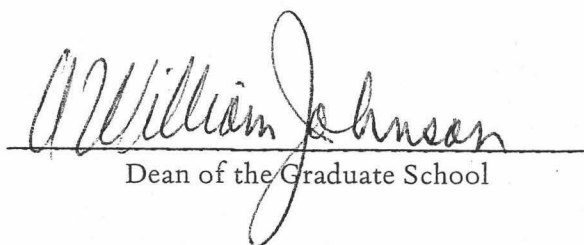
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This thesis submitted by Mary Woods Scott in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.


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Dean of the Graduate School

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Title Annotated Bibliography of the Geology of North Dakota, 1806 - 1959

Department Geology

Degree Master of Science

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Date April 13, 1972

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Many people deserve acknowledgement for their help with this project. In particular I want to thank Dr. Wilson M. Laird, Professor of Geology and State Geologist Emeritus, for his assistance in setting up the project and providing employment while I was working on the project. Dr. E. A. Noble, State Geologist and Chairman of the Geology Department, has continued this support and encouragement and arranged for the publication of this thesis by the North Dakota Geological Survey. Drs. Lee Clayton and Alan M. Cvancara of the Geology Department suggested the project, willingly served on my advisory committee, and suffered through the reading of all the annotations. I am indebted to them for their advice and patience. Professor Ralph Perkins, Chairman of the Library Science Department, also served as a committee member and his help is appreciated. Sidney Anderson and Clarence Carlson of the North Dakota Geological Survey deserve thanks for helping me keep the stratigraphic nomenclature organized. Dr. F. D. Holland, Jr., Professor of Geology, gave me many valuable suggestions and assistance with special problems. I would like to thank my fellow geology graduate students, both past and present, in particular Samuel S. Harrison, Thomas M Hamilton, Kirth Erickson, and J. Mark Erickson, for their support and encouragement. Mrs. Adelaura O'Connell, Interlibrary Loan Librarian, Chester Fritz Library, was helpful in obtaining copies of many of the reports. Special thanks go to Mrs. Clara Laughlin and the North Dakota Geological Survey Publications Department staff, Helen Sweeney, Kathleen Miller, and Elizabeth Klym, for typing the manuscript. And last, but not least, extra special thanks go to my husband, Michael, who married into the middle of this project and has been most understanding, encouraging, and helpful.

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ABSTRACT

References to the literature on North Dakota geology published between 1805 and 1960 are listed in this annotated bibliography. Published bibliographies on North American geology, bibliographies on geological subjects important to North Dakota, unpublished lists of references, and references cited in each entry herein were used to compile the bibliography. Each reference is provided with an annotation of its contents. A subject and geographical index and a list of serials cited are included.

INTRODUCTION

This bibliography includes all the known literature on North Dakota geology published between 1805 and 1960. Some references on related subjects such as pedology and surface hydrology are included if the report was considered to be of interest to geologists. Reports on the areas bordering North Dakota, but not directly describing North Dakota geology, are included where they seemed particularly relevant. Unpublished items such as theses, dissertations, and open-file reports that could be verified are included. Omissions and corrections to this bibliography should be brought to the attention of the State Geologist, North Dakota Geological Survey, Grand Forks, North Dakota 58201.

This bibliography was compiled from many sources. The United States Geological Survey bibliographies of North American geology from 1785 through 1959 (Nickles, 1924; U.S. Geological Survey, 1931, 1944, 1957, 1965) and Chrissie E. Budge's (1946) "Bibliography of the Geology and Natural Resources of North Dakota, 1814-1944" with its two supplements in 1948 and 1951 (Budge, 1948, 1952) provided the basis for this bibliography. The list of references cited in each article was checked against the other entries in the bibliography. Mr. G. J. Powers, Librarian, United States Atomic Energy Commission Office, Grand Junction, Colorado, provided three bibliographies on radioactive occurrences in North Dakota. Dr. F. D. Holland, Jr., Professor of Geology, University of North Dakota, provided access to his personal library and bibliography of early geologic literature and the literature of early scientific exploration of North Dakota.

The annotations were written to present the contents and coverage of the reports to aid the user of the bibliography in locating desired information. Except for a few items that could not be located, I reviewed all the literature included in the bibliography.

Items that were not in the University of North Dakota Libraries were obtained through interlibrary loans. Photocopies of the borrowed materials were made and placed in the Geology Library Reprint File for future reference. The open-file reports from the United States Geological Survey and the North Dakota Geological Survey are available for use in the library.

Geologic terminology used in the annotations is that which is currently used by the North Dakota Geological Survey and the Geology Department of the University of North Dakota and not necessarily that of the report which was annotated. Stratigraphic terminology used in the annotations and not currently used in the state is enclosed in quotation marks, for example: "Lance Formation" and Fort Union "Formation." The stratigraphic column in current use by the North Dakota Geological Survey and adopted as the standard for this bibliography is included as Figure 1.

The bibliography and subject index are styled after the format of the "Bibliography of North American Geology" published by the United States Geological Survey. The citation format is that which is set forth in "Suggestions to Authors of the Reports of the United States Geological Survey," fifth edition, pages 105-122. (U. S. Geological Survey, 1958). The entries in the bibliography are arranged alphabetically by author. Several reports by the same author are arranged chronologically from oldest to youngest. Reports by two or more authors are listed following the reports by the first-named author alone. Cross references direct the user from second and subsequent authors to the entry under the first-named author.

The bibliography is followed by an index which contains both subject and geographical headings. The major headings are divided into subheadings where necessary and where possible. Cross references of two types are included. "See references" indicate that the term listed is not used as a heading and the user is referred to the correct index term, for example: Fossils *See* Paleontology. "See also references" indicate that the user should consult the related headings listed for additional reports that may interest him, for example:

ERA	SYSTEM	SEQUENCE	GROUP	FORMATION
CENOZOIC	Quaternary	Tejas		Various unnamed units
	Tertiary		Fort Union	Golden Valley Sentinel Butte Tongue River Cannonball-Ludlow Tullock
MESOZOIC	Cretaceous	Zuni		Hell Creek
			Montana	Fox Hills Pierre
			Colorado	Niobrara Carlile Greenhorn Belle Fourche
			Dakota	Mowry Newcastle Skull Creek Fall River Lakota
	Jurassic		Morrison Sundance Piper	
Triassic				
PALEOZOIC	Permian	Absaroka		Spearfish Minnekahta Opeche Minnelusa Amsden Tyler
	Pennsylvanian			
	Mississippian	Kaskaskia	Big Snowy	Heath Otter Kibbey
				Madison Bakken Three Forks Birdbear Duperow Souris River Dawson Bay Prairie Winnipegosis
	Devonian			
	Silurian	Tippecanoe		Interlake Stonewall Stony Mountain Red River
	Ordovician		Winnipeg	Roughlock Ice Box Black Island
Cambrian	Sauk		Deadwood	
	Precambrian			

Figure 1. Stratigraphic column of North Dakota.

Geomorphology *See also* Areal Geology, Quaternary-Glacial Features, and Lacustrine Geology. "Areal Geology" is subdivided by county name as well as by other major divisions of the state such as Missouri Coteau, Badlands, and Keene Dome. Most of the stratigraphic reports will be found under the name of the particular period rather than under the term "Stratigraphy." All the reports containing a geologic map are listed under the heading "Maps-Geologic." A single report may be listed under several different headings in the index. The index was organized using suggestions found in "Guide to Indexing Bibliographies and Abstract Journals of the U. S. Geological Survey" (U. S. Geological Survey, 1967a).

The index was compiled using unisort cards (Library Analysis Card Form Y16) manufactured by the Burroughs Corporation. The card has a series of 51 holes along its edges. Each hole was assigned a subject term. The reference and annotation for each entry in the bibliography were typed on the card and the appropriate subject terms were notched out. When all the cards were collected together and a sort needle inserted in a particular hole and through the deck, all the cards notched for that subject would fall out of the deck. The separated cards were then sorted by hand into the subdivisions for each subject (Frost, 1964).

In addition to the bibliography and index, a list of the serials cited is included. The abbreviated forms of the titles are arranged alphabetically. The abbreviations are from "Serial Publications Commonly cited in Technical Bibliographies of the United States Geological Survey" (U. S. Geological Survey, 1967b), "Suggestions to Authors of Reports of the United States Geological Survey" (U. S. Geological Survey, 1958), fifth edition, pages 111-119, and the list of serials in the various bibliographies of North American geology that were used.

BIBLIOGRAPHY

BIBLIOGRAPHY

Abbott, George A., 1937, The fluoride content of North Dakota ground waters: N. Dak. Geol. Survey Bull. 9, 15 p., illus.

The fluoride content of the groundwaters as related to the occurrence and distribution of mottled enamel of teeth is discussed. A table showing the mineral content of artesian waters from the Dakota Sandstone is presented.

Abbott, George A., and Voedisch, F. W., 1939, The municipal ground water supplies of North Dakota: N. Dak. Geol. Survey Bull. 11, 104 p.

The geological and chemical properties of the groundwater supplies of 295 incorporated towns in the state are presented.

Abernethy, R. F. See Cooper, H. M., Abernethy, R. F., and Tarpley, E. C., 1948.

Abernethy, R. F. See Cooper, H. M., Snyder, N. H., Abernethy, R. F., and Tarpley, E. C., 1948.

Ableiter, J. K. See Edwards, M. J., and Ableiter, J. K., 1942, 1944, 1951.

Adam, H. W. See Ewing, Robert A., Adam, H. W., Miles, F. W., Bearse, A. E., and Richardson, A. C., 1950.

Ahlman, C. See Larrabee, D. M., Huff, L. C., and Ahlman, C., 1946.

Akin, Philmore D. See also Aronow, Saul, Dennis, P. E., and Akin, P. D., 1953a,b.

Akin, Philmore D. See also Dennis, P. E., and Akin, P. D., 1950.

Akin, Philmore D. See also Dennis, P. E., Akin, P. D., and Jones, S. L., 1949, 1950.

Akin, Philmore D. See also Dennis, P. E., Akin, P. D., and Worts, G. F., Jr., 1949.

Akin, Philmore D., 1946, Ground water in beach deposits of glacial Lake Agassiz near Mountain, Pembina County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 2, 27 p., illus.

Typical units of beach deposits and delta deposits are described. The geology and hydrology of the area were studied to determine the groundwater conditions and possibilities.

Akin, Philmore D., 1947, Geology and ground-water conditions at Minot, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 6, 99 p., illus. incl. geol. map (scale 1:20,000).

The bedrock and glacial geology of the area is discussed with emphasis on the groundwater conditions. The results of quantitative studies of the water-bearing glacial material and of the Fort Union "Formation" are presented.

Akin, Philmore D., 1951, Ground water in the Mohall area, Bottineau and Renville Counties, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 17, 76 p., illus. incl. geol. map (scale 1:62,500).

The alluvium, till and associated glacial deposits, and the bedrock formations are described. A detailed discussion of the groundwater content and quality in each of the geologic units is included.

Akin, Philmore D., 1952, Ground water in the Litchville area, Barnes County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 18, 51 p., illus. incl. geol. map (scale 1:62,500).

The geology and occurrence of groundwater in the alluvium, outwash-channel deposits, till and associated glacial deposits, and the bedrock formations are discussed. The report includes well records and logs for the test holes.

Alden, William C., 1924, Physiographic development of the northern Great Plains: Geol. Soc. America Bull., v. 35, p. 385-424, illus.

The article includes a discussion of the drainage changes of the Yellowstone and upper Missouri Rivers in western North Dakota.

Alden, William C., 1932, Physiography and glacial geology of eastern Montana and adjacent areas: U. S. Geol. Survey Prof. Paper 174, 133 p., illus. incl. geol. map (scale 1:500,000).

The report includes a discussion of the physiography and geology of the Missouri Coteau district in northwestern North Dakota.

Allen, Joel A., 1876, The Little Missouri "Bad Lands": Am. Naturalist, v. 10, p. 207-216.

The paper is a report of an expedition through the badlands in western Dakota. It contains a detailed discussion of the burning lignite beds and the "metamorphic" and "igneous" action in the area.

Allen, J. C., 1935, Glacial deposits of gold: N. Dak. Engineer, v. 11, no. 3, p. 10.

The paper is a brief discussion of the discovery of gold in sand and gravel deposits in 1908. It includes a report of assays of 1500 samples made by the University of North Dakota.

Alpha, Andrew G., 1935, Geology and ground water resources of Burke, Divide, Mountrail, and Williams Counties in North Dakota: Grand Forks, N. Dak., North Dakota, Univ., M.S. Thesis (unpub.), 62 p., illus.

The physiography, bedrock geology, glacial geology, occurrences of groundwater, and water supplies of each county are discussed. A summary of water conditions and well logs are included.

Amerada Petroleum Corporation, 1952, Nesson anticline (N. Dak.), in Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Sept. 1952: p. 93-95, illus.

Cross sections illustrating the stratigraphic markers used as identifiable units in drill cuttings and on electrical logs are presented. These sections show the regional structural attitudes of the units in the subsurface. (Hor. scale is approx. 1:380,000, vert. scale 1:48,000.)

Anderson, A. C. See also Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Anderson, A. C. See also Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, M., and Anderson, A. C., 1917.

Anderson, A. C. See also Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914.

Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917, Soil survey of Lamoure County, North Dakota: U.S. Dept. Agr., Bur. Soils, Advance Sheets-Field Operations of the Bur. of Soils, 1914, 53 p., illus. soil map (scale 1:63,360).

Each type of soil present in the county is mapped, described physically, analyzed chemically, and discussed as to its agricultural value.

Anderson, R. L. See Bell, C. H., and Anderson, R. L., 1948.

Anderson, Sidney B. See also Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955.

Anderson, Sidney B. *See also* Folsom, Clarence B., Jr., Carlson, Clarence G., and Anderson, Sidney B., 1959.

Anderson, Sidney B. *See also* Folsom, Clarence B., Jr., Hansen, Miller, and Anderson, Sidney B., 1958.

Anderson, Sidney B. *See also* Laird, Wilson M., Hansen, Miller, Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955.

Anderson, Sidney B., 1954, Stratigraphic sections of the Mississippian System in North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 16, 2 sheets, illus.

The Mississippian formations in North Dakota are described. Three electric and lithologic log cross sections are included.

Anderson, Sidney B., 1958, Study reveals Mississippian series possibilities (N. Dak.): *World Oil*, v. 147, no. 7, p. 136-144, illus.; reprinted, 1958: N. Dak. Geol. Survey Rept. Inv. no. 31, 9 p., illus.; 1959, erratum: *World Oil*, v. 148, no. 1, p. 300.

The study of the Upper Madison Group facies in northwestern North Dakota includes discussions of nomenclature, correlations, distribution, lithology, thickness, and oil production possibilities of the formations.

Anderson, Sidney B., and Carlson, Clarence G., 1958, Madison subcrop-Spearfish isopach map—Bottineau area: N. Dak. Geol. Survey Rept. Inv. no. 30, 1 sheet, illus. colored map (scale 1:156,680). (Revised 1965)

A brief discussion accompanies the map.

Anderson, Sidney B., and Hansen, Dan E., 1957, Halite deposits in North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 28, 3 sheets, illus.

The salt deposits, their lithologic associations, and their tectonic significance are discussed. The illustrations include isopach maps of the salt deposits; electrical, radioactivity, and micrologs of the salt sections; and a composite section of the salt sequence.

Anderson, Sidney B., and Nelson, LaVerne B., 1956, Mississippian stratigraphic studies, Bottineau County, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 24, 4 sheets, illus.

The stratigraphy and oil production for each formation in the Madison Group are discussed. The illustrations include electric and lithologic log cross sections and four maps.

Andrews, David A., 1935, Early stages of glacial Lake Souris, North Dakota (abs.): *Washington Acad. Sci. Jour.*, v. 25, p. 568-569.

The abstract contains a brief description of the shore lines. A tentative interpretation of the origin of Lake Souris is presented.

Andrews, David A., 1936, Suggested Lance-Fort Union correlations in adjacent parts of Montana and North and South Dakota (abs.): *Washington Acad. Sci. Jour.*, v. 26, p. 387-388.

Correlation problems and changes suggested by detailed mapping of the area are discussed.

Andrews, David A., 1939, Geology and coal resources of the Minot region, North Dakota: *U. S. Geol. Survey Bull.* 906-B, p. 43-84, illus. incl. geol. map (scale 1:125,000).

The report includes a discussion of the geology, geography, geomorphology, stratigraphy, and structure; a detailed discussion of the coal beds; estimates of the coal reserves; and a brief statement on the oil, gas, sodium sulfate, and artesian water in the area. The report also includes an index map of western North Dakota outlining areas described in previously published reports.

Andrews, David A., and Huddle, J. W., 1948, The coal fields of Michigan, North Dakota, South Dakota, and Texas, *in* U. S. Bureau of Mines, Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, p. 1-7, illus.

The lignite deposits of North Dakota are described and compared with the other areas. A map of the coal fields and a bibliography are included.

Andrichuk, John M., 1952, Devonian of the northern Rocky Mountain and Great Plains area, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, Sept. 4-7, 1952: p. 56-63, illus.

This is a general discussion of the Devonian with emphasis on the Williston basin. It includes a summary of the sedimentation history.

Annell, C. S. *See* Deul, Maurice, and Annell, C. S., 1956.

Arneman, H. F., and Wright, H. E., Jr., 1959, Petrography of some Minnesota tills: *Jour. Sed. Pet.*, v. 29, no. 4, p. 540-554, illus.

The Red River Valley, including the portion of the valley in North Dakota, is included in the study.

Aronow, Saul, 1954, Problems in late Pleistocene and Recent history of the Devils Lake region, North Dakota: U. S. Geol. Survey open-file report, 123 p., 35 pls., 28 figs.

Aronow, Saul, 1955, Problems in late Pleistocene and Recent history of the Devils Lake region North Dakota: Madison, Wisc., Wisconsin, Univ., Ph.D. Dissert. (unpub.), 123 p., illus. incl. geol. maps.

The history of Devils Lake and Stump Lake during Pleistocene time and the major glacial problems of the area are discussed. Evidence for the postglacial-prehistoric history of Devils Lake and Stump Lake and a summary of recent events in the history of the lakes are presented.

Aronow, Saul, 1957, On the postglacial history of the Devils Lake region, North Dakota: *Jour. Geology*, v. 65, no. 4, p. 410-427, illus.

The changes in water level of Devils and Stump Lakes are discussed. The abandoned strand lines and the associated lacustrine deposits containing buried soils, vertebrate remains, and rooted stumps are described and discussed.

Aronow, Saul, 1959, Drumlins and related streamline features in the Warwick-Tokio area, North Dakota: *Am. Jour. Sci.*, v. 257, no. 3, p. 191-203, illus. incl. geol. sketch map (scale approx. 1:190,000).

The glacial features in the area, the theories of their formation, and their relation to the bedrock are discussed. This area is in the Drift Prairie physiographic province.

Aronow, Saul, Dennis, P. E., and Akin, P. D., 1953a, Geology and ground-water resources of the Michigan City area, Nelson County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 21, 125 p., illus. incl. geol. sketch maps.

This is a discussion of the glacial geology and hydrology of the area. It contains a detailed discussion of the aquifers in the glacial drift and the bedrock.

Aronow, Saul, Dennis, P. E., and Akin, P. D., 1953b, Geology and ground-water resources of the Minnewaukan area, Benson County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 19, 125 p., illus. incl. geol. map (scale 1:63,360).

The glacial geology and hydrology of the area including Devils and Stump Lakes are discussed. A discussion of the aquifers in the area and an analysis of the groundwater conditions and probability for the area are included in the report.

Babcock, Earle J. *See also* Clapp, C. H., and Babcock, E. J., 1906.

Babcock, Earle J. *See also* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., 1925.

Babcock, Earle J., 1890, Coal, *in* First Report, Commissioner of Agriculture and Labor to the Governor of North Dakota for the year ending October 31, 1890: N. Dak. Public Doc. 14, p. 33-48.

The geology and extent of lignite deposits in North Dakota are described. Statistics from 18 mines and analyses of coal samples are included.

Babcock, Earle J., 1892, Clays of economic value in North Dakota, *in* Second Bienn. Rept. Commissioner Agr. and Labor: N. Dak. Public Doc. no. 6, p. 135-167, illus.; reissued, 1892: Bismarck, N. Dak., Tribune, State Printers and Binders, 36 p., illus.

The origin, distribution, characteristics, and composition of clay are discussed. Local descriptions are presented for North Dakota clay deposits.

Babcock, Earle J., 1899, Coal in North Dakota: Mines and Minerals, v. 19, p. 254.

The article is a brief reply to an inquiry published in a previous issue of Mines and Minerals.

Babcock, Earle J., 1901, First Biennial Report of the Geological Survey of North Dakota (1899-1900): N. Dak. Public Doc. 23, 103 p., illus.

The topography, geology, clays of economic value, coal, and water in North Dakota are discussed.

Babcock, Earle J., 1902, Water resources of the Devils Lake region: N. Dak. Geol. Survey 2d Bienn. Rept., p. 208-250, illus.

The topography, stratigraphy, and water resources of the Devils Lake region of North Dakota are discussed.

Babcock, Earle J., 1906, The uses and value of North Dakota clays: N. Dak. Geol. Survey 4th Bienn. Rept., p. 191-243, illus.

The report contains analyses of brick, refractory, stoneware, and earthenware clays in North Dakota.

Babcock, Earle J., 1911, The economic utilization of lignite coal: N. Dak. Univ., Quart. Jour., v. 1, no. 3, p. 193-213, illus.

The results of a study of the methods of manufacturing briquets and producing gas from lignite are summarized.

Babcock, Earle J., 1914, The coal and clay resources of North Dakota: N. Dak. Univ., Quart. Jour., v. 5, no. 1, p. 52-56.

The possible uses and economic value of the coal and clay resources of the state are discussed.

Babcock, Earle J., 1925, The lignite of North Dakota, its character, composition and utilization, *in* Leonard, A. G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 169-234, illus.

The report is a general discussion of lignite in North Dakota. The results of analyses and tests of lignite, ash, char, and gas are presented.

Babcock, E. J., and Clapp, C. H., 1906, Economic geology of North Dakota clays: N. Dak. Geol. Survey 4th Bienn. Rept., p. 95-189, illus.

The report contains a general description of the Cretaceous, "Laramie," Tertiary, and Pleistocene clay deposits in North Dakota. It also contains the results of physical tests on the clay samples.

Bachman, George O. *See* Denson, Norman M., Bachman, George O., and Zeller, H. D., 1952, 1954.

Bachman, George O. *See* Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955.

Baillie, Andrew D., 1953a, Devonian names and correlation in Williston Basin area: *Am. Assoc. Petroleum Geologists Bull.*, v. 37, no. 2, p. 444-447, illus.; reprinted, 1953: *Oil in Canada*, v. 5, no. 41, p. 21-22, illus.

The report proposes nomenclature for the Devonian in the Williston basin area of Saskatchewan, Manitoba, North Dakota, and eastern Montana.

Baillie, Andrew D., 1953b, Devonian system of Williston Basin area: *Manitoba Dept. Mines and Nat. Resources Mines Br. Pub.* 52-5, 105 p., illus.; 1955, condensed: *Am. Assoc. Petroleum Geologists Bull.*, v. 39, no. 5, p. 575-629, illus.; 1956, revised in 3 parts: *Canadian Oil and Gas Industries*, v. 9, no. 9, p. 65-75, illus.; v. 9, no. 10, p. 56-66, illus.; v. 9, no. 11, p. 120-127, illus.

This is the report of a study of the Devonian in North Dakota and parts of Manitoba, Saskatchewan, Montana, and South Dakota. It includes a revision of the nomenclature; introduction of new lithologic units; correlation of units within the area; isopach-lithofacies maps of each major unit; and interpretation of the tectonic, environmental, and depositional history.

Ball, J. R., 1947, Maddock quadrangle, North Dakota (abs.): *Geol. Soc. America Bull.*, v. 58, p. 1165.

The abstract is a brief discussion of the disorganized drainage conditions in the quadrangle. It also indicates evidences of the Wisconsin substage of glaciation.

Ballard, Norval *See also* Howells, W. C., Irwin, J. S., and Ballard, Norval, 1943.

Ballard, Norval, 1942, Regional geology of Dakota basin: *Am. Assoc. Petroleum Geologists Bull.*, v. 26, p. 1557-1584, illus. incl. geol. maps (scale 1:6,250,000).

The article contains a discussion of the stratigraphy of the surface and subsurface formations found in North Dakota and South Dakota. The structure and geologic history are discussed. The illustrations include geologic maps, structure maps, isopach maps, and cross sections. The possible oil and gas producing zones are discussed.

Ballard, William N., 1942, Stratigraphy of North Dakota: *Am. Assoc. Petroleum Geologists Bull.*, v. 26, no. 11, p. 1776.

This is a discussion of V. H. Kline's article, "Stratigraphy of North Dakota." (See Kline, Virginia H., 1942.)

Bara, J. P., 1953a, Laboratory studies on foundation material--Lone Tree Power Plant--Garrison Division--Missouri River Basin Project, North Dakota: *U. S. Bur. Reclamation, Eng. Lab. Div., Earth Lab. Rept. no. EM-365*, 46 p., illus.

The results of laboratory tests on samples of sand and shale are discussed. Geologic logs of the test holes are included in the report.

Bara, J. P., 1953b, Laboratory tests on foundation material--Lincoln Valley Power Plant--Garrison Division--Missouri River Basin Project, North Dakota: *U. S. Bur. Reclamation, Eng. Lab. Br., Earth Lab. Rept. no. EM-343*, 22 p., illus.

The results of laboratory tests on representative samples of the glacial till in the foundation of the proposed Lincoln Valley Power Plant are discussed.

Bara, J. P., 1953c, Laboratory tests on samples representing proposed impervious borrow materials--Lone Tree Dam--Missouri-Souris Division--Missouri River Basin Project, North Dakota: *U. S. Bur. Reclamation, Eng. Lab., Earth Lab. Rept. no. EM-367*, 32 p., illus.

The results of the laboratory tests are discussed. Logs of the test holes are included in the report.

Bara, J. P., 1954, Laboratory tests on samples representing proposed impervious borrow materials--Wintering Dam--Missouri-Souris Division--Missouri River Basin Project, North Dakota: *U. S. Bur. Reclamation, Eng. Lab., Earth Lab. Rept. no. EM-368*, 37 p., illus.

The results of the tests on the samples of glacial deposits in the area are reported. The dam area is located in a glacial spillway channel, Sheridan County, North Dakota. Drill logs from the test holes are presented.

Barger, Thomas C., 1937a, North Dakota gold: N. Dak. Engineer, v. 13, no. 2, p. 7, 20.

The article is a report of a study of the deposition of gold in sand and gravel by the continental glacier. It includes the results of a study of samples from parts of Ward, McHenry, and Pierce Counties.

Barger, Thomas C., 1937b, Prospecting for gold in North Dakota: N. Dak., Univ., Div. of Mines and Mining Expts. Circ. no. 9, 5 p.

The article contains a discussion of the glacial origin of gold-bearing sands in the state and an outline of a simple method of testing gravel for gold.

Barnes, Thomas R., 1952, The Williston Basin--a new province for oil exploration, in Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, Sept. 4-7, 1952: p. 92-117, illus.; reissued, 1953: Am. Assoc. Petroleum Geologists Bull., v. 37, no. 2, p. 340-354, illus.; correction, 1953: Am. Assoc. Petroleum Geologists Bull., v. 37, no. 6, p. 1526.

The article is a general introduction to the stratigraphy of the Williston basin. It includes isopach maps of several formations in the basin.

Barnett, V. H. See Calvert, W. R., Beekly, A. L., Barnett, V. H., and Pishel, M. A., 1914.

Barry, John G., 1908, The Bottineau gas field: N. Dak. Geol. Survey 5th Bienn. Rept., p. 245-251, illus.

The report is a preliminary study of a newly discovered gas field. It contains generalized sections from the wells and an analysis of the gas. The possible relation of the glacial history of the area to the origin of the gas is discussed.

Barry, John G., and Melsted, V. J., 1908, The geology of northeastern North Dakota with special reference to cement materials: N. Dak. Geol. Survey 5th Bienn. Rept., p. 115-211, illus. incl. geol. map (scale 1:375,000).

The report is a discussion of the physiographic features, stratigraphy, and glacial geology of Pembina, Cavalier, and portions of Walsh and Ramsey Counties. Special mention is made of cement rocks in the area.

Bartram, John G., and Erdmann, C. E., 1935, Natural gas in Montana, in Geology of natural gas--a symposium: Tulsa, Okla., Am. Assoc. Petroleum Geologists, p. 245-276, illus.

The paper contains a discussion of the Cedar Creek anticline which extends into North Dakota. A structure-contour map of the anticline is included.

Bauer, Clyde M., 1915, A sketch of the late Tertiary history of the upper Missouri River: Jour. Geology, v. 23, p. 52-58, illus.

A few late Tertiary river channels which may indicate former courses of the Missouri River and several of its larger tributaries are discussed.

Bauer, Clyde M., and Herald, F. A., 1921, Lignite in the western part of the Fort Berthold Indian Reservation, south of the Missouri River, North Dakota: U. S. Geol. Survey Bull. 726-D, p. 109-172, illus. incl. geol. map (scale 1:62,500).

The report contains a brief description of the general geology of the area. It includes detailed descriptions of the lignite beds.

Bauer, H. L., Jr. See Beroni, Ernest P., and Bauer, H. L., Jr., 1952.

Bearse, A. E. See Ewing, Robert A., Adam, H. W., Miles, F. W., Bearse, A. E., and Richardson, A. C., 1950.

Beekly, A. L. See Calvert, W. R., Beekly, A. L., Barnett, V. H., and Pishel, M. A., 1914.

Bell, C. H., and Anderson, R. L., 1948, Production, distribution, and use, in U. S. Bureau of Mines, Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, p. 13-22.

The report is a discussion of the production, distribution, and use of lignite. North Dakota's lignite is compared to that of the other states in the report.

Bell, Gordon L., 1954, Geology of the McVille quadrangle, North Dakota (abs.): N. Dak. Acad. Sci. Proc. 1954, v. 8, p. 54.

The glacial geology of the area is discussed and a brief mention of the Pierre Shale outcrops in the area is included.

Bell, Gordon L., and Petter, Charles K., Jr., 1956, Buck Hill burning lignite bed, Theodore Roosevelt Memorial National Park, North Dakota (abs.): N. Dak. Acad. Sci. Proc. 1956, v. 10, p. 25.

The abstract includes a description of the burning lignite bed, a discussion of the past geologic history of the area, and a discussion of the influence of the scoria on the development of landforms.

Bennett, Frank, Worthen, E. L., Willard, R. E., and Watson, E. B., 1909, Soil Survey of Richland County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets--Field Operations of the Bur. Soils, 1908, 38 p., illus. soil map (scale 1:63,360); reprinted, 1910: N. Dak. Agr. Coll. Survey 5th Bienn. Rept., p. 116-151, illus. soil map (scale 1:63,360).

Each type of soil present in the county is mapped, described physically and chemically, and discussed as to its agricultural value.

Benson, William E., 1949, Golden Valley Formation of North Dakota (abs.): Geol. Soc. America Bull., v. 60, p. 1873-1874.

The abstract contains brief lithologic and stratigraphic descriptions of the Golden Valley Formation. Paleontological evidence demonstrating the Eocene age of the beds is presented.

Benson, William E., 1951a, Geologic map of North Dakota southwest of the Missouri River: U. S. Geol. Survey Prelim. Map (scale 1:500,000).

Benson, William E., 1951b, Structure contour map of the Knife River area, North Dakota: U. S. Geol. Survey Prelim. Map (scale 1:95,040).

The contours are drawn on the base of the Beulah-Zap coal bed. The area includes parts of Mercer, Dunn, and McLean Counties.

Benson, William E., 1952, The geology of the Knife River area, North Dakota: New Haven, Conn., Yale Univ., Ph.D. Dissert. (unpub.), 323 p., illus. incl. geol. maps (scales 1:500,000 and 1:63,360); revised, 1952: U. S. Geol. Survey Open-file Report, 323 p., illus. incl. geol. maps (scales 1:500,000 and 1:63,360).

The report covers an area of six 15-minute quadrangles in west-central North Dakota. The stratigraphy, structural geology, and geomorphology are mapped and described. The stratigraphic units discussed are of Paleocene, Eocene, Pleistocene, and Recent age.

Benson, William E., 1954a, Kaolin of early Eocene age in North Dakota: Science, v. 119, no. 3090, p. 387-388.

The distribution, composition, physical description, and depositional history of the clay deposits of the Golden Valley Formation are included in the discussion.

Benson, William E., 1954b, Mapping of surface structures in western North Dakota, in N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954: p. 14-15.

The key beds of the surface formations reflect the shallow structures of the Williston basin and some of the deeper large oil-producing structures. The paper contains a description of the beds and a discussion of mapping techniques.

Benson, William E., and Golder, Charles R., 1950, Paleocene deformation in North Dakota (abs.): Geol. Soc. America Bull., v. 61, p. 1444.

The faulting exposed in the Fort Union strata by the excavation for the spillway of Garrison Dam is discussed.

Benson, William E., and Laird, Wilson M., 1947, Eocene in North Dakota (abs.): Geol. Soc. America Bull., v. 58, p. 1166-1167.

The abstract reports the discovery of fossil evidence that proves the Eocene age of the Golden Valley Formation. The name Golden Valley is proposed and the type locality is designated.

Bergstrom, John R., 1956a, The general geology of uranium in southwestern North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 23, 1 sheet, illus. incl. geol. sketch map (scale 1:633,600).

The report contains a general discussion of the stratigraphy of the area and a discussion of the uranium-bearing rocks. It includes a detailed description of two representative localities, Sentinel Butte and Lutheran Church property.

Bergstrom, John R., 1956b, Uranium in southwestern North Dakota: N. Dak., Univ., Quarterly, v. 24, no. 2, p. 33-39, illus.

The distribution and geology of the uranium deposits are discussed.

Berkey, Charles P., 1905, Economic geology of the Pembina region of North Dakota: Am. Geol., v. 35, p. 142-152, illus. incl. geol. map (scale 1:187,500).

The article includes discussions of the structure of the Pembina escarpment, the stratigraphy of the area, the cement marls in the area, and the clay deposits in the area.

Beroni, Ernest P. See also Gott, G. B., Wyant, D. G., and Beroni, E. P., 1952.

Beroni, Ernest P. See also Wyant, Donald G., and Beroni, Ernest P., 1950.

Beroni, Ernest P., and Bauer, H. L., Jr., 1952, Reconnaissance for uraniferous lignites in North Dakota, South Dakota, Montana and Wyoming: U. S. Geol. Survey Rept. TEI-123, 93 p., illus. incl. geol. maps. (Report prepared for U. S. Atomic Energy Commission.)

The report includes a general discussion of the stratigraphy with major emphasis on the uraniferous lignites present. It includes detailed analyses for certain localities. Geologic maps of Bullion Butte and Sentinel Butte in North Dakota are included among the illustrations.

Bierbauer, Bruno, 1891, A check-list of the Palaeozoic fossils of Wisconsin, Minnesota, Iowa, Dakota and Nebraska: Minn. Acad. Nat. Sci. Bull., v. 3, no. 2, p. 206-247.

The check-list enumerates all the described fossils of the Paleozoic formations in the states named. Fourteen Dakota fossils are listed.

Billings Geological Society, 1952, Guidebook, 3d Annual Field Conference, Black Hills-Williston Basin, September 4-7, 1952, (Sonnenberg, Frank P., editor): Billings, Mont., 178 p. incl. ads, illus. incl. geol. map.

The book includes papers by numerous authors that are cited individually.

Binyon, Eugene O., 1952, North Dakota sodium sulfate deposits: U. S. Bur. Mines Rept. Inv. 4880, 41 p., illus.

The report includes a description of the deposits of sodium sulfate, a discussion of the geology and origin of sodium sulfate, and analyses of samples from the deposits.

Blackstone, D. L., Jr. See Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942.

Blain, William S., 1955, "Scoria" of North Dakota: *Compass*, v. 32, no. 2, p. 138-143; reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 138-143.

The report is a discussion of the formation of "scoria," the causes of the burning of the lignite, the general effects on the overlying beds, the character of the rock formed, and the influence of this on the topography.

Bliss, Jay W., 1927, Testing a lignite field: *N. Dak. Engineer*, v. 3, no. 2, p. 4-5, illus.

The article is an account of an investigation to determine the best coal-bearing sections and to estimate the tonnage of coal in a lignite field in western North Dakota.

Boardman, Leona, and Young, Ruth C., 1954, Geological map index of North Dakota: *U. S. Geol. Survey Index Geol. Mapping U. S.*, scale 1:750,000.

The map shows the areas of geologic mapping in the state. A bibliography of geologic maps of North Dakota is included.

Boucher, A. C. See Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914.

Bowlby, S. F., 1952, The Williston Basin, today's newest, most exciting oil province: *Oil and Gas Jour.*, v. 51, no. 28, p. 317-320.

The significance of the area with regard to the national supply situation is appraised, and the geology and development of the basin are discussed.

Bownocker, J. A. See Campbell, M. R., and Bownocker, J. A., 1929.

Branch, John R., 1947, The geology of the Flora Quadrangle: *N. Dak. Geol. Survey Bull.* 22, 35 p., illus. incl. geol. map (scale 1:62,500).

The glacial geology and the groundwater resources of the quadrangle are discussed.

Brant, Russell, 1953, Lignite resources of North Dakota: *U. S. Geol. Survey Circ.* 226, 78 p., illus. incl. geol. map (scale 1:1,250,000).

The report is a summary of all available information on the lignite reserves of North Dakota through 1952. The geologic descriptions of the lignite fields and the reports of the lignite reserves are presented by county units.

Brookhart, Joseph W. See also Robinove, Charles J., Langford, R. H., and Brookhart, J. W., 1958.

Brookhart, Joseph W., 1958, Use of photogrammetry in mapping beach ridges of glacial Lake Agassiz in Traill County, North Dakota, in *Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958*: *N. Dak. Geol. Survey Misc. Ser.* no. 10, p. 78-79.

The article is a report of a project using photogrammetry to detect and map the beach ridges.

Brown, Roland W., 1935, Some fossil conifers from Maryland and North Dakota: *Washington Acad. Sci. Jour.*, v. 25, no. 10, p. 441-450, illus.

Fossil conifers (*Sequoia dakotensis* Brown, n. sp.) from along the Cannonball River are described. The fossils are apparently from the lower part of the Hell Creek Formation.

Brown, Roland W., 1936a, A fossil shelf-fungus from North Dakota: *Washington Acad. Sci. Jour.*, v. 26, no. 11, p. 460-462, illus.

A fragment of a fossil shelf-fungus (*Polyporites stevensoni*, n. sp.) from the Hell Creek Formation is described. The fragment was later found to be a syringopore coral. (See Brown, R. W., 1938b.)

Brown, Roland W., 1936b, The genus *Glyptostrobus* in America: *Washington Acad. Sci. Jour.*, v. 26, no. 9, p. 353-357, illus.

The author redescribes and renames the species *Glyptostrobus europaeus* described from the Fort Union "Formation" of North Dakota by J. S. Newberry. It is renamed *Glyptostrobus dakotensis*. (See Newberry, J. S., 1898.)

Brown, Roland W., 1938a, The Cretaceous-Eocene boundary in Montana and North Dakota (abs.): Washington Acad. Sci. Jour., v. 28, no. 9, p. 421-422.

The Mesozoic-Cenozoic boundary is placed between the Hell Creek and Fort Union strata and the name Hell Creek is raised to formational status in North Dakota. A Paleocene age is suggested for the Fort Union strata.

Brown, Roland W., 1938b, Two fossils misidentified as shelf-fungi: Washington Acad. Sci. Jour., v. 28, no. 3, p. 130-131.

The specimen identified as *Polyporites stvensoni* Brown was reexamined and found to be a syringopore coral. (See Brown, R. W., 1936a.)

Brown, Roland W., 1939a, Fossil leaves, fruits, and seeds of *Cercidiphyllum*: Jour. Paleontology, v. 13, no. 5, p. 485-499, illus.

Fossil leaves, seeds, and fruits from the Hell Creek and Fort Union beds in North Dakota are described.

Brown, Roland W., 1939b, Fossil plants from the Colgate Member of the Fox Hills Sandstone and adjacent strata: U. S. Geol. Survey Prof. Paper 189-I, p. 239-275, illus. incl. geol. map (scale 1:7,500,000).

The paper consists of a general discussion of the Colgate Member, a discussion of the fossil flora of the Fox Hills Sandstone, and a general discussion of the Hell Creek Formation. North Dakota localities included are near Mandan, Marmarth, and along the Cannonball River.

Brown, Roland W., 1948a, Age of the Kingsbury Conglomerate is Eocene: Geol. Soc. America Bull., v. 59, p. 1165-1172, illus.

A discussion of the Paleocene-Eocene boundary in North Dakota is presented.

Brown, Roland W., 1948b, Correlation of Sentinel Butte Shale in western North Dakota: Am. Assoc. Petroleum Geologists Bull., v. 32, no. 7, p. 1265-1274, illus.

The stratigraphic and paleontologic evidence for determining the age of the Sentinel Butte Shale is discussed. The shale is assigned to the upper part of the Fort Union "Formation" (Paleocene).

Brown, Roland W., 1952, Tertiary strata in eastern Montana and western North and South Dakota, in Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, September 4-7, 1952: p. 89-92, illus.

The Tertiary formations and paleontology are discussed. The illustrations include characteristic Paleocene and Eocene plants.

Brown, Roland W., and Lemke, R. W., 1948, Newly discovered outcrops of the Cannonball Formation in North Dakota: Science, v. 107, p. 624-625.

The article contains a discussion of previous studies of the Cannonball Formation and a discussion of some new outcrops of the formation. A list of the fossils found in the formation is included.

Bryce, George, 1891, Surface geology of the Red River and Assiniboine Valleys: Hist. and Sci. Soc. Manitoba, Transaction 41, Season 1890-1891, 7 p., illus.

The report is a discussion of Lake Agassiz, its beaches, deltas, and their origin.

Buddhue, John D., 1949, Miscellaneous notes on meteorites from Holbrook (Ariz.), Richardton (N. Dak.), Xlquipilco (Mex.), and Mount Elden (Ariz.): Pop. Astronomy, v. 57, no. 8, p. 400-402, illus.; reprinted, 1949: Meteor Soc. Contr., v. 4, no. 3, p. 208-210, illus.

The article includes a brief note on the moisture content of the Richardton meteorite.

Budge, Chrissie E., 1946, Bibliography of the geology and natural resources of North Dakota 1814-1944: N. Dak. Research Found. Bull. no. 1, 214 p.; reprinted with Supplements one and two, 1959: N. Dak. Geol. Survey, 375 p.

Budge, Chrissie E., 1948, First supplement 1948 bibliography of the geology and natural resources of North Dakota: N. Dak. Research Found. Bull. no. 4, 90 p.; reprinted with Bibliography, 1814-1944 and supplement two, 1959: N. Dak. Geol. Survey, 375 p.

Budge, Chrissie E., 1952, Second supplement 1951 bibliography of the geology and natural resources of North Dakota: N. Dak. Research Found. Bull. no. 6, 61 p.; reprinted with Bibliography 1814-1944 and supplement one, 1959: N. Dak. Geol. Survey, 375 p.

Budge, Chrissie E., 1954, The mineral resources of North Dakota: N. Dak. Research Found. Bull. no. 8, 68 p., illus.

The locations of the deposits of nineteen minerals of possible economic importance are given, together with data on the extent of the resource, an historical note, statement of properties, and information on development and production. A bibliography is included for each mineral.

Budge, W. E. *See also* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., 1930.

Budge, W. E. *See also* Leonard, Arthur G., Gauger, A. W., Budge, W. E., and Dove, L. P., 1926.

Budge, W. E., 1926, North Dakota clays, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak. Univ. Departmental Bull., v. 11, no. 1 (N. Dak. Univ., Div. Mines and Mining Expts. Bull. 9) p. 38-45, illus.

The properties of clays, the clay deposits of North Dakota, and the manufacture of clay products in North Dakota are discussed.

Budge, W. E., 1930, North Dakota clays *in* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., Geology and natural resources of North Dakota: N. Dak. Univ. Departmental Bull., v. 14, no. 1 (N. Dak. Univ., Div. Mines and Mining Expts. Bull. no. 11) p. 56-64, illus.

The properties of clays, the clay deposits of North Dakota, and the manufacture of clay products are discussed.

Budge, W. E., 1937, School of Mines survey 1937: N. Dak. Engineer, v. 14, no. 1, p. 3-4, illus.

The bleaching clay near Walhalla, the cement rock in the Pembina Mountains, and the marl deposits in Horseshoe Lake near Warwick are discussed.

Burchard, Ernest F., 1904, Lignites of the middle and upper Missouri Valley, *in* Emmons, S. F., and Hayes, C. W., Contributions to economic geology 1903: U. S. Geol. Survey Bull. 225, p. 276-288.

The physical, chemical, geologic, and economic aspects of the lignite deposits in North Dakota and northeastern Nebraska are presented.

Burdick, Usher L., 1942, North Dakota has the lignite to win this war: U. S. Congressional Record, 77th Cong., 2nd Sess., Appendix, v. 88, pt. 10, p. A3099-A3102.

The production and value of the lignite of North Dakota is compared with that of Texas, Montana, South Dakota, and Germany.

Burg, Kenneth E., 1952, Exploration problems of the Williston Basin: Geophysics, v. 17, no. 3, p. 465-480, illus.; reprinted, 1952, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, September 4-7, 1952: p. 118-127, illus.

A brief discussion of the geology of the basin and some of the exploration problems encountered is presented. An outline of the role of geophysics in the solution of the problems is included.

Burgess, J. L. *See* Fippin, E. O., and Burgess, J. L., 1906.

Burr, Alexander C., Fallgatter, W. S., and MacMillan, W. W., 1950, Raw materials for the manufacture of Portland cement in North Dakota: N. Dak. Acad. Sci. Proc., v. 3, p. 15-18.

A summary of the search for a calcareous material to provide the major source of lime is presented. The Niobrara Limestone, the marl deposits near Devils Lake, and the White River Formation at Colgrove Butte are considered as possibilities.

Burr, Alexander C., and Jaffer, M. M., 1951, Sulfur in North Dakota lignite, III, humic and resinic sulfur: N. Dak. Acad. Sci. Proc., v. 5, p. 11-18.

The resolution of the organic sulfur content of the lignite into the humic and resinic fraction is discussed. (For parts I and II see Magnusson, Adelynn, 1950, and Burr, Alexander C., and Magnusson, Adelynn, 1950.)

Burr, Alexander C., and Magnusson, Adelynn, 1950, Sulphur in North Dakota lignite, Pt. II: N. Dak. Acad. Sci. Proc., v. 4, p. 49-52.

The average sulfur content of North Dakota lignite is tabulated on both a state-wide and a county basis. (For parts I and III see Magnusson, Adelynn, 1950 and Burr, A. C., and Jaffer, M. M., 1951.)

Bushnell, T. M., *See also* Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917.

Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916, Soil survey of Dickey County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets--Field Operations of the Bur. of Soils, 1914, 56 p., illus. incl. soil map (scale 1:63,360).

Each type of soil present in the county is mapped, described physically and chemically, and discussed as to its agricultural value.

Buster, S., *See* Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925.

Caine, Thomas A., 1904, Soil survey of the Fargo area: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 59-86, illus. incl. soil map.

The surficial geology, soil types, soil conditions, drainage, and agricultural conditions are discussed.

Caine, Thomas A., and Kocher, A. E., 1904, Soil survey of Jamestown area: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 87-111, illus. incl. soil map.

The climate, physiography, surficial geology, soil types, agricultural conditions, and history of settlement are discussed.

Caldwell, John W., 1954, Surface structure of western Stark County and adjacent areas of North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 14, 1 sheet, illus. incl. geol. map (scale 1:125,000).

The stratigraphy and structure are discussed for the Fryburg-South Heart area and the Little Badlands syncline area. The illustrations include a surface structure map and a form-line map.

Calvert, W. R., Beekly, A. L., Barnett, V. H., and Pishel, M. A., 1914, Geology of the Standing Rock and Cheyenne River Indian Reservations, North and South Dakota: U. S. Geol. Survey Bull. 575, 49 p., illus. incl. geol. map (scale 1:500,000).

The geography, stratigraphy, paleontology, structure, hydrogeology, and economic geology are discussed for the two reservations.

Campbell, Marius R. and others, 1915, Guidebook of the western United States. Part A, the Northern Pacific Route, with a side trip to Yellowstone Park: U. S. Geol. Survey Bull. 611, 212 p., illus. incl. geol. maps (scale 1:500,000).

The geology and geography of North Dakota, particularly the towns along the Northern Pacific Railroad, are described. Strip maps illustrate the topography and geology of the area adjacent to the railroad.

Carlson, Clarence G. *See also* Anderson, Sidney B., and Carlson, C. G., 1958.

Carlson, Clarence G. *See also* Folsom, Clarence B., Jr., Carlson, Clarence G., and Anderson, Sidney B., 1959.

Carlson, Clarence G., 1958, The stratigraphy of the Deadwood-Winnipeg interval in North Dakota and northwestern South Dakota, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 20-26, illus.

The stratigraphy, economic possibilities, and history of nomenclature of the Winnipeg-Deadwood interval are discussed. Isopach maps are included for each formation and member of the interval.

Chamberlin, Thomas C., 1883, Preliminary paper on the terminal moraine of the Second Glacial Epoch: U. S. Geol. Survey 3rd Ann. Rept., p. 291-402, illus.

The moraine of the Dakota Valley glacier and the moraine of the Missouri Coteau are described as portions of the terminal moraine.

Chamney, Thomas P., 1958, Isometric panel diagram—Jurassic system, *in* Goodman, A. J., Jurassic and Carboniferous of western Canada: Am. Assoc. Petroleum Geologists, John Andrew Allan Memorial Volume, p. 98-99, illus.

The lateral correlation of the Jurassic System is discussed for western Canada and northern United States. The panel diagram crosses northwestern North Dakota, incorporating the Williston basin.

Chandler, E. F. *See* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., 1930.

Chang, Shih T., 1950, Tests on North Dakota shale to determine possible use as highway material: Grand Forks, N. Dak., North Dakota, Univ., M.S. Thesis (unpub.), 50 p., illus.

The general geology of the state is reviewed. The geological origin, distribution, and physical properties of North Dakota shale are discussed. The shale deposits studied are of Cretaceous age.

Chapman, J. E. *See* Knobel, E. W., Peightal, M. F., and Chapman, J. E., 1924.

Check, R., 1956, Winnipegosis Formation of Saskatchewan and adjacent areas (abs.), *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 140.

The areal extent and lithology of the formation are discussed. The oil and gas potential of the Winnipegosis reefs is mentioned.

Clabaugh, S. E. *See* Larrabee, D. M., Clabaugh, S. E., and Dow, D. H., 1945a,b.

Clapp, C. H. *See also* Babcock, Earle J., and Clapp, C. H., 1906.

Clapp, C. H., 1907, The clays of North Dakota: Econ. Geol., v. 2, no. 6, p. 551-564.

A short discussion of the stratigraphy of the state is followed by a discussion of the clay deposits of Cretaceous and Tertiary age in the state. The stratigraphic positions, physical properties, chemical analysis, and genesis of the deposits are given.

Clapp, C. H., and Babcock, E. J., 1906, Clay and its properties with special reference to North Dakota clays: N. Dak. Geol. Survey 4th Bienn. Rept., p. 9-61.

The physical properties, chemistry, and origin of clay are discussed with reference to North Dakota clay deposits.

Clark, F. R. See Campbell, M. R., and Clark, F. R., 1916.

Clark, W. H., 1908, Good roads and road materials: N. Dak. Geol Survey 5th Bienn. Rept., p. 253-269.

The relation of roads to topography and geology is discussed. The available road materials, such as sand, gravel, and scoria are discussed.

Clarke, Fremont F., 1948, Southwestern North Dakota clay deposits, Stark, Slope and Billings counties, N. Dak.: U. S. Bur. Mines Rept. Inv. 4219, 32 p., illus. incl. geol. maps.

The clay beds were studied to determine the average alumina content, the most feasible method of extracting alumina, and the commercial uses of the clay. The map areas include the South Heart Little Badlands, the Chalky Buttes, the Marmarth area, and the Belfield area.

Clevenger, W. A., 1951, Laboratory tests on foundation samples--Jamestown Dam site--Missouri-Souris Division--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Research and Geol. Div., Earth Materials Lab. Rept. no. EM-266, 29 p., illus.

The results of laboratory tests on undisturbed samples of foundation materials from two proposed dam axes at the Jamestown Dam site are discussed.

Clevenger, W. A., 1953, Bearing capacity studies of tower foundation materials--Jamestown-Fargo Transmission Line--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Eng. Lab. Br., Earth Lab. Rept. no. EM-359, 50 p., illus.

The samples analyzed include glacial moraine and glacial lake-bed soils. The results of the tests are discussed.

Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, M., and Anderson, A. C., 1917, Soil survey of Bottineau County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets--Field Operations of the Bur. of Soils, 1915, 54 p., illus. map (scale 1:63,360).

Each type of soil is shown on the map, described physically, analyzed chemically, and discussed as to its agricultural value.

Cobban, William A. See also Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942.

Cobban, William A., and Reeside, John B., Jr., 1952, Correlation of the Cretaceous Formations of the Western Interior of the United States: Geol. Soc. America Bull., v. 63, no. 10, p. 1011-1044, illus.

This article includes discussions of the historical background of classification, a standard reference sequence, suggested zonal indices and other fossils, faunal relations, and annotations explaining the items on the correlation charts.

Cole, Willard A., and Zetterstrom, John D., 1954, Investigations of lightweight aggregates of North and South Dakota: U. S. Bur. Mines Rept. Inv. 5065, 43 p., illus.

The shale and clay deposits of North and South Dakota are studied as possible raw materials for the production of lightweight aggregates.

Collier, Arthur J., 1918, A formation hitherto unaccounted for in North Dakota (abs.): Washington Acad. Sci. Jour. v. 8, p. 412-413.

The material filling the valleys along the Missouri River in eastern Montana and western North Dakota is identified as loess.

Collier, Arthur J., 1919, The Nesson Anticline, Williams County, North Dakota: U. S. Geol. Survey Bull. 691-G, p. 211-217, illus. structure map (scale approx. 1:26,500).

The topography, geology, structure, lignite deposits, and oil and natural gas possibilities of the area are discussed.

Colton, Roger B. *See also* Lemke, Richard W., and Colton, Roger B., 1958.

Colton, Roger B., 1958a, Ice-crack moraines in northwestern North Dakota and northeastern Montana, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 99-107, illus.

The distribution, shape, composition, origin, and significance of the ice-crack moraines are discussed.

Colton, Roger B., 1958b, Note on the intersecting minor ridges in the Lake Agassiz Basin, North Dakota, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 74-77, illus.

The article is based on the work of Horberg (1951) in the same area. The origin of the ridges is interpreted. Superposition of the ridges is noted.

Colton, Roger B., and Lemke, R. W., 1955, Drumlins in North Dakota (abs.): Geol. Soc. America Bull., v. 66, no. 12, p. 1673.

The drumlins are described as to location, shape, size, and orientation.

Cooper, H. M., Abernethy, R. F., and Tarpley, E. C., 1948, Description of mine samples, *in* U. S. Bureau of Mines, Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, p. 64-95.

The description includes the location of the mine, sample location in the mine, stratigraphic position, thickness of bed, system of mining, and estimated life of the mine.

Cooper, H. M., Snyder, N. H., Abernethy, R. F., and Tarpley, E. C., 1948, Analyses of mine, tippie, and delivered samples, *in* U. S. Bureau of Mines, Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, p. 27-63.

Lignite from North Dakota mines is analyzed as follows: 1) proximate analysis—moisture, volatile matter, fixed carbon, and ash; 2) ultimate analysis—sulfur, hydrogen, carbon, nitrogen, oxygen, and ash; 3) softening temperature of ash; 4) agglomerating index; 5) mineral-matter-free basis: a) dry fixed carbon and B.t.u., b) moist B.t.u.

Cooper, Margaret, 1955, Bibliography and index on uranium and thorium and radioactive occurrences in the United States, Pt. 4, Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas: Geol. Soc. America Bull., v. 66, p. 257-326.

The main bibliography consists of an author listing followed by three indexes: a gazetteer, a geographical index, and a subject index.

Cope, Edward D., 1874, [On the Cretaceous age of the lignites of the West]: Philadelphia, Acad. Nat. Sci., Proc. v. 26, p. 10-13.

Professor Cope presents a discussion of the vertebrate paleontological evidence for the Cretaceous age of the lignite beds in the upper Missouri River region. Remarks by LeConte and Frazer are included.

Cope, Edward D., 1875, The vertebrata of the Cretaceous formations of the West: U. S. Geol. Survey of the Territories, Rept., v. 2, 302 p., illus.

The species are described and illustrated. Some of the specimens are from the area now included in the state of North Dakota.

Cope, Edward D., 1883a, On a new extinct genus and species of Percidae from Dakota Territory: Am. Jour. Sci. 3rd Ser., v. 25, p. 414-416.

Four fossil fish collected at Sentinel Butte are described and measured. A new genus, *Plioplarchus*, is named and described.

Cope, Edward D., 1883b, [White River beds near Sully Springs, Dakota]: Am. Philos. Soc. Proc., v. 21, p. 216-217.

The article is a letter from Prof. E. D. Cope reporting the discovery of a new lake of White River age in southwestern North Dakota.

Cox, Herbert M., 1953, Williston basin--Mississippian reservoir characteristics and proved reserves: Am. Assoc. Petroleum Geologists Bull., v. 37, no. 10, p. 2294-2302, illus.

The structure, lithologic character of the pay zone, and reservoir data are discussed for the Beaver Lodge and Tioga fields in North Dakota and the East Poplar and Richey fields in Montana. The reserves are calculated for the fields.

Crosby, Spurgeon C., II, 1958, The basement of North Dakota: Grand Forks, N. D., North Dakota, Univ., M.A. Thesis (unpub.), 46 p., illus. incl. basement geologic map (scale 1:2,230,000).

The topography, structure, composition, and geologic history of the basement and the petrography of the Precambrian basement rocks are discussed.

Cross, C. Whitman, 1921, Are the Lance and Fort Union formations of Mesozoic time?: Science, n.s., v. 53, no. 1370, p. 304-307.

The review of T. W. Stanton's paper (1921) by Charles Schuchert (1921) is discussed. The position of the U. S. Geological Survey regarding the age of the formations is supported against the position of Schuchert.

Cross, C. Whitman, 1922, Tertiary aspects of Lance beds: Pan-Am. Geol., v. 37, p. 66-67.

The sedimentary history of the formation is discussed.

Culbertson, Thaddeus A., 1851, Journal of an expedition to the Mauvaises Terres and the Upper Missouri in 1850: Smithsonian Inst., 5th Ann. Rept., p. 84-145; reissued, McDermott, John F., ed., 1952: Smithsonian Inst., Bur. Am. Ethnology Bull. 147, 164 p., illus.

The daily journal contains detailed accounts of the geology, biology, climate, people, and cultures encountered. The journey was made up the Missouri River from St. Louis to a point beyond the Milk River. The specimens collected during the trip were presented to the Smithsonian Institute.

Culbertson, William C. See also Kepferle, Roy C., and Culbertson, William C., 1955.

Culbertson, William C., 1955, Strippable coal reserves in the Fort Union region of Montana and North Dakota (abs.): Econ. Geol., v. 50, no. 1, p. 102.

The results of the 1950-1953 U. S. Geological Survey project of mapping strippable coal deposits in the area are discussed.

Culver, Garry E., 1890, Report of Professor Garry E. Culver, University of Dakota, field geologist for North and South Dakota: U. S. 51st Cong., 1st sess., Senate Ex. Doc. 222, p. 55-63, illus.

The geology of the Dakotas is described and the relation of the water-bearing rock to the surface geology is discussed.

Culver, Garry E., 1893, Report of Prof. Garry E. Culver: U. S. 52nd Cong., 1st sess., Senate Ex. Doc. 41, pt. 3, p. 191-209, illus. incl. geol. map (scale 1:2,500,000).

The Dakota artesian basin, the supply of the water, and the geology of the Black Hills are discussed.

Cumming, Alastair D., Fuller, J. G. C. M., and Porter, J. W., 1959, Separation of strata: Paleozoic limestones of the Williston Basin, *in* Bell, W. D., chm., Symposium on concepts of stratigraphic classification and correlation: *Am. Jour. Sci.*, v. 257, no. 10, p. 722-733, illus.

Previous work done on the Williston basin Paleozoics is compiled with a discussion of theoretical considerations of the existence of limestones.

Curtiss, Robert E., 1957, Stratigraphic correlation of lignitic uranium deposits in the Sentinel Butte Member, Billings County, North Dakota (abs.): *Geol. Soc. America Bull.*, v. 68, no. 12, p. 1860.

Two marker intervals are identified and used for correlation within the Sentinel Butte "Member" throughout Billings County.

Cvancara, Alan M. *See also* Holland, Frank D., Jr., and Cvancara, Alan M., 1955, 1958.

Cvancara, Alan M., 1955, Lignite--valuable resource of North Dakota: *Compass*, v. 32, no. 2, p. 133-137, illus.; reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 133-137, illus.

This is a general discussion of lignite in North Dakota.

Cvancara, Alan M., 1957, Gastropoda from the Pierre Shale (Upper Cretaceous) of Emmons County, south-central North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 62 p., illus.

Fourteen species of gastropods found are arranged in twelve genera. The evidence indicates that gastropods cannot be used in defining a Pierre-Fox Hills contact. The concept of a gradational contact is strengthened.

Darton, Nelson H., 1896, Preliminary report on artesian waters of a portion of the Dakotas: *U. S. Geol. Survey 17th Ann. Rept.* pt. 2, p. 603-694, illus.

The area includes southeastern North Dakota and eastern South Dakota. The water-bearing beds are located, the territory of artesian flows is outlined, the prospects for a continued water supply are discussed, and the results of irrigation are presented.

Darton, Nelson H., 1898, Geothermal data from deep artesian wells in the Dakotas: *Am. Jour. Sci.* 4th Ser., v. 5, p. 161-168, illus.

The underground temperature of waters in the Dakota artesian basin is recorded. The rate of temperature-increase with depth is calculated and plotted on a map. This is discussed in relation to the bedrock surface topography.

Darton, Nelson H., 1905, Preliminary list of deep borings in the United States, 2nd ed. with additions: *U. S. Geol. Survey Water-Supply Paper* 149, 175 p.

Wells over 400 feet deep in North Dakota are listed with information on their yield and depth of water.

Dawson, George M., 1875a, On the superficial geology of the central region of North America: *Geol. Soc. London Quart. Jour.*, v. 31, p. 603-623, illus.

The geologic history and the glacial features of the region along the 49th parallel, north latitude, between the 96th and 114th meridians, are discussed. The Pembina Mountain, Red River Valley, Turtle Mountains, and Missouri Coteau are described.

Dawson, George M., 1875b, Report on the geology and resources of the region in the vicinity of the Forty-ninth Parallel, from the Lake of the Woods to the Rocky Mountains: Montreal, British North American Boundary Commission, 379 p., illus. incl. geol. sketch map.

The geology and stratigraphy of the northern boundary area of North Dakota are discussed. Particular areas mentioned are the Red River Valley, Pembina Escarpment, Turtle Mountains, Souris River Valley, Missouri Coteau, and the Badlands.

Denison, A. Rodger, 1953, The Williston Basin--structure and stratigraphy in relation to recent oil and gas discoveries: Tulsa Geol. Soc. Digest, v. 21, p. 42-47, illus.

The Williston basin is defined and a brief summary of the geologic history is given. Two structure contour maps, one on the Dakota interval and one on the Mississippian interval, are included.

Denison, A. Rodger, 1954, The Williston Basin--structure and stratigraphy in relation to occurrence of oil and gas, in Moore, Carl A., ed., 1954, Third Subsurface Geological Symposium Proceedings, Norman, Oklahoma, March 3-4, 1953: p. 55-62, illus.

The exploration and production history, geological history, and structure of the basin are discussed. The structure of the Nesson anticline is also discussed. Structure contour maps of the Williston basin and the Beaver Lodge and Tioga fields are included.

Dennis, Philip E. See also Aronow, Saul, Dennis, P. E., and Akin, P. D., 1953.

Dennis, Philip E., 1947a, Ground water in the Aneta area, Nelson County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 7, 25 p., illus. incl. geol. sketch map (scale 1:93,750).

The glacial deposits and the bedrock are described and their water-bearing characteristics are discussed. Tables of the analyses of groundwater, well records, and well logs are included.

Dennis, Philip E., 1947b, Ground water in the Sharon area, Steele County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 8, 29 p., illus. incl. geol. sketch map (scale 1:93,750).

The geology and hydrology of the glacial deposits and the bedrock are discussed. The analyses of the groundwater and well records and logs are included.

Dennis, Philip E., 1947c, Ground water near Buxton, Traill County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 5, 29 p., illus. incl. geol. sketch map (scale 1:62,500).

The geology and hydrology of the water-bearing formations, both glacial and bedrock, are discussed. The analyses of groundwater and well records and logs are included.

Dennis, Philip E., 1948a, Ground water in the Hope area, Steele County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 9, 30 p., illus.

The geology and hydrology of the glacial deposits and the bedrock are discussed. The analyses of groundwater and well records and logs are included in the report.

Dennis, Philip E., 1948b, Ground water in the Wimbledon area, Barnes and Stutsman Counties, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 10, 38 p., illus. incl. geol. sketch map (scale 1:20,000).

The geology and hydrology are discussed for the glacial deposits and bedrock in the area. Tables showing the analyses of groundwater, well records and well logs are included.

Dennis, Philip E., and Akin, P. D., 1950, Ground water in the Portland area, Traill County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 15, 50 p., illus. incl. geol. map (scale 1:250,000).

The geology and hydrology including the water-bearing characteristics of the river alluvium, glacial deposits, Lake Agassiz deposits, and bedrock are discussed. Chemical analyses of the groundwater, and well records and logs of the test holes are included.

Dennis, Philip E., Akin, P. D., and Jones, S. L., 1949, Ground water in the Wyndmere area, Richland County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 13, 59 p., illus. incl. geol. map (scale 1:62,500).

The geology and occurrence of groundwater in Lake Agassiz deposits, glacial deposits, and bedrock are discussed. The quality of groundwater is reported, and well records and logs are included.

Dennis, Philip E., Akin, P. D., and Jones, S. L., 1950, Ground water in the Kindred area, Cass and Richland Counties, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 14, 75 p., illus. incl. geol. map (scale 1:62,500).

The geology and occurrence of groundwater in the glacial deposits, Lake Agassiz deposits, and bedrock are discussed. Well records, and well and test hole logs are included with a discussion of the water quality.

Dennis, Philip E., Akin, P. D., and Worts, G. F., Jr., 1949, Geology and ground-water resources of parts of Cass and Clay Counties, North Dakota and Minnesota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 11; Minnesota Ground-Water Studies no. 1, 177 p., illus.

The geology and hydrology of Lake Agassiz deposits, glacial deposits, and bedrock are discussed. The problem of development and production of groundwater is discussed. Well records and well logs are included in the report.

Denson, Norman M. *See also* Gill, James R., and Denson, Norman M., 1955, 1956a,b, 1957a,b.

Denson, Norman M., 1950, The lignite deposits of the Cheyenne River and Standing Rock Indian Reservations Corson, Dewey, and Ziebach Counties, South Dakota and Sioux County, North Dakota: U. S. Geol. Survey Circ. 78, 22 p., illus. incl. geol. map (scale 1:500,000).

The bedrock geology is described with emphasis on the lignite deposits. The mine areas are mapped and discussed.

Denson, Norman M., Bachman, G. O., and Zeller, H. D., 1952, Radioactive lignite deposits in the Dakotas, *in* Summary of uranium-bearing coal, lignite, and carbonaceous shale investigations in the Rocky Mountain region during 1951: U. S. Geol. Survey Rept. TEM-341A, p. 13-19. (Report prepared for U. S. Atomic Energy Commission.)

The stratigraphy, structure, occurrence of uranium, and potential of the field are discussed for the Medicine Pole Hills area in Bowman County.

Denson, Norman M., Bachman, G. O., and Zeller, H. D., 1954, Uranium-bearing lignite and its relation to the White River and Arikaree formations in northwestern South Dakota and adjacent states: U. S. Geol. Survey TEI-467 (Report prepared for the U. S. Atomic Energy Commission.); published, 1959, Uranium-bearing lignite in northwestern South Dakota and adjacent states: U. S. Geol. Survey Bull. 1055-B, p. 11-57, illus. incl. geol. maps (scale 1:63,360, Medicine Pole Hills area, N. Dak.).

The stratigraphy, structure, and uranium-bearing lignite deposits are discussed for several areas including Medicine Pole Hills area in Bowman County, North Dakota.

Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955, Uraniferous coal beds in parts of North Dakota, South Dakota, and Montana: U. S. Geol. Survey Coal Inv. Map C-33, block diagrams and geol. maps (scales 1:62,500 and 1:31,250).

The block diagrams show the relationship of radioactive lignite beds to the regional geologic setting and to the base of the White River Group. The geologic maps are of Bullion Butte area, Billings and Golden Valley Counties; Sentinel Butte area, Golden Valley County; Medicine Pole area, Bowman County; Ekalaka Hills, Montana; and Lodgepole area, South Dakota.

Denson, Norman M., and Gill, James R., 1956, Uranium-bearing lignite and its relation to volcanic tuffs in eastern Montana and the Dakotas, *in* United Nations, Geology of uranium and thorium: Internat. Conf. Peaceful Uses Atomic Energy, Geneva, Aug. 1955, Proc. v. 6, p. 464-467, illus. incl. geol. map; revised *in* Page, L. R., Stocking, H. E., and Smith, H. B., Contributions to the geology of uranium and thorium...: U. S. Geol. Survey Prof. Paper 300, p. 413-418, illus. incl. geol. map (scale 1:1,000,000).

The geographic and stratigraphic locations of the uranium-bearing deposits are described. The lignite deposits are discussed in relation to the overlying beds and possible origin of the uranium. A generalized stratigraphic column is included.

Denson, Norman M., and Gill, James R., 1958, Regional synthesis—eastern Montana and the Dakotas, in *Geologic investigations of radioactive deposits semiannual progress report for December 1, 1957 to May 31, 1958*: U. S. Geol. Survey Rept. TEI-740, p. 188-201, illus. (Report prepared for U. S. Atomic Energy Commission.)

The results of semiquantitative spectrographic analyses of samples of uranium-bearing lignite and carbonaceous shale from the Ludlow, Tongue River, and Sentinel Butte "Members" of the Fort Union "Formation" in the Slim Buttes, North Cave Hills, and little Missouri River escarpment areas are presented.

Denson, Norman M., and others, 1959, Uranium in coal in the western United States: U. S. Geol. Survey Bull. 1055, 315 p., illus.

The bulletin contains papers by several authors that are cited individually.

Desjardins, Louis H., 1952, Photogeology in the Williston Basin: *Petroleum Engineer*, v. 24, no. 9, p. B62-B63, illus.

The use of aerial photographs in the mapping of the structure and outcrop pattern of the Williston basin is discussed.

Deul, Maurice, and Ansell, C. S., 1956, The occurrence of minor elements in ash of low-rank coals from Texas, Colorado, North Dakota, and South Dakota: U. S. Geol. Survey Bull. 1036-H, p. 155-172, illus.

The results of the analysis of the ash samples for 27 minor elements are presented and interpreted. Lignite from Bowman County, North Dakota is included in the study.

Dingman, Robert J., and Gordon, Ellis D., 1954, Geology and ground-water resources of Fort Berthold Indian Reservation, North Dakota: U. S. Geol. Survey Water-Supply Paper 1259, 115 p., illus. incl. geol. map (scale 1:96,000).

The stratigraphy, geologic history, economic geology, and hydrology are discussed for the area. The chemical quality of the groundwater and well logs and records are included.

Dobbin, C. E. *See also* Thom, W. Taylor, Jr., and Dobbin, C. D., 1924a,b.

Dobbin, C. E., and Larsen, R. M., 1934, Geologic and structure-contour map of the southern half of the Cedar Creek Anticline, Fallon County, Montana and Bowman County, North Dakota: U. S. Geol. Survey Gen. Mineral Resource Map (scale 1:63,360).

The Pierre Shale, Fox Hills Sandstone, and "Lance Formation" are the units illustrated on the geologic map. The structure contours are drawn on the phosphatic pebble bed at the top of the Pierre Shale.

Dobbin, C. E., and Reeside, J. B., Jr., 1924, The Lance-Fox Hills contact in eastern Montana and the Dakotas (abs.): *Washington Acad. Sci. Jour.* v. 14, p. 165-166.

The Fox Hills and Lance are seen as representing continuous deposition. The Fox Hills of the Dakotas is considered Upper Cretaceous, whereas the Fox Hills of Montana is considered early Eocene.

Dobbin, C. E., and Reeside, J. B., Jr., 1930, The contact of the Fox Hills and Lance formations: U. S. Geol. Survey Prof. Paper 158-B, p. 9-25, illus.

The authors describe the contact of the Fox Hills and "Lance" Formations and their equivalent units over much of the area of their occurrence. The problem of the Cretaceous-Tertiary boundary in the Western Interior region is discussed.

Doneghue, R. C., *See* Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Dorf, Erling, 1940, Relationship between floras of the type Lance and Fort Union Formations: *Geol. Soc. America Bull.* v. 51, p. 213-236, illus.

Flora from the type locality of the "Lance Formation" is compared to the flora from the Fort Union, Upper Cretaceous, and Tullock-Ludlow beds. Flora collected from three locations in western North Dakota is included.

Dorf, Erling, 1942, Application of paleobotany to the Cretaceous-Tertiary boundary problem: *New York Acad. Sci., Trans.*, ser. 2, v. 4, no. 3, p. 73-78.

The Mesozoic-Cenozoic boundary is placed between the true dinosaur-bearing "Lance Formation" and the overlying basal unit of the Fort Union. Paleobotanical evidence is correlated with invertebrate and vertebrate evidence for this conclusion.

Doroshenko, Jerry *See* Hadley, Herbert D., Lewis, Paul J., and Larsen, Roger B., 1952; revised (and Doroshenko, Jerry), 1953.

Douglass, Earl, 1908a, Fossil horses from North Dakota and Montana: *Carnegie Mus., Annals*, v. 4, p. 267-277, illus.

Parts of two fossil horses, *Mesohippus bairdi* (Leidy) and *Mesohippus brachystylus?* Osborn, found at White Butte, Billings County, North Dakota, are described.

Douglass, Earl, 1908b, Rhinoceroses from the Oligocene and Miocene deposits of North Dakota and Montana: *Carnegie Mus., Annals*, v. 4, p. 256-266, illus.

Two skulls found at White Butte and in the Little Bad Lands are described and provisionally identified as *Aceratherium tridactylum* Osborn.

Douglass, Earl, 1909, A geological reconnaissance in North Dakota, Montana, and Idaho; with notes on Mesozoic and Cenozoic geology: *Carnegie Mus., Annals*, v. 5, p. 211-288, illus.

The first part of the report describes the geology of North Dakota as seen from the Great Northern Railroad. From Medora a trip through the Little Missouri Badlands was made by stage and horseback. The scenery and geology are described. Both Black Butte and White Butte were examined. Mention is made of the Fort Union and White River beds on White Butte. The fossils collected in the area are listed.

Dove, Leonard P. *See also* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., 1925.

Dove, Leonard P. *See also* Leonard, Arthur G., Dove, L. P., and Eaton, H. N., 1925.

Dove, Leonard P. *See also* Leonard, Arthur G., Gauger, A. W., Budge, W. E., and Dove, L. P., 1926.

Dove, Leonard P., 1921, The problem of prospecting for coal in glaciated areas: *N. Dak. Univ., Quart. Jour.*, v. 11, no. 3, p. 215-222, illus.

The problem consists largely of locating and evaluating deposits covered by glacial drift. Some methods of prospecting under these conditions are discussed.

Dove, Leonard P., 1922a, Clinkertill, a new metamorphic rock: *Science*, n. s., v. 56, no. 1447, p. 338.

A boulder-clay till capping the northern bluffs along the Missouri River in Williams County, North Dakota has been baked by the burning of the underlying lignite bed and is here described as clinkertill.

Dove, Leonard P., 1922b, The geology and structure of the east side of Nesson Anticline: *N. Dak., Univ., Quart. Jour.* v. 12, no. 3, p. 240-249, illus. incl. geol. map (scale 1:31,680).

The east side of the anticline was mapped to supplement the work of A. J. Collier (1919). The stratigraphy, topography, geological history, structure, and economic considerations are discussed.

Dove, Leonard P., 1923, The prospecting and evaluation of lignite lands in North Dakota: *N. Dak., Univ., Quart. Jour.*, v. 14, p. 60-69.

Some important elements in the problem of prospecting and evaluation such as the depth of coal, nature of overburden, thickness of the bed, glacial materials as overburden, accessibility, and quality are discussed.

Dove, Leonard P., 1925a, McLean County, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 111-125, illus.

This county is on the eastern margin of the lignite area of North Dakota. The important coal mining districts of the county are described in detail. Some measured sections are included.

Dove, Leonard P., 1925b, Morton County, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 131-139, illus.

The New Salem-Glen Ullin, Hebron, and Little Heart River lignite mining districts are described.

Dove, Leonard P., 1925c, The prospecting, development, and evaluation of lignite lands in North Dakota, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 10-27, illus.

The important geological factors involved in the prospecting of lignite lands are discussed.

Dove, Leonard P., 1926, Dakalite, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak. Univ. Departmental Bull., v. 11, no. 1 (N. Dak. Univ., Div. Mines and Mining Expts. Bull. 9) p. 33-37.

The history, the chemistry, the geology, the manufacture, and the uses of dakalite are described. Dakalite is a wood stain made from the mineral leonardite.

Dove, Leonard P., and Eaton, H. N., 1925, Williams and Mountrail Counties, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 153-165, illus. incl. geol. sketch maps (scale 1:31,680 and 1:62,500).

The lignite beds are described for the three districts in the area: the Williston district, the Hanks district, and the White Earth River district. A sketch map of each district is included along with a geological and structure map of the east side of the Nesson anticline.

Dow, D. H. *See also* Larrabee, D. M., Clabaugh, S. E., and Dow, D. H., 1945a,b.

Dow, D. H., 1945a, Mineral resources of the Missouri Valley region, Part 1, Metallic mineral resources: U. S. Geol. Survey Missouri Basin Studies no. 1, pt. 1, geol. map, scale 1:2,500,000; reprinted, 1957.

The map has a geologic base with structure contours and the metallic mineral resources indicated on it. Manganese is indicated in Rolette County, North Dakota.

Dow, D. H., 1945b, Mineral resources of the Missouri Valley region, Part 3, Fuel resources: U. S. Geol. Survey, Missouri Basin Studies no. 1, pt. 3, geol. map, scale 1:2,500,000; reprinted 1957.

The structure contours and oil, gas, and coal resources are indicated on the geologic map. Lignite and gas are the resources indicated in North Dakota.

Downs, G. R. *See* Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942.

Dunn, J. E. *See* Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914.

Easker, David G., 1949, The geology of the Tokio Quadrangle: N. Dak. Geol. Survey Bull. 24, 35 p., illus. incl. geol. map (scale 1:62,500).

The glacial geology of the Tokio area, located in parts of Benson, Eddy, and Ramsey Counties, is presented and the features observed are mapped in detail. The groundwater resources of the area are mentioned.

Eaton, H. N. *See* Dove, Leonard P., and Eaton, H. N., 1925.

Eaton, H. N. *See* Leonard, Arthur G., Dove, L. P., and Eaton, H. N., 1925.

Eaton, H. N. *See* Leonard, Arthur G., and Eaton, H. N., 1925a,b.

Eckel, Edwin C., 1905, Cement materials and industry of the United States: U. S. Geol. Survey Bull. 243, 395 p., illus.

A short chapter on the Portland cement resources of North Dakota is included.

Eckel, Edwin C., 1913, Portland cement materials and industry in the United States: U. S. Geol. Survey Bull. 522, 401 p., illus.

A short section on the Portland cement resources of North Dakota is included. The physical characteristics and chemical composition of the Niobrara Limestone are described.

Edwards, M. J., and Ableiter, J. K., 1942, Soil survey of McKenzie County, North Dakota: U. S. Dept. Agr., Soil Survey Div., Series 1933, no. 37, 99 p., illus. incl. soil maps (scale 1:63,360).

Each type of soil present in the county is shown on the maps and described as to its physical characteristics and agricultural value.

Edwards, M. J., and Ableiter, J. K., 1944, Soil survey of Billings County, North Dakota: U. S. Dept. Agr., Soil Survey Div., Series 1934, no. 25, 111 p., illus. incl. soil map (scale 1:63,360).

Each type of soil present in the county is shown on the map and described as to its physical characteristics and agricultural value.

Edwards, M. J., and Ableiter, J. K., 1951, Soil survey of Morton County, North Dakota: U. S. Dept. Agr., Div. Soil Survey, Series 1936, no. 28, 145 p., illus. incl. soil map (scale 1:63,360).

Each type of soil present in the county is shown on the map and described as to its physical characteristics and agricultural value.

Ehlers, Allen, 1943, Williston Basin wildcat test, Oliver County, North Dakota: Am. Assoc. Petroleum Geologists Bull., v. 27, no. 12, p. 1618-1622.

This brief discussion of the Emma L. Semling No. 1 well includes a detailed log of the section from the Tertiary, Fort Union "Formation," down to the Precambrian, a total of 8,850 feet.

Eisner, A. *See* Fisher, C. H., Sprunk, G. C., Eisner, A., Fein, M. L., and Storch, H. H., 1940.

Eldridge, George H., 1893, Artesian wells of eastern Dakota, *in* Emmons, S. F., Geological guidebook of the Rocky Mountain Excursion: Internat. Geol. Cong., 5th, Washington, 1891, Comptes rendus, p. 318.

The two belts of artesian wells in North Dakota, one in the Red River Valley and one in the James River Valley, are described.

Ellis, W., 1956, Laboratory tests on samples of embankment materials--Wintering Dam, New Home Dam, and New Home Dike--Garrison Division--Missouri River Basin Project: U. S. Bur. Reclamation, Div. of Eng. Lab., Earth Lab. Rept. no. EM-445, 42 p., illus.

Description of the samples and the results of tests on the samples of proposed embankment material are discussed.

Ely, Charles W., Willard, Rex E., and Weaver, J. T., 1907, Soil survey of Ransom County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets-Field Operations of the Bur. Soils, 1906, 39 p., illus. soil map (scale 1:63,360); reprinted, 1910: N. Dak. Agr. Coll. Survey 4th Bienn. Rept., p. 134-172, illus. soil map (scale 1:125,000).

Each type of soil present in the county is mapped and described as to its physical characteristics and its agriculture value.

Engineering and Mining Journal-Press, 1923, Test well suggested in Nesson Anticline in North Dakota: Eng. and Mining Jour.-Press, v. 115, no. 24, p. 1074.

The Department of the Interior suggests that a well be drilled on the Nesson anticline to test for the existence of pools of oil and gas. The site suggested is near Ray, N. D.

Erdmann, C. E. *See* Bartram, John G., and Erdmann, C. E., 1935.

Erickson, M. B. *See* Willard, Daniel E., and Erickson, M. B., 1904.

Ewing, Robert A., Adam, H. W., Miles, F. W., Barse, A. E., and Richardson, A. C., 1950, Recovery of uranium from North Dakota lignites-final report: U. S. Atomic Energy Comm. Rept. BMI-237, 51 p. (Report prepared by Battelle Memorial Institute, Columbus, Ohio.)

An estimated mineralogical composition and results of chemical analyses of samples of North Dakota lignite are presented. Methods of recovery of uranium from lignite are discussed.

Fallgatter, W. S. *See* Burr, Alexander C., Fallgatter, W. S., and MacMillan, W. W., 1950.

Featherstonhaugh, G. W., 1836, Report of a geological reconnoissance made in 1835, from the seat of government, by the way of Green Bay and the Wisconsin Territory, to the Coteau de Prairie, an elevated ridge dividing the Missouri from the St. Peter's River: U. S. Cong. Senate Doc. 333, 168 p., illus.

The area of the Red River Valley and eastern North Dakota from the Coteau de Prairie to Lake Winnipeg is described. The salt lakes, Pembina Hills, and Devils Lake are mentioned in particular.

Fein, M. L. *See* Fisher, C. H., Sprunk, G. C., Eisner, A., Fein, M. L., and Storch, H. H., 1940.

Felix, C. J. *See* Schopf, James M., Gray, F. J., and Felix, C. J., 1955.

Filaseta, Leonard, 1946, Ground water in the Fessenden area, Wells County, North Dakota: N. Dak. State Water Conserv. Comm. Ground Water Studies no. 1, 25 p., illus.

The geology of the area, including the Cretaceous bedrock and the glacial deposits, is discussed. The groundwater possibilities in the area are considered.

Fippin, Elmer O., and Burgess, J. L., 1906, Soil survey of the Cando area: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 56-83, illus. incl. soil map (scale 1:125,000).

A brief discussion of the surface geology and the glacial drainage changes in the area is included. The major portion of the report is a description of the soil types present in the area.

Fischer, E. C. *See* Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947.

Fish, Andrew R., and Kinard, John C., 1959, Madison group stratigraphy and nomenclature in the northern Williston Basin, *in* Am. Assoc. Petroleum Geologists Rocky Mtn. Sec., Geological Record, Feb. 1959: p. 117-129, illus. incl. geol. map (scale 1:1,125,000); reissued, 1959, *in* Billings Geol. Soc., Guidebook, 10th Ann. Field Conf., Sawtooth-Disturbed Belt Area, August 13-15, 1959: p. 50-58, illus. incl. geol. map (scale 1:1,125,000).

In addition to the discussion of the Mississippian stratigraphy, the report includes a brief discussion of the structure of the basin and a historical summary of nomenclature.

Fisher, C. H., Sprunk, G. C., Eisner, A., Fein, M. L., and Storch, H. H., 1940, Hydrogenation and petrography of lignites, sub-bituminous coals, and bituminous coals from North Dakota, Wyoming, Utah, and Montana: *Fuel in Science and Practice*, v. 19, p. 186-195.

A detailed description of the petrography and hydrogenation of some 30 coals, including lignite from North Dakota, is presented.

Fisher, Stanley P., Jr., 1951, Geology of Emmons County, North Dakota (Preliminary Maps): N. Dak. Geol. Survey Rept. Inv. no. 5, 3 p., illus. geol. and surface structure maps (scale 1:125,000).

The three pages of text contain a brief description of the two maps. A completed report was published as N. Dak. Geol. Survey Bull. 26. See Fisher, Stanley P., Jr., 1952a.

Fisher, Stanley P., Jr., 1952a, The geology of Emmons County, North Dakota: N. Dak. Geol. Survey Bull. 26, 47 p., illus. incl. geol. map (scale 1:125,000).

The description of the geology includes the discussion of the stratigraphy and paleontology of the Cretaceous, Tertiary, and Quaternary formations present. The illustrations include plates of some Pierre and Fox Hills fossils.

Fisher, Stanley P., Jr., 1952b, Geology of the Turtle Lake-Coleharbor Quadrangles: N. Dak. Geol. Survey Open-file Rept., 34 p., illus. incl. geol. maps (scale 1:62,500).

The physiography, groundwater resources, and geology are discussed. The geology includes Tertiary Fort Union deposits and Pleistocene glacial deposits. The quadrangles are located in McLean County.

Fisher, Stanley P., Jr., 1953, Geology of west central McKenzie County, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 11, 2 sheets, illus. incl. structure map (scale 1:125,000).

The descriptive text includes discussions of the topography, glacial deposits, Pleistocene drainage changes, Tertiary Golden Valley and Fort Union stratigraphy, the surface structure, and the scoria beds.

Fisher, Stanley P., Jr., 1954, Structural geology of the Skaar-Trotters area, McKenzie and Golden Valley Counties, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 15, 1 sheet, illus. incl. structure map (scale 1:125,000).

The surface rocks of the area are part of the Tongue River Formation. Special mention is made of the surficial structural geology and the scoria in the area.

Flood, A. L. *See* Harrison, Ray L., and Flood, A. L., 1956.

Foley, F. C., 1940, Careful exploration required in North Dakota oil search: *Oil and Gas Jour.*, v. 39, p. 14-15.

The geological formations and structural features in North Dakota are discussed. Well logs for four deep-test wells are included.

Folsom, Clarence B., Jr. *See also* Laird, Wilson M., and Folsom, Clarence B., Jr., 1956.

Folsom, Clarence B., Jr. *See also* Laird, Wilson M., Hansen, Miller, Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955.

Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955, What are prospects in Williston Basin's east side?: Oil and Gas Jour., v. 54, no. 32, p. 92-96, illus.; reprinted, 1955: N. Dak. Geol. Survey Rept. Inv. no. 20, 5 p., illus.

A summary of the geology, stratigraphy, and early production of the basin is presented. A preliminary stratigraphic chart is included.

Folsom, Clarence B., Jr., Carlson, Clarence G., and Anderson, Sidney B., 1959, Preliminary report of the Antelope-Madison and Antelope-Sanish Pools: N. Dak. Geol. Survey Rept. Inv. no. 32, 38 p., illus.

The stratigraphy, structure, oil accumulation, possibilities, history, and reservoir characteristics of the pools are discussed.

Folsom, Clarence B., Jr., Hansen, Miller, and Anderson, Sidney B., 1958, Preliminary report on the Newburg-Spearfish Charles and South Westhope-Spearfish Charles Pools: N. Dak. Geol. Survey Rept. Inv. no. 29, 25 p., illus.

The geology and engineering characteristics of the pools are discussed. A magnetic map of the area is included.

Fox, E. L. See Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947.

Fox, S. K., Jr., and Ross, R. J., Jr., 1940, Foraminiferal evidence for the Midway (Paleocene) age of the Cannonball marine beds in North Dakota (abs.): Geol. Soc. America Bull., v. 51, p. 1970.

On the basis of an analysis of 61 species of Foraminifera from the Cannonball, evidence for the Midway age of the formation is presented.

Fox, S. K., Jr., and Ross, R. J., Jr., 1942, Foraminiferal evidence for the Midway (Paleocene) age of the Cannonball formation in North Dakota: Jour. Paleontology, v. 16, p. 660-673, illus. incl. geol. map (scale approx. 1:250,000).

An analysis of 64 species of Foraminifera from Cannonball beds at five localities in North Dakota is reported. Paleobotanical and vertebrate paleontological evidence for the Midway age of the Cannonball beds is presented. The Cannonball Formation is correlated with Gulf Coast deposits of Midway age.

Francis, David R., 1956, Jurassic stratigraphy of the Williston Basin area: Saskatchewan Dept. Mineral Resources Rept., no. 18, 69 p., illus. incl. geol. maps (scale 1:2,500,000); summarized, 1956, in N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 179-185, illus.; condensed, 1957: Am. Assoc. Petroleum Geologists Bull., v. 41, no. 3, p. 267-298, illus.

This stratigraphic report is a study of the Jurassic rocks underlying parts of Saskatchewan, Manitoba, Montana, and North Dakota.

Freas, Donald H., 1959, Occurrence, mineralogy, and origin of the lower Golden Valley kaolinitic clay deposits near Dickinson, North Dakota: Madison, Wisc., Wisconsin Univ., Ph.D. Dissert. (unpub.); published, 1962: Geol. Soc. America Bull., v. 73, p. 1341-1364, illus. incl. geol. map (scale 1:125,000).

The paper includes the results of field and laboratory investigations of the lower Golden Valley Formation in parts of Stark, Dunn, Slope, and Hettinger Counties.

Friends of the Pleistocene, Midwestern Section, 1958, Guidebook 9th Annual Field Conference, East-Central North Dakota, May 17-18, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, 114 p., illus. incl. geol. map (scale 1:1,000,000).

The report contains a road log for the field trip and papers by several authors which are individually cited.

Froebel, Charles, 1870, Notes of some observations made in Dakota, during two Expeditions, under command of General Alfred Sully against the hostile Sioux, in the years 1864 and 1865: New York. Lyceum of Nat. History. Proc. v. 1, p. 64-73.

The first expedition followed the Missouri River from Fort Rice to Fort Union and Fort Berthold. The second took in the area of Devils Lake and the Mouse River. The configuration of both regions, the lignite beds, the greenish limestone in the Takaokutah [Killdeer] Mountains, sandstone, silicified wood, agates, clay-stones, a black basaltic lava bed between the Cannonball and Heart Rivers, and fragments of formations observed in the streams are described.

Fuller, J. G. C. M. *See* Cumming, Alastair D., Fuller, J. G. C. M., and Porter, J. W., 1959.

Fuller, J. G. C. M. *See* Porter, John W., and Fuller, J. G. C. M., 1958, 1959.

Gauger, A. W. *See also* Leonard, Arthur G., Gauger, A. W., Budge, W. E., and Dove, L. P., 1926.

Gauger, A. W., and Iverson, H. G., 1930, Microstructure of Dakota lignite: N. Dak., Univ., Quart. Jour., v. 20, no. 4, p. 267-293, illus.

The physical characteristics and the formation of lignite are discussed. The methods of preparing thin sections of lignite are presented. Photomicrographs of sections of North Dakota lignite are explained.

Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., 1930, Geology and natural resources of North Dakota: N. Dak., Univ. Departmental Bull., v. 14, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. 11), 64 p.

The bulletin contains articles by several authors which are cited individually.

Genik, G. J., 1954, A regional study of the Winnipeg formation: Alberta Soc. Petroleum Geologists News Bull., v. 2, no. 5, p. 1, 3-5, illus. incl. geol. maps (scale, approx. 1:12,500,000).

The study includes discussions of the lithology, textural and heavy mineral analysis, palaeontology, age, correlation, source, tectonic environment, and deposition of the Winnipeg "Formation." The area includes parts of Manitoba, Saskatchewan, Montana, and North Dakota.

Gibbs, H. J., 1948, Laboratory tests on foundation materials from the spillway and outlet works of Heart Butte Dam, Heart River Unit-Missouri Basin Project, North Dakota: U. S. Bur. Reclamation, Research and Geol. Div., Earth Materials Lab. Rept. EM-167, 27 p., illus.

The results of the laboratory tests are summarized and discussed.

Gidley, James W., 1917, Notice of a new Paleocene mammal, a possible relative of the Titanotheres: U. S. Nat. Mus., Proc., v. 52, p. 431-435, illus.

The specimen, consisting of a few associated fossil teeth and jaw fragments, was collected from Fort Union beds near old Fort Union (Buford), North Dakota. The specimen is described and a new genus, *Titanoides*, and a new species, *Titanoides primaevus*, are named.

Gill, James R. *See also* Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955.

Gill, James R. *See also* Denson, Norman M., and Gill, James R., 1956, 1958.

Gill, James R. *See also* Miller, Ralph L., and Gill, James R., 1954.

Gill, James R., 1954, Uranium in carbonaceous rocks, coal and lignite, northwestern South Dakota, southwestern North Dakota, and eastern Montana, *in* Geologic investigations of radioactive deposits—semiannual progress report—June 1 to November 30, 1954: U. S. Geol. Survey Rept. TEI-490, p. 149-155, illus. incl. geol. map (scale 1:63,360). (Report prepared for U. S. Atomic Energy Commission.)

This is a general report of the uranium content of some shales, sandstones, lignites, and freshwater limestones in southwestern North Dakota.

Gill, James R., 1955, Uranium in carbonaceous rocks, lignite investigations, northwestern South Dakota, southwestern North Dakota and eastern Montana, *in* Geologic investigations of radioactive deposits—Semiannual progress report—December 1, 1954 to May 31, 1955: U. S. Geol. Survey Rept. TEI-540, p. 153-158, illus. geol. sketch map (scale 1:1,250,000). (Report prepared for U. S. Atomic Energy Commission.)

The uranium-bearing lignite deposits are discussed and located on the map.

Gill, James R., and Denson, Norman M., 1955, Lignite investigations—regional synthesis, eastern Montana and North and South Dakota, *in* Geologic investigations of radioactive deposits—Semiannual progress report—June 1 to November 30, 1955: U. S. Geol. Survey Rept. TEI-590, p. 233-240, illus. incl. geol. map (scale 1:1,250,000). (Report prepared for U. S. Atomic Energy Commission.)

The pre-Oligocene erosion surface is mapped and its influence on the accumulation of the uranium ore is discussed. A semiquantitative spectographic analysis of ash from uranium-bearing lignite deposits is included. Structural features in the area are mentioned.

Gill, James R., and Denson, Norman M., 1956a, Regional synthesis, eastern Montana and North and South Dakota, *in* Geologic investigations of radioactive deposits, semiannual progress report for June 1 to November 30, 1956: U. S. Geol. Survey Rept. TEI-640, p. 207-208. (Report prepared for U. S. Atomic Energy Commission.)

The progress of field studies, mapping, and laboratory investigations is reported for the time period indicated.

Gill, James R., and Denson, Norman M., 1956b, Uranium in carbonaceous rocks, lignite investigations—regional synthesis—eastern Montana and North and South Dakota, *in* Geologic investigations of radioactive deposits, semiannual progress report for December 1, 1955 to May 31, 1956: U. S. Geol. Survey Rept. TEI-620, p. 235-244, illus. incl. geol. maps (scale 1:156,680). (Report prepared by U. S. Atomic Energy Commission.)

The late Tertiary structures in the Little Badlands, North Dakota, are discussed in relation to the occurrences of uranium deposits. Geochemical investigations were conducted on lignite and water samples from the area.

Gill, James R., and Denson, Norman M., 1957a, Regional synthesis—eastern Montana and the Dakotas, *in* Geologic investigations of radioactive deposits, semiannual progress report for December 1, 1956 to May 31, 1957: U. S. Geol. Survey Rept. TEI-690 (book 2), p. 419-425, illus. incl. structure map (scale approx. 1:2,000,000). (Report prepared for U. S. Atomic Energy Commission.)

The progress of the investigations of uranium-bearing lignite deposits is reported. The relation of the regional structure to the occurrence of the uranium deposits is discussed.

Gill, James R., and Denson, Norman M., 1957b, Regional synthesis—eastern Montana and the Dakotas, *in* Geologic investigations of radioactive deposits, semiannual progress report for June 1 to November 30, 1957: U. S. Geol. Survey Rept. TEI-700, p. 160-171, illus. incl. geol. map (scale approx. 1:4,000,000). (Report prepared for U. S. Atomic Energy Commission.)

The report includes discussions of the regional structural setting in relation to the uranium-bearing lignite deposits, paleo-landslides, and the geochemistry of the groundwater from tuffs and uranium occurrences.

Gilles, Verner A., 1951, Some inferred relations between Tertiary and Paleozoic folding in the Williston Basin, *in* Billings Geol. Soc., Guidebook, 2d Ann. Field Conf., Sept. 1951: p. 58-60.

The report is a review of the literature concerning the folding of the Fort Union and Lance coal beds.

Gilles, Verner A., 1952, Notes on the early investigations of the Glendive-Baker or Cedar Creek Anticline, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, Sept. 4-7, 1952: p. 17-30, illus.

The stratigraphy and structure of the anticline are included in this discussion of the early investigation and development of the feature. A table of bench marks on the Pierre Shale-Colgate contact is included.

Golder, Charles R. *See also* Benson, William E., and Golder, Charles R., 1950.

Golder, Charles R., and Smith, C. K., 1948, Geology of the Garrison Dam, North Dakota (abs.): Geol. Soc. America Bull., v. 59, p. 1325-1326.

Some of the geological engineering aspects of the project of constructing a dam using Fort Union sediments are mentioned.

Goodin, Maury, 1953, Williston Basin search moves east: Rocky Mountain Oil Reporter, v. 10, no. 3, p. 28-29.

The discovery of oil in the Turtle Mountain area of Bottineau County, North Dakota is discussed. A summary of the development of the east side of the basin is presented.

Gordon, Ellis D. *See* Dingman, Robert J., and Gordon, Ellis D., 1954.

Gott, Garland B. *See also* Howard, Arthur D., Gott, Garland B., and Lindvall, Robert M., 1946.

Gott, G. B., Wyant, D. G., and Beroni, E. P., 1952, Uranium in black shales, lignites, and limestones in the United States: U. S. Geol. Survey Circ. 220, p. 31-35.

The Paleocene and Eocene lignites in the Dakotas, Montana, and Wyoming are described as uranium-bearing deposits.

Gray, R. J. *See* Schopf, James M., Gray, R. J., and Felix, C. J., 1955.

Great Northern Railway Company, Mineral Research and Development Department, 1955a, Great Northern Railway Company lignite drilling program, Williston Basin, North Dakota and Montana: Great Northern Railway Co. Mineral Research and Devel. Dept. Rept., no. 1, 4 p. with app. A-U incl. sketch maps.

Two areas in Williams County, North Dakota are included in the study. Each area is described, stripping ratios for various beds are shown on the maps, cross sections through important locations are presented, and the tonnage is calculated.

Great Northern Railway Company, Mineral Research and Development Department, 1955b, Salt in the Williston Basin: Great Northern Railway Co., Mineral Research and Devel. Dept. Rept., no. 3, 16 p.; revised, 1959: Great Northern Railway Co., Mineral Research and Devel. Dept. Rept., no. 7, 6 p. with app. A-M incl. isopach maps and sections.

The report is a discussion of the occurrence and geology of the sodium chloride and potash bearing salt deposits along the Great Northern Railway in North Dakota and Manitoba.

Great Northern Railway Company, Mineral Research and Development Department, 1958a, Fuller's earth deposit, Pembina Mountains, North Dakota: Great Northern Railway Co. Mineral Research and Devel. Dept. Rept., no. 6, 18 p., illus.

A reconnaissance survey of the area was conducted to determine industrial possibilities of the Fuller's earth deposits.

Great Northern Railway Company, Mineral Research and Development Department, 1958b, Williston Basin clays, North Dakota and Montana: Great Northern Railway Co. Mineral Research and Devel. Dept. Rept., no. 5, 23 p., illus. incl. geol. sketch map.

The report is the result of a survey of the clay deposits in the Williston basin as a possible source of alumina. It includes the analyses of promising deposits.

Greenlee, Arthur L., 1942, The geology of the Turtle Mountains of North Dakota and Manitoba: Boulder, Colo., Univ. of Colorado, M. A. Thesis (unpub.), 49 p., illus.; abs., 1942: Colorado Univ. Studies Gen. ser. A, v. 27, no. 1, Colorado Univ. Bull., v. 42, no. 17, p. 31.

The report includes a discussion of the geologic formations between the Pierre Shale and the glacial drift. Two water bearing horizons, coal and manganese deposits, and the possible structures for the accumulation of oil are described. Well logs from the area are listed and interpreted.

Gries, John P., 1948, Exploration in the Dakota Basin: World Oil, v. 128, p. 121-122, 124, 126, illus.

The history of exploration is reviewed, specific areas of exploration are outlined, and unexplored possibilities are presented for the Williston basin in North and South Dakota.

Gries, John P., 1952a, History of exploration in Williston Basin, North Dakota, South Dakota, Montana, and Canada (abs.): Am. Assoc. Petroleum Geologists Bull., v. 36, no. 5, p. 964.

This is an abstract of a report that deals with the highlights in the development of exploration in the Williston basin area.

Gries, John P., 1952b, Stratigraphic possibilities of the Dakota side of the Williston Basin: Tulsa Geol. Soc. Digest v. 20, p. 56-64, illus.

The paper is a review of the surface geology, the structure, the Paleozoic stratigraphy, and the history of subsurface investigations in the Williston basin in North and South Dakota.

Gries, John P., 1952c, Williston Basin area defined: Oil, v. 11, no. 12, p. 38-39, illus.

The geological and geographical definitions of the Williston or Dakota basin are presented. The basin includes parts of North and South Dakota, Montana, Manitoba, and Saskatchewan.

Gries, John P., 1954, Cretaceous rocks of Williston Basin [North and South Dakota and Montana]: Am. Assoc. Petroleum Geologists Bull., v. 38, no. 4, p. 443-453, illus. incl. geol. map (scale, approx. 1:10,000,000).

The correlation of the Cretaceous sediments in the basin is reviewed and the known oil and gas showings are summarized. Possible areas for further investigation of the Cretaceous sandstones are indicated.

Grossman, Irving G., 1949a, Geology of the sodium sulphate deposits of North Dakota (abs.): N. Dak. Acad. Sci. Proc., v. 2, p. 22.

The possible origins of the sulphate radical in the sodium sulphate deposits in northwestern North Dakota are discussed. The deposits are described.

Grossman, Irving G., 1949b, The sodium sulphate deposits of western North Dakota. A progress report: N. Dak. Geol. Survey Rept. Inv. no. 1, 66 p., illus. incl. geol. maps (scale 1:48,000).

The various deposits are described including brine analyses and the geology and origin of the deposits in saline lakes in western North Dakota.

Grossman, Irving G., 1950, Geomorphology of the interior saline basins of western North Dakota (Summary): N. Dak. Acad. Sci. Proc., v. 3, p. 14-15.

Two hypotheses on the origin of the surficial salt deposits in western North Dakota are presented. Both are related to the geomorphology of the area.

Gruner, John W., and Smith, Deane K., Jr., 1955, Progress report no. 10 for period April 1 to October 1, 1955: U. S. Atomic Energy Comm. Tech. Inf. Service Rept. RME-3125, 19 p.

The report contains observations made in the field, an outline of hypothesis concerning concentration of uranium in sedimentary rocks, and the identification of the uranium minerals in Colorado, Wyoming, and western South and North Dakota.

Gruner, John W., Smith, Deane K., Jr., and Knox, James A., 1956, Annual report for April 1, 1955 to March 31, 1956, pt. 2: U. S. Atomic Energy Comm. Tech. Inf. Service Rept. RME-3137 (Pt. 2), 24 p.

The report contains the results of two studies: "Mineral determinations in uranium deposits and prospects in Wyoming, northwestern Colorado and western South and North Dakota," and "Minerals identified from properties in Wyoming, northern Colorado, North Dakota, and South Dakota." The second study contains lists of the minerals by county.

Grunseth, Arland C., 1955, Foraminifera of the Niobrara Formation of northeastern North Dakota: *Compass*, v. 32, no. 2, p. 120-132, illus.; reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 120-132, illus.

The report presents the results of a preliminary study of the foraminifera of the Niobrara Formation along the Pembina River in Cavalier County.

Hadley, Herbert D. *See also* Smith, George W., and Hadley, Herbert D., 1954.

Hadley, Herbert D., 1951, The well that opened a new petroleum province, *in* *Billings Geol. Soc., Guidebook*, 2d Ann. Field Conf., Sept. 7-9, 1951: p. 62-63, illus.

The geology of the Amerada Petroleum Corporation Iverson No. 1, the discovery well in the Williston basin, is discussed.

Hadley, Herbert D., Lewis, Paul J., and Larsen, Roger B., 1952, Catalog of formation names for Williston Basin and adjacent areas, *in* *Billings Geol. Soc., Guidebook*, 3d Ann. Field Conf., Black Hills-Williston Basin, Sept. 4-7, 1952: p. 132-143; revised (and Doroshenko, Jerry), 1953, *in* *Billings Geol. Soc., Guidebook*, 4th Ann. Field Conf., Little Rocky Mtns.-Montana, southwestern Saskatchewan, Sept. 10-12, 1953: p. 170-182; revised, 1954, *in* *Billings Geol. Soc., Guidebook*, 5th Ann. Field Conf., Pryor Mtns.-northern Bighorn Basin, Montana, Sept. 9-11, 1954: p. 140-158.

The distribution, type locality, original describer, gross lithology, and remarks are included for each name.

Hadley, Herbert D., and Smith, George W., 1952, Developments in Montana, North Dakota, and South Dakota in 1951: *Am. Assoc. Petroleum Geologists, Bull.*, v. 36, no. 6, p. 1014-1022, illus.

The drilling activity, production statistics, exploration activity, and historical background of the petroleum production in the area are summarized in the report.

Hadley, Herbert D., and Smith, George W., 1953, Developments in Montana, North Dakota, and South Dakota in 1952: *Am. Assoc. Petroleum Geologists, Bull.*, v. 37, no. 6, p. 1233-1240, illus.

The drilling activity, production statistics, exploration activity, and historical background of the petroleum production in the area are summarized. The first production in Bottineau County is reported.

Hague, Arnold, 1893a, From Jamestown to Livingston, *in* Emmons, S. F., *Geological guide book of the Rocky Mountain Excursion: Internat. Geol. Cong., 5th, Washington 1891, Comptes rendus*, p. 322-325.

The geologic itinerary along the Northern Pacific Railway route between Jamestown, North Dakota and Livingston, Montana is described.

Hague, Arnold, 1893b, The Great Plains of the North, *in* Emmons, S. F., Geological guide book of the Rocky Mountain Excursion: Internat. Geol. Cong., 5th, Washington 1891, Comptes rendus, p. 319-322.

A general sketch of the Great Plains from Jamestown, North Dakota to the base of the Rocky Mountains along the route of the Northern Pacific Railway is presented.

Hainer, John L., 1956, The geology of North Dakota: N. Dak. Geol. Survey Bull. 31, 46 p., illus. incl. geol. map (scale 1:2,500,000).

The report includes sections on the local physiographic forms and their history, the subsurface geology, the stratigraphic column, the geologic history, and the mineral resources of the state.

Hall, Charles M., 1902, Official state map and preliminary geologic and economic map of North Dakota: Fargo, N. Dak., Agricultural College Survey of North Dakota, colored map (scale 1:1,000,000).

The western part of the state and the Turtle Mountains are mapped as "Laramie" clays and shales, the eastern part is mapped as glacial drift over Cretaceous or "Montana" formation and Lake Agassiz deposits. The Dakota Artesian Basin is outlined.

Hall, Charles M., 1904a, A brief history of Glacial Lake Agassiz: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 27-30.

The paper discusses the topography and geologic history of glacial Lake Agassiz.

Hall, Charles M., 1904b, The rivers and drainage of southeastern North Dakota: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 30-35, illus.

The Red River of the North, the Sheyenne, Wild Rice, Buffalo, and Maple Rivers are the major rivers in the area. The glaciers and the formation of Lake Agassiz influenced the drainage development of these rivers.

Hall, Charles M., and Willard, D. E., 1905, Description of the Casselton and Fargo quadrangles N. Dak.-Minn.: U. S. Geol. Survey Geol. Atlas, Folio 117, 7 p. illus. incl. geol. maps (scale 1:125,000).

The folio includes a description of the geography, general geology, economic geology, and water supply of the quadrangles. The maps include topographic, areal geology, and artesian water maps. Well logs and records are also included.

Hall, Gary O., 1958, The stratigraphy and geologic history of the Cannonball Formation (Paleocene): Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 64 p., illus. incl. geol. maps (scale 1:126,720 and 1:1,000,000).

In addition to the detailed discussion of the stratigraphy of the Cannonball Formation; the structure, paleontology, environment of deposition, and historical geology are discussed. A detailed geologic map of the formation in Oliver, McLean, Burleigh, and Emmons Counties is included. The appendix includes descriptions of the measured sections.

Hammond, Charles R. *See* Sandberg, Charles A., and Hammond, Charles R., 1958.

Hampton, David G. *See* Splies, Robert G., and Hampton, David G., 1959.

Hancock, Eugene T., 1921, The New Salem Lignite Field, Morton County, North Dakota: U. S. Geol. Survey Bull. 726-A, 39 p., illus. incl. geol. map (scale 1:126,720).

The Tertiary Fort Union and Lance "Formations" are described. The physical and chemical properties of the lignite beds are discussed. The lignite beds in each township are described in detail.

Hansen, Alan R., 1959, Stratigraphic analysis of the Mississippian Mission Canyon formation, Williston Basin: Salt Lake City, Utah, Univ., Ph.D. Dissert. (unpub.), 95 p.; abstract published: Dissert. Abs., v. 20, no. 3, p. 992.

The sedimentary history of the Williston basin is reviewed. The results of isopach and lithofacies studies of Mississippian strata are discussed.

Hansen, Dan E. *See also* Anderson, Sidney B., and Hansen, Dan E., 1957.

Hansen, Dan E., 1955a, A preliminary correlation of Lower Cretaceous sediments in North Dakota: *Compass*, v. 32, no. 2, p. 109-119, illus.; reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 109-119, illus.

Subsurface lithologic study, stratigraphic position, electric logs, and gamma ray logs are used to correlate the Lower Cretaceous Lakota, Fuson, Fall River, Skull Creek, Newcastle-Mowry, Belle Fourche, and Greenhorn Formations.

Hansen, Dan E., 1955b, Subsurface correlations of the Cretaceous Greenhorn-Lakota interval in North Dakota: *N. Dak. Geol. Survey Bull.* 29, 46 p., illus. incl. geol. map (scale approx. 1:3,168,000).

The stratigraphy and sedimentation of each formation included in the interval are discussed.

Hansen, Dan E., 1955c, Subsurface correlations of the Cretaceous Greenhorn-Lakota interval in North Dakota—a study in facies: *Grand Forks, N. D., North Dakota, Univ., M.S. Thesis* (unpub.), 86 p., illus. incl. geol. map (scale 1:2,500,000).

The thesis is published as *North Dakota Geological Survey Bulletin* 29. (See Hansen, Dan E., 1955b). The thesis text includes, in addition, tables of the well log data used.

Hansen, Dan E., 1957, Structure map on top of Fuson: *N. Dak. Geol. Survey Misc. Map* no. 4, scale 1:1,000,000.

The Fuson, a sand and shale unit in the Dakota Group, is used as the datum plane for the subsurface structure map.

Hansen, Dan E., 1958, The Jurassic-Cretaceous boundary in North Dakota, *in* *North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium*, Regina, Saskatchewan, April 23-25, 1958: p. 47-54, illus.

The subsurface stratigraphic section is studied resulting in a new interpretation of the Jurassic-Cretaceous boundary. The illustrations include isopach, paleogeological, paleolithologic, and structure maps.

Hansen, Dan E., 1959, North Dakota has rapid Mesozoic facies changes: *World Oil*, v. 149, no. 7, p. 93-97, illus.; reprinted, 1959: *N. Dak. Geol. Survey Rept. Inv.* no. 34, illus.

The article is a modified and condensed version of a paper presented at the *Second Williston Basin Symposium*. (See Hansen, Dan E., 1958.)

Hansen, Miller *See also* Folsom, Clarence B., Jr., Hansen, Miller, and Anderson, Sidney B., 1958.

Hansen, Miller *See also* Laird, Wilson M., and Hansen, Miller, 1957.

Hansen, Miller *See also* Laird, Wilson M., Hansen, Miller, Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955.

Hansen, Miller, 1952a, Preliminary geologic map of North Dakota: *N. Dak. Geol. Survey Misc. Map* no. 1, scale 1:1,000,000.

The surface geology of the state is illustrated on the map. An index map and the bibliographic sources used in compiling the map are included on the map.

Hansen, Miller, 1952b, Preliminary report of recent work on Oligocene White River deposits of North Dakota (abs.): *N. Dak. Acad. Sci. Proc.* v. 6, p. 53-54.

The area of the study includes Colgrove Butte and Bull Butte in Hettinger County, Lefor Buttes in Stark County and some fossils from Black Butte in Hettinger County.

Hansen, Miller, 1953a, Geologic report on limestone deposits in Stark County and Hettinger County, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 8, 57 p., illus. incl. geol. maps (scales 1:4,800, 1:14,400, and 1:20,000); reprinted, 1958.

The White River limestone deposits from seven buttes in southwestern North Dakota were mapped, sampled, described, and analyzed in search of deposits for the manufacture of cement.

Hansen, Miller, 1953b, Geomagnetic survey [of portions of] Benson and Ramsey Counties North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 9, 1 sheet, map scale 1:126,720.

The geomagnetic map of the area is presented and the results of the survey are discussed.

Hansen, Miller, 1954, Structural interpretations in southwestern North Dakota, *in* N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954: p. 16-17.

The known surface structures and structural trends are presented by a review of certain geologic mapping projects.

Hansen, Miller, 1956a, Geologic map of North Dakota: N. Dak. Geol. Survey Misc. Map no. 2, scale 1:1,000,000.

Ten pre-glacial formations are illustrated on the map. The major glacial features are shown on a separate map.

Hansen, Miller, 1956b, Geomagnetic survey of the Tioga area, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 21, 1 sheet, map scale 1:63,360.

The results of the survey are presented on the geomagnetic map of parts of Williams, Mountrail, and Burke Counties. A brief discussion of field procedure and the results is included.

Hansen, Miller, 1957, Structure map on Pre-Cambrian [N. Dak.]: N. Dak. Geol. Survey Misc. Map no. 5, scale 1:1,000,000.

A contour interval of 1,000 feet is used on the map.

Hansen, Miller, 1958, A summary of the Pleistocene and recent history of the Devils Lake area, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 80-84.

This summary includes discussions of the last glaciation in the area, the origin and early history of Devils Lake, recorded history of levels of the lake and the proposed reclamation project for the area.

Hansen, Miller, 1959, Clays of North Dakota as a potential source of alumina: N. Dak. Geol. Survey Rept. Inv. no. 33, 15 p., illus. geol. map (scale 1:1,000,000).

The clay deposits were studied to determine if a deposit rich in alumina existed. The geology of the deposits is presented and the results of the study are discussed. A section on the chemical analysis of clay for alumina content is included. A list of sample locations and analyses is also included. The geologic map is of the western portion of the state.

Hanson, Bernold M., 1955, Geology of the Elkhorn Ranch area, Billings and Golden Valley Counties, North Dakota: N. Dak. Geol. Survey Rept. Inv. no 18, 1 sheet, illus. incl. geol. map (scale 1:126,720).

The surface structure is mapped and discussed. The stratigraphy of the area consists of the Tongue River Formation, the Sentinel Butte "Member," and some Miocene (?) surface gravels and boulders. The stratigraphy is discussed and some problems of correlation are mentioned.

Haraldson, Harald C., 1952, *Mammuthus Primigenius?* a Proboscidean find in North Dakota: N. Dak. Acad. Sci. Proc. 1952, v. 6, p. 58-59.

This is a preliminary report of some mammoth remains found in McKenzie County.

Haraldson, Harald C., 1953a, Geomagnetic survey of part of the east edge of Williston Basin: N. Dak. Geol. Survey Rept. Inv. no. 10, 1 sheet, illus. geomagnetic map (scale 1:126,720); text only, revised, 1953: N. Dak. Acad. Sci. Proc. 1953, v. 7, p. 48-53.

The area surveyed includes parts of Pierce, Benson, Wells, and Sheridan Counties. The surface, subsurface and basement geology, and the geologic interpretation of the survey are discussed.

Haraldson, Harald C., 1953b, A geomagnetic survey of parts of Pierce, Benson, Sheridan and Wells Counties: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 58 p., illus.

The lithology and relief of the basement rocks of the area were studied by using the cuttings and cores of the rocks and by mapping their polarization with a vertical magnetometer. A basement surface contour map was constructed.

Hard, Herbert A. *See also* Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914.

Hard, Herbert A. *See also* Meinzer, Oscar E., and Hard, Herbert A., 1925.

Hard, Herbert A., 1910, Notes on the water supply of Morton, Burleigh and Kidder Counties, N. D.: N. Dak. Agr. Coll. Survey 5th Bienn. Rept., p. 18-33, illus.

The wells and surface water supply were studied for irrigation possibilities. The records of typical wells in each county are presented.

Hard, Herbert A., 1912a, Object of a soil and geological survey: N. Dak. Agr. Coll. Survey 6th Bienn. Rept. [1911-1912], p. 8-16.

The benefits derived by the farmer and business man from soil and geologic surveys are discussed. The laws of North Dakota governing such surveys are cited.

Hard, Herbert A., 1912b, A system of eskers and kames in eastern Barnes County, North Dakota: N. Dak. Agr. Coll. Survey 6th Bienn. Rept. [1911-1912], p. 39-43, illus. incl. geol. sketch map (scale 1:126,720).

The eskers and kames are mapped and described. Their origin and economic value are discussed.

Hard, Herbert A., 1923, Artesian wells of North Dakota: N. Dak. Flood Control Comm. 2d Bienn. Rept., 75 p., illus.

The results of an investigation to determine the cause of decline and loss in the artesian wells of the state are reported. The artesian wells in Dickey and LaMoure Counties are described and the report of natural gas in artesian wells of LaMoure, Stutsman, and Dickey Counties is discussed.

Hard, Herbert A., 1929, Geology and water resources of the Edgeley and LaMoure Quadrangles of North Dakota: U. S. Geol. Survey Bull. 801, 90 p., illus. incl. geol. maps (scale 1:125,000).

The area of the report includes most of Dickey County, two-thirds of LaMoure County, and small portions of Ransom and Sargent Counties. The surficial Cretaceous and Quaternary geology is mapped and discussed. The water resources, artesian conditions, and natural gas possibilities are also discussed. Artesian well records are included.

Hares, C. J. *See also* Lloyd, E. R., and Hares, C. J., 1915.

Hares, C. J., 1928, Geology and lignite resources of the Marmarth Field, southwestern North Dakota: U. S. Geol. Survey Bull. 775, 110 p., illus. incl. geol. map (scale 1:126,720).

The area includes parts of Slope, Bowman, Golden Valley, and Billings Counties. The geography, stratigraphy, structure, and economic geology of the area are discussed. The lignite beds are described in detail by townships.

Harrington, L. C., 1937, Mineral resources report to Governor and 25th Legislative Assembly State of North Dakota, January 4, 1937: N. Dak. State Planning Board, Mineral Resources Comm. Rept., mineo., 37 p., illus.

The mineral resources in the report include lignite, clay, sodium sulfate or Glauber's salt, building stone, sand and gravel, natural gas and oil, and gold. The report indicates that Benson County is the most likely site of oil in the state. The gold was discovered in crops of turkeys raised near Denbigh, North Dakota.

Harris, Edward, 1846, On the geology of the Upper Missouri: Philadelphia, Acad. Nat. Sci., Proc. v. 2, p. 234-238.

This report, in the form of a letter to a committee of the Academy, contains observations of the strata along the Missouri River from its mouth to the mouth of the Yellowstone. Mention is made of burning coal seams, red pumice and its possible origin, and the "concretations" at the mouth of the Cannonball River. (For the committee's report on the red pumice see Rogers, Henry D., Morton, S. G., and Johnson, Walter R., 1846.)

Harris, Steven H. *See also* Pohly, Richard A., and Harris, Steven H., 1954.

Harris, Steven H., 1952, Williston Basin oil development during the last year: Mines Mag., v. 42, no. 11, p. 163-168, 181, illus.

The development of 72 new wells and five separate pools in North Dakota during the 1951-1952 season is discussed. A table summarizes the pertinent data from significant exploratory tests in North Dakota. A bibliography of articles on Williston basin problems is included.

Harris, Steven H., 1953a, North Dakota: New oil state: Petroleum Eng., v. 25, no. 7, p. B7-B14, illus.

The subsurface stratigraphy, producing areas, and outlook of the Williston basin in North Dakota are discussed.

Harris, Steven H., 1953b, Production in Williston Basin: Petroleum Eng., v. 25, no. 6, B92-97, illus.

The 36 separate oil fields in the basin are described as to discovery well, location, discovery date, producing horizon, average depth to producing horizon, number of wells, gravity of oil, and accumulated production.

Harris, Steven H., 1958, Rocky Ridge pool, Billings County, North Dakota, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 40-46, illus.

The development, production, stratigraphy, interpretative sedimentology, and petrography are discussed for this field which produces from a lower Pennsylvanian sandstone lens.

Harris, Steven H., and Mallin, James W., 1956, Devonian of the Williston Basin (abs.), *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st. Internat., Bismarck, N. Dak., Oct. 1956: p. 130.

The sedimentary history of the Devonian in the Williston basin is discussed. Oil production possibilities are mentioned.

Harris, Steven H., and Mallin, James W., 1957, Devonian of the United States portion of the Williston Basin: Williston Basin Oil Review, v. 6, no. 5, p. 15-19, illus.

The Devonian stratigraphy is discussed and illustrated by isopachous maps and electric logs.

Harrison, Ray L., Jr., 1954, The story of Williston Basin: Oil and Gas Jour., v. 52, no. 50, p. 187-195, illus.

The history of the development of the Williston basin is presented. The article includes an extensive bibliography.

Harrison, Ray L., Jr., and Flood, A. L., 1956, Mississippian correlations in the International Boundary areas, *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 36-51, illus.; reprinted, 1957, Mississippian correlations in the Williston Basin: Canadian Oil and Gas Industries, v. 10, no. 7, p. 79-88, illus.

The paper includes discussions of the nomenclature, stratigraphy, and correlation of the Mississippian section from central North Dakota to southeastern Saskatchewan.

Harrison, Ray L., Jr., and Larson, T. C., 1958, Oil production from the "Spearfish" and Charles in the Newburg field Bottineau County, North Dakota, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 27-32, illus.

The stratigraphy, structure, reservoir characteristics, and production are discussed for the Jurassic-Triassic "Spearfish" and Mississippian Charles on the east flank of the Williston basin.

Haseltine, Robert M., 1901, Lignite deposits or fields of brown coal in North Dakota--their extent, thickness and fuel value: *Mines and Minerals*, v. 21, p. 545-547.

The report contains a discussion of the origin of lignite, a description of the deposits, an analysis of the lignite, and a discussion of its value as a fuel.

Hatcher, John B., 1902, Origin of the Oligocene and Miocene deposits of the Great Plains: *Am. Philos. Soc., Proc.*, v. 41, no. 169, p. 113-131.

The origin of the White River series is considered to be lacustrine, fluvial, flood-plain, and eolian. Sedimentary and paleontological evidence is presented to support this theory. The stratigraphy of the White River Formation is discussed.

Hayden, F. V. *See also* Meek, Fielding B., and Hayden, F. V., 1856a,b,c, 1857, 1861, 1862.

Hayden, F. V., 1857, Notes explanatory of a map and section illustrating the geological structure of the country bordering on the Missouri River, from the mouth of the Platte River to Fort Benton, in lat. 47°30'N., long. 110°30'W.: Philadelphia, Acad. Nat. Sci., *Proc.*, v. 9, p. 109-116, illus. geol. map.

The rocks represented on the map and in the section are placed in four systems: the Carboniferous, Cretaceous, Tertiary, and Quaternary.

Hayden, F. V., 1862, On the geology and natural history of the upper Missouri; with a map: *Am. Philos. Soc., Trans.*, n. s., v. 12, pt. 1, p. 1-218, illus. incl. geol. map (scale 1:3,750,000).

The report contains discussions of the historical explorations, areal geology, the rock units, fossils, zoology, and botany of the country drained by the Missouri River and its tributaries.

Henderson, Edward P., and Perry, Stuart H., 1942, The Freda, N. Dak., Meteorite: a nickel-rich ataxite: *U. S. Nat. Mus., Proc.*, v. 92, no. 3134, p. 21-23, illus.

The meteorite is described. Results of the chemical analysis and the metallurgical study are presented.

Hendricks, Thomas A., and Laird, Wilson M., 1943, Manganese deposits of the Turtle Mountains, North Dakota: *Econ. Geol.*, v. 38, no. 7, p. 591-602; reprinted, 1943: *N. Dak. Geol. Survey Bull.* 15, 11 p., illus.

The geology, location, mode of origin, and analyses of the ore deposits are discussed.

Hennen, Ray V., 1943, Tertiary geology and oil and gas prospects in Dakota Basin of North Dakota: *Am. Assoc. Petroleum Geologists Bull.*, v. 27, no. 12, p. 1567-1594, illus.

The Tertiary stratigraphy is discussed and a west-east cross-section of Tertiary strata is presented. The structure of the Dakota (Williston) basin is illustrated on a map and discussed. The history of the oil and gas development is discussed and two well logs are presented.

Hennen, Ray V., 1948, Correlation of Sentinel Butte Shale in western North Dakota: *Am. Assoc. Petroleum Geologists Bull.*, v. 32, no. 9, p. 1823-1824.

This article is a reply to, and discussion of, an article by the same title by Roland W. Brown, 1948.

Herald, F. A. *See also* Bauer, Clyde M., and Herald, F. A., 1921.

Herald, Frank A., 1913, The Williston Lignite Field, Williams County, North Dakota: *U. S. Geol. Survey Bull.* 531, p. 91-157, illus. incl. geol. map (scale 1:125,000).

The general geology and geography of the area are described followed by a discussion of the physical and chemical properties of lignite. The lignite deposits are discussed in detail by townships.

Hibbard, H. V. *See also* Willard, Daniel E., and Hibbard, H. V., 1906a,b,c.

Hibbard, H. V., 1904, The water supply of the Tower Quadrangle: *N. Dak. Agr. Coll. Survey 2d Bienn. Rept.*, p. 152-167.

The surface water and groundwater resources of the quadrangle are discussed. The report includes a table of well records of the quadrangle.

Hibbard, H. V., 1906, A description of the plateau region of North Dakota: *N. Dak. Agr. Coll. Survey 3d Bienn. Rept.*, p. 133-142, illus.

This is a descriptive discussion of the Missouri Plateau and related features such as the major streams, Sentinel Butte, and the Badlands.

Hilton, G. S. *See* Truesdell, P. E., and Hilton, G. S., 1947.

Holland, Frank D., Jr., 1957a, Guidebook for geologic field trip in the Bismarck-Mandan area, North Dakota—geology month in scouting, October, 1957: *N. Dak. Geol. Survey Misc. Ser. no. 4*, 19 p., illus. incl. state geol. map (scale 1:2,500,000).

The field trip is designed to show as many different geologic phenomena as possible within driving distance of Bismarck-Mandan. The report contains a road log and description of the geologic features of the area.

Holland, Frank D., Jr., 1957b, Guidebook for geologic field trip in the Dickinson area, North Dakota—geology month in scouting, October, 1957: *N. Dak. Geol. Survey Misc. Ser. no. 5*, 18 p., illus. incl. geol. map (scale 1:125,000).

The field trip is designed to show as many different geologic phenomena as possible in the Dickinson area. The trip includes the Little Badlands. The report contains a road log and description of the geologic features along the trip route.

Holland, Frank D., Jr., 1957c, Guidebook for geologic field trip, Fargo to Valley City—geology month in scouting, October, 1957: *N. Dak. Geol. Survey Misc. Ser. no. 8*, 4 p.

The route of the field trip follows U. S. Highway 10. The report contains a road log and description of the geologic features of the area.

Holland, Frank D., Jr., 1957d, Guidebook for geologic field trip, Grand Forks to Park River—geology month in scouting, October, 1957: *N. Dak. Geol. Survey Misc. Ser. no. 9*, 7 p.

The report contains a road log and description of the geologic features in the area. The route begins in the Lake Agassiz basin, travels west to the beach ridges, and then north along the beach ridges.

Holland, Frank D., Jr., 1957e, Guidebook for geologic field trip in the Jamestown area, North Dakota—geology month in scouting, October, 1957: *N. Dak. Geol. Survey Misc. Ser. no. 7*, 16 p., illus. incl. state geol. map (scale 1:2,500,000).

The field trip is designed to show as many different geologic phenomena as possible in the Jamestown area. Emphasis is placed on features associated with the Altamont moraine. The report contains a road log and discussion of the features along the trip route.

Holland, Frank D., Jr., 1957f, Guidebook for geologic field trip in the Williston area, North Dakota—geology month in scouting, October, 1957: N. Dak. Geol. Survey Misc. Ser. no. 6, 21 p., illus. incl. state geol. map (scale 1:2,500,000).

The field trip includes the oil fields and geomorphological history of the Williston-Watford City area. A road log and a description of the features along the trip route are included.

Holland, Frank D., Jr., and Cvancara, Alan M., 1955, Crabs from the Cannonball Formation (Paleocene) of North Dakota (abs.): Geol. Soc. America Bull., v. 66, no. 12, p. 1574.

The preservation of the crabs is described. The associated fauna of the Cannonball Formation is listed.

Holland, Frank D., Jr., and Cvancara, Alan M., 1958, Crabs from the Cannonball Formation (Paleocene) of North Dakota: Jour. Paleontology, v. 32, no. 3, p. 495-505, illus.; reprinted, 1958: N. Dak. Geol. Survey Misc. Ser. no. 11, 11 p., illus.; correction, 1959: Jour. Paleontology, v. 33, no. 1, p. 194.

The article is based on a study of more than 50 specimens collected in southern Morton and Burleigh Counties. The new genus *Camarocarcinus* is described with the new species *C. arnesoni* as the type species. Another new species, *Ranina* (?) *burleighensis* is also described.

Holland, Frank D., Jr., and Waldren, Charles H., 1955, Conodonts in the Winnipeg Formation (Ordovician) of North Dakota (abs.): Geol. Soc. America Bull., v. 66, no. 12, p. 1574.

Thirteen species (one new) in six genera were identified from the basal sandstone unit of the Winnipeg "Formation." The conodont fauna is evidence for an age of Blackriverian or Chazyan for the basal sandstone unit.

Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914, Soil survey of Barnes County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets—Field Operations of the Bur. Soils, 1912, 47 p., illus. soil map (scale 1:63,360).

Each type of soil present in the county is mapped and described as to its physical characteristics and its agricultural value.

Holtz, W. G., 1946, Laboratory test on earth materials from the proposed foundation and borrow areas, Heart Butte Dam, Heart Butte Project, North Dakota: U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Lab. Rept. EM-88, 52 p., illus.

Mechanical analyses, permeability-consolidation tests, and pore pressure-consolidation tests were conducted on the foundation materials. Compaction test, percolation tests, consolidation tests, and triaxial shear tests were conducted on the borrow materials. The results are summarized and discussed.

Hopper, T. H., and Walster, H. L., 1924, The chemical composition of the soils of Cass County, pt. 2 of Soil survey of Cass County, North Dakota: U. S. Dept. Agr., Bur. Chemistry and Soils, Series 1924, no. 29, 80 p., illus. incl. soil maps (scale 1:63,360).

The chemical composition of each soil type is tabulated. Discussion and comparisons of some types are included.

Horberg, Leland, 1949, Intersecting minor ridges on the Lake Agassiz plain, North Dakota (abs.): Geol. Soc. America Bull., v. 60, p. 1970.

It is proposed that the ridges represent frozen-ground structures developed during the retreat of the ice. The ridges are well developed in eastern Pembina County.

Horberg, Leland, 1951, Intersecting minor ridges and periglacial features in the Lake Agassiz Basin, North Dakota: Jour. Geology, v. 59, no. 1, p. 1-18, illus.

The ridges and other related features are described and illustrated. The possible origin of the ridges is discussed.

Howard, Arthur D., 1946, Caliche in glacial chronology (abs.): Geol. Soc. America Bull., v. 57, no. 12, p. 1204.

Studies in northwestern North Dakota and northeastern Montana were conducted to determine the value of the thickness of caliche on pebbles in determining the age of glacial drift.

Howard, Arthur D., 1947a, Evaluation of caliche-coated pebbles in glacial chronology (abs.): Geol. Soc. America Bull., v. 58, no. 12, p. 1194-1195.

The study reported by A. D. Howard (1946) was continued. The results remained negative.

Howard, Arthur D., 1947b, Glacial drifts of northeastern Montana and northwestern North Dakota (abs.): Geol. Soc. America Bull., v. 58, no. 12, p. 1195.

Four glacial drifts were tentatively identified in the study area.

Howard, Arthur D., 1950, Till isopleth map of northeastern Montana and northwestern North Dakota (abs.): Geol. Soc. America Bull., v. 61, no. 12, p. 1525.

The limestone-dolomite pebble content of the surface tills of the area are represented on an isopleth map. The study is discussed. No map is presented with the abstract.

Howard, Arthur D., 1956, Till-pebble isopleth maps of parts of Montana and North Dakota: Geol. Soc. America Bull., v. 67, no. 9, p. 1199-1206, illus.

The maps show the areal distribution of pebbles of different rock types in till. The part of North Dakota included in the study is the Williston area.

Howard, Arthur D., 1958, Drainage evolution in northeastern Montana and northwestern North Dakota: Geol. Soc. America Bull., v. 69, no. 5, p. 575-588, illus.

It is suggested that the Missouri, Yellowstone, and Little Missouri rivers were diverted in Kansan time and the Little Missouri again in Wisconsin time.

Howard, Arthur D., Gott, Garland B., and Lindvall, Robert M., 1946, Late Wisconsin terminal moraine in northwestern North Dakota (abs.): Geol. Soc. America Bull., v. 57, no. 12, p. 1204-1205.

The Altamont moraine and its relation to the Fort Union beds is discussed.

Howells, W. C., Irwin, J. S., and Ballard, Norval, 1943, Regional geology of Dakota Basin (discussion): Am. Assoc. Petroleum Geologists Bull., v. 27, no. 1, p. 90-91.

Two brief discussions of the article by the same title by Norval Ballard (1942) are presented with a reply by Ballard. Attention is focused on the northwestward extension of the Williston basin.

Huddle, J. W. *See* Andrews, David A., and Huddle, J. W., 1948.

Huff, L. C. *See* Larrabee, D. M., Huff, L. C., and Ahlman, C., 1946.

Huntington, Oliver W., 1890, A new meteoric iron from Stutsman County, North Dakota: Am. Acad. Arts and Sci., Proc., v. 25, p. 229-232, illus.

A piece of meteoritic iron found southeast of Jamestown in 1885 is described. A preliminary analysis of the specimen is given.

Hurst, L. A. *See* Kocher, A. E., and Hurst, L. A., 1906.

Hutton, F. Z. *See also* Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917.

Hutton, F. Z., and Nichols, Earl, 1920, Soil survey of Traill County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets-Field Operations of the Bur. Soils, 1918, 47 p., illus. incl. soil map (scale 1:63,360).

Each type of soil present in the county is mapped and described as to its physical characteristics and its agricultural value.

Ince, J. W. *See* Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Donegue, R. C., and Ince, J. W., 1916.

Ingalls, P. C., 1952a, Limits of Williston Basin: *Oil and Gas Jour.*, v. 51, no. 7, p. 135, illus.
A standardized outline of the boundary of the Williston basin is proposed.

Ingalls, P. C., 1952b, Williston Basin—today's most exciting oil province: *Oil and Gas Jour.*, v. 51, no. 10, p. 92-96, 118, illus.

The geologic features of the basin are described and the significant developments in the basin through June 1952 are presented.

Ingalls, P. C., 1952c, Williston—one year old: *Oil and Gas Jour.*, v. 50, no. 48, p. 75-76, illus.
The history of the first year of production and development in the Williston basin is presented.

Ingalls, P. C., 1953, Williston Basin's oil fields: *Oil and Gas Jour.*, v. 51, no. 38, p. 423.
A report on the exploration and development of the oil fields in the basin is presented.

Irwin, J. S. *See* Howells, W. C., Irwin, J. S., and Ballard, Norval, 1943.

Iverson, H. G. *See* Gauger, A. W., and Iverson, H. G., 1930.

Jaffer, M. M. *See* Burr, Alexander C., and Jaffer, M. M., 1951.

Jefferson, Thomas, 1806, Message from the President of the United States, communicating discoveries made in exploring the Missouri, Red river, and Washita, by Captains Lewis and Clark, Doctor Sibley, and Mr. Dunbar; with a statistical account of the countries adjacent. February 19, 1806: Washington, D. C., A. and G. Way, printers (by order of the Senate), 171 p.

This report includes a letter from Captain Lewis written from Fort Mandan in which he mentions sending the President 67 specimens of earths, salts, and minerals.

Jenke, Arthur L. *See* Townsend, Roland C., and Jenke, Arthur L., 1951.

Jenkinson, Lewis F., 1950, Geology of the Drake Quadrangle North Dakota: Iowa City, Iowa, State University of Iowa, M.S. Thesis (unpub.), 88 p., illus. incl. geol. map (scale 1:62,500).

Drake Quadrangle is located in McHenry and Sheridan Counties. The geology of the area is discussed and mapped. The glacial features of the area consist of marginal morainic areas, outwash, ground moraine, eskers, kames, and crevasse fillings. The groundwater conditions are discussed.

Jensen, Charles A., and Neill, N. P., 1904, Soil survey of the Grand Forks, area, North Dakota: *N. Dak. Agr. Coll. Survey 2d Bienn. Rept.*, p. 35-58, illus. incl. soil map (scale 1:62,500).

In addition to the discussion of the soils in the area, a discussion of the surficial and bedrock geology of the area is included.

Jensen, Fred S. *See* Lemke, Richard W., Jensen, Fred S., and Smith, James H., 1951.

Johnson, M. M., 1951, Oil in the Williston Basin: *Independent Petroleum Assoc. America Monthly*, v. 22, no. 6, p. 40, 42, 44, 45, illus.

The stratigraphy of the basin is discussed. The history of drilling and production in the basin is summarized. A stratigraphic column and a list of important wells in the basin are included in the report.

Johnson, Walter, 1956, Mississippian oil fields of northeastern Williston Basin (abs.): Oil and Gas Jour., v. 54, no. 53, p. 139; reprinted, 1956, in N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 52.

The role of anhydrite in forming seals for the reservoirs is discussed.

Johnson, Walter R. See Rogers, Henry D., Morton, S. G., and Johnson, Walter R., 1846.

Johnson, William D., Jr., and Kunkel, Robert P., 1954, Geologic map of the Square Buttes district, Oliver and Mercer Counties, North Dakota: U. S. Geol. Survey Oil and Gas Inv. Map OM-148, scale 1:62,500.

The Tertiary and Quaternary surface geology is illustrated on the map. Structure contours, drawn on the base of the Hagel coal bed (Fort Union "Formation"), are superimposed on the geology.

Johnson, William D., Jr., and Kunkel, Robert P., 1959, The Square Buttes coal field, Oliver and Mercer Counties, North Dakota: U. S. Geol. Survey Bull. 1076, 91 p., illus. incl. geol. map (scale 1:48,000).

The geology, geography, structure, reserves, and economic value of the coal beds are discussed. The Pleistocene geology of the area is summarized. The coal beds are described by township units.

Johnston, W. A., 1916, The genesis of Lake Agassiz: A confirmation: Jour. Geology, v. 24, no. 7, p. 625-638, illus.

Upham's conception of the life-history of Lake Agassiz is discussed in light of the record of Lake Agassiz found in the Rainy River-Lake of the Woods area. The question of differential uplift is also discussed.

Johnston, W. A., 1946, Glacial Lake Agassiz, with special reference to the mode of deformation of the beaches: Canada, Dept. Mines and Resources, Mines and Geology Br., Geol. Survey Bull. no. 7, 20 p., illus.

The elevations of the beaches, the outlets and ice borders of the lake, the theory of deformation of the beaches, and the correlation of Lake Agassiz with the Great Lakes are discussed. The beaches are described.

Jones, C. T., 1940, Contribution to stratigraphy of northern Great Plains area: Kansas Geol. Soc. Guidebook, 14th Ann. Field Conf., p. 129-139, illus.

The California Company's Kamp no. 1 well on the Nesson anticline, Williams County, North Dakota is one of the four wells discussed and correlated with the nearest outcrop in the Black Hills. Discussions by O. A. Seager and R. A. Carmody are included.

Jones, S. L. See Dennis, Philip E., Akin, P. D., and Jones, S. L., 1949, 1950.

Kaye, Clifford A. See Lemke, Richard W., and Kaye, Clifford A., 1953, 1958.

Kemler, Emory N., and Lacabanne, W. D., 1954, The Williston Basin: Spring Park, Minn., Summary Reports, 272 p.

The book is a compilation of information on many aspects involving the past and influencing the future development of the basin.

Kennedy, Gene O. See Middleton, Herman F., and Kennedy, Gene O., 1956.

Kepferle, Roy C. See also Moore, George W., Melin, R. E., and Kepferle, R. C., 1956, 1959.

Kepferle, Roy C., and Culbertson, William C., 1955, Strippable lignite deposits, Slope and Bowman Counties, North Dakota: U. S. Geol. Survey Bull. 1015-E, p. 123-182, illus.

The geography, stratigraphy, and structural geology of the area are discussed. Detailed descriptions of the principle lignite deposits are given and the feasibility of the application of strip mining methods to the deposits is discussed.

Keyes, Charles R., 1922a, Biotic significance of Cannonball fauna: *Pan-Am. Geol.*, v. 37, p. 73-74.

The problems of using fossils in determining the age of the Cannonball Formation are discussed.

Keyes, Charles R., 1922b, Stratigraphy of Black Hills Tertiaries: *Pan-Am. Geol.*, v. 37, no. 1, p. 63-64, illus.

The stratigraphy and sedimentary history of the "Lance Formation" in North Dakota are discussed.

Kinard, John C. *See* Fish, Andrew R., and Kinard, John C., 1959.

King, Philip B., 1924, Notes on the physiography of southwestern North Dakota (abs.): *Iowa Acad. Sci., Proc.*, v. 31, p. 333.

The terraces of the Cannonball River and the present drainage of the Missouri and Little Missouri Rivers are mentioned.

Kline, Virginia H., 1942, Stratigraphy of North Dakota: *Am. Assoc. Petroleum Geologists Bull.*, v. 26, p. 336-379, illus. incl. geol. map.

The entire stratigraphic column is discussed. The Cretaceous and Tertiary formations are described in more detail. Well logs, which show a typical section of the various formations, are included.

Klipfel, Clarence *See* Laird, Wilson M., Ness, Marjorie, and Klipfel, Clarence, 1952.

Knobel, E. W., Peightal, M. F., and Chapman, J. E., 1924, Soil survey of Cass County, North Dakota, *with* Hopper, T. H., and Walster, H. L., pt. 2, The chemical composition of the soils of Cass County: U. S. Dept. Agr., Bur. Chemistry and Soils, Series 1924, no. 29, 80 p., illus. incl. soil maps (scale 1:63,360).

Each type of soil present in the county is shown on the map, described physically, and discussed as to its agricultural value. Part 2 of the report contains a tabulation of the chemical composition of each soil type and discussions and comparisons of different soil types.

Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925, Soil survey of McHenry County, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets-Field Operations of the Bur. of Soils, 1921, p. 929-973, illus. incl. soil map (scale 1:63,360).

Each type of soil present in the county is mapped, described physically, and discussed as to agricultural value.

Knowlton, F. H., 1909, Stratigraphic relations and paleontology of the "Hell Creek Beds," "Ceratops Beds" and equivalents, and their reference to the Fort Union Formation: *Washington Acad. Sci., Proc.*, v. 11, no. 3, p. 179-238.

The Fort Union "Formation" is divided into two members, the lower member is considered equivalent to the "Hell Creek Beds," "Ceratops Beds" and others. The distribution and paleontology of this member are discussed. Its stratigraphic relations to adjacent beds are also discussed.

Knowlton, F. H., 1911, Further data on the stratigraphic position of the Lance Formation ("Ceratops Beds"): *Jour. Geology*, v. 19, p. 358-376, illus.; condensed, 1911: *Washington Acad. Sci., Jour.*, v. 1, p. 294-296.

Evidence is presented that the "Lance Formation" is part of the Fort Union "Formation" and is Eocene in age.

Knowlton, F. H., 1916, The flora of the Fox Hills sandstone: U. S. Geol. Survey Prof. Paper 98-H, p. 85-93, illus.

The specimens illustrated and described in the report are from Colorado, however many also occur in North Dakota.

Knowlton, F. H., 1921, Are the Lance and Fort Union formations of Mesozoic time?: *Science*, n. s., v. 53, no. 1370, p. 307-308.

The floral evidence for the age of the formations is presented in this discussion of the review of T. W. Stanton's (1921) paper by Charles Schuchert (1921).

Knowlton, F. H., 1922a, Floral continuity in Lance and Union sections: *Pan-Am. Geol.*, v. 37, p. 67-68.

The problem of establishing the divisional line between the Mesozoic and Cenozoic formations is discussed with mention of the flora of the Lance and the Fort Union "Formations."

Knowlton, F. H., 1922b, The Laramie flora of the Denver basin with a review of the Laramie problem: *U. S. Geol. Survey Prof. Paper* 130, 175 p., illus.

The Fort Union and Lance "Formations" in North Dakota are discussed in connection with the historical review of the Laramie problem.

Knox, James A. *See* Gruner, John W., Smith, Deane K., Jr., and Knox, James A., 1956.

Kocher, A. E. *See also* Caine, Thomas A., and Kocher, A. E., 1904.

Kocher, A. E., and Hurst, L. A., 1906, Soil survey of the Carrington area, North Dakota: *N. Dak. Agr. Coll. Survey 3d Bienn. Rept.*, p. 84-108, illus. incl. soil map (scale 1:125,000).

Twelve types of soil are mapped and described. Two systems of moraines extending north and south across the area are described. The James and Sheyenne River valleys are discussed. The glacial drift and the underlying Cretaceous shale are described.

Kocher, A. E., and Stevens, R. P., 1908, Soil survey of the McKenzie area, North Dakota: *U. S. Dept. Agr., Bur. Soils, Advance Sheets—Field Operations of the Bur. Soils* 1907, 25 p., illus. incl. soil map (scale 1:63,360); reprinted, 1910: *N. Dak. Agr. Coll. Survey 4th Bienn. Rept.*, p. 58-80, illus. incl. soil map (scale 1:125,000).

The survey covers 10 townships in the southwestern corner of McKenzie County. The soil types are mapped and described. A mechanical analysis of each soil type is included.

Kohanowski, Nicholas N., 1951, Geomagnetic survey of Rolette and Towner Counties, North Dakota: *N. Dak. Geol. Survey Rept. Inv. no. 6*, 4 p., illus.; reprinted, 1952: *Oil and Gas Jour.*, v. 50, p. 126-128, illus.

The methods of investigation, the description of the area, the surface geology, and the results of the survey are discussed. The illustrations include a magnetic map and geomagnetic cross sections.

Kohanowski, Nicholas N., 1956, Salt measures in the Tioga area, North Dakota: *N. Dak. Acad. Sci. Proc.* 1956, v. 10, p. 44-49, illus.

The occurrence of the salt, the petrology of the salt units, and the origin of the salt at Tioga are discussed.

Kohanowski, Nicholas N., 1957a, On origin of leonardite: *N. Dak. Acad. Sci. Proc.* 1957, v. 11, p. 60-64.

Three types of leonardite are described. A table showing the average chemical analyses of leonardites, lignite, and bituminous coal is presented.

Kohanowski, Nicholas N., 1957b, Salt measures in the Williston Basin, North Dakota: *Mines Mag.*, v. 47, no. 10, p. 74-77, illus.

The salt deposits of the state are outlined and described. The order of formation of the salt is discussed and compared for the different strata. The association of the salt and oil is discussed.

Kornfeld, Joseph A., 1941, Geology and economic significance of the northern Great Plains Basin: *World Petroleum*, v. 12, no. 3, p. 36-49, 60, 62, illus. incl. geol. map.

The basin includes the Williston basin of North Dakota. The history of the producing area is summarized. The production, leasing, geophysics, structure, stratigraphy, and prospects are discussed.

Kornfeld, Joseph A., 1952, Big drilling campaign in prospect: *Oil and Gas Jour.*, v. 51, no. 10, p. 98-107, illus.

The current drilling activity in the Williston basin is reported. A sample drilling log for the Williston basin is included.

Kornfeld, Joseph A., 1954, Seismic problems in Williston Basin: *Oil and Gas Jour.*, v. 52, no. 50, p. 196-200, illus.

The problems of thick Tertiary cover, badlands, and Quaternary glacial mantle are discussed. The results of seismic studies in the area are presented.

Kresl, Ronald J. *See also* Schmitz, Emmett R., and Kresl, Ronald J., 1955.

Kresl, Ronald J., 1955, Geology of the Eldridge quadrangle, North Dakota: *Compass*, v. 32, no. 2, p. 85-91, illus. incl. geol. map (scale 1:125,000); reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 85-91, illus. incl. geol. map (scale 1:125,000).

The geology of the area consists of a few exposures of Pierre Shale and a large amount of glacial drift.

Kresl, Ronald J., 1956, Geology of the lower Pipestem Creek area, North Dakota: *N. Dak. Geol. Survey Rept. Inv. no. 25*, 1 sheet, illus. incl. geol. map (scale 1:63,360).

The area is in east-central Stutsman County. The discussion includes the glacial features, glacial drainage, structural geology, paleontology, economic geology, groundwater, and geologic history.

Krumbein, W. C., and Nagel, F. G., 1953, Regional stratigraphic analysis of "Upper Cretaceous" rocks of Rocky Mountain region: *Am. Assoc. Petroleum Geologists Bull.* v. 37, no. 5, p. 940-960, illus.

Isopach-lithofacies maps and vertical variability maps of the "Upper Cretaceous" rocks are presented and discussed. Western North Dakota is included in the study area.

Kunkel, Robert P. *See also* Johnson, William D., Jr., and Kunkel, Robert P., 1954, 1959.

Kunkel, Robert P., 1954, Structure contour map of the base of Mississippian rocks in the Williston Basin and adjoining areas of Montana, North Dakota, South Dakota, and Wyoming: *U. S. Geol. Survey Oil and Gas Inv. Map OM-165*, scale 1:1,000,000.

Lacabanne, W. D. *See* Kemler, Emory N., and Lacabanne, W. D., 1954.

Laird, Wilson M. *See also* Benson, William E., and Laird, Wilson M., 1947.

Laird, Wilson M. *See also* Hendricks, Thomas A., and Laird, Wilson M., 1943.

Laird, Wilson M. *See also* Mitchell, Robert H., and Laird, Wilson M., 1943.

Laird, Wilson M. *See also* Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942.

Laird, Wilson M., 1941, Selected deep well records: *N. Dak. Geol. Survey Bull.* 12, 31 p.

Records of wells in Adams, Foster, Kidder, Logan, Pembina, Ramsey, Renville, Walsh, Ward, and Williams Counties are compiled to present information concerning the stratigraphy of the beds below the Dakota "Sandstone."

Laird, Wilson M., 1943, The geology of the Turtle River State Park: *N. Dak. Hist. Quart.*, v. 10, no. 4, p. 245-251, illus. incl. geol. map (scale 1:6,600); reprinted, 1943, 1959: *N. Dak. Geol. Survey Bull.* 16, 20 p., illus. incl. geol. map (scale 1:6,600).

The park is located in Grand Forks County. The area is underlain by glacial deposits associated with the Campbell and McCauleyville beaches of glacial Lake Agassiz. The deposits have been eroded by the Turtle River.

Laird, Wilson M., 1944a, The geology and ground water resources of the Emerado Quadrangle: *N. Dak. Geol. Survey Bull.* 17, 35 p., illus. incl. geol. map (scale 1:62,500).

The quadrangle located in east-central Grand Forks County, is on the Lake Agassiz plain. The report contains discussions of the geography, pre-glacial geology, glacial geology, and groundwater resources of the area.

Laird, Wilson M., 1944b, Stratigraphy and structure of North Dakota: Natl. Oil Scouts and Landmen's Assoc. Yearbook, v. 14, p. 420-430, illus.; reprinted, 1944: N. Dak. Geol. Survey Bull. 18, 12 p., illus.

The general stratigraphy and structure of the state is reviewed. Maps and charts are presented showing the subsurface structure and location of important tests. The status of leasing activity is discussed.

Laird, Wilson M., 1946, The subsurface stratigraphy of the Nesson Anticline: N. Dak. Geol. Survey Bull. 21, pt. 2, p. 11-25; reprinted, 1951.

The core record of the California Company Nels Kamp No. 1 well in Williams County is presented. An interpretation of the stratigraphy of the well is discussed.

Laird, Wilson M., 1948a, Ground water in the Zeeland area, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 12, 38 p., illus. incl. geol. map (scale 1:62,500).

The study area is in the southwestern corner of McIntosh County. The glacial deposits and the underlying Pierre Shale are described. The groundwater conditions are discussed and the results of the pumping tests, the quality of the water, and logs of the test holes are presented.

Laird, Wilson M., 1948b, Oil in North Dakota: N. Dak. Engineer, v. 24, no. 1, p. 6-7, 18-20.

The history of oil prospecting in the state is reviewed. The geology of the state as related to the accumulation of oil and the possibilities of oil deposits are discussed.

Laird, Wilson M., 1949a, Stratigraphy of North Dakota with reference to oil possibilities: N. Dak. Geol. Survey Rept. Inv. no. 2, 2 sheets, illus. incl. geol. maps (scale 1:3,750,000); revised, Laird, Wilson M., and Towse, D. F., 1953.

The report includes maps showing the extent of the geologic systems, Cambrian through Tertiary, present in the state. The stratigraphy is reviewed and data on significant tests for oil and gas in the state are presented.

Laird, Wilson M., 1949b, Water supply study at Cavalier, North Dakota (abs.): N. Dak. Acad. Sci. Proc., v. 2, p. 54.

The study area is located in central Pembina County. The area is underlain by deposits associated with Lake Agassiz. The water was found associated with a sand body probably associated with the Pembina delta.

Laird, Wilson M., 1950, The geology of the South Unit, Theodore Roosevelt National Memorial Park: N. Dak. History, v. 17, no. 4, p. 225-240, illus.; reprinted, 1950: N. Dak. Geol. Survey Bull. 25, 18 p., illus.

A general description of the geology of the area and the unusual geologic features of the park is given. A road log pointing out features of geologic interest along the main road in the park is included.

Laird, Wilson M., 1951a, Developments of oil and gas in North Dakota: Mines Mag., v. 41, no. 10, p. 101-110, illus.

The conditions as to source beds, reservoir rocks, and traps in North Dakota are outlined. The stratigraphy is reviewed.

Laird, Wilson M., 1951b, Discovery heightens interest in North Dakota geology—Pt. 1: World Oil, v. 132, no. 7, p. 73-75, 84, illus.; Pt. 2, v. 133, no. 1, p. 83-85; reprinted, [pt. 1, 2], 1951: N. Dak. Geol. Survey Rept. Inv. no. 3, 7 p., illus.

The impact of the Clarence Iverson 1 well as the first commercial oil discovery well is discussed. The general structure and stratigraphy of the state is reviewed.

Laird, Wilson M., 1951c, Geology of North Dakota in relation to oil (abs.): N. Dak. Acad. Sci. Proc. v. 5, p. 43-44.

The geology of the Williston basin is reviewed. The best possibilities for oil production are discussed.

- Laird, Wilson M., 1951d, Geology of the Pembina Hills: N. Dak. Outdoors, v. 13, no. 12, p. 12-13, illus. geol. map (scale 1:1,250,000); reprinted, 1951: N. Dak. Geol. Survey Rept. Inv. no. 4, 2 p., illus. geol. map (scale 1:1,250,000).

The geological history and physiographic geology of the area in Pembina and Cavalier Counties is discussed.

- Laird, Wilson M., 1952, Geology of the Williston Basin in North Dakota--[Pt. 1]: World Petroleum, v. 23, no. 1, p. 42-44, 47-48, 61, illus.; [Pt. 2]: World Petroleum, v. 23, no. 2, p. 46-50, illus.; revised, 1952: Oil in Canada, v. 4, no. 20, p. 18-30, illus.; reprinted 1952, in Petroleum Information, An introduction to the Williston Basin, p. 16-32, illus.; reprinted 1953: Interstate Oil Compact Quart. Bull., v. 12, no. 2, p. 71-79, illus.; reprinted 1953: Oil in Canada, v. 6, no. 4, p. 18-26, illus.

The structure of the Williston basin, the potential source rocks, and the stratigraphy of the basin are discussed. A series of isopach maps of systems present in the basin is included.

- Laird, Wilson M., 1953, The geology of the Williston Basin: Williston Basin Oil Review, v. 2, no. 8, p. 26-35, illus.

The history of the discovery of oil in the basin is reviewed. The structural geology and stratigraphy of the basin are discussed.

- Laird, Wilson M., 1955a, The history of the Geology Department at the University of North Dakota: Compass, v. 32, no. 2, p. 153-156; reprinted, 1955: N. Dak. Geol. Survey Bull. 28, p. 153-156.

The development of the department from its beginning as part of the Chemistry Department in 1895 is traced up until 1955. The growth of the State Survey is also discussed.

- Laird, Wilson M., 1955b, Oil and North Dakota: N. Dak. Acad. Sci. Proc. v. 9, p. 46-51.

The history of oil development and its impact on the state is discussed.

- Laird, Wilson M., 1956a, Geology of the North Unit, Theodore Roosevelt National Memorial Park: N. Dak. History, v. 23, no. 2, p. 53-77; reprinted, 1956: N. Dak. Geol. Survey Bull. 32, 27 p., illus.

A brief historical sketch of the region is included with the discussion of the geology and geomorphology of the park. Particular attention is given to the geologic processes important in the formation of the land forms in the park. A road log through the park is included.

- Laird, Wilson M., 1956b, Guide for geologic field trip in northeastern North Dakota: N. Dak. History, v. 23, no. 1, p. 27-44; reprinted, 1956: N. Dak. Geol. Survey Bull. 30, 20 p., illus. incl. geol. map (scale 1:1,750,000).

The bedrock geology, geologic history, glacial geology, geomorphology, and economic geology of the area are discussed. The road log for the trip starts at Grafton in Walsh County, passes through Pembina County, and ends in eastern Cavalier County.

- Laird, Wilson M., 1956c, The Williston Basin--a backward look with a view to the future, in N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 14-22, illus.

The basin is defined and the production figures are compiled and interpreted. The reserves are presented. The exploration methods used were surveyed and the results discussed in terms of future exploration.

- Laird, Wilson M., 1957a, Guidebook for geologic field trip in the Devils Lake area, North Dakota--geology month of scouting, October, 1957: N. Dak. Geol. Survey Misc. Ser. no. 3, 17 p., illus. incl. state geol. map (scale 1:2,500,000).

The geological processes important in the formation of the landscape in the area, the preglacial geology, and the glacial geology of the area are discussed. The field trip route covers an area south of Devils Lake in parts of Benson and Eddy Counties.

Laird, Wilson M., 1957b, Guidebook for geologic field trip in the Minot area, North Dakota—geology month in scouting, October, 1957: N. Dak. Geol. Survey Misc. Ser. no. 2, 18 p., illus. incl. state geol. map (scale 1:2,500,000).

The geological processes important in the formation of the landscape in the area and the preglacial and glacial geology of the area are discussed. The trip route covers an area south and east of Minot.

Laird, Wilson M., and Folsom, Clarence B., Jr., 1956, North Dakota's Nesson Anticline—[Pt. 1], [Geologic and production problems]: World Oil, v. 142, no. 4, p. 89-92, 94; [Pt. 2], Madison problems are unusual: World Oil, v. 142, no. 7, p. 136-152; Pt. 1, 2, reprinted, 1956: N. Dak. Geol. Survey Rept. Inv. no. 22, 12 p., illus.

The geologic and production characteristics of the area are discussed. A detailed description of operating problems, particularly the Madison problems in the Beaver Lodge and Tioga-Madison pools, is presented.

Laird, Wilson M., and Hansen, Miller, 1957, Guidebook for geologic field trip in the Valley City area, North Dakota—geology month in scouting, October, 1957: N. Dak. Geol. Survey Misc. Ser. no. 1, 15 p., illus. incl. geol. sketch map (scale 1:188,360).

The geological processes important in the formation of the landscape in the area, and the preglacial and glacial geology of the area are discussed. The field trip route covers an area north and east of Valley City.

Laird, Wilson M., Hansen, Miller, Folsom, Clarence B., Jr., and Anderson, Sidney B., 1955, The Beaver Lodge and Tioga fields, Mountrail and Williams Counties, North Dakota, *in* Am. Assoc. Petroleum Geologists Rocky Mtn. Sec., 1955 Geological Record: p. 37-54, illus.

The history of exploration of the Nesson anticline leading to the discoveries of the two fields is reviewed. The regional geology, the stratigraphy of the two fields, and the reservoir characteristics of the "Mission Canyon Formation" are discussed.

Laird, Wilson M., and Mitchell, Robert H., 1942, The geology of the southern part of Morton County, North Dakota: N. Dak. Geol. Survey Bull. 14, 42 p., illus. incl. geol. map (scale 1:125,000).

The Cretaceous and Tertiary stratigraphy, including 12 detailed sections, is discussed. The report also includes discussions of the structure, physiography, and economic geology of the area.

Laird, Wilson M., Ness, Marjorie, and Klipfel, Clarence, 1952, Additional well logs for North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 7, 137 p.

A collection of logs, mostly from water wells, is published.

Laird, Wilson M., and Towse, D. F., 1953, Stratigraphy of North Dakota with reference to oil possibilities: N. Dak. Geol. Survey Rept. Inv. no. 2, 2 sheets, illus. incl. geol. maps (scale 1:3,750,000), revised.

See Laird, Wilson M., 1949a.

Lane, A. C., 1915, On certain resemblances between the earth and a butternut: The Scientific Monthly, Nov. 1915, p. 132-139, illus.

The article contains some comparisons of the earth's structure and that of the butternut.

Langford, R. H. *See* Robinove, Charles J., Langford, R. H., and Brookhart, J. W., 1958.

Lanum, W. J. *See* Wenger, W. J., and Lanum, W. J., 1954.

Larrabee, D. M. *See also* Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947.

Larrabee, D. M., Clabaugh, S. E., and Dow, D. H., 1945a, Mineral resources of the Missouri Valley region, Part 4, Construction materials: U. S. Geol. Survey Missouri Basin Studies no. 1, pt. 4, geol. map, scale 1:2,500,000.

Structure contours and the deposits of construction materials are indicated on the geologic map. Sand, gravel, limestone, quartzite, bentonite, pottery clay, brick and tile clay, and fire and refractory clay are the materials located in North Dakota.

Larrabee, D. M., Clabaugh, S. E., and Dow, D. H., 1945b, Mineral resources of the Missouri Valley region, Part 2, Nonmetallic mineral resources: U. S. Geol. Survey Missouri Basin Studies no. 1, pt. 2, geol. map, scale 1:2,500,000.

Structure contours and nonmetallic mineral resources are shown on a geologic base map. Sodium sulfate, sodium carbonate, and Fullers earth are the resources indicated in North Dakota.

Larrabee, D. M., Huff, L. C., and Ahlman, C., 1946, Preliminary map showing sand and gravel deposits of North Dakota: U. S. Geol. Survey Missouri Basin Studies no. 3, scale 1:500,000.

The map shows the tested deposits of sand or gravel as well as possible sources. The deposits include stream terraces, glacial lake beaches, outwash plains, old channels and spillways, eskers, kames, and lenses in moraines.

Larsen, Roger B. *See* Hadley, Herbert D., Lewis, Paul J., and Larsen, Roger B., 1952.

Larsen, R. M. *See* Dobbin, C. E., and Larsen, R. M., 1934.

Larson, T. C. *See* Harrison, Ray, and Larson, T. C., 1958.

Lavine, Irvin, 1928, Developing the lignite fuel of North Dakota: N. Dak. Univ., Quart. Jour., v. 19, p. 185-189.

The composition, characteristics, distribution, and estimated reserves of lignite are discussed. The history and future of the lignite industry in North Dakota is discussed.

Lavine, Irvin, Feinstein, H., and Skene, E., 1935, Glauber salt in North Dakota: Chem. Met. Eng., v. 42, no. 12, p. 681-682, illus.

The deposits are in lake bottoms in northwestern North Dakota. The deposits are described and the analyses of samples are presented. The methods of study and sampling are discussed.

Lee, Jean L. *See* Smith, George W., Summers, George E., Jr., Wallington, Dale, and Lee, Jean L., 1958.

Leiberg, John B., 1889a, Notes on the flora of western Dakota and eastern Montana adjacent to the Northern Pacific Railroad: Minn. Acad. Nat. Sci. Bull, v. 3, no. 1, p. 63-69.

The paper is primarily a listing of modern flora species found in the area. A brief mention of the fossil flora is made but no species are identified.

Leiberg, John B., 1889b, Some notes upon the more recent fossil flora of North Dakota and an inquiry into the causes that have led to the development of the treeless areas of the northwest: Minn. Acad. Nat. Sci., Bull. v. 3, no. 1, p. 145-151.

The large amount of silicified wood, lignite, and fossil leaf imprints is an indication that western North Dakota has not always been so barren.

Leighton, Morris M., 1958, Some reflections on certain aspects of the problems of the Des Moines Lobe and Lake Agassiz, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 58-61, illus.

The problem of relating the Des Moines lobe and the Lake Michigan lobe is informally presented. Caution is advised in the use of air photographs and radiocarbon dates in the mapping of glacial geology.

Lemke, Richard W. *See also* Brown, Roland W., and Lemke, R. W., 1948.

Lemke, Richard W. *See also* Colton, Roger B., and Lemke, R. W., 1955.

Lemke, Richard W., 1950, Preliminary report on the geology of the Velva quadrangle North Dakota: U. S. Geol. Survey open-file report, 18 p., illus. incl. geol. map (scale 1:48,000).

The report includes discussions of bedrock formations, surficial deposits, glacial history, and economic geology of the area. (See Lemke, Richard W., 1953.)

Lemke, Richard W., 1952, Preliminary geologic map showing boundaries of glacial Lake Souris, North Dakota: U. S. Geol. Survey open-file report, map (scale 1:312,500).

Lemke, Richard W., 1953, Geology of the Velva Quadrangle, North Dakota: U. S. Geol. Survey Geol. Quad. Map GQ-31 (scale 1:62,500), with text.

The Cannonball Formation and Fort Union "Formation," the structural geology, the glacial deposits, and the geologic history of the area are discussed.

Lemke, Richard W., 1954, Revised interpretation for the origin of linear glacial ridges in north-central North Dakota (abs.): Geol. Soc. America Bull., v. 65, no. 12, p. 1380.

The ridges, formerly interpreted to be crevasse fillings, are now interpreted as a special type of drumlinoidal feature.

Lemke, Richard W., 1956, Engineering-geology problems involving Pleistocene deposits in the northern Great Plains (abs.): Geol. Soc. America Bull., v. 67, no. 12, p. 1716.

The report is a discussion of examples of problems caused by Pleistocene deposits. The ground moraine in northwestern North Dakota is classed as unsuitable for irrigation.

Lemke, Richard W., 1958a, Glacial history of the Souris River lobe, North Dakota, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 85-92, illus.

The glacial history of the Souris River lobe and Glacial Lake Souris is discussed. The Souris River lobe is compared to the Leeds lobe to the east.

Lemke, Richard W., 1958b, Narrow linear drumlins near Velva, North Dakota: Am. Jour. Sci., v. 256, no. 4, p. 270-283, illus. incl. geol. sketch map (scale 1:375,000).

The geologic setting of the area is discussed. The morphological characteristics and composition of the ridges are given. The interpretation of the ridges as drumlins is presented and the origin of the drumlins in the Velva area is discussed.

Lemke, Richard W., and Colton, Roger B., 1958, Summary of the Pleistocene geology of North Dakota, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 41-57, illus.

The literature on the preglacial drainage, the pre-Wisconsinan deposits, and the Wisconsinan Age in North Dakota is summarized.

Lemke, Richard W., Jensen, Fred S., and Smith, James H., 1951, Linear crevasse fillings, outwash channels, and other similarly oriented glacial features in north-central North Dakota (abs.): Geol. Soc. America Bull., v. 62, no. 12, p. 1460.

Linear glacial features, Wisconsinan in age, in north-central North Dakota all trend southeast. An hypothesis for this is presented.

Lemke, Richard W., and Kaye, Clifford A., 1953, Geology of the Bowbells Quadrangle, North Dakota: U. S. Geol. Survey Geol. Quad. Map GQ-26 (scale 1:62,500) with text.

The physiography, geologic history, and lignite deposits are discussed. The various geologic units illustrated on the map are described. The Fort Union "Formation" is the only bedrock unit exposed.

Lemke, Richard W., and Kaye, Clifford A., 1958, Two tills in the Donnybrook area, North Dakota, *in* Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota: N. Dak. Geol. Survey Misc. Ser. no. 10, p. 93-98, illus.

The stratigraphic relations, compositions, and ages of two tills believed to belong to two different substages of the Wisconsin Stage are discussed.

Leonard, Arthur G. *See also* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., 1930.

Leonard, Arthur G., 1904a, The geological formations of North Dakota: N. Dak. Geol. Survey 3rd Bienn. Rept., p. 140-177, illus.

The formations discussed represent the Paleozoic Era, Cretaceous Period, Tertiary Period, and Pleistocene Period. The report includes some measured sections.

Leonard, Arthur G., 1904b, Topographic features of North Dakota: N. Dak. Geol. Survey 3rd Bienn. Rept., p. 127-139, illus.

North Dakota is separated into three plains rising one above another, the Red River Valley, the Coteau du Missouri, and the level between. The features on each plain are described and discussed.

Leonard, Arthur G., 1905, The purpose and value of a geological survey: Univ. Bull. (N. Dak.), v. 2, no. 2, p. 7-11, illus.

The benefits of a state geological survey are discussed and the history of the North Dakota Geological Survey is reviewed.

Leonard, Arthur G., 1906a, The North Dakota-Montana lignite area: U. S. Geol. Survey Bull. 285, p. 316-330.

The area includes most of the western half of North Dakota. The report includes a discussion of the stratigraphy, an analysis of the lignite beds, and a discussion of the occurrence of the lignite beds.

Leonard, Arthur G., 1906b, Stratigraphy of North Dakota clays: N. Dak. Geol. Survey 4th Bienn. Rept., p. 63-94, illus. incl. geol. map (scale 1:2,250,000).

All the geological formations of the state are described. The clay deposits of economic value found in each formation are discussed. A state geological map accompanies the report.

Leonard, Arthur G., 1908a, The geological history of North Dakota: N. Dak. Geol. Survey 5th Bienn. Rept., p. 227-243.

The geological history of North Dakota is presented in a popular account for use in schools.

Leonard, Arthur G., 1908b, The geology of southwestern North Dakota with special reference to the coal: N. Dak. Geol. Survey 5th Bienn. Rept., p. 27-114, illus. incl. geol. map (scale 1:312,500).

The drainage, topography, stratigraphy, structure, and coal deposits of Billings and Bowman counties are described.

Leonard, Arthur G., 1911a, The Cretaceous and Tertiary formations of western North Dakota and eastern Montana: Jour. Geology, v. 19, p. 507-547, illus.

The formations described are the Pierre Shale, Fox Hills Formation, "Lance Formation," Fort Union "Formation," and White River Formation.

Leonard, Arthur G., 1911b, Natural gas in North Dakota: U. S. Geol. Survey Bull. 431, p. 7-10, illus.

The natural gas wells in Bottineau, Williams, and LaMoure Counties are described. The report includes well records and the results of an analysis of the gas.

Leonard, Arthur G., 1912a, Description of the Bismarck Quadrangle: U. S. Geol. Survey, Geol. Atlas, Folio 181, 8 p., illus. incl. geol. map (scale 1:125,000).

The topography, stratigraphy, geologic history, economic geology, and water resources of the quadrangle are discussed.

Leonard, Arthur G., 1912b, The geology of south-central North Dakota: N. Dak. Geol. Survey 6th Bienn. Rept., p. 21-99, illus. incl. geol. map (scale 1:750,000).

The physiography, stratigraphy, structure, geologic history, economic resources, water resources, and soils of Morton and Emmons Counties and parts of Burleigh, Kidder, Hettinger, Logan, and McIntosh Counties are discussed.

Leonard, Arthur G., 1913, The geological map of North Dakota: N. Dak., Univ., Quart. Jour., v. 4, no. 1, p. 3-13, illus. incl. geol. map (scale 1:250,000).

The surficial geologic formations are described.

Leonard, Arthur G., 1916a, The lignite deposits of North Dakota: N. Dak., Univ., Quart. Jour., v. 6, no. 3, p. 234-240, illus.

The lignite bearing formations and the origin of lignite are discussed. The lignite beds are described and the history of lignite mining is reviewed.

Leonard, Arthur G., 1916b, The Pleistocene drainage changes in western North Dakota: Geol. Soc. America Bull., v. 27, p. 295-304, illus.

The age of the Missouri River valley, the Pleistocene valleys of the Missouri and Yellowstone Rivers, the preglacial valley of the Little Missouri River, the abnormal drainage features of the Little Missouri tributaries, and the evidence of a postglacial age for the lower Little Missouri Valley are discussed.

Leonard, Arthur G., 1916c, The pre-Wisconsin drift of North Dakota: Jour. Geology, v. 24, no. 6, p. 521-532, illus.

Some of the features of the pre-Wisconsinan drift in Morton, Dunn, McKenzie, Burleigh, and other counties are described. A map showing the margins of the drift and the Altamont Moraine is included.

Leonard, Arthur G., 1917a, The geological history of North Dakota: N. Dak., Univ., Quart. Jour., v. 7, no. 3, p. 228-235, illus. incl. geol. map (scale 1:1,250,000).

The surface geology including bedrock and glacial deposits is mapped and the various formations are described.

Leonard, Arthur G., 1917b, Geological map of North Dakota: N. Dak. Geol. Survey, map (scale 1:1,250,000). (Reprinted from N. Dak., Univ., Quart. Jour., v. 7, no. 3, facing p. 232.)

Ten geologic formations including glacial deposits are presented on the map.

Leonard, Arthur G., 1919a, The geology of North Dakota: Jour. Geology, v. 27, no. 1, p. 1-27, illus. incl. geol. map (scale 1:3,125,000).

The following formations are described in this discussion: Cretaceous "Benton Shale," Niobrara Formation, Pierre Shale, and Fox Hills Formation; Tertiary? "Lance Formation"; Tertiary Fort Union "Formation" and White River Formation; and Quaternary glacial drift and lake silt.

Leonard, Arthur G., 1919b, The surface features of North Dakota and their origin: N. Dak., Univ., Quart. Jour., v. 9, p. 209-219, illus.

The drainage is divided into three drainage areas. The state is divided into three plains: the lacustrine plains, the drift plain, and the Missouri Plateau west of the Missouri River, and each is described. The Badlands and the Turtle Mountains are also described.

Leonard, Arthur G., 1920, Possibilities of oil and gas in North Dakota: N. Dak. Geol. Survey Bull. 1, 9 p.

The stratigraphy and structure, particularly the anticlines in North Dakota, are discussed. The natural gas production in the state is reviewed and mention is made of the probable source of the gas. Oil possibilities are briefly mentioned.

Leonard, Arthur G., 1922, The White River Formation in North Dakota: N. Dak., Univ., Quart. Jour., v. 12, no. 3, p. 218-228, illus.

The discussion of the formation includes a description of the lithology and paleontology of the beds at seven known localities. Measured sections are included for some areas and a map showing areas of White River Formation in North Dakota is included.

Leonard, Arthur G., 1924, Gravel deposits of North Dakota suitable for road surfacing and construction work: N. Dak., Univ., Quart. Jour., v. 14, no. 4, p. 383-393.

The gravel deposits are classified according to their mode of occurrence and origin: glacial drift gravel, stream terrace gravel, lake beach gravel, residual gravel outside glaciated areas, and gravel of the White River Formation. Each is described briefly. Examples are given for each class.

Leonard, Arthur G., 1925a, Adams and Grant Counties, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 31-34.

The Scranton and Haynes coal beds are the two important lignite deposits in the area. The Haynes coal bed is described in detail.

Leonard, Arthur G., 1925b, Billings and Golden Valley Counties, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 34-58, illus.

The lignite beds of the Fort Union and "Lance Formations" are described. Measured sections are included in the report.

Leonard, Arthur G., 1925c, Bowman and Slope Counties, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 58-77, illus.

The Scranton and Bowman coal beds are described as the important lignite deposits in Bowman County. The coal beds in Slope County are divided into five groups and described.

Leonard, Arthur G., 1925d, Dunn County, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 80-87.

The lignite beds along the valley of the Little Missouri River in Dunn County are described.

Leonard, Arthur G., 1925e, Hettinger County, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 88-95, illus.

There are numerous lignite deposits in the county. One of the most important, the Coalbank coal bed, is described in detail.

Leonard, Arthur G., 1925f, The lignite deposits of North Dakota, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 1-9, illus.

This general introduction to the lignite of North Dakota includes discussions of the lignite bearing formations, the burning of the lignite beds, the origin of lignite, the history of lignite mining, and the quantity of lignite in North Dakota. The illustrations include a map showing the distribution of lignite beds over 4 feet thick.

Leonard, Arthur G., 1925g, McKenzie County, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 95-111, illus.

The entire county is underlain by workable beds of lignite. The county is divided into four districts and the lignite deposits in each district are described.

Leonard, Arthur G., 1925h, Mercer County, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 125-131, illus. incl. geol. sketch map (scale 1:63,360).

The most important and extensive coal bed in the county is the Beulah-Zap coal bed. It is described in detail and its distribution is indicated on the map. The coal beds near Stanton and Hazen are also discussed.

Leonard, Arthur G., 1925i, Oliver County, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 139-140.

The thickness and locations of several lignite beds in Oliver County are reported.

Leonard, Arthur G., 1925j, Possibilities of oil and gas in North Dakota: N. Dak. Engineer, v. 2, no. 1, p. 11-13.

The geologic structure and stratigraphy are discussed. The occurrence of natural gas in Bottineau and Renville Counties is reported.

Leonard, Arthur G., 1925k, Stark County, *in* Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 140-146, illus.

The Fryburg coal bed and the Heart River coal bed in the Belfield-South Heart district, and the Lehigh coal bed in the Lehigh district are described.

Leonard, Arthur G., 1926a, The geology of North Dakota, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 11, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. 9) p. 4-10; revised, 1930: N. Dak., Univ., Departmental Bull., v. 14, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. 11) p. 5-11, illus.

The stratigraphy of the state from the "Dakota Sandstone" through the glacial deposits is described.

Leonard, Arthur G., 1926b, The lignite deposits of North Dakota, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 11, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 9) p. 19-23, illus.; revised, 1930: N. Dak., Univ., Departmental Bull., v. 14, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 11) p. 40-45, illus.

The lignite-bearing formations, the lignite beds, the origin of the lignite, the history of lignite mining, and the quantity of lignite are discussed.

Leonard, Arthur G., 1926c, Lignitic coals of North Dakota: Pan-Am. Geol., v. 45, p. 135-140, illus.

The lignite beds are described. The results of microscopic examination of thin-sections of lignite and the chemical analysis of the lignite are reported. The uses of lignite are discussed.

Leonard, Arthur G., 1926d, The surface features of North Dakota and their origin, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 11, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 9) p. 11-18; revised, 1930: N. Dak., Univ., Departmental Bull., v. 14, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 11) p. 12-20, illus.

The lacustrine plains (Lake Agassiz and Lake Souris), the Drift Plain, the Missouri Plateau, the Badlands, and the Turtle Mountains are discussed.

Leonard, Arthur G., 1928, Sources of North Dakota gravels: N. Dak. Engineer, v. 4, no. 2, p. 2-5.

The gravel deposits are described and classified into five classes on the basis of origin.

Leonard, Arthur G., 1931a, North Dakota sand and gravel deposits largely of glacial origin: Pit and Quarry, v. 22, p. 29-33, illus.

The deposits are described according to their mode of occurrence and origin: gravel associated with glacial drift; stream terrace gravel; beaches of extinct and existing lakes; residual gravel outside the glaciated area; and deposits of the White River Formation. Examples are given for each type.

Leonard, Arthur G., 1931b, Will oil and gas be found in North Dakota?: N. Dak., Univ., Quart. Jour., v. 21, p. 327-336.

The stratigraphy and structure of the state are discussed. A log for a well in Foster County which was drilled to the Precambrian is presented. The natural gas production is reviewed and the oil possibilities are discussed.

Leonard, Arthur G., 1932, Black Butte and its "eruption": N. Dak., Univ., Quart. Jour., v. 23, p. 160-162.

The origin of Black Butte is discussed. The burning of the lignite beds and the formation of "scoria" are discussed in connection with the explanation of the so called "eruption" of Black Butte.

Leonard, Arthur G., Babcock, E. J., and Dove, L. P., 1925, The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, 240 p., illus. incl. maps.

The bulletin includes reports by several authors which are individually cited.

Leonard, Arthur G., Dove, L. P., and Eaton, H. N., 1925, Description of the lignite deposits by counties, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 32-165, illus. incl. geol. sketch maps.

This section of the bulletin includes reports on individual counties by several authors which are individually cited.

Leonard, Arthur G., and Eaton, H. N., 1925a, Divide and Burke Counties, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 78-80, illus.

Lignite beds in the vicinity of Noonan, Columbus, Larson, and Alkabo are described. Some measured sections are included and reference is made to the chemical analysis of the lignite.

Leonard, Arthur G., and Eaton, H. N., 1925b, Ward County, in Leonard, Arthur G., Babcock, E. J., and Dove, L. P., The lignite deposits of North Dakota: N. Dak. Geol. Survey Bull. 4, p. 146-153, illus.

The area is divided into four districts: Kenmare, Baden-Donnybrook, Foxholm-Burlington, and Southeastern districts. The important coal beds in each district are described.

Leonard, Arthur G., Gauger, A. W., Budge, W. E., and Dove, L. P., 1926, Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 11, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 9), 45 p., illus.

The bulletin contains articles by several authors which are cited individually.

Leonard, Arthur G., and Smith, Carl D., 1909, The Sentinel Butte Lignite Field, North Dakota and Montana: U. S. Geol. Survey Bull. 341, p. 15-35, illus.

The stratigraphy of the "Eocene" Fort Union "Formation" is discussed and three measured sections are presented. The overlying Oligocene rocks are mentioned. The lignite is discussed and each lignite bed is described. A map showing the outcrops of the coal beds in the Sentinel Butte lignite field is included in the report.

Leriche, Maurice, 1942, Contribution a l'étude faunes ichthyologiques marine des terrains Tertiaires de la Plaine Cotière Atlantique et du centre des États-Unis: Soc. Geol. France Mem. 45, n. s., v. 20, pts. 2-4, 110 p., illus.

Three species of elasmobranchs from Oliver County, North Dakota, are described. Two of the species are said to be of Midway (Paleocene) age.

Leverett, Frank, 1912a, Correlation of Lake Agassiz with glacial lakes in Great Lakes basins (abs.): Mich. Acad. Sci., Rept., v. 14, p. 115.

The deformation of the shore lines of Lake Agassiz is correlated with the deformation of the shore lines of Lake Algonquin.

Leverett, Frank, 1912b, Early stages and outlets of Lake Agassiz in relation to the waning ice sheet: N. Dak. Agr. Coll. Survey 6th Bienn. Rept. [1911-1912], p. 17-28, illus. incl. geol. map (scale 1:750,000).

The different glacial and lake features present in southeastern North Dakota (Cass, Sargent, Ransom, and Richland Counties) are discussed and illustrated on the map.

Leverett, Frank, 1913, Beginnings of Lake Agassiz (abs.): Geol. Soc. America Bull., v. 24, p. 697.

The Milnor Beach, different lake stages, different outlets, and water-laid moraines are mentioned.

Leverett, Frank, 1932, Quaternary geology of Minnesota and parts of adjacent states: U. S. Geol. Survey Prof. Paper 161, 149 p., illus. incl. geol. maps.

The area described includes the entire state of Minnesota and parts of Wisconsin, Iowa, North and South Dakota, which have a glacial history similar to that of Minnesota. The area of North Dakota included is the area of glacial Lake Agassiz.

Lewis, Meriwether, and Clark, William, 1814, History of the expedition under the command of Captains Lewis and Clark, to the sources of the Missouri, thence across the Rocky mountains and down the river Columbia to the Pacific ocean. Performed during the years 1804-5-6: New York, Bradford and Inskeep, 2 v.; reprinted, 1903: Chicago, A. C. McClurg and Co., 2 v.

The region along the Missouri River in North Dakota is described. Mention is made of deposits of lignite and Glauber's salt. (This edition, compiled by Nicholas Biddle, is often referred to as the Biddle edition.)

Lewis, Meriwether, and Clark, William, 1904-05, Original journals of the Lewis and Clark expedition, 1804-1806: New York, Dodd, Mead, and Co., 8 v., illus.

In addition to a description of the landscape, mention is made of the strata observed in the area. It is noted that along the Missouri River in the area of North Dakota, the coal strata and "burnt earth" appear at the same level and in some places meet.

Lewis, Meriwether, and Clark, William, 1947-1948, Lewis and Clark in North Dakota: N. Dak. History, v. 14-15, 359 p., illus.

The original manuscript journals and the text of the Biddle edition during the time the expedition remained in North Dakota were combined for this reprinting. Explanatory notes by Russell Reid are included.

Lewis, Paul J. *See also* Hadley, Herbert D., Lewis, Paul J., and Larsen, Roger B., 1952.

Lewis, Paul J., 1953, Ordovician of the Williston Basin (abs.): Am. Assoc. Petroleum Geologists Bull., v. 37, no. 11, p. 2615.

The correlation between the sediments in the basin and the outcrop areas on the fringes of the basin is discussed.

Lewis, Paul J., and Smith, Maurice H., 1957, Catalog of formation names for Crazy Mountain Basin and adjacent areas [Mont.-Wyo.-Williston Basin], in Billings Geol. Soc., Guidebook, 8th Ann. Field Conf., Crazy Mountain Basin, Sept. 6-7, 1957: p. 90-98.

The distribution, type locality, original describer, gross lithology, and remarks are presented for formation and group names used in the basin and adjacent areas including the Williston basin area of North Dakota.

Lindberg, Marie L., 1944, Heavy mineral correlation of the Fox Hills, Hell Creek, and Cannonball sediments, Morton and Sioux Counties, North Dakota: Jour. Sed. Petrology, v. 14, p. 131-143, illus.; reprinted, 1945: N. Dak. Geol. Survey Bull. 19.

The stratigraphy and sedimentary structures of the formations are reviewed. The mineral suites are described and a schematic correlation between sections and zones is presented.

Lindsey, K. B., 1954, Petroleum in the Williston Basin, including parts of Montana, North and South Dakota, and Canada, as of July 1953: U. S. Bur. Mines Rept. Inv. 5055, 70 p., illus.

The geology, history, exploration, drilling activities, economics, and characteristics of the various oil fields of the Williston basin are discussed. The reports of crude petroleum analyses are presented in the appendix of the report. The report includes a comprehensive bibliography of the activity in the Williston basin.

Lindvall, R. M. See Benson, W. E., and Lindvall, R. M., 1951.

Lindvall, R. M. See Howard, Arthur D., Gott, G. B., and Lindvall, R. M., 1946.

Link, Theo. A., 1958, The Williston Basin is large and deep, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 6-7, illus.

A brief and general discussion of the history of discovery and production in the Williston basin is given.

Listoe, Bruce, 1955, Beta Zeta Chapter history: *Compass*, v. 32, no. 2, p. 152; reprinted, 1955: N. Dak. Geol. Survey Bull. 28, p. 152.

The history of the Geology Club at the University of North Dakota is traced from its founding in 1937, through its installation as the Beta Zeta Chapter of Sigma Gamma Epsilon in 1950, and its activities through 1955 are discussed.

Lloyd, E. R., 1914, The Cannonball River Lignite Field, North Dakota: U. S. Geol. Survey Bull. 541-G, p. 243-291, illus. incl. geol. maps (scale 1:125,000).

The geography, stratigraphy, and structural geology of the area are described. The distribution and physical and chemical properties of the lignite deposits are reported. Detailed descriptions of the deposits are given. The area includes parts of Adams, Grant, Hettinger, and Morton Counties.

Lloyd, E. R., and Hares, C. J., 1915, The Cannonball marine member of the Lance formation of North and South Dakota and its bearing on the Lance-Laramie problem: *Jour. Geology*, v. 23, p. 523-547, illus. incl. geol. map (scale 1:1,875,000).

The Fox Hills Formation, "Lance Formation," and Fort Union "Formation" are described. Several measured sections are included. Particular attention is paid to the Cannonball "Member." A list of the fauna of the Cannonball "Member" is included.

Loeblich, Alfred R., Jr., and Tappan, Helen N., 1950, Characteristic western interior Callovian species, pt. 2 of North American Jurassic foraminifera: *Washington Acad. Sci., Jour.*, v. 40, no. 1, p. 5-19, illus.

One of the seven localities selected for this study was the Sundance Formation in the J. H. Kline Well no. 1, in Ward County, North Dakota. The foraminiferal assemblage from the Callovian (basal Upper Jurassic) beds is described and illustrated.

Lowitz, C. A., 1956, Laboratory studies of foundation and backfill materials--Grand Forks Substation--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Div. Eng. Lab., Earth Lab. Rept. no. EM-450, 16 p., illus.

The results of the tests on the soil samples are discussed. A log of one of the drill holes is included.

Lowitz, C. A., 1957, Laboratory studies on proposed subgrade and earth construction materials--Sheyenne Delta Sample Area--Red River Valley Unit--Garrison Division--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Div. Eng. Lab., Earth Lab. Rept. EM-493, 34 p.

The results of the laboratory tests are summarized and discussed.

Lukk, Gerhard E., 1954, The Williston Basin and its exploration problems: *Geophysics*, v. 19, no. 3, p. 572-581, illus.

The history of exploration and the geology of the basin are reviewed briefly. The stratigraphy is discussed and the seismic problems are outlined and discussed.

Macauley, George, 1955, A general discussion of the Winnipeg formation: Alberta Soc. Petroleum Geologists, Jour., v. 3, no. 4, p. 49-52, 59, illus.

The lithology, fauna, age and correlation, and origin of the formation are discussed. The area of the report covers parts of Manitoba, Saskatchewan, and North and South Dakota.

McBride, Thomas H., 1883, The Little Missouri Bad Lands: Popular Sci. Monthly, v. 23, p. 468-474, 634-642, illus.

The physical and scenic geology are described. The burning lignite beds are discussed. The paleobotany is illustrated and described.

McCabe, Hugh R., 1959, Mississippian stratigraphy of Manitoba: Manitoba Dept. Mines and Nat. Resources, Mines Br. Pub. 58-1, 99 p., illus. incl. geol. map (scale 1:5,000,000).

The report area includes a section in north-central North Dakota. The stratigraphy is described and interpreted.

McCabe, William S., 1954, Williston Basin Paleozoic unconformities: Am. Assoc. Petroleum Geologists Bull., v. 38, no. 9, p. 1997-2010, illus. incl. isopach maps (scale 1:7,816,800).

The Paleozoic stratigraphic section is discussed with reference to the eight unconformities which occur at the base of the Flathead, Deadwood, Winnipeg, Ashern, Bakken, Kibbey, Amsden, and Opeche Formations.

McCauley, Victor T., 1956, Pennsylvanian and lower Permian of the Williston Basin, in N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: p. 150-164, illus.

The Permian-Pennsylvanian strata are correlated with the Hartville Formation of Wyoming and the Minnelusa of the Black Hills. An attempt is made to divide the strata into recognized and mappable units.

McDermott, John F. See Culbertson, Thaddeus A., 1851.

McGehee, J. Rex, 1952, A resume of the Elk Point formation in view of recent drilling in the Williston Basin, in Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, September 4-7, 1952: p. 64.

A brief report is presented of a sequence of strata encountered during drilling in the Williston basin which is believed to be equivalent to the Elk Point Formation of the Alberta plains.

McGowan, LaVern L. See Waldren, Charles H., Meldahl, Elmer G., and McGowan, LaVern L., 1955.

McLaughlin, Thad G., 1946, Ground water at Dickinson, North Dakota: [N. Dak. State Water Conserv. Comm.] Ground-Water Studies no. 3, 31 p., illus.

The geology of the area is described. Potential water-producing aquifers and the physical properties of the water-bearing materials are discussed. The results of pumping tests are presented. Well logs and well schedules for the area are included.

MacMillan, W. W. See Burr, Alexander C., Fallgatter, W. S., and MacMillan, W. W., 1950.

Magnusson, Adelynn See also Burr, Alexander C., and Magnusson, A., 1950.

Magnusson, Adelynn, 1950, Sulfur in North Dakota lignite [Pt. I]: N. Dak. Acad. Sci. Proc., v. 3, p. 18-21.

The sulfur in the lignite was studied to determine its form, origin, and effects on the value of the lignite. (For Part II see Burr, A. C., and Magnusson, A., 1950; and for Part III see Burr, A. C., and Jaffer, M. M., 1951.)

Mallin, James W. See Harris, Steven H., and Mallin, James W., 1956, 1957.

Manz, Oscar E., 1953, Investigation of some North Dakota clays and shales: N. Dak. Geol. Survey Rept. Inv. no. 13, 36 p., illus.

The results of laboratory experiments on clay and shale from various parts of North Dakota to determine their commercial value and possible uses are presented and discussed.

Manz, Oscar E., 1954, Investigation of light-weight aggregate possibilities of some North Dakota clays and shales: N. Dak. Geol. Survey Rept. Inv. no. 17, 48 p., illus.

The results of laboratory tests to determine the possibilities of the deposits of lower grade clay and shale in North Dakota are presented and discussed. The outcrops where the samples were obtained are described.

Manz, Oscar E., 1955, Ceramic research in North Dakota: Compass, v.32, no. 2, p. 144-151, illus.; reprinted, 1955: N. Dak. Geol. Survey Bull. 28, p. 144-151, illus.

The geological occurrence of North Dakota clay and shale, the laboratory equipment and methods used in the research, and the future possibilities of North Dakota clay and shale are indicated in the report.

Manz, Oscar E., 1956, Investigation of Lake Agassiz clay deposits: N. Dak. Geol. Survey Rept. Inv. no. 27, 34 p., illus.

The results are reported of a laboratory investigation of Lake Agassiz silt and clay units as possible materials for making brick and tile. Brief physical descriptions of the sample localities are included.

Matthew, William D., 1921, The Cannonball Lance formation: Science, n. s., v. 54, no. 1384, p. 27-29.

The vertebrate faunal evidence for the age of the formations is presented in this discussion of Charles Schuchert's (1921) review of the paper by T. W. Stanton (1921).

Matthew, William D., 1922, Phyletic relations of Lance vertebrates: Pan-Am. Geol., v. 37, p. 68-69.

The vertebrate fauna of the "Lance" and its relation to younger and older fauna is discussed.

May, Paul R., 1954a, Clinker, in N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954: p. 18-19, illus.

The formation of clinker or "scoria" by the burning of lignite of the Fort Union "Formation" is described.

May, Paul R., 1954b, Strippable lignite deposits, Wibaux area, Montana and North Dakota: U. S. Geol. Survey Bull. 995-G, p. 255-292, illus.

The bulletin includes discussions of the structure of the area, the Fort Union "Formation," characteristics of the lignite, descriptions of the lignite beds, and descriptions of the selected strippable deposits. The area of the report includes part of Golden Valley County in North Dakota.

Maywald, Richard H., 1957, North Dakota Pre-Mesozoic paleogeologic map: N. Dak. Geol. Survey Misc. Map no. 3, scale 1:1,000,000.

The Precambrian, Ordovician, Silurian, Devonian, Mississippian, Permian, and Pennsylvanian Systems are illustrated on the map. The Mississippian is divided into five formations.

Meek, Fielding B., 1876, A report on the invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey of the Terr. (Hayden), Rept., v. 9, 629 p., illus. incl. 45 pls.

North Dakota west of the Missouri River is included in the area of the report. The Cretaceous and Tertiary rocks are described. The fossils are described and illustrated. This report is an expansion of an earlier work by Meek and Hayden in 1865, published by the Smithsonian Institution. (See Meek, Fielding B., and Hayden, F. V., 1856c.)

Meek, Fielding B., and Hayden, F. V., 1856a, Descriptions of new fossil species of Mollusca collected by Dr. F. V. Hayden in Nebraska Territory; together with a complete catalogue of all the remains of Invertebrata hitherto described and identified from the Cretaceous and Tertiary Formations of that region: Philadelphia, Acad. Nat. Sci., Proc., v. 8, p. 265-286.

Twenty species of Mollusca are described. The catalog contains 191 species.

Meek, Fielding B., and Hayden, F. V., 1856b, Descriptions of new species of Acephala and Gasteropoda, from the Tertiary formations of Nebraska Territory, with some general remarks on the geology of the country about the sources of the Missouri River: Philadelphia, Acad. Nat. Sci., Proc., v. 8, p. 111-126.

The introduction contains a summary of the earlier surveys in the area. The Tertiary lignite formation from which the fossils were collected is described. The fossils are described.

Meek, Fielding B., and Hayden, F. V., 1856c, Palaeontology of the Upper Missouri: Invertebrates, part I: Smithsonian Contr. Knowledge, 172, 136 p., illus.

Full descriptions and figures of all the known "Primordial," Carboniferous, Permian, and Jurassic species of invertebrate fossils from the area are presented. None of the specimens described were collected in the area now in North Dakota but reference is made to the entire upper Missouri area. For an expansion of this report see Meek, Fielding B., 1876.

Meek, Fielding B., and Hayden, F. V., 1857, Descriptions of new species and genera of fossils, collected by Dr. F. V. Hayden in Nebraska Territory, under the direction of Lieut. G. K. Warren, U. S. Topographical Engineer; with some remarks on the Tertiary and Cretaceous formations of the north-west, and parallelism of the latter with those of other portions of the United States and Territories: Philadelphia, Acad. Nat. Sci., Proc., v. 9, p. 117-148.

Some of the samples described were collected along the Missouri River in the area now included in the state of North Dakota. There is a review of reports of earlier surveys in the area.

Meek, Fielding B., and Hayden, F. V., 1861, Descriptions of new organic remains from the Tertiary, Cretaceous and Jurassic rocks of Nebraska: Philadelphia, Acad. Nat. Sci., Proc., v. 12, p. 175-185.

Several new species of fossil Mollusca, including two collected in North Dakota, are described.

Meek, Fielding B., and Hayden, F. V., 1862, Descriptions of new Lower Silurian, (Primordial), Jurassic, Cretaceous, and Tertiary fossils, collected in Nebraska, by the Exploring Expedition under the command of Capt. Wm. F. Reynolds, U. S. Top. Engrs.; with some remarks on the rocks from which they were obtained: Philadelphia, Acad. Nat. Sci., Proc., v. 13, p. 415-447.

Capt. Reynolds' expedition did not pass through the area now included in the state of North Dakota; however, the report contains the original description of the Fort Union Group.

Meinzer, Oscar E., and Hard, Herbert A., 1925, The artesian water supply of the Dakota sandstone in North Dakota, with special reference to the Edgeley Quadrangle: U. S. Geol. Survey Water-Supply Paper 520-E, p. 73-95, illus.

The topography and geology of the Edgeley Quadrangle, the artesian horizons in the Dakota "Sandstone," the original head and area of artesian flow, the yield and capacities of flowing wells, the beneficial results of a state conservation program, and the drilling of wells are discussed.

Meissner, V. S., 1946, Laboratory tests on foundation materials, Dickinson Dam-Heart River Project, North Dakota: U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Earth Materials Lab. Rept. EM-100, 35 p., illus.

The material from the area ranges from lean clay to gravelly sand. Fine sand is predominant. The results of the laboratory tests on the samples are discussed.

Meldahl, Elmer G. See also Waldren, Charles H., Meldahl, Elmer G., and McGowan, LaVern L., 1955.

Meldahl, Elmer G., 1956, The geology of the Grassy Butte area, McKenzie County, North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 42 p., illus. incl. geol. map (scale 1:63,360); published, 1956: N. Dak. Geol. Survey Rept. Inv. no. 26, 1 sheet, illus. incl. geol. map (scale 1:125,000).

The stratigraphy and geologic structure of the area are discussed. Lignite beds of possible economic value are described. Several stratigraphic sections are presented.

Melin, R. E. *See* Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955.

Melin, R. E. *See* Moore, George W., Melin, R. E., and Kepferle, R. C., 1956, 1959.

Melsted, V. J. *See* Barry, John G., and Melsted, V. J., 1908.

Menneer, Jack, 1952, The lid is off the Williston Basin!: *Petroleum Engineer*, v. 24, no. 12, p. B75-B83, illus.

The exploration and development activities of the first year of production in the basin are reported. Current production cost figures are discussed for a well on the Poplar anticline in Montana.

Metzger, H. *See* Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925.

Middleton, Herman F., and Kennedy, Gene O., 1956, Stratigraphy of the Nesson Anticline, in *N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956*: p. 53-60, illus.

The subsurface geologic formations are described based on a study of electric logs and the microscopic examination of drill bit samples. The economic aspects of the oil reservoirs are discussed.

Miles, F. W. *See* Ewing, Robert A., Adam, H. W., Miles, F. W., Bearse, A. E., and Richardson, A. C., 1950.

Miller, Ralph L., and Gill, James R., 1954, Uranium from coal: *Sci. American*, v. 191, no. 4, p. 36-39, illus.

The occurrence of uranium in the lignite deposits in the Badlands of North and South Dakota is discussed. The origin of the buttes in the area is discussed. The theories of the origin of uranium are presented.

Mitchell, Porter H., and Petter, Charles K., Jr., 1958, The Lignite field, Burke County, North Dakota, in *North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958*: p. 64-69, illus.

The oil in the Lignite field is produced from the "Midale Beds" of the "Charles Formation" of Mississippian age. The reservoir characteristics, stratigraphy, environments of deposition, and structure of the oil field are discussed.

Mitchell, Robert H. *See also* Laird, Wilson M., and Mitchell, Robert H., 1942.

Mitchell, Robert H., and Laird, Wilson M., 1943, Notes on gypsum crystals in Morton County, North Dakota: *Rocks and Minerals*, v. 18, no. 1, p. 10.

The occurrence of gypsum crystals in the Hell Creek, Ludlow, and Cannonball Formations is described. The origin of the crystals is discussed.

Moir, D. R., 1957, An occurrence of buried coniferous wood in the Altamont moraine in North Dakota: *N. Dak. Acad. Sci., Proc.*, v. 11, p. 69-74.

The wood samples from the moraine in Kidder County were identified as white spruce and radiocarbon dated at approximately 11,480 B.P. (Sample W-542). The significance of these results is discussed.

Moir, D. R., 1958, Occurrence and radiocarbon date of coniferous wood in Kidder County, North Dakota, in *Friends of the Pleistocene Midwestern Section Guidebook 9th Ann. Field Conf., East-Central North Dakota, 1958*: *N. Dak. Geol. Survey Misc. Ser. no. 10*, p. 108-114.

This is a revision of Moir, D. R., 1957.

Moore, George W. *See also* Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955.

Moore, George W., 1953, Uranium in carbonaceous rocks—North Dakota, *in* Geologic investigations of radioactive deposits—Semiannual progress report, June 1 to Nov. 30, 1953: U. S. Geol. Survey Rept. TEI-390, p. 123-125, illus. incl. geol. map (scale 1:79,200). (Report prepared for U. S. Atomic Energy Commission.)

The uranium-bearing lignite deposits in the HT Butte and Chalky Buttes area, Slope County; Bullion Butte, Billings and Golden Valley Counties; and the Sentinel Butte area, Golden Valley County are discussed. The map includes the HT Butte and Chalky Buttes area.

Moore, George W., 1954, Uranium in carbonaceous rocks—North Dakota, *in* Geologic investigations of radioactive deposits—Semiannual progress report, Dec. 1, 1953 to May 31, 1954: U. S. Geol. Survey Rept. TEI-440, p. 102-109, illus. (Report prepared for U. S. Atomic Energy Commission.)

The inferred reserves of lignite and the estimated content of uranium in the HT Butte, Chalky Butte, Bullion Butte, and Sentinel Butte areas of southwestern North Dakota are presented.

Moore, George W., Melin, R. E., and Kepferle, R. C., 1956, Preliminary geologic map of the Chalky Buttes area, Slope County, North Dakota: U. S. Geol. Survey Coal Inv. Map C-38, scale 1:31,680.

The Tertiary Fort Union, Chadron, and Brule "Formations" are shown on the map. A diagrammatic section is included with the map.

Moore, George W., Melin, R. E., and Kepferle, R. C., 1959, Uranium-bearing lignite in southwestern North Dakota: U. S. Geol. Survey Bull. 1055-E, p. 147-166, illus. incl. geol. maps (scale 1:31,680).

The Tertiary and Quaternary stratigraphy of the area is discussed. The uranium-bearing lignites were analyzed for uranium content. The reserves, origin, and occurrence of the uranium are discussed.

Morton, S. G. *See* Rogers, Henry D., Morton, S. G., and Johnson, Walter R., 1846.

Mueller, Edward L., 1954, In the Williston Basin, Geology points to major oil province: *World Oil*, v. 139, no. 1, p. 104, 106, 109-110, 112, illus.

The structure, stratigraphy, and oil prospects of the basin are discussed. The illustrations include structural, paleogeologic, and isopach maps.

Munro, J. A., 1949, Grasshopper outbreaks in North Dakota, 1808-1948: *N. Dak. History*, v. 16, no. 3, p. 143-164.

The destruction of vegetation by swarms of grasshoppers is reported for several times in the history of North Dakota. The effect of this on soil erosion is discussed.

Murray, George H., Jr., 1959, Examples of hydrodynamics in the Williston Basin at Poplar and North Tioga fields, *in* Am. Assoc. Petroleum Geologists, Rocky Mtn. Sec., Geological Record, Feb. 1959: p. 55-59, illus.

The structure, reservoir characteristics, and production of the North Tioga pool, located in northwestern North Dakota, are discussed.

Nagel, F. G. *See* Krumbein, W. C., and Nagel, F. G., 1953.

National Petroleum News, 1923, Valuable guide to possible oil sands given by North Dakota log: *Nat. Petroleum News*, v. 15, June 20, 1923, p. 109-110.

The record of the Blum No. 1 well of the DesLacs Western Oil Co., Ward County, North Dakota, is presented and discussed. The Upper Cretaceous rocks are indicated as possible important source and reservoir rocks.

Neill, N. P. *See* Jensen, Charles A., and Neill, N. P., 1904.

Nelson, LaVerne B. *See* Anderson, Sidney B., and Nelson, L. B., 1956.

Ness, Marjorie *See* Laird, Wilson M., Ness, Marjorie, and Klipfel, Clarence, 1952.

Nevin, Charles, 1946, The Keene Dome, northeast McKenzie County, North Dakota: N. Dak. Geol. Survey Bull. 21, pt. 1, p. 1-10, illus.

The stratigraphy and structure of northeast McKenzie County are discussed. The dome is mapped and recommendations for oil exploration on the dome are presented.

Newberry, John S., 1868, Notes on the later extinct floras of North America, with descriptions of some new species of fossil plants from the Cretaceous and Tertiary strata: Lyceum Nat. History, N. Y., Annals, v. 9, p. 1-76.

The Tertiary flora collected along the upper Missouri River is described. Many of the specimens were collected by F. V. Hayden in 1855.

Newberry, John S., 1874, On the lignites and plant-beds of western America: Am. Jour. Sci., ser. 3, v. 7, p. 399-404.

The fossil plants common to the Upper Missouri lignite beds are listed and the age of the flora is discussed.

Newberry, John S., 1885a, Notes on the geology and botany of the country bordering the Northern Pacific Railroad: N. Y. Acad. Sci., Annals, v. 3, p. 242-270.

The valley of the Little Missouri and the Badlands of the Missouri are described.

Newberry, John S., 1885b, Notes on the surface geology of the country bordering the Northern Pacific Railroad: Am. Jour. Sci., ser. 3, v. 30, p. 337-346.

The valley of the Little Missouri and the Badlands of the Missouri are mentioned. The drift of the Upper Missouri is discussed.

Newberry, John S., 1898, The later extinct floras of North America: U. S. Geol. Survey Mon. 35, 295 p., illus.

Fossil plants from the Cretaceous and Tertiary, including some from the Fort Union Group collected near Fort Berthold, Fort Clark, and Fort Union, North Dakota, are described and illustrated.

Nichols, Earl *See* Hutton, F. Z., and Nichols, Earl, 1920.

Nikiforoff, C. C., 1947, The life history of Lake Agassiz: alternate interpretation: Am. Jour. Sci., v. 245, p. 205-239, illus.

The Upham-Leverett theory for the evolution of Lake Agassiz is summarized. Objections to this theory are presented and an alternate interpretation is discussed.

Nikiforoff, C. C., 1952, Origin of microrelief in the Lake Agassiz basin: Jour. Geology, v. 60, p. 99-103.

In this discussion of an article by Horberg (1951) some of the assumptions on which the interpretations are based are criticized and alternative interpretations are presented.

Noell, O. A., 1946, Supplemental laboratory tests on foundation samples from Heart Butte Dam, Heart River Project, North Dakota: U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Earth Materials Lab. Rept. no. EM-122, 16 p., illus.

This report contains information additional to that reported in Lab Rept. no. EM-88 (Holtz, 1946). The test results are discussed.

Noell, O. A., 1947, Laboratory tests on foundation materials from Broncho Damsite-Knife River Unit-Missouri Basin Project, North Dakota: U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Earth Materials Lab. Rept. no. EM-140, 34 p., illus.

The test program included one-dimensional consolidation, three-dimensional consolidation, and triaxial shear tests on representative samples. Notes on the condition of the undisturbed samples, tables summarizing the test data, and curves of the test results are included.

Noell, O. A., 1953, Foundations investigations at the site of the Prophets Mountain Pumping Plant--Missouri-Souris Division--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Eng. Lab. Br., Earth Lab. Rept. no. EM-361, 18 p., illus.

The results of tests on samples of the glacial "debris" that covers the bedrock in this area are discussed.

Nordquist, Jack W., 1953, Mississippian stratigraphy of northern Montana, *in* Billings Geol. Soc., Guidebook, 4th Ann. Field Conf., Little Rocky Mountains--Montana, southwestern Saskatchewan, Sept. 10-12, 1953: p. 68-82, illus.

In this report the Bakken Formation is named and its lithology is described. The type well is the Amerada Petroleum Corporation-H. O. Bakken No. 1 in Williams County, North Dakota.

Nordquist, Jack W., 1955, Pre-Rierdon Jurassic stratigraphy in northern Montana and Williston Basin, *in* Billings Geol. Soc., Guidebook, 6th Ann. Field Conf., Sweetgrass Arch--Disturbed Belt, Montana, Sept. 7-9, 1955: p. 96-106, illus.

The paper is a discussion of the Sawtooth-Piper relationships and an introduction to the nomenclature of subdivisions of the pre-Rierdon Jurassic sediments east of the axis of Sweetgrass arch including the part of the Williston basin in North Dakota.

North Dakota Agricultural College Survey, 1904, 2d Biennial Report, 1903-1904: Bismarck, N. Dak., 187 p.

The report contains papers by several authors which are individually cited.

North Dakota Agricultural College Survey, 1906, 3d Biennial Report, 1905-1906: Bismarck, N. Dak., 160 p.

The report contains papers by several authors which are individually cited.

North Dakota Agricultural College Survey, 1910a, 4th Biennial Report, 1907-1908: Bismarck, N. Dak., 258 p.

The report contains papers by several authors which are individually cited.

North Dakota Agricultural College Survey, 1910b, 5th Biennial Report, 1909-1910: Bismarck, N. Dak., 151 p., illus.

The report contains papers by several authors which are individually cited.

North Dakota Agricultural College Survey, 1912, 6th Biennial Report, 1911-1912: Bismarck, N. Dak., 372 p., illus.

The report contains papers by several authors which are individually cited.

North Dakota Geological Society, 1954a, Guidebook southwestern North Dakota field conference, June 25-27, 1954: Bismarck, N. Dak., 49 p., illus.

Includes papers by numerous authors which are cited individually.

North Dakota Geological Society, 1954b, Stratigraphy of the Williston Basin: N. Dak. Geol. Soc., 70 p., illus.

This is a manual of Williston basin nomenclature. The type location, lithology, paleontology, thickness, stratigraphic position, depositional environment, correlation, and a composite section are presented for each formation.

North Dakota Geological Society, 1955, Guidebook South Dakota Black Hills field conference, Sept. 14-17, 1955: Bismarck, N. Dak., 90 p., illus.

The book contains papers by numerous authors which are cited individually.

North Dakota Geological Society, 1959a, Cambrian-Ordovician-Silurian interim report: Geogram, v. 2, no. 9 [!10], p. 1, 3-4, illus.

The report contains the conclusions of the committee concerning the nomenclature and classification of the Cambrian, Ordovician, and Silurian strata in the Williston basin.

North Dakota Geological Society, 1959b, Mississippian Committee interim report: Geologram, v. 2, no. 4, p. 1-3, illus.; reprinted 1959: Williston Basin Oil Rev., v. 8, no. 8 [16], p. 28-29, 32, illus.

The report contains the conclusions of the committee concerning nomenclature and classification of the Madison Group in the Williston basin, north-central North Dakota and southeastern Saskatchewan.

North Dakota Geological Society, 1959c, Nesson anticline of North Dakota: Bismarck, N. Dak., Conrad Pub. Co., 81 p., illus.

The development, stratigraphy, nomenclature, and geologic structure are discussed. Field data are presented for the fields along the Nesson anticline.

North Dakota Geological Society, Tertiary Committee, 1954, Description of the Tertiary formations, *in* N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954: p. 9-11.

The descriptions of the formations and members include the type locality, nomenclator, lithology, paleontology, thickness, stratigraphic position, depositional environment, correlation, and remarks. The bibliographic references given are vague.

North Dakota Geological Society and Saskatchewan Geological Society, 1956, Williston Basin Symposium, 1st International, Bismarck, North Dakota, October 9-12, 1956: Bismarck, N. Dak., Conrad Pub. Co., 202 p., illus.

The symposium includes papers by numerous authors which are cited individually.

North Dakota Geological Society and Saskatchewan Geological Society, 1958, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: Bismarck, N. Dak., Conrad Pub. Co., 129 p.

The symposium includes papers by numerous authors which are cited individually.

North Dakota Geological Survey, 1901, First Biennial Report [1899-1900]. *See* Babcock, Earle J., 1901.

North Dakota Geological Survey, 1902, Second Biennial Report [1901-1902]: Bismarck, N. Dak., 262 p., illus.

The report includes papers by numerous authors which are cited individually.

North Dakota Geological Survey, 1904, Third Biennial Report [1903-1904]: Bismarck, N. Dak., 220 p., illus.

The report includes papers by numerous authors which are cited individually.

North Dakota Geological Survey, 1906, Fourth Biennial Report [1905-1906]: Bismarck, N. Dak., 324 p., illus. incl. geol. map (scale 1:2,250,000).

The report includes papers by numerous authors which are cited individually.

North Dakota Geological Survey, 1908, Fifth Biennial Report [1907-1908]: Bismarck, N. Dak., 269 p., illus. incl. geol. maps.

The report includes papers by numerous authors which are cited individually.

North Dakota Geological Survey, 1912, Sixth Biennial Report [1909-1910]: Bismarck, N. Dak., 165 p., illus.

The report includes papers by A. G. Leonard and H. E. Simpson which are cited individually.

North Dakota Geological Survey, 1912-1941, Seventh through Twenty-first Biennial Reports.

During these years only brief administrative reports in mimeographed form were issued with a limited distribution.

North Dakota Geological Survey, 1942-1958, Twenty-second through Thirtieth Biennial Reports.

The biennial reports issued during this period of time consist of administrative reports presenting the activities of the Survey, projects in progress, and publications issued.

North Dakota Geological Survey, 1952-1959a, (Summaries of North Dakota oil wells): N. Dak. Geol. Survey Circ. nos. 6-223.

The circulars give descriptions of well cuttings and cores together with other pertinent information on the completion of a well.

North Dakota Geological Survey, 1952-1959b, Well data and tops of significant wells: N. Dak. Geol. Survey Circ. no. 5.

Circular no. 5 provides a summary of available information on location, completion, and production of North Dakota oil wells. It is revised as needed. The seventh revision was published in 1959.

Oil and Gas Journal, 1951, Williston Basin test: Oil and Gas Jour., v. 50, no. 2, p. 67.

A test on the Baker-Glendive anticline is announced by the Shell Oil Company. The geology and oil and gas production of the anticline are discussed.

Oil and Gas Journal, 1952a, Amerada hits again: Oil and Gas Jour., v. 51, no. 27, p. 85.

The opening of Amerada Petroleum Corporation's fifth new oil pool in North Dakota is reported. The pool is on the Nesson anticline.

Oil and Gas Journal, 1952b, Beaver Lodge growing: Oil and Gas Jour., v. 51, no. 3, p. 66, illus.

A brief report on the development of this field in the Williston basin is presented.

Oil and Gas Journal, 1953a, North Dakota outlook: Oil and Gas Jour., v. 51, no. 36, p. 65, illus.

The development record for 1952 is presented and some predictions for development in 1953 in the state are set forth.

Oil and Gas Journal, 1953b, Williston--newest producing basin of the Rockies: Oil and Gas Jour., v. 52, no. 17, p. 72-80, illus.

The general geology, stratigraphy, and history of the basin are reviewed. Reports of exploration activity, drilling, and production are included in the descriptions of the various oil fields.

O'Malley, F. Ward, 1953, Williston Basin--exploration frontier: Mines Mag., v. 43, no. 10, p. 38-48, 154-155, illus.

The basin is defined and outlined. The stratigraphy, structural and sedimentary history, drilling, testing, logging, completion, and economic problems are discussed as well as the different methods of exploratory approach. A subsurface evaluation of the basin is presented.

Opp, Albert G., 1955, A magnetometer survey of the Keene Dome, McKenzie County, North Dakota: N. Dak. Geol. Survey Rept. Inv. no. 19, 1 sheet, illus.

The results of a study of the deformation of the sediments of the dome by means of a magnetometer survey are discussed with respect to the geologic knowledge of the area. The illustrations include a vertical magnetic intensity map and a surface structure map of the dome.

Osterwald, Frank W., and Dean, B. G., 1957, Preliminary tectonic map of western North Dakota, showing the distribution of uranium deposits: U. S. Geol. Survey Mineral Inv. Map MF-125, scale 1:500,000.

An index map of western North Dakota, showing sources of data is included.

Paulson, Quentin F., 1951, Ground water in the Neche area, Pembina County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 16, 37 p., illus.

The deposits of the area, consisting of stream deposits, Lake Agassiz deposits, the Horrigan Ridge deposits, till, and bedrock formations, are described and their water-bearing characteristics are discussed. Well records and logs of test holes are included.

Paulson, Quentin F., 1952, Geology and occurrence of ground water in the Streeter area, Stutsman, Logan and Kidder Counties, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 20, 73 p., illus. incl. geol. map (scale approx. 1:63,360).

The geology of the area is described and the occurrence of groundwater in the deposits is discussed. Well records and logs of test holes are included.

Paulson, Quentin F., 1953, Ground water in the Fairmount area, Richland County, North Dakota, and adjacent areas in Minnesota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 22, 67 p., illus.

The geology and the occurrence of water in the glacial deposits and bedrock formations in the area are discussed. Records and logs of wells and test holes are included.

Paulson, Quentin F., 1954, Geology and occurrence of ground water in the Stanley area, Mountrail County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 23, 59 p., illus. incl. geol. map (scale approx. 1:63,360).

The geology of the glacial deposits and the bedrock formations is described and the occurrence of groundwater in the different units is discussed. Records and logs of wells and test holes are included.

Paulson, Quentin F., and Powell, John E., 1957, Geology and ground-water resources of the Upham area, McHenry County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 26, 66 p., illus. incl. geol. map (scale 1:63,360).

The geology and the occurrence of groundwater in the glacial deposits, including deposits of glacial Lake Souris, and the bedrock formations are discussed. Records and logs of wells and test holes are included.

Peightal, M. F. See Knobel, E. W., Peightal, M. F., and Chapman, J. E., 1924.

Peightal, M. F. See Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925.

Perry, E. S., and Sloss, L. L., 1943, Big Snowy group: Lithology and correlation in the northern Great Plains: Am. Assoc. Petroleum Geologists Bull., v. 27, no. 10, p. 1287-1304, illus. incl. geol. maps.

The distribution, stratigraphic relations, geologic age, lithology, correlations, paleogeography, and oil possibilities of the formations in the Big Snowy Group are discussed. Paleogeologic and paleogeographic maps are included. The area of the report includes the Williston basin in North Dakota.

Perry, Stuart H. See Henderson, Edward P., and Perry, Stuart H., 1942.

Peterson, Hjalmer V., 1938, The occurrence and distribution of selenium in North Dakota ground waters: Grand Forks, N. D., North Dakota, Univ., M.A. Thesis (unpub.), 26 p.

Water from different geologic horizons was analyzed for selenium. The geologic units are described and the results of the study are discussed.

Peterson, James A., 1957a, Marine Jurassic of northern Rocky Mountains and Williston Basin: Am. Assoc. Petroleum Geologists Bull., v. 41, no. 3, p. 399-440, illus.; reprinted, 1958, in Goodman, A. J., ed., Jurassic and Carboniferous of western Canada: Am. Assoc. Petroleum Geologists, John Andrew Allan Memorial Volume, p. 100-141, illus.

The paleotectonic setting, stratigraphy, geologic history and lithogenesis, and problems of the nomenclature of the Jurassic formations of the northern Rockies and the Williston basin are discussed. The illustrations include paleofacies maps of the formations.

Peterson, James A., 1957b, The Swift-Rierdon boundary problem in central Montana and the Williston Basin, *in* Billings Geol. Soc., Guidebook, 8th Ann. Field Conf., Crazy Mountain Basin, Sept. 6-7, 1957; p. 76-79, illus.

Evidence, historical background, and opinions on the problem are presented and suggestions regarding a correct interpretation of the boundary are discussed.

Petroleum Information, 1952, An introduction to the Williston Basin: Casper, Wyo., Petroleum Information, 173 p.

The book contains articles on the search, discovery, leasing, recovery, and marketing of oil in the Williston basin. The papers by W. T. Thom, Jr., and W. M. Laird are cited individually.

Petter, Charles K., Jr. *See also* Bell, Gordon L., and Petter, Charles K., Jr., 1956.

Petter, Charles K., Jr. *See also* Mitchell, Porter J., and Petter, Charles K., Jr., 1958.

Petter, Charles K., Jr., 1956, The late Tertiary history of the upper Little Missouri River, North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 49 p., illus. incl. geol. map (scale 1:63,360).

The area of the report includes parts of Bowman, Slope, Golden Valley, Billings, and McKenzie Counties. The structure, stratigraphy, physiography, topography, and geologic history of the area are discussed. The sequence of events which culminated in the formation of the Little Missouri River are outlined.

Pishel, Max A. *See also* Calvert, W. R., Beekly, A. L., Barnett, V. H., and Pishel, M. A., 1914.

Pishel, Max A., 1912, Lignite in the Fort Berthold Indian Reservation N. Dak., north of Missouri River: U. S. Geol. Survey Bull. 471, p. 170-186, illus.

The topography, stratigraphy, and geologic structure of the area are discussed. The physical and chemical properties, distribution, and use of lignite are presented. Measured sections of the lignite beds and a map showing the distribution of the lignite beds are included. The report area includes parts of Mountrail, McLean, and Ward Counties.

Pohly, Richard A., and Harris, Steven H., 1954, In the Williston Basin . . . Exploration problems and procedures: *World Oil*, v. 139, no. 1, p. 119-124, illus.

The various geophysical and geological tools employed in the basin are described. Their application to the exploration in the basin is discussed and evaluated.

Porter, John W. *See also* Cumming, Alastair D., Fuller, J. G. C. M., and Porter, J. W., 1959.

Porter, John W., and Fuller, J. G. C. M., 1958, Succession of lower Paleozoic rocks in the northern part of the Williston Basin, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 33-39, illus. incl. geol. map (scale 1:7,500,000).

A stratigraphic description is given for each formation and a correlation from outcrop to the subsurface sections is presented.

Porter, John W., and Fuller, J. G. C. M., 1959, Lower Paleozoic rocks of northern Williston Basin and adjacent areas: *Am. Assoc. Petroleum Geologists Bull.*, v. 43, no. 1, p. 124-189, illus. incl. geol. map (scale 1:5,000,000).

The stratigraphy and surface-subsurface correlation are discussed. Isopach maps of the formations are presented. Oil prospects of the different formations are discussed. The report area includes northern North Dakota.

Powell, John E. *See also* Paulson, Quentin E., and Powell, John E., 1957.

Powell, John E., 1956, Geology and ground-water resources of the Hankinson area Richland County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 25, 45 p., illus. incl. geol. map (scale 1:63,360).

The geologic units consisting of Lake Agassiz deposits, end moraine, till, meltwater deposits, Cretaceous shale, and Precambrian rocks are described and the occurrence of groundwater is discussed. Records and logs of the wells and test holes are included.

Powell, John E., 1959, Progress report on the geology and ground-water resources of the Westhope area Bottineau County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 27, 68 p., illus.

The glacial deposits consisting of Lake Souris deposits, till, and associated meltwater deposits, and the bedrock units consisting of the Cannonball(?), the Fox Hills "Sandstone," and the Pierre Shale, are described. The occurrence and quality of the groundwater is discussed. Records and logs of the wells and test holes are included.

Powers, William E., 1945, White River Formation of North Dakota (abs.): Geol. Soc. America Bull., v. 56, no. 12, p. 1192.

A restudy of all known areas of the White River Formation indicates that the Chalky Buttes stratigraphy is the most complete and should probably be used as a standard section.

Powers, William E., 1946, Cement rock and limestone resources of North Dakota (abs.): Geol. Soc. America Bull., v. 57, no. 12, p. 1272.

The Niobrara Formation, which crops out near the Pembina-Cavalier County line, is described as a natural cement rock. Limestone deposits are described in Stark and Hettinger Counties.

Prescott, Gordon W., and Smith, C. K., 1952, Rebound phenomena in the Ft. Union Formation [N. Dak.] and their influence on design (abs.): Geol. Soc. America Bull., v. 63, no. 12, p. 1291.

The influence of rebound in the Fort Union "Formation" due to excavation during the construction of the Garrison Dam north of Bismarck, North Dakota is discussed.

Pye, Willard D., 1952, Relationship of oil accumulation to paleogeology and structure in Manitoba, eastern North and South Dakota (abs.): Am. Assoc. Petroleum Geologists Bull., v. 36, no. 5, p. 965; reprinted, 1952: Oil and Gas Jour., v. 50, no. 44, p. 125.

The abstract contains a brief discussion of the structure of the Precambrian rocks on the east side of the Williston basin, and the structure and lithology and paleogeological maps of the sediments in the basin.

Pye, Willard D., 1953, Structural deformation in the Williston Basin (abs.): Geol. Soc. America Bull., v. 64, no. 12, p. 1552.

The structural history of the basin from Precambrian through Tertiary time is discussed.

Pye, Willard D., 1954, Unconformities, stratigraphic traps and sedimentational patterns in northern Great Plains, in Billings Geol. Soc., Guidebook, 5th Ann. Field Conf., Pryor Mts.-Northern Bighorn Basin, Montana, Sept. 9-11, 1954: p. 67-71, illus.

Sedimentational trends of the Precambrian and Paleozoic and the Mesozoic and Tertiary are shown on maps. A chart of the unconformities, facies, and age relationships across the northern Great Plains is presented. The maps and chart are discussed.

Pye, Willard D., 1955, Discovery prospects good on Williston's east flank: World Oil, v. 140, no. 4, p. 82-92, illus.

The possibility of oil accumulations in stratigraphic traps formed by combinations of stratigraphic structural conditions on the east flank of the basin is discussed.

Pye, Willard D., 1957a, Aluminum clays of North Dakota (abs.): Geol. Soc. America Bull., v. 68, no. 12, pt. 2, p. 1870-1871.

The Tertiary underclay deposits in western North Dakota are described.

Pye, Willard D., 1957b, Geological and geophysical studies, Red River Valley, Minnesota and North Dakota (abs.): *Geol. Soc. America Bull.*, v. 68, no. 12, pt. 2, p. 1871.

The results of a series of geological resistivity studies of the various types of deposits in the Lake Agassiz basin, along its margins, and well back from its edges are discussed.

Pye, Willard D., 1958a, Habitat of oil in northern Great Plains and Rocky Mountains, *in* Weeks, Lewis G., ed., *Habitat of oil—a symposium*: Tulsa, Okla., Am. Assoc. Petroleum Geologists, p. 178-224, illus. incl. geol. map (scale approx. 1:21,875,000).

The structural, stratigraphic, and sedimentational history are interpreted in an evaluation of the oil possibilities of the area, particularly of the Williston basin.

Pye, Willard D., 1958b, Northern Great Plains paleogeology and inter-stratigraphic relationships, *in* North Dakota Geological Society and Saskatchewan Geological Society, Second Williston Basin Symposium, Regina, Saskatchewan, April 23-25, 1958: p. 8-16, illus.

Stratigraphic environments which may be important in controlling the occurrence of oil and gas along the eastern side of the Williston basin are discussed. The illustrations include isopach and paleogeological maps for each system.

Pye, Willard D., 1959, Insoluble residue and porosity zones, upper Ordovician and Silurian of northeastern Williston Basin (abs.): *Geol. Soc. America Bull.*, v. 70, no. 12, pt. 2, p. 1741-1742.

The methods of study used are discussed and the results of the study are presented.

Quirke, Terence T., 1913, Geology of the Killdeer Mountains, Dunn County, North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 41 p., illus. incl. geol. map (scale 1:31,680).

The drainage, topography, stratigraphy, petrography, and origin of the Killdeer Mountains are discussed.

Quirke, Terence T., 1918, The geology of the Killdeer Mountains, North Dakota: *Jour. Geology*, v. 26, no. 3, p. 255-271, illus. incl. geol. map (scale 1:63,360).

The physiography, origin, and stratigraphy (including the Fort Union and White River Formation) of the Killdeer Mountain area are discussed.

Quirke, Terence T., 1919a, Metallic copper in a meteorite vein: *Econ. Geol.*, v. 14, p. 619-624, illus.

The minerals found in the veins of the Richardton meteorite are described and discussed. Metallic copper, previously unknown in meteorites, is one of the minerals described.

Quirke, Terence T., 1919b, The Richardton meteorite: *Science*, n. s., v. 49, no. 1256, p. 92-93.

The fall of a meteorite in the district between Mott and Richardton, North Dakota, on the night of July 21, 1918, is reported. (This is an incorrect date. See Quirke, T. T., 1919c, for correct information.)

Quirke, Terence T., 1919c, The Richardton meteorite: *Jour. Geology*, v. 27, p. 431-448, illus.

The meteorite that fell between Mott and Richardton, North Dakota, June 30, 1918, is described. An analysis of the meteorite is included. Several eyewitness accounts of the fall are presented in the discussion.

Rader, Miles T., Jr., 1952, Ordovician and Silurian carbonates of the central Williston Basin, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., September 4-7, 1952: p. 48-55, illus. incl. geol. maps (scale 1:5,000,000).

The units are described as they are encountered in the subsurface of the central part of the basin. Three isopach maps of the formations are included.

Rader, Miles T., Jr., 1953, Silurian stratigraphy of the Williston Basin (abs): Geol. Soc. America Bull., v. 64, no. 12, p. 1552.

The lithology and correlation of the Silurian beds are discussed.

Rasmussen, William C., 1945, A reconnaissance of possible well irrigation areas: N. Dak. Geol. Survey Bull. 20, 6 p., illus. incl. geol. map.

The areas studied are divided into three geological classes: outwash deposits, valley trains, and lake deposits. The Oakes area in Dickey County was recommended for further study. A map of the Pleistocene geology of the state is included.

Rasmussen, William C., 1947, Ground water in the deposits of ancient Lake Dakota, Dickey County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 4, 87 p., illus. incl. geol. map (scale approx. 1:125,000).

The hydrology, potential development of the groundwater resources, quality of water, and geologic history of the deposits of Lake Dakota are discussed. Well records and logs are included.

Raynolds, William F., 1867, Report of Brevet Colonel W. F. Raynolds, U.S.A. Corps of Engineers, on the exploration of the Yellowstone and Missouri Rivers, in 1859-1860: U. S. 40th Cong., 1st sess., Senate Ex. Doc. 77, 174 p., illus.

The general description of the country traversed includes mention of geologic features and deposits observed. The geology of the area was studied by Hayden but was not published as part of the report.

Redlinger, J. F. *See* Smith, Carneal K., and Redlinger, J. F., 1953.

Reeside, John B., Jr. *See* Cobban, William A., and Reeside, John B., Jr., 1952.

Reeside, John B., Jr. *See* Dobbin, C. E., and Reeside, J. B., Jr., 1924, 1930.

Reid, Russell *See* Lewis, Meriwether, and Clark, William, 1947-48.

Rice, Thomas D., Willard, R. E., and Weaver, J. T., 1908, Soil survey of the Williston area, North Dakota: U. S. Dept. Agr., Bur. Soils, Advance Sheets-Field Operations of the Bur. Soils, 1906, 28 p., illus. incl. soil map (scale 1:63,360); reprinted 1910: N. Dak. Agr. Coll. Survey 4th Bienn. Rept., p. 81-107, illus. soil map (scale 1:125,000).

The survey covers an area in the center of Williams County. The soil types are mapped and described including the results of mechanical analyses.

Richardson, A. C. *See* Ewing, Robert A., Adam, H. W., Miles, F. W., Bearse, A. E., and Richardson, A. C., 1950.

Riffenburg, Harry B., 1929, Quality of the waters of North Dakota, *in* Simpson, Howard E., Geology and ground-water resources of North Dakota: U. S. Geol. Survey Water-Supply Paper 598, p. 272-275.

The total dissolved solids, the mineral substances present, and the hardness of the water are discussed.

Robinove, Charles J., 1956, Geology and ground-water resources of the Hettinger area, Adams County, North Dakota: N. Dak. State Water Conserv. Comm. Ground-Water Studies no. 24, 44 p., illus.

A brief description of the area and a summary of the geologic history are presented. The geologic formations and their water-bearing properties are described. The Tongue River and Fox Hills Formations provide most of the water in the area. Records and logs of the wells and test holes are included in the report.

Robinove, Charles J., Langford, R. H., and Brookhart, J. W., 1958, Saline-water resources of North Dakota: U. S. Geol. Survey Water-Supply Paper 1428, 72 p., illus.

The aquifers yielding saline groundwater are described. The major saline-water aquifers are Cretaceous in age. The chemical analyses of saline groundwater are included. Saline surface waters in lakes and streams are discussed.

- Roe, Walter B.**, 1950, Geologic features of North Dakota lignite: *Econ. Geol.* v. 45, p. 434-440.

The physical and chemical properties of the lignite beds are described. The origin of the lignite is discussed. The geologic history of the Fort Union and "Lance" deposits is presented. The effect of glaciation on the lignite area in western North Dakota is discussed.

- Rogers, Henry D., Morton, S. G., and Johnson, Walter R.**, 1846, Of the red pumice of the Missouri: *Philadelphia Acad. Nat. Sci., Proc.*, v. 2, p. 239-240.

The red pumice sent to the Academy by Edward Harris (1846) is identified as an argillaceous sandstone, probably a lacustrine deposit of Tertiary age.

- Rominger, Joseph R.**, 1954, Relationships of plasticity and grain size of Lake Agassiz sediments: *Jour. Geology*, v. 62, no. 6, p. 537-572, illus.

The grain size distribution, plasticity, and natural water content are reported for 71 samples from Grand Forks and Fargo, North Dakota. The megascopic lithology and mineralogy are described. The results and the relationships of the properties are discussed.

- Rominger, Joseph R., and Rutledge, Philip C.**, 1952, Use of soil mechanics data in correlation and interpretation of Lake Agassiz sediments [Minn.-N. Dak.]: *Jour. Geology*, v. 60, no. 2, p. 160-180, illus.

The quantitative data on the soil mechanics properties are used in establishing five stratigraphic units within the lake deposits.

- Rommel, Wm.** See Holmes, L. C., Dunn, J. E., Hard, H. A., Anderson, A. C., Rommel, Wm., and Boucher, A. C., 1914.

- Ross, R. J., Jr.** See Fox, S. K., Jr., and Ross, R. J., Jr., 1940, 1942.

- Roth, Fritz J., and Zimmerman, James T.**, 1955, Physiography of North Dakota: *Compass*, v. 32, no. 2, p. 83-84, illus.; reprinted, 1955: *N. Dak. Geol. Survey Bull.* 28, p. 83-84, illus.

The state is divided into six major physiographic divisions: Agassiz Lake Plain, Drift Prairie, Turtle Mountains, Souris and Devils Lake Plain, Coteau du Missouri, and Missouri Plateau. A map illustrating these divisions accompanies the report.

- Roth, Kingsley W.**, 1953, Development in the Nesson Anticline area, North Dakota (abs.): *Am. Assoc. Petroleum Geologists Bull.*, v. 37, no. 11, p. 2616.

The oil discovery, development, structural data, stratigraphic data, and production information for the Nesson anticline of northwestern North Dakota are discussed.

- Roth, Kingsley W.**, 1954a, Amerada No. 1 Benhomer Risser, Croff area, McKenzie County, North Dakota, *in* *N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954*: p. 20-21, illus.

This well on the Nesson anticline is the discovery well for the Croff field and McKenzie County. It is bottomed in the Silurian and produces from the Madison.

- Roth, Kingsley W.**, 1954b, Fryburg field Billings County, North Dakota, *in* *N. Dak. Geol. Soc., Guidebook southwestern North Dakota field conference, June 25-27, 1954*: p. 22-24, illus.

The Fryburg field is located in the south-central portion of the Williston basin, Billings County. The structure, stratigraphy, development, reservoir characteristics, and production are discussed for the field.

- Rothrock, Edgar P.**, 1955, What is the Williston Basin? (abs.): *S. Dak. Acad. Sci. Proc.*, 1954, v. 33, p. 71.

The use of the term "basin" for a region of early Paleozoic sediments rather than for the structural basin is discussed.

Russell, Alice E., 1950, Pebbles in the glacial till of eastern North Dakota: Grand Forks, N. D., North Dakota, Univ., M.A. Thesis (unpub.), 47 p., illus.

The lithology, shape, and roundness of twenty-three samples of glacial till (1 cubic foot each) were analyzed. The relationships among the various factors are presented and discussed.

Russell, W. L., 1928, The origin of artesian pressure: *Econ. Geol.*, v. 23, p. 132-157; discussion, 1929: *Econ. Geol.*, v. 24, p. 542-554, and 758-771.

The stratigraphy, structure, and artesian water of the Dakota artesian basin are discussed.

Rutledge, Philip C. See Rominger, Joseph R., and Rutledge, Philip C., 1952.

Ryan, M. O., 1934, A boundless resource: *N. Dak. Engineer*, v. 11, no. 1, p. 6-7, illus.

The history of the first 50 years of lignite mining in the state is reviewed. The results of a survey of possible uses of lignite are presented.

Sand, H. H. See Wenzel, L. K., and Sand, H. H., 1942.

Sandberg, Charles A., and Hammond, Charles R., 1958, Devonian system in Williston basin and central Montana: *Am. Assoc. Petroleum Geologists Bull.*, v. 42, no. 10, p. 2293-2334, illus. incl. geol. map (scale approx. 1:5,000,000).

The Devonian stratigraphy and geologic history are discussed. Petroleum possibilities from the Devonian sediments are discussed.

Sandberg, Dorothy T., 1959, Structure contour map on top of the middle member of the Piper formation of middle Jurassic age in the Williston basin and adjacent areas in Montana, North Dakota, and South Dakota: *U. S. Geol. Survey Oil and Gas Inv. Map OM-179*, scale 1:750,000.

An east-west cross section and a sample log showing part of the Jurassic System are included on the map. A brief text includes a discussion of the stratigraphy, structure, and oil production of the Piper Formation.

Saskatchewan Geological Society See North Dakota Geological Society and Saskatchewan Geological Society, 1956, 1958.

Sayre, A. N., 1936, The relation of the drought of 1934 to ground-water supplies in the James and Sheyenne River-basins of North and South Dakota: *Am. Geophysical Union, Trans.*, 17th Ann. Meeting, Pt. II, p. 366-370.

The sources of water supplies for cities and farms and the effect of the drought on well levels were studied and the results of the study are discussed with suggestions for additional water supply.

Schellenbaum, Ralph See Wild, Robert, and Schellenbaum, Ralph, 1951.

Schmitt, George T., 1953, Regional stratigraphic analysis of middle and upper marine Jurassic in northern Rocky Mountains-Great Plains: *Am. Assoc. Petroleum Geologists Bull.*, v. 37, no. 2, p. 355-393, illus. incl. geol. maps (scale approx. 1:12,500,000).

Western North Dakota is included in the study. The formations are described. Tectonic and environmental conditions are reconstructed from isopach-lithofacies and paleogeologic maps. Clastic ratios and sand-shale ratios are used to define the lithologic variation.

Schmitz, Emmett R., 1955, Stream piracy and glacial diversion of Little Missouri River, North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 39 p., illus. incl. geol. map (scale 1:63,360); condensed, 1957: *Compass*, v. 34, p. 310-326, illus.

The structure, stratigraphy, physiography, and topography of the area are described. The geologic history of the Little Missouri River is discussed. The geologic map includes parts of McKenzie and Dunn Counties and the Fort Berthold Indian Reservation.

Schmitz, Emmett R., and Kresl, Ronald J., 1955, Postglacial warping in North Dakota: *Compass*, v. 32, no. 2, p. 92-97, illus.; reprinted, 1955: N. Dak. Geol. Survey Bull. 28, p. 92-97, illus.

The evidence of tilting recorded by Upham on the Herman beach of Lake Agassiz is correlated with the evidence calculated by Leonard along the Little Missouri River.

Schopf, James M. *See also* Zeller, Howard D., and Schopf, James M., 1959.

Schopf, James M., Gray, R. J., and Felix, C. J., 1955, Uranium in carbonaceous rocks, lignite investigations—coal petrology [North and South Dakota], in *Geologic investigations of radioactive deposits—Semiannual progress report—December 1, 1954 to May 31, 1955*: U. S. Geol. Survey Rept. TEI-540, p. 155, 159-161, illus. (Report prepared for U. S. Atomic Energy Commission.)

The results of petrologic investigations of Dakota uraniferous lignite are presented.

Schuchert, Charles, 1921, Are the Lance and Fort Union formations of Mesozoic time?: *Science*, n.s., v. 53, no. 1359, p. 45-47.

The U. S. Geol. Survey Professional Paper by T. W. Stanton, (1921) "The Fauna of the Cannonball Marine Member of the Lance Formation," is reviewed. The Cannonball and Fox Hills faunas are discussed.

Schuchert, Charles, 1922, Lance and Union formation are Mesozoic in age: *Pan-Am. Geol.*, v. 37, p. 65-66.

The stratigraphic position of the two formations is discussed.

Schultz, Edward H., 1958, The Ordovician-Silurian contact in the Williston Basin, in *Billings Geol. Soc., Guidebook, 9th Ann. Field Conf., Beartooth Uplift and Sunlight Basin, August 14-16, 1958*: p. 44-48, illus.

Isopach maps based on mechanical logs are used to show the various configurations that may be considered characteristic of Silurian and Ordovician sedimentation in the basin. The upper Stony Mountain Formation is postulated as the top of the Ordovician.

Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942, *Stratigraphy of North Dakota*: Am. Assoc. Petroleum Geologists Bull., v. 26, no. 8, p. 1414-1423.

This is a discussion of the article by V. H. Kline (1942) entitled "Stratigraphy of North Dakota." It is an attempt to clarify certain geologic interpretations involved in Kline's article. Additional information and data are presented.

Sherman, G. D., and Thiel, G. A., 1939, Dolomitization in glacio-lacustrine silts of Lake Agassiz: *Geol. Soc. America Bull.*, v. 50, p. 1535-1551, illus.

The distribution of dolomitic silts, data on the distribution of carbonates in the silts, the petrography of the silts, the mode of occurrence of the dolomite, and the origin of the dolomite are discussed.

Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947, *Construction materials and nonmetallic mineral resources of North Dakota*: U. S. Geol. Survey Missouri Basin Studies no. 14, map, scale 1:500,000.

Each resource indicated on the map is described in the brief text. The resources include: bentonite, glacial boulders, clay, "scoria," limestone, cement rock, marl, mineral pigment, quartzite, sandstone, sodium sulfate, and volcanic ash.

Simpson, Howard E. *See also* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., 1930.

Simpson, Howard E., 1912, The physiography of the Devils-Stump Lake region, North Dakota: N. Dak. Geol. Survey 6th Bienn. Rept., p. 101-157, illus.

The physical features in the vicinity of Devils and Stump Lakes are described and their origin and geographic relations are discussed. Devils Lake is described, including an analysis of the water in 1907. The bedrock of the region is discussed. The history of Devils Lake and Glacial Lake Minnewaukan is discussed.

Simpson, Howard E., 1916, The islands of Devils Lake, North Dakota, and their significance (abs.): Geog. Rev., v. 1, p. 135.

The islands are described as ice-built boulder piles in a rapidly disappearing glacial lake.

Simpson, Howard E., 1923, Artesian water conditions in North Dakota: N. Dak. Geol. Survey Bull. 2 (Artesian Water Conserv. Fund Artesian Water Paper 1), 8 p.; revised, 1935.

The definition and conditions of artesian flow are discussed. The artesian water law enacted by the 17th Legislative Assembly of North Dakota is included. The 1st Biennial Report of the Water Geologist of the state is also included.

Simpson, Howard E., 1924, Methods of reducing the flow of artesian wells: N. Dak. Geol. Survey Bull. 3 (Artesian Water Conserv. Fund Artesian Water Paper 2), 7 p.; revised, 1932.

The methods in use in the Dakota artesian area of North Dakota are reviewed.

Simpson, Howard E., 1925, The principles of conservation as applied to artesian water: N. Dak., Univ., Quart. Jour., v. 15, no. 4, p. 287-297, illus.; reprinted, 1926: N. Dak. Geol. Survey Bull. 5 (Artesian Water Conserv. Fund Artesian Water Paper 3), 23 p., illus.

The purpose and principles of conservation, the conservation of water, artesian water conditions, and the Dakota artesian system are discussed. The Artesian Water Conservation Law of 1921 and 1925 and the 2nd Biennial Report of the State Water Geologist are included.

Simpson, Howard E., 1926, The Badlands of the Little Missouri: N. Dak., Univ., Quart. Jour., v. 16, p. 148.

A brief and artistic description of the Badlands is presented.

Simpson, Howard E., 1927, The water supply of Harvey, N. Dak., A method of water prospecting: N. Dak. Engineer, v. 3, no. 3; reprinted, 1927: N. Dak. Geol. Survey Bull. 6 (Artesian Water Conserv. Fund Artesian Water Paper 4), 17 p., illus.

The method of study, the results of the study, and the recommendations of the geologist are discussed. The 3rd Biennial Report of the State Water Geologist is included.

Simpson, Howard E., 1929, Geology and groundwater resources of North Dakota: U. S. Geol. Survey Water-Supply Paper 598, 312 p., illus.

The physiography and climate of the state are discussed. The geology and water content of the water-bearing formations are described. The artesian systems in North Dakota are described.

Simpson, Howard E., 1930, The ground water resources of North Dakota, in Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., Geology and natural resources of North Dakota: N. Dak. Univ. Departmental Bull., v. 14, no. 1 (N. Dak. Univ., Div. Mines and Mining Expts. Bull. no. 11) p. 25-39, illus.

The general geology and groundwater conditions of the state are discussed.

Simpson, Howard E., 1932, The ground waters of North Dakota: N. Dak. Geol. Survey Bull. 7 (Artesian Water Conserv. Fund Artesian Water Paper 5), 26 p., illus.

The classification of groundwater and the geologic conditions in the state are discussed. The groundwater provinces are described. The 4th Biennial Report of the State Water Geologist is included.

Simpson, Howard E., 1935, The artesian waters of North Dakota: N. Dak. Geol. Survey Bull. 8 (Artesian Water Conserv. Fund Artesian Water Paper 6), 47 p., illus.

The types of artesian systems in North Dakota, the artesian areas, and the artesian system of the Dakota "Sandstone" in North Dakota are discussed. The 5th and 6th Biennial Reports of the State Water Geologist are included.

Simpson, Howard E., 1937, Change in ground water levels in North Dakota: N. Dak. Geol. Survey Bull. 10, 23 p., illus.

The methods of inquiry are discussed. The results of the study are summarized in a table and presented on a map showing changes in water levels for a period of 18 years.

Simpson, Howard E., Jr., 1942, The Pleistocene geology of Garrison Quadrangle, North Dakota: Urbana, Ill., Illinois, Univ., M.S. Thesis (unpub.), 40 p., illus. incl. geol. map (scale 1:62,500).

The Eocene Fort Union "Formation" and the Pleistocene deposits are mapped and described. The Pleistocene history of the area is outlined. Economic geology of the area is discussed. The field and laboratory methods are described and the results and conclusions are discussed.

Skene, E. See Lavine, Irvin, Feinstein, H., and Skene, E., 1935.

Skinner, Morris F., 1951, The Oligocene of western North Dakota, *in* Soc. Vertebrate Paleontologists, Guidebook, 5th Field Conf., Aug.-Sept. 1951: p. 51-58, illus.

A composite stratigraphic section of Oligocene deposits in Stark County, North Dakota, is presented. The North Dakota deposits are correlated with the deposits in South Dakota.

Sloss, Laurence L. See also Perry, E. S., and Sloss, L. L., 1943.

Sloss, Laurence L. See also Seager, O. A., Blackstone, D. L., Jr., Cobban, W. A., Downs, G. R., Laird, W. M., and Sloss, L. L., 1942.

Sloss, Laurence L., 1952, Introduction to the Mississippian of the Williston Basin, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., September 4-7, 1952: p. 65-69, illus.

The formations are described as they are encountered in the subsurface. An attempt is made to apply central Montana nomenclature to the Mississippian of the basin.

Sloss, Laurence L., 1956, Geologic comparison of Williston and other productive basins, *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: Bismarck, N. Dak., Conrad Pub. Co., p. 6-13, illus.

The history of a major segment of the continent in terms of the position, sources of sediment, and type of the major sedimentary basins, is reviewed and related to the position of the Williston basin.

Smeby, J. G., 1926, Map showing topographic features of North Dakota, *in* Leonard, A. G., Gauger, A. W., Budge, W. E., and Dove, L. P., Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 11, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 9), p. 24-25; reprinted, 1930, *in* Gauger, A. W., Leonard, A. G., Chandler, E. F., Simpson, H. E., and Budge, W. E., Geology and natural resources of North Dakota: N. Dak., Univ., Departmental Bull., v. 14, no. 1 (N. Dak., Univ., Div. Mines and Mining Expts. Bull. no. 11), p. 32-33, scale 1:2,500,000.

The physiographic divisions of the state are illustrated on the map.

Smies, E. H. See Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Smith, A. Leonard, 1950, Results of testing proposed earth embankment materials for Jamestown Dam—Missouri-Souris Division—Missouri River Basin Project: U. S. Bur. Reclamation, Research and Geol. Div., Earth Materials Lab. Rept. EM-253, 38 p., illus.

The results of the laboratory tests on the samples are discussed. Information on three gravel deposits is included in the study.

Smith, Carl D. *See also* Leonard, Arthur G., and Smith, Carl D., 1909.

Smith, Carl D., 1910a, The Fort Berthold Indian Reservation lignite field, North Dakota: U. S. Geol. Survey Bull. 381, p. 30-39, illus. incl. geol. map (scale 1:250,000).

The stratigraphy and structure of the field are discussed. The lignite deposits are described.

Smith, Carl D., 1910b, The Washburn lignite field, North Dakota: U. S. Geol. Survey Bull. 381, p. 19-29, illus.

The geology, geography, and structure of the area are discussed. The lignite deposits are described, including the physical and chemical characteristics of the lignite.

Smith, Carneal K. *See also* Golder, Charles R., and Smith, C. K., 1948.

Smith, Carneal K. *See also* Prescott, Gordon W., and Smith, C. K., 1952.

Smith, Carneal K., and Redlinger, J. F., 1953, Soil properties of Fort Union clay shale: Internat. Conf. Soil Mechanics and Found. Eng., 3d, Zurich, Switzerland 1953, Proc., v. 1, p. 62-66, illus.

Samples of the Fort Union Clay Shale from the site of the Garrison Dam in North Dakota are discussed. The paper includes the geological description, soil classification, results of laboratory tests, and the field data.

Smith, Deane K., Jr. *See* Gruner, John W., and Smith, Deane K., Jr., 1955.

Smith, Deane K., Jr. *See* Gruner, John W., Smith, Deane K., Jr., and Knox, James A., 1956.

Smith, George W. *See also* Hadley, Herbert D., and Smith, George W., 1952, 1953.

Smith, George W., 1951a, Some problems of Williston Basin surface geology, *in* Billings Geol. Soc., Guidebook, 2nd Ann. Field Conf., September 7-9, 1951: p. 68-69.

The problem of a suitable marker bed for surface mapping is discussed.

Smith, George W., 1951b, Williston Basin oil possibilities: *World Oil*, v. 133, no. 1, p. 78-80, illus.

The early development, production, and exploration in the basin are discussed.

Smith, George W., and Hadley, Herbert D., 1954, Developments in Montana, North Dakota, and South Dakota in 1953: *Am. Assoc. Petroleum Geologists Bull.*, v. 38, no. 6, p. 1011-1019, illus.

The report is a resume of the developments in petroleum exploration and production. Significant new production is reported for the deeper part of the Williston basin.

Smith, George W., Summers, George E., Jr., Wallington, Dale, and Lee, Jean L., 1958, Mississippian oil reservoirs in Williston Basin, *in* Weeks, Lewis G., ed., *Habitat of oil—a symposium*: Tulsa, Okla., *Am. Assoc. Petroleum Geologists*, p. 149-177, illus. incl. geol. sketch maps.

The relationship between the character and distribution of the Madison Formation and Mississippian oil occurrences in the Williston basin is discussed.

Smith, James H. *See* Lemke, Richard W., Jensen, Fred S., and Smith, James H., 1951.

Smith, Maurice H. *See also* Lewis, Paul J., and Smith, Maurice H., 1957.

Smith, Maurice H., 1956, Types of oil fields in Bottineau County, North Dakota, *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: Bismarck, N. Dak., Conrad Pub. Co., p. 101-110, illus.

The North Westhope field and the Northeast Landa field are presented as examples of the two known types of oil fields in the county. The history, stratigraphy, structure, and production are discussed for each field.

Snyder, N. H. *See* Cooper, H. M., Snyder, N. H., Abernethy, R. F., and Tarpley, E. C., 1948.

Sohn, I. G. *See* Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947.

Sonnenberg, Frank P. *See* Billings Geological Society, 1952.

Spence, Bartholomew J., 1912, Some physical properties of North Dakota clays: N. Dak. Univ., Quart. Jour., v. 2, p. 141-148.

The results of an investigation of the thermal conductivity of the clay deposits are presented.

Splies, Robert G., and Hampton, David G., 1959, Chemical analysis of clay for alumina content, *in* Hansen, Miller, 1959, Clays of North Dakota as a potential source of alumina: N. Dak. Geol. Survey Rept. Inv. no. 33, p. 8-10.

A shortcut procedure of alumina analysis was developed from the classical methods for use in the laboratory analysis of the clay samples in the report.

Sprunk, G. C. *See* Fisher, C. H., Sprunk, G. C., Eisner, A., Fein, M. L., and Storch, H. H., 1940.

Stainbrook, Merrill A., 1923, Apparent fossil fruits from the Fort Union beds of North Dakota: Iowa Acad. Sci., Proc., v. 30, p. 455-458, illus.

Small spheroidal bodies collected from the Fort Union beds are described as possible fossilized fruits of an Eocene plant.

Stanton, Timothy W., 1909, The age and stratigraphic relations of the "Ceratops Beds" of Wyoming and Montana: Washington Acad. Sci. Proc. v. 11, no. 3., p. 239-293.

Part of this report is a discussion of the age of the Fox Hills, "Lance," and Fort Union beds along the Missouri River in North Dakota.

Stanton, Timothy W., 1910, Fox Hills sandstone and Lance formation ("Ceratops Beds") in South Dakota, North Dakota and eastern Wyoming: Am. Jour. Sci., 4th ser., v. 30, p. 172-188.

The stratigraphy and lithology of the Fox Hills Formation are described. Several measured sections and lists of fossils are included in the discussion. The sedimentary history is discussed.

Stanton, Timothy W., 1914, Boundary between Cretaceous and Tertiary in North America as indicated by stratigraphy and invertebrate faunas: Geol. Soc. America Bull., v. 25, p. 341-354.

The "Lance Formation" in North Dakota and its relations with the Fox Hills and its Cretaceous fauna are discussed.

Stanton, Timothy W., 1917, A Cretaceous volcanic ash bed on the Great Plains in North Dakota: Washington Acad. Sci. Jour., v. 7, no. 2, p. 80-81.

An ash bed located near Linton, North Dakota, Emmons County, is described. It lies in the Fox Hills Formation and has a thickness of 26 feet at one exposure.

Stanton, Timothy W., 1921, The fauna of the Cannonball marine member of the Lance formation: U. S. Geol. Survey Prof. Paper 128, p. 1-60, illus. incl. geol. map (scale 1:1,500,000).

The stratigraphic, faunal, and paleogeographic relations are discussed. The species are described and illustrated.

Stanton, Timothy W., 1922, Affinities of the Cannonball fauna: *Pan-Am. Geol.*, v. 37, p. 64-65.

The Cannonball fauna includes 2 species of foraminifera, 6 of corals, 60 mollusks, and 2 sharks.

Stebbins, M. E. *See* Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917.

Stebbins, M. E. *See* Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Stebbins, M. E. *See* Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, Melvin, and Anderson, A. C., 1917.

Stevens, R. P. *See* Kocher, A. E., and Stevens, R. P., 1908.

Stewart, W. T. *See* Zechmeister, L., and Stewart, W. T., 1941.

Stocker, George R., 1956, Deadwood and Winnipeg correlations in the Williston Basin, *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: Bismarck, N. Dak., Conrad Pub. Co., p. 112-114, illus.

The stratigraphy of the Winnipeg "Formation" in the subsurface of North Dakota, and the stratigraphy of the Deadwood Formation in the Black Hills are presented and correlation between the two is attempted. The oil potential of the unit is discussed.

Storch, H. H. *See* Eisner, A., Sprunk, G. C., Clarke, L., Fein, M. L., Fisher, C. H., and Storch, H. H., 1940.

Storey, Taras P., 1958, Jurassic of the Williston Basin and adjacent areas: *Alberta Soc. Petroleum Geologists, Jour.*, v. 6, no. 4, p. 90-104, illus.

The stratigraphic correlations, nomenclature, and relationships of the Jurassic are discussed.

Strahorn, A. T. *See* Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, Melvin, and Anderson, A. C., 1917.

Summers, George E., Jr. *See* Smith, George W., Summers, George E., Jr., Wallington, Dale, and Lee, Jean L., 1958.

Sveen, Lloyd W., 1953, How they're whipping Williston's winter: *World Oil*, v. 136, no. 2, p. 120-122, illus.

The problems of blizzards, extreme cold, and frozen ground associated with drilling in the winter in the Williston basin are discussed. Examples of solutions to these problems are presented.

Tabor, G. F., Jr., 1952a, Laboratory test on a sample representing bentonitic seams in the Jamestown Spillway Foundation--Jamestown Unit--Missouri River Basin Project--North Dakota: U. S. Bur. Reclamation, Eng. Lab. Br., Lab. Rept. no. EM-291, 5 p.

The results of expansion tests on a sample of bentonite in the foundation of the spillway of the proposed Jamestown Dam are discussed.

Tabor, G. F., Jr., 1952b, Laboratory tests on embankment materials from Area B and E-Jamestown Dam site--Missouri-Souris Division--Missouri River Basin Project, North Dakota: U. S. Bur. Reclamation, Eng. Lab. Br., Earth Lab. Rept. no. EM-315, 29 p., illus.

The results of laboratory tests on samples of embankment materials proposed for use in the pervious and impervious sections of the dam are discussed.

Tallard, Charles A., 1954, Oil frontiers in North Dakota (abs.): Oil and Gas Jour., v. 52, no. 50, p. 208, illus.

The surface geology and subsurface structures are discussed.

Tappan, Helen N. See Loeblich, Alfred R., Jr., and Tappan, Helen N., 1950.

Tarpley, E. C. See Cooper, H. M., Abernethy, R. F., and Tarpley, E. C., 1948.

Tarpley, E. C. See Cooper, H. M., Snyder, N. H., Abernethy, R. F., and Tarpley, E. C., 1948.

Tarr, Ralph S., 1900, The Bad Lands of North Dakota: Sci. American Supp., v. 49, no. 1254, p. 20101-20102.

The geologic history of the badlands is presented. The origin of "scoria" is discussed. A description of the badlands scenery is presented.

Taylor, Frank B., 1913, The glacial and postglacial lakes of the Great Lakes region, in Smithsonian Rept. for 1912: Smithsonian Inst. Pub. 2201, p. 291-327, illus.

Glacial Lake Agassiz is discussed in relation to the other glacial and postglacial lakes of the Great Lakes basins.

Tetrick, Paul R., 1949, Glacial geology of the Oberon Quadrangle: N. Dak. Geol. Survey Bull. 23, 35 p., illus. incl. geol. map (scale 1:62,500).

The glacial features of this area in Eddy and Benson Counties include the North Viking moraine, the Heimdal moraine, ground moraine, loess, outwash, and the Sheyenne River and terraces. The gravel and sand deposits and groundwater resources of the quadrangle are discussed.

Thames, Clement B., Jr., 1959, Facies relationships in the Mississippian of the Williston Basin and their effects upon fluid migration, in Am. Assoc. Petroleum Geologists, Rocky Mtn. Sec., Geological Record, Feb. 1959: p. 83-86, illus.

The sedimentation and fluid migration in the basin are discussed. An interpretation of depositional environments is presented.

Thom, William T., Jr., 1917, Cretaceous-Eocene boundary problems in Montana and the Dakotas: Baltimore, Md., Johns Hopkins Univ., Ph.D. Dissert. (unpub.), [189 p.], illus.

The Fox Hills Sandstone, "Lance Formation," and Fort Union "Formation" are described. Proposed formation correlations are discussed. The diastrophic basis and the biologic basis for the division of the Cretaceous and Eocene are discussed.

Thom, William T., Jr., 1952a, How the Basin got its name: Oil and Gas Jour., v. 51, no. 10, p. 97.

The history of the discovery and naming of the Williston basin are discussed.

Thom, William T., Jr., 1952b, The importance of recent oil discoveries in the Williston Basin, in Petroleum Information, An introduction to the Williston Basin: Casper, Wyo., Petroleum Information, p. 4-8.

This article is a letter from W. T. Thom, Jr. giving a complete history of the naming of the basin, his appraisal of the basin, and his philosophy as to the nature of the development which should take place in the basin.

Thom, William T., Jr., and Dobbin, C. E., 1924a, Correlation of the Lebo member of the Fort Union with Cannonball member of the Lance (abs.): Washington Acad. Sci., v. 14, p. 165.

The faunal, floral, and lithologic evidence is cited as indicating the local continuity of sedimentation from Fox Hills into the Wasatch (Golden Valley?). The Cretaceous-Eocene contact is provisionally placed at the top of the Tongue River "Member" of the Fort Union.

Thom, William T., Jr., and Dobbin, C. E., 1924b, The stratigraphy of Cretaceous-Eocene transition beds in eastern Montana and the Dakotas: Geol. Soc. America Bull., v. 35, p. 481-506, illus.; 1924, (abs.): Geol. Soc. America Bull., v. 35, p. 98.

The stratigraphy and the interpretation of the depositional history of the Cretaceous and Eocene beds are discussed. The relation of the northern Plains and the Denver Basin sections is discussed.

Thomas, G. E., 1954, The Mississippian of the northeastern Williston Basin: Canadian Mining Metall. Bull., v. 47, no. 503, p. 136-142, illus.; reissued, 1954: Canadian Inst. Mining Metall. Trans., v. 57, p. 68-74, illus.

The stratigraphy and oil and gas production of the Mississippian formations in the area of southeastern Saskatchewan, southwest Manitoba, and adjacent parts of North Dakota are discussed. The illustrations include isopach and lithofacies maps.

Thomas, Melvin See Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917.

Thomas, Melvin See Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Thomas, Melvin See Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, Melvin, and Anderson, A. C., 1917.

Thorpe, Malcolm R., 1924, White River (Oligocene) Eporeodons: Am. Jour. Sci., ser. 5, v. 7, p. 219-226.

The holotype of one of the species described [*Eporeodon dickinsonensis* (Douglass) 1907] was collected near Dickinson, North Dakota.

Thorsteinsson, Thorsteinn, 1949, Preliminary report on the geology of Colgrove Butte, Hettinger County, North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 31 p., illus.

The stratigraphy of the Fort Union Group and the White River Formation is described. The results of a study of the limestone beds in the White River Formation to determine their usefulness for cement manufacture are presented. Well logs and sections are included in the appendix.

Tisdale, Ernest E., 1941, The geology of the Heart Butte Quadrangle: N. Dak. Geol. Survey Bull. 13, 32 p., illus. incl. geol. map (scale 1:62,500).

The quadrangle is located in parts of Grant and Morton Counties. The stratigraphy of the quadrangle consisting of the Cannonball "Member" of the "Lance Formation" and the Fort Union "Formation," is described. The results of sedimentation studies of the Fort Union "Formation" are discussed.

Todd, James E., 1885, The Missouri Coteau and its moraines: Am. Assoc. Adv. Sci. Proc. v. 33, p. 381-393, illus. map.

The results of a survey of the Coteau south of 47° N. lat. are expressed including discussions of the structure of the Coteau, the two moraines (the outer and the inner) of the Coteau, the portion of the Coteau outside the moraines, and the drainage of the Coteau.

Todd, James E., 1890, The lineage of Lake Agassiz (abs.): Iowa Acad. Sci., Proc. for 1887-89, p. 57-58.

The history of Lake Agassiz is traced through six stages back to Eocene time.

Todd, James E., 1896, The moraines of the Missouri Coteau and their attendant deposits: U. S. Geol. Survey Bull. 144, 71 p., illus. incl. glacial map (scale approx. 1:2,191,800).

The moraines located in the area between the Missouri and James Rivers, and between Jamestown, N. Dak., and Huron, S. Dak. are described. Lake Dakota deposits and other glacial features in the area are discussed. A summary of wells in the area is included.

Todd, James E., 1914, The Pleistocene history of the Missouri River: Science, n. s., v. 39, no. 995, p. 263-274, illus.

The positions of the river during the stages of the Pleistocene are plotted on the map. The action of the river during each stage is discussed.

Todd, James E., 1920, Certain diverse interpretations of Pleistocene in the Dakotas (abs.): Geol. Soc. America Bull., v. 31, p. 134-135.

A. G. Leonard's interpretation of the history of the Missouri River is presented and his conclusions are compared with the conclusions of the author.

Todd, James E., 1923a, Glacial diversion of the Missouri River: Pan-Am. Geol., v. 39, no. 3, p. 169-184.

The history of the Missouri River during glacial times is reviewed.

Todd, James E., 1923b, Is the channel of the Missouri River through North Dakota of Tertiary origin?: Geol. Soc. America Bull., v. 34, p. 469-494, illus.

A. G. Leonard's arguments for the Tertiary origin of the channel are presented and refuted. Evidence is presented placing the origin of the channel during the Wisconsin Stage of the Pleistocene.

Townsend, Roland C., 1950, Deformation of Fort Union Formation near Lignite, North Dakota: Am. Assoc. Petroleum Geologists Bull., v. 34, no. 7, p. 1552-1564, illus.

The topography and general geology of the area in Burke County are discussed. The structurally deformed beds are described and the cause of the folding is discussed. The relation between the structures and the Altamont (?) Moraine is discussed.

Townsend, Roland C., 1954a, Geology of the Crosby Quadrangle, North Dakota: U. S. Geol. Survey Geologic Quadrangle Map GQ-46, scale 1:62,500, with text.

The engineering geology, physiography, geologic history, and groundwater resources of the quadrangle located in Divide County are discussed. The geologic map units are described.

Townsend, Roland C., 1954b, Geology of the Noonan Quadrangle, North Dakota: U. S. Geol. Survey Geologic Quadrangle Map GQ-44, scale 1:62,500, with text.

The engineering geology, physiography, geologic history, and groundwater resources of this area in Divide County are discussed. The geologic map units are described.

Townsend, Roland C., 1954c, Geology of the Portal Quadrangle, North Dakota: U. S. Geol. Survey Geologic Quadrangle Map GQ-47, scale 1:62,500, with text.

The engineering geology, physiography, geologic history, structure, and groundwater resources of this quadrangle in Burke County are discussed. The geologic map units are described.

Townsend, Roland C., and Jenke, Arthur L., 1951, The problem of the origin of the Max moraine of North Dakota and Canada: Am. Jour. Sci., v. 249, p. 842-858, illus. incl. geol. sketch map (scale approx. 1:441,800).

The moraine and surrounding area are described. Four stages are proposed for the history of the area.

Towse, Donald F. See also Laird, Wilson M., and Towse, D. F., 1953.

Towse, Donald F., 1951, Geology and oil and gas development and possibilities of the Williston Basin: Petroleum Engineer, v. 23, no. 12, p. A49-A66, illus.

The development of oil production in the state and the geology and stratigraphy of North Dakota and its relation to possible future development and oil possibilities are discussed.

Towse, Donald F., 1952a, Preliminary report on sedimentational history of North Dakota (abs.): Oil and Gas Jour., v. 50, no. 44, p. 125; Am. Assoc. Petroleum Geologists Bull., v. 36, no. 5, p. 964-965.

Some preliminary interpretations of a sedimentational analysis of the subsurface stratigraphy of North Dakota are presented.

Towse, Donald F., 1952b, Subsurface geology of south-central North Dakota: N. Dak. Acad. Sci., Proc., v. 6, p. 26-34, illus.; reprinted in part, 1952: N. Dak. Geol. Survey Bull. 27, 23 p., illus.

The oil possibilities and subsurface stratigraphy of the state are reviewed on the basis of new well records. A correlation between the new wells and existing wells is presented. A sample well log is included in N. Dak. Geol. Survey Bulletin 27.

Towse, Donald F., 1953, Stratigraphic sections of the Devonian System in western North Dakota and adjacent areas: N. Dak. Geol. Survey Rept. Inv. no. 12, 1 sheet, illus.

A north-south cross section of the subsurface Devonian in western North Dakota is presented. The nomenclature is discussed and the lithologic units are described.

Towse, Donald F., 1954a, Jurassic System in Williston Basin: Am. Assoc. Petroleum Geologists Bull., v. 38, no. 4, p. 454-462, illus.

The nomenclature, lithology, and correlations are discussed for each formation of the Jurassic System in the basin. Sample well logs are presented.

Towse, Donald F., 1954b, Petrology of the Beaver Lodge Madison Reservoir (abs.): N. Dak. Acad. Sci., Proc., v. 8, p. 44.

A brief summary of the results of a study of the Mississippian Madison Formation in the Beaver Lodge field is presented.

Towse, Donald F., 1954c, Williston exploration and geology: Petroleum Eng., v. 26, no. 12, p. B39-B46, illus.

The problems of exploration, the stratigraphy, and the prospects of the east side of the Williston basin are discussed.

Towse, Donald F., 1957a, North Dakota uranium summary: Williston Basin Oil Rev., v. 6, no. 3, p. 7-9, 27-29, illus. incl. geol. map (scale approx. 1:1,500,000).

The history of the exploration and development of uranium in the state is reviewed. The geology of the deposits is discussed.

Towse, Donald F., 1957b, Petrology of Beaver Lodge Madison limestone reservoir, North Dakota: Am. Assoc. Petroleum Geologists Bull., v. 41, no. 11, p. 2493-2507, illus.

The results of a study to determine the lithologic character and distribution of the porous zones of the Madison Limestone reservoir rock are presented.

Towse, Donald F., 1957c, Uranium deposits in western North Dakota and eastern Montana: Econ. Geol., v. 52, no. 8, p. 904-913, illus. incl. geol. map (scale approx. 1:1,500,000).

The history of the development and exploration in the state is reviewed. The geology of the uranium deposits is described. Exploration methods and production in the state are discussed.

Traverse, Alfred F., Jr., 1954, A method for the petrographic analysis of commercially delivered lignite: Econ. Geol., v. 49, no. 1, p. 92-100, illus.

The results of a petrographic study of a column sample of lignite and of a crushed commercially delivered lignite sample from Dakota Collieries mine, Zap, Mercer County are presented.

Traverse, Alfred F., Jr., 1955, Behavior of petrographic components of North Dakota lignite in preparation, low-temperature carbonization and steam-drying (abs.): Econ. Geol., v. 50, no. 1, p. 102.

Samples of Fort Union Lignite were used for the study.

Truesdell, P. E., and Hilton, G. S., 1947, Reconnaissance map showing locations of possible sources of riprap in western North Dakota and northwestern South Dakota: U. S. Geol. Survey Missouri Basin Studies no. 20, map, scale 1:500,000.

Quartzite, sandstone, limestone, and deposits of erratics are located on the map. The properties, size, and stratigraphy of the deposits are noted.

Tullis, Edward L., 1952, Igneous and metamorphic rocks of the Black Hills and the Williston Basin, *in* Billings Geol. Soc., Guidebook, 3d Ann. Field Conf., Black Hills-Williston Basin, September 4-7, 1952: p. 38-41, illus.

The records or samples of most of the holes drilled to the Precambrian in the basin were studied. The rock type described was plotted on a map of the basin.

Tychsen, Paul C., 1950, Geology and groundwater hydrology of the Heart River Irrigation Project and the Dickinson area, North Dakota: U. S. Geol. Survey Circ. 34, 59 p., illus. incl. geol. map (scale 1:188,360).

The area of the report includes parts of Stark, Morton, and Grant Counties. The geologic formations, their water-bearing properties, and the groundwater conditions are discussed. A table of well records for the counties is included.

Tyrrell, Joseph B., 1891, Pleistocene of the Winnipeg basin: *Am. Geol.*, v. 8, p. 19-28.

The Pleistocene lacustrine deposits in the Winnipeg area of Manitoba are described. Mention is made of the total area and duration of Lake Agassiz.

Tyrrell, Joseph B., 1896, The genesis of Lake Agassiz: *Jour. Geology*, v. 4, p. 811-815.

The history of Lake Agassiz is outlined.

Ulman, Conrad W., 1935, North Dakota bentonite: *N. Dak. Engineer*, v. 11, no. 2, p. 9, 12.

The origin, composition, occurrences, reserves, and uses of bentonite are discussed.

Underhill, F. S., 1890, Report of F. S. Underhill, Division Field Agent for North Dakota: U. S. 51st Cong., 1st sess., Senate Ex. Doc. 222, p. 105-109, illus.

A summary of the reports of artesian wells in North Dakota is presented.

United States Atomic Energy Commission, Division of Raw Materials, 1956, Location of uranium deposits in southwestern North Dakota and the Cave Hills and Slim Buttes areas, Harding County, South Dakota: U. S. Atomic Energy Comm. Tech. Inf. Service Rept. RME-1076, 12 p., illus.

The report consists of three index maps and accompanying lists which give the location of uranium deposits containing more than 0.10 percent U_3O_8 .

United States Bureau of Mines, 1948, Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, 106 p., illus.

The report contains articles by several authors which are cited individually.

United States Bureau of Mines, 1954, Occurrence and properties, *sec. 3 of Pt. 1, of* Technology of lignite coals: U. S. Bur. Mines Inf. Circ. 7691, p. 33-76, illus.

The geologic features, distribution, reserves, composition, petrography, and paleobotany of the Fort Union lignite are discussed.

United States Geological Survey, 1922a, Ancient forest in North Dakota: *Jour. Franklin Inst.*, v. 193, p. 403.

The abundance of fossil plants in the Fort Union "Formation" in North Dakota is discussed.

United States Geological Survey, 1922b, Geological Survey examines Cedar Creek anticline: *Internat. Petroleum Reporter*, v. 1, no. 2, p. 24.

The geology and the oil and gas prospects in the Cedar Creek anticline and vicinity in Montana, North and South Dakota are discussed.

United States Geological Survey, 1922c, Montana and Dakotas have recently geologized: Oil and Gas Jour., v. 20, no. 34, p. 78.

The oil and gas prospects in the Cedar Creek anticline and vicinity in Montana, North and South Dakota are discussed.

Upham, Warren, 1880, Preliminary report on the geology of central and western Minnesota: Minn., Geol. and Nat. History Survey 8th Ann. Rept., p. 70-125.

The report includes a description of the lacustrine basin of the Red River Valley. The name "Lake Agassiz" is proposed for this basin.

Upham, Warren, 1882, Lake Agassiz: a chapter in glacial geology: Minn. Acad. Nat. Sci., Bull., v. 2, p. 290-314; reprinted, 1884: Minn., Geol. and Nat. History Survey, 11th Ann. Rept., p. 137-153.

The formation of Lake Agassiz, the beaches, the Red River Valley, the outlets of Lake Agassiz, the northern barrier of the lake, and the area and depth of the lake are described and discussed.

Upham, Warren, 1887, The upper beaches and deltas of the Glacial Lake Agassiz: U. S. Geol. Survey Bull. 39, 84 p., illus.

The upper or Herman beaches and deltas in Minnesota and the Dakotas are described from Lake Traverse to the international boundary. The history of study of the area is reviewed.

Upham, Warren, 1890, Artesian wells in North and South Dakota: Am. Geol., v. 6, p. 211-221; reprinted, 1901: Minn. Acad. Nat. Sci., Bull., v. 3, no. 3, p. 370-379.

Water quality, artesian pressure, well sections, water quantity, and hydrogeology of the Dakota "Sandstone" in the Red River Valley are discussed.

Upham, Warren, 1891a, Area and duration of Lake Agassiz: Am. Geol., v. 8, p. 127-128.

In reply to an article by J. B. Tyrrell (1891), Upham discusses the area of Lake Agassiz at its various stages and the duration of the lake.

Upham, Warren, 1891b, History of Lake Agassiz: Am. Geol., v. 7, p. 188-194, 222-231. (From Part E. of the annual report of the Geol. and Nat. Hist. Sur., Canada, 1888-89.)

This report is a very concise history of Lake Agassiz.

Upham, Warren, 1894, Tertiary and early Quaternary baseleveling in Minnesota, Manitoba, and northwestward: Am. Geol., v. 14, p. 235-246; 1895, (abs.): Geol. Soc. America Bull., v. 6, p. 17-20.

The erosional history of the Tertiary Era is reviewed. The topographic features which are a result of the baseleveling are discussed. The relationship of the baseleveling to the glacial period is discussed.

Upham, Warren, 1895, The glacial Lake Agassiz: U. S. Geol. Survey Mon. 25, 658 p., illus.

The report includes a discussion of the topography of the lake basin, the geologic formations present under the drift, the history of Lake Agassiz, the beaches and deltas of the lake, the artesian and other wells of the valley, and the agricultural and material resources of the area.

Upham, Warren, 1903, The life and work of Professor Charles M. Hall: Am. Geol., v. 31, no. 4, p. 195-198, illus.; reprinted, 1904: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 13-16, illus.

Charles M. Hall (1870-1903), a professor of geology at the Agricultural College of North Dakota during 1895-1903, was one of the early geologists in the state. He was interested in hydrology.

Upham, Warren, 1904a, Age of the Missouri River: Am. Geol., v. 34, p. 80-87.

The Tertiary and Cretaceous history of the Missouri River area is summarized. The present course of the river dates from the beginning of the Quaternary Era. The geologic events connected with the history of the river are related to similar events of the Ohio and Colorado Rivers.

Upham, Warren, 1904b, The outer glacial drift in the Dakotas, Montana, Idaho, and Washington: *Am. Geol.*, v. 34, p. 151-162.

The report is a detailed description of the outermost boundary of the glacial drift of the continental ice sheet.

Upham, Warren, 1909, The Glacial Lake Agassiz (abs.): *Canadian Mining Jour.*, v. 30, p. 646; *Geol. Mag.*, 5th ser., v. 6, p. 475-476; reprinted, 1910: *British Assoc. Adv. Sci.*, Rept. 79, p. 472-473.

The history of the lake and a brief description of the lake are presented. Explanations to account for the northward ascent of its beaches are reviewed.

Upham, Warren, 1910, Englacial and superglacial drift in Minnesota, the Dakotas, and Manitoba (abs.): *Minn. Acad. Sci., Bull.* 4, p. 428-429.

The distribution and description of the drift are discussed. Interpretations of the glacial history based on the drift deposits are presented.

Upham, Warren, 1914, The Sangamon Interglacial Stage in Minnesota and westward: *Internat. Geol. Cong.*, 12th, Toronto 1913, *Comptes rendus*, p. 455-465.

Evidence of a prolonged interglacial stage which may be correlated with the Sangamon stage in Illinois is presented and discussed.

Upham, Warren, 1915, Revision of the map of Lake Agassiz: *Jour. Geology*, v. 23, no. 8, p. 780-784.

On the basis of work done by Frank Leverett in mapping part of Lake Agassiz, Upham presents some revisions to his map published in 1895 in *U. S. Geol. Survey Monograph*, volume 25.

Vaughan, Thomas W., 1921, Corals from the Cannonball marine member of the Lance formation: *U. S. Geol. Survey Prof. Paper* 128, p. 61-66, illus.

The species of coral are described and illustrated. All the specimens are from North Dakota.

Vigard, Arthur I., 1932, A study of particle size distribution in North Dakota clays: Grand Forks, N. Dak., North Dakota, Univ., M.S. thesis (unpub.), 48 p., illus.

The particle size distribution of clay is compared with the known properties of the clay. A theory of sedimentation of clay is presented. The results of the comparison are discussed. The samples were obtained largely from the ceramic industries in the southwestern part of North Dakota.

Voedisch, F. W. *See* Abbott, George A., and Voedisch, F. W., 1939.

Voelker, Stanley, 1954, Mineral rights and oil development in Williams County, North Dakota: *N. Dak. Agr. Coll. Expt. Sta. Bull.* 395, 55 p., illus.

This report provides information that can be used in development of better management of subsurface rights. The methods of holding rights, the disposal and acquisition of rights, and the sales prices of rights in oil, gas, and minerals are discussed.

Wagner, A. A., 1946a, Laboratory tests on Earth Materials from proposed pervious borrow areas - Heart Butte Dam, Heart River Project, North Dakota: *U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Earth Materials Lab. Rept.* EM-96, 21 p., illus.

Samples from nine gravel pits were tested and the results of the tests are discussed.

Wagner, A. A., 1946b, Laboratory tests on earth materials from Spillway and N. E. Borrow Areas-Heart Butte Dam, Heart River Project, North Dakota: *U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Earth Materials Lab. Rept.* EM-116, 31 p., illus.

The results of the tests are summarized and discussed. The data are arranged in five broad soil classification groups.

Wagner, A. A., 1947, Laboratory tests on earth materials from proposed borrow areas and gravel pits for Dickinson Dam, Heart River Unit--Missouri Basin Project: U. S. Bur. Reclamation, Eng. and Geol. Control and Research Div., Materials Lab. Rept. EM-125, 68 p., illus.

The results of the tests are summarized and discussed.

Waldren, Charles H. *See also* Holland, Frank D., Jr., and Waldren, Charles H., 1955.

Waldren, Charles H., 1955, Preliminary investigation of conodonts in the Winnipeg formation (Ordovician) of North Dakota (abs.): N. Dak. Acad. Sci., Proc., v. 9, p. 17.

The methods of study and the genera found in the samples are discussed.

Waldren, Charles H., Meldahl, Elmer G., and McGowan, LaVern L., 1955, North Dakota oil state: *Compass*, v. 32, no. 2, p. 98-108, illus.; reprinted, 1955: N. Dak. Geol. Survey Bull. 28, p. 98-108, illus.

A brief summary of the geology of the Williston basin, and the history and development of the oil industry in North Dakota are presented.

Wallington, Dale *See* Smith, George W., Summers, George E., Jr., Wallington, Dale, and Lee, Jean L., 1958.

Walster, H. L. *See* Hopper, T. H., and Walster, H. L., 1924.

Walster, H. L. *See* Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925.

Waring, Gerald A., 1949, Statistical data on glacial boulders: *Science*, v. 109, p. 283-284, illus.

The number of glacial boulders of different size-groups in the James River area, South Dakota, and the Crosby-Minot area, North Dakota, were studied statistically.

Warren, G. K., 1868, On certain physical features of the upper Mississippi River: *Am. Naturalist*, v. 2, p. 497-502.

A large lake basin extending from Lake Traverse to the north end of Lake Winnipeg and having a well defined beach to mark its former level, was observed during the survey of the region.

Watkins, W. I. *See* Bushnell, T. M., Smies, E. H., Watkins, W. I., Anderson, A. C., Thomas, M., Stebbins, M. E., Doneghue, R. C., and Ince, J. W., 1916.

Watkins, W. I. *See* Cobb, W. B., Watkins, W. I., Strahorn, A. T., Stebbins, M. E., Thomas, Melvin, and Anderson, A. C., 1917.

Watson, E. B. *See* Bennett, Frank, Worthen, E. L., Willard, R. E., and Watson, E. B., 1909.

Weaver, John T. *See also* Ely, Charles W., Willard, Rex E., and Weaver, J. T., 1907.

Weaver, John T. *See also* Rice, Thomas D., Willard, R. E., and Weaver, J. T., 1908.

Weaver, John T., 1906, Chemical consideration of the soils of the Cooperstown-Carrington area: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 109-115.

The common rocks and minerals which had a part in the formation of the soils in the area are considered as to their composition and contribution as sources of plant food.

Weeks, R. A. *See* Shride, A. F., Fischer, E. C., Larrabee, D. M., Weeks, R. A., Sohn, I. G., and Fox, E. L., 1947.

Wells, Roger C., 1937, Analyses of rocks and minerals from the laboratory of the United States Geological Survey: U. S. Geol. Survey Bull. 878, 134 p.

A sample of thenardite from dry lake deposits of Divide County, North Dakota is included in the analyses reported.

Wenger, W. J., and Lanum, W. J., 1954, Characteristics of petroleum from Williston Basin fields: Petroleum Eng., v. 26, no. 7, p. C-43-C-47, illus.

Crude oil samples from North Dakota and Montana fields were analyzed. The data from the analysis, and geological and other data that identify the oil are presented.

Wenzel, L. K., and Sand, H. H., 1942, Water supply of the Dakota Sandstone in the Ellendale-Jamestown area, North Dakota with reference to changes between 1923 and 1938: U. S. Geol. Survey Water-Supply Paper 889-A, 81 p., illus.

The study of water-bearing formations includes parts of Stutsman, Barnes, La Moure, and Dickey Counties. The water and wells in the Dakota "Sandstone," and the artesian wells and flow are described. Records of artesian wells in the area are included in the report.

Westergaard, William H., 1904, The water supply of the Eckelson Quadrangle: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 168-179.

The surface water and groundwater resources of the area are discussed. The report includes a table of well records for the quadrangle.

Wharen, George B., 1926, The economic use of North Dakota lignite for steam generation: Mech. Eng., v. 48, no. 6, p. 583-585, illus.

The characteristics of lignite are presented. The uses of lignite are discussed. The principal deposits in the state are listed.

White, Charles A., 1883a, Glacial drift in the upper Missouri River region: Am. Jour. Sci. 3rd Ser., v. 25, p. 206.

Glacial drift was observed by the author for some distance north and westward from Bismarck, North Dakota up the Missouri and Yellowstone River valleys.

White, Charles A., 1883b, On the commingling of ancient faunal and modern floral types in the Laramie Group: Am. Jour. Sci. 3rd Ser., v. 26, p. 120-123.

The report deals especially with the Fort Union Group in northeastern Montana and adjacent parts of North and South Dakota and the large collection of plants made by F. V. Hayden from this stratum. Many of Hayden's localities were collected by White. Fossil lists are included, listing Mollusca, Vertebrata, and plant fossils.

White, Charles A., 1883c, On the existence of a deposit in northeastern Montana and northwestern Dakota that is possibly equivalent with the Green River Group: Am. Jour. Sci. 3rd Ser., v. 25, p. 411-414.

The top stratum of Sentinel Butte is described as Green River of Eocene age. Stratigraphic evidence is presented for this claim. The discovery of fossil fish in the deposit is mentioned.

White, Charles A., 1884, The glacial drift in Montana and Dakota: Am. Jour. Sci. 3rd Ser., v. 27, p. 112-113.

Glacial drift was observed in the Missouri River valley from the Great Falls of the Missouri to Bismarck, North Dakota.

White, Eugene W., 1958, An investigation of the mineralogy, petrography, and paleobotany of uranium-bearing lignites (consists of thesis: Uranium mineralization in some North and South Dakota lignites): U. S. Atomic Energy Comm. Rept. NYO-7948, 79 p., illus. incl. geol. map (scale 1:941,800). (Report prepared by Pennsylvania State Univ., College of Mineral Industries.)

The megascopically visible uranium minerals from 11 deposits of Tertiary lignite from North and South Dakota are characterized on the basis of optical, chemical, X-ray diffraction, and dehydration properties.

Wild, Robert, and Schellenbaum, Ralph, 1951, X-ray diffraction studies of mineral matter in North Dakota lignite: *N. Dak. Acad. Sci., Proc.*, v. 5, p. 40-42.

The experimental procedure of the study is discussed. The mineral analyses of natural lignite, lignite char briquet, and lignite char briquet ash are reported.

Wilder, Frank A., 1902a, Coal deposits of Stark County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 151-159, illus.

The lignite deposits of Stark County, North Dakota are described.

Wilder, Frank A., 1902b, The fuel value of the lignites of North Dakota: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 168-189, illus.

The properties of lignite, the analysis of lignite, and the results of a comparison study between lignite and eastern bituminous coal are discussed.

Wilder, Frank A., 1902c, The lignite coal fields of North Dakota: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 33-55, illus.

The topography, drainage, stratigraphy, and extent of the lignite fields in North Dakota are described.

Wilder, Frank A., 1902d, Lignite deposits of Billings County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 63-74, illus.

The lignite deposits in Billings County, North Dakota are described.

Wilder, Frank A., 1902e, Lignite deposits of Burleigh County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 60-63.

The lignite deposits in Burleigh County near Wilton, North Dakota are described.

Wilder, Frank A., 1902f, Lignite deposits of Emmons County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 161-162.

The paper is a brief discussion of lignite in Emmons County, North Dakota.

Wilder, Frank A., 1902g, Lignite deposits of Hettinger County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 159-161.

The paper is a brief description of lignite deposits in Hettinger County, North Dakota.

Wilder, Frank A., 1902h, Lignite deposits of Morton County: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 147-151, illus.

The lignite deposits of Morton County, North Dakota are described.

Wilder, Frank A., 1902i, The lignite deposits of North Dakota: *Eng. Mining Jour.*, v. 74, p. 674-675, illus.

The nature and extent of the lignite deposits in North Dakota are discussed.

Wilder, Frank A., 1902j, The lignite deposits of Williams County and vicinity: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 56-60, illus.

The lignite deposits in the Williams County area are described.

Wilder, Frank A., 1902k, Lignite in the Turtle Mountains: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 162.

The paper is a brief discussion of lignite in the Turtle Mountains, North Dakota.

Wilder, Frank A., 1902l, Significance of the lignite to the state: *N. Dak. Geol. Survey 2d Bienn. Rept.*, p. 190-197.

The economic advantages of the lignite in North Dakota are discussed.

Wilder, Frank A., 1903a, The fuel value of the North Dakota lignites: Eng. and Mining Jour., v. 75, p. 222-223, illus.

The composition of the lignite is presented. The economical advantages of the use of lignite are discussed. The results of a test using lignite for railroad engines are presented.

Wilder, Frank A., 1903b, The lignite mines of North Dakota: Eng. and Mining Jour., v. 75, p. 326-327, illus.

The history of the mining and production of the lignite is discussed. The lignite deposits and the mines are described.

Wilder, Frank A., 1903c, A possible origin for the lignites of North Dakota: Iowa Acad. Sci., Proc., v. 10, p. 129-135.

The distribution, characteristics, and composition of the lignite beds are discussed. The paleontology of the lignite beds is discussed. An hypothesis of the origin of the lignite beds is presented.

Wilder, Frank A., 1904a, The Laramie and Fort Union beds in North Dakota: Jour. Geology, v. 12, p. 290-293.

The relationship between the "Laramie" beds and the Fort Union beds is discussed.

Wilder, Frank A., 1904b, The lignite on the Missouri, Heart and Cannon Ball Rivers and its relation to irrigation: N. Dak. Geol. Survey 3rd Bienn. Rept., p. 9-40, illus.

The nature and extent of lignite beds in the state are discussed. The possibility of using lignite to generate steam for power is studied.

Wilder, Frank A., 1905, The lignite of North Dakota and its relation to irrigation: U. S. Geol. Survey Water-Supply Paper 117, 59 p., illus.

The lignite deposits are described, analyzed, and evaluated to determine the effectiveness of their use as a fuel for pumping water for irrigation.

Wilder, Frank A., 1906, The lignite coals of North Dakota: Econ. Geol., v. 1, p. 674-681.

The distribution, quality, and economic value of the lignite beds are discussed.

Wilder, Frank A., and Wood, L. H., 1902a, Lignite of McLean County: N. Dak. Geol. Survey 2d Bienn. Rept., p. 74-82, illus.

The lignite deposits in McLean County, North Dakota are described.

Wilder, Frank A., and Wood, L. H., 1902b, Lignite deposits of Mercer County: N. Dak. Geol. Survey 2d Bienn. Rept., p. 82-83.

The paper is a report of a preliminary study of lignite deposits in Mercer County, North Dakota.

Wilder, Frank A., and Wood, L. H., 1902c, Lignite deposits of Oliver County: N. Dak. Geol. Survey 2d Bienn. Rept., p. 83.

The paper is the report of a preliminary study of the lignite deposits in Oliver County, North Dakota.

Willard, Daniel E. *See also* Hall, Charles M., and Willard, D. E., 1905.

Willard, Daniel E., 1904a, Geologic history of eastern North Dakota: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 138-144, illus.

The report is a discussion of the bedrock formations under the glacial drift in eastern North Dakota.

Willard, Daniel E., 1904b, The geology of the soils of southeastern North Dakota: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 135-138, illus.

The soils and subsoils, their origin, alkali content, and water content are discussed.

Willard, Daniel E., 1904c, The surface formations of southeastern North Dakota: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 128-134, illus.

The surface deposits of southeastern North Dakota are drift materials. The units described are lacustrine silt, beach deposits, delta deposits, sand dunes, back-beach lagoon deposits, morainic islands, and unmodified drift.

Willard, Daniel E., 1904d, The water supply: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 144-152, illus.

The report is a discussion of the groundwater of southeastern North Dakota.

Willard, Daniel E., 1906a, A description of geologic formations in eastern North Dakota: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p.6-9.

The Cretaceous Pierre and Colorado "Shales" and the Dakota "Sandstone" are found beneath the deposits of glacial drift. The report contains a description of these formations in the Tower quadrangle.

Willard, Daniel E., 1906b, A preliminary study of the soils west of the Missouri River: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 143-154, illus.

A general resume of the knowledge about the great trans-Missouri domain is presented for the general public living in eastern North Dakota. Questions of climate, rainfall, soil, water supply, available fuel, and transportation are discussed.

Willard, Daniel E., 1906c, Description of the Tower Quadrangle: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 1-5, illus.

The description includes a discussion of the geographic relations, the topography, and the drainage of the quadrangle area.

Willard, Daniel E., 1906d, Geologic history of the Tower Quadrangle: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 28-37, illus.

The pre-Quaternary history is covered briefly with the major emphasis on Quaternary events and the histories of the Sheyenne and Maple Rivers.

Willard, Daniel E., 1906e, Notes on the water supply of a portion of Cass, Barnes and Ransom counties: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 38-43.

The water supply is considered in terms of surface water and groundwater. The discussion of surface water includes streams, springs, lakes and ponds, and shallow wells. The groundwater discussion includes artesian wells, and the quality and source of water.

Willard, Daniel E., 1906f, Notes on the wells of a portion of the Dakota artesian basin: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 44-46.

The groundwater and artesian wells in the Tower quadrangle are discussed.

Willard, Daniel E., 1906g, The history of Maple River: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 51-54, illus.

The history of the Maple River is associated with the recession of the glacial ice sheet from eastern North Dakota and the formation of Lake Agassiz.

Willard, Daniel E., 1906h, The soils of the Tower quadrangle: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 47-50.

The soils are divided into four groups for discussion: soils deposited directly from the ice, soils derived from stream deposits, soils derived from lake deposits, and soil deposits derived from shale.

Willard, Daniel E., 1907, The story of the prairies or the landscape geology of North Dakota: Kalamazoo, Mich., Ihling Bros. Everard Co., 377 p., illus. incl. geol. map; 9th ed., 1921.

The topics discussed in the book include: glaciers in North Dakota, glacial Lake Agassiz, other extinct glacial lakes, Devils Lake, Sheyenne River, Maple River, lakes of North Dakota, the Badlands, coal beds, the beginnings of North Dakota, the Coteaus of the Missouri, the plateau region, water supply, a study of soils, minerals in North Dakota, and the future of North Dakota. Geological guides for trips on three railroad lines in North Dakota are included.

Willard, Daniel E., 1909a, Description of the Jamestown-Tower district: U. S. Geol. Survey, Geol. Atlas, Folio 168, 10 p., illus. incl. geol. maps (scale 1:125,000); reprinted, 1910: N. Dak. Agr. Coll. Survey 4th Bienn. Rept., p. 173-233, illus.

The district includes the Jamestown, Eckelson, and Tower quadrangles in parts of Cass, Barnes, Stutsman, Ransom, and LaMoure Counties. The geology, including Cretaceous, Tertiary, and Quaternary deposits, and groundwater of the area are discussed.

Willard, Daniel E., 1909b, Soil map of North Dakota; Official state agricultural and geologic map: N. Dak. State Agr. and Geol. Survey, 1 sheet, scale 1:125,000.

The origin, composition, and use of the mapped soils are described. The boundaries of the glacial lakes are shown and the badlands and rock-capped buttes are designated.

Willard, Daniel E., and Erickson, M. B., 1904, A survey of the Coteaus of the Missouri: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 17-27, illus. incl. map.

The origin of the Missouri Coteau is discussed and a geographical description of the area is included in the report.

Willard, Daniel E., and Hibbard, H. V., 1906a, A peculiar type of hills: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 55.

This is a description and interpretation of kames in the vicinity of Tower City, North Dakota.

Willard, Daniel E., and Hibbard, H. V., 1906b, Late glacial and post-glacial deposits of the Sheyenne and Maple Rivers: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 21-27, illus.

The terraces, deposits, and delta of the Sheyenne River, and the terraces and deposits of the Maple River are described.

Willard, Daniel E., and Hibbard, H. V., 1906c, The Quaternary (drift) formations of the Tower Quadrangle: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 10-20, illus.

The general character and relations of the drift, ground moraines, and the Fergus Falls moraine of the Wisconsinan Age are described.

Willard, Rex E. *See also* Bennett, Frank, Worthen, E. L., Willard, R. E., and Watson, E. B., 1909.

Willard, Rex E. *See also* Ely, Charles W., Willard, Rex E., and Weaver, J. T., 1907.

Willard, Rex E. *See also* Rice, Thomas D., Willard, R. E., and Weaver, J. T., 1908.

Willard, Rex E., 1904, Soil survey of the Minot area: N. Dak. Agr. Coll. Survey 2d Bienn. Rept., p. 114-127, illus. incl. soil map.

The soils are related to the glacial deposits in the area. The soil types are discussed. The physiography of the area is described.

Willard, Rex E., 1906, A preliminary report on the soils of Williams County: N. Dak. Agr. Coll. Survey 3d Bienn. Rept., p. 122-125, illus.

The effects of glaciation on soil formation in the form of glacial drift deposits, meltwater channels, and glacial stream deposits are considered. The "buffalo boulder" is illustrated and defined.

Willis, Bailey, 1885, Lignites of the Great Sioux Reservation: U. S. Geol. Survey Bull. 21, 16 p., illus.

The geology from Mandan to the Moreau River is described. Special emphasis is placed on the lignite deposits between the Grand and Moreau Rivers, South Dakota.

Willis, Ronald P., 1959, Upper Mississippian-Lower Pennsylvanian stratigraphy of central Montana and Williston Basin: Am. Assoc. Petroleum Geologists Bull., v. 43, no. 8, p. 1940-1966, illus.

The stratigraphy, paleontology, and history of sedimentation are discussed.

Wilson, Everett E., 1957, An investigation of the corals from the Cannonball formation (Paleocene) of North Dakota (abs.): N. Dak. Acad. Sci. Proc., v. 11, p. 15-16.

A new collecting locality is reported and one new species and one genus are recognized for the first time in North Dakota. A total of six species are identified.

Wilson, Everett E., 1958, Foraminifera from outcrops of the Pierre shale (Upper Cretaceous) of North Dakota: Grand Forks, N. D., North Dakota, Univ., M.S. Thesis (unpub.), 134 p., illus.

The stratigraphy, history of nomenclature, paleoecology, analysis of the fauna, and systematic description of the fauna are included in the paper.

Wilson, James L., 1956, Stratigraphic position of the upper Devonian branchiopod *Rhabdostichus* in the Williston Basin: Jour. Paleontology, v. 30, no. 4, p. 959-965, illus.

The localities of the fossil are indicated and systematic descriptions are presented. The stratigraphic significance of the occurrence of the species is discussed.

Wilson, John H., 1936, A proposed geophysical program of exploration for Nebraska and the Dakotas: Geophysics, v. 1, p. 189-195, illus.

The geological conditions and the history of exploration of the area are discussed. A method is proposed whereby the area is subjected to a reconnaissance seismic survey to determine the location of the major structural features.

Winchell, N. H., 1878, The water supply of the Red River Valley: Minn., Geol. and Nat. History Survey, 6th Ann. Rept. for the year 1877, p. 9-42, illus.

The surface geology of the Red River Valley is described. The history of a large, fresh-water lake which occupied the valley is discussed.

Witkind, Irving J., 1952, The localization of sodium sulfate deposits in northeastern Montana and northwestern North Dakota: Am. Jour. Sci., v. 250, no. 9, p. 667-676, illus.

The localization of the deposits is related to buried channels of glacial origin. Hypotheses for localization of the deposits are discussed.

Witkind, Irving J., 1959, Quaternary geology of the Smoke Creek-Medicine Lake-Grenora area Montana and North Dakota: U. S. Geol. Survey Bull. 1073, 80 p., illus. incl. geol. map (scale 1:62,500).

The stratigraphy, structure, geologic history, and mineral resources of the area are discussed. The buried glacial channels and their relation to the sodium sulfate deposits are discussed.

Wood, L. H. See also Wilder, Frank A., and Wood, L. H., 1902.

Wood, L. H., 1902, Preliminary report on Ward County and adjacent territory with special reference to the lignite: N. Dak. Geol. Survey 2d Bienn. Rept., p. 84-146, illus.

The paper includes discussions of the topographic divisions of the county, stratigraphy, the pre-glacial surface of the Laramie, and a systematic description of the lignite centers of the county.

Wood, L. H., 1904, Report on the region between the Northern Pacific Railroad and Missouri River. Its topography, climate, vegetation, irrigation possibilities and coal deposits: N. Dak. Geol. Survey 3rd Bienn. Rept., p. 41-125, illus.

The topography of the valley of the Little Missouri River and of the Badlands is described. Factors of formation of the Badlands are discussed. The climate of the area is discussed. The distribution and stratigraphic relations of the lignite deposits are discussed. The drift, and in particular, the margin of the drift is described.

World Oil, 1952, Williston Basin pays off: World Oil, v. 134, no. 5, p. 108-112, illus.

The problems encountered during the early drilling in the basin are discussed. A list of producing wells and drilling activity in the basin is included.

Worthen, E. L. *See* Bennett, Frank, Worthen, E. L., Willard, R. E., and Watson, E. B., 1909.

Worts, G. F., Jr. *See* Dennis, Philip E., Akin, P. D., and Worts, G. F., Jr., 1949.

Wright, H. E., Jr. *See* Arneman, H. F., and Wright, H. E., Jr., 1959.

Wyant, Donald G. *See also* Gott, G. B., Wyant, D. G., and Beroni, E. P., 1952.

Wyant, Donald G., and Beroni, Ernest P., 1950, Reconnaissance for trace elements in North Dakota and eastern Montana—pt.1. Geology and radioactivity; pt. 2. Reserves and summary: U. S. Geol. Survey Rept. TEI-61 (pts. 1 & 2), 29 p., illus. incl. geol. map (scale 1:220,040). (Report prepared for U. S. Atomic Energy Commission.)

The origin, composition, physical characteristics, and radioactivity of the various formations are described. The analyses of samples of radioactive lignites are presented. The reserves of radioactive lignite are discussed. A report of the petrographic examination of selected samples of lignite is presented.

Young, Ruth C. *See* Boardman, Leona, and Young, Ruth C., 1948.

Zechmeister, L., and Stewart, W. T., 1941, Isolation of some compounds from North Dakota lignite: *Am. Chem. Soc., Jour.*, v. 63, p. 2851-2852.

Samples of lignite from Velva district were submitted to chromatographic analysis. The methods used and the resulting compounds discovered are discussed.

Zeller, Howard D. *See also* Denson, Norman M., Bachman, George O., and Zeller, Howard D., 1952, 1954.

Zeller, Howard D. *See also* Denson, Norman M., Bachman, G. O., Zeller, H. D., Gill, J. R., Moore, G. W., and Melin, R. E., 1955.

Zeller, Howard D., and Schopf, James M., 1959, Core drilling for uranium-bearing lignite in Harding and Perkins Counties, South Dakota and Bowman County, North Dakota: *U. S. Geol. Survey Bull.* 1055-C, p. 59-95, illus. incl. geol. maps (scale 1:24,000).

A brief description of the geology of the area is presented. The data from the drill cores are presented and discussed. The tonnage and grade of uranium-bearing lignite reserves are estimated.

Zetterstrom, John D. *See* Cole, Willard A., and Zetterstrom, John D., 1954.

Zieglar, D. L., 1955, Pre-Piper post-Minnekahta "red beds" in the Williston Basin, *in* N. Dak. Geol. Soc., South Dakota Black Hills Field Conf., Guidebook: p. 49-55, illus.; revised, 1956, *in* N. Dak. Geol. Soc., Williston Basin Symposium, 1st Internat., Bismarck, N. Dak., Oct. 1956: Bismarck, N. D., Conrad Pub. Co., p. 170-178, illus.

The stratigraphic position, lithology, physical characteristics, and correlations of the formations are discussed.

Zimmerman, James T. *See* Roth, Fritz J., and Zimmerman, James T., 1955.

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Benson County

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Pembina County

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Stark County

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Stutsman County

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Burleigh County

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Divide County

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Dunn County

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Emmons County

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Golden Valley County

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Hettinger County

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McKenzie County

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McLean County

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Mountrail County

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Oliver County

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Robert P., 1954, 1959.

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C., 1959.
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Charles R., 1958.
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Jean L., 1958.
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Folsom, Clarence G., Jr., Hansen,
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Opp, Albert G., 1955.

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Morton County

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Richland County

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Towner County

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Ward County

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Williams County

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Dow, D. H., 1945a,b.

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Fisher, Stanley P., Jr., 1954.

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Keene Dome

Nevin, Charles, 1946.

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McKenzie County

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McLean County

Benson, William E., 1951b.

Mercer County

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Nesson Anticline

Collier, Arthur J., 1919.

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Caldwell, John W., 1954.

Williston Basin

Ballard, Norval, 1942.

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Lloyd, E. R., and Hares, C. J., 1915.
Schuchert, Charles, 1921, 1922.
Stanton, Timothy W., 1914.
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Wilder, Frank A., 1904a.

Paleontology

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Mitchell, Robert H., and Laird, Wilson M., 1943.

Leonardite

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Sedimentation History

Hansen, Alan R., 1959.
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McCabe, Hugh R., 1959.
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Nordquist, Jack W., 1953.
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Hansen, Alan R., 1959.
Thomas, G. E., 1954.

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ORDOVICIAN**Correlation**

- Lewis, Paul J., 1953.
Stocker, George R., 1956.

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- Carlson, Clarence G., 1958.
Stocker, George R., 1956.

Economic Possibilities

- Carlson, Clarence G., 1958.
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Sedimentation

- Pye, Willard D., 1959.
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- Schultz, Edward H., 1958.

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Schultz, Edward H., 1958.

Winnipeg Group

- Carlson, Clarence G., 1958.
Genik, G. J., 1954.
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Charles H., 1955.
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- Stanton, Timothy W., 1922.
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Crustacea

- Holland, Frank D., Jr., and Cvacara,
Alan M., 1955, 1958.

General Fossil Lists And Descriptions

- Bierbauer, Bruno, 1891.
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W., 1948.
Cobban, William A., and Reeside,
John B., Jr., 1952.
Dorf, Erling, 1942.
Douglass, Earl, 1909.
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Alan M., 1955.
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V., 1856c, 1857.
Stanton, Timothy W., 1921.
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Mollusca

- Cvacara, Alan M., 1957.
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V., 1856a,b, 1861.
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1940, 1942.
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Helen N., 1950.
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General

- Willis, Ronald P., 1959.

Paleobotany

- Brown, Roland W., 1935, 1936a,b,
1938b, 1939a,b.
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Knowlton, F. H., 1916, 1922a,b.
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Newberry, John S., 1868, 1874,
1898.
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- Cope, Edward D., 1874, 1875.
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Mammalia

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M., 1958, 1959.

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- Maywald, Richard H., 1957.

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Petroleum Possibilities

- Gries, John P., 1952b.

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- Caine, Thomas A., 1904.
 Clevenger, W. A., 1953.
 Hopper, T. H., and Walster, H. L., 1924.
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- Lowitz, C. A., 1957.
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- Jensen, Charles A., and Neill, N. P., 1904.
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Grant County

- Gibbs, H. J., 1948.
 Holtz, W. G., 1946.
 Noell, O. A., 1946.
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- Weaver, John T., 1906.

La Moure County

- Anderson, A. C., Hutton, F. Z., Bushnell, T. M., Thomas, M., and Stebbins, M. E., 1917.

McHenry County

- Knobel, E. W., Walster, H. L., Metzger, H., Buster, S., and Peightal, M. F., 1925.

McKenzie County

- Edwards, M. J., and Ableiter, J. K., 1942.
 Kocher, A. E., and Stevens, R. P., 1908.

McLean County

- Ellis, W., 1956.
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Mercer County

- Noell, O. A., 1947.
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Morton County

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North Dakota State

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Ransom County

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Richland County

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 Ellis, W., 1956.

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- Meissner, V. S., 1946.
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Towner County

- Fippin, Elmer O., and Burgess, J. L., 1906.

Traill County

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Ward County

- Willard, Rex E., 1904.

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Williams County

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