NEWSLETTER

NDGS

John P. Bluemle, Editor

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COVER PICTURE

The picture on the cover of this newsletter is of a bluff along the shore of Lake Sakakawea near Riverdale. Two separate layers of glacial sediment (till), separated by a bed of iron-cemented gravel can be seen. The lower, lighter colored till is generally considered to be pre-Wisconsinan in age (more than 40,000 years old), as is the cemented gravel that overlies it. The upper till here may be either early Wisconsinan or it may also be pre-Wisconsinan in age. The lower till was deposited by ice that came from the northwest, and it contains large amounts of sand and many lignite fragments derived from the Tertiary sandstones to the northwest. It also contains large inclusions of silty lake sediments (right foreground), presumably picked up when the glacier overrode proglacial lakes that were dammed in the preglacial valleys. The upper till was deposited by ice that came from the northeast. The large amounts of dark Cretaceous shale the ice picked up make the upper till darker in color than the lower one.

This location is the type section of the Coleharbor Group, the geologic unit that includes all of the glacial deposits in North Dakota. Wave action along the shore of the reservoir is continually eroding the materials, creating new exposures for geologists to study.

Photo by John Bluemle.

SURVEY ACTIVITIES

--Sid Anderson

The search for a replacement for Dr. Don L. Halvorson, who resigned as State Geologist in the summer 1985, is currently on hold. This was necessitated because of a required cut in appropriated funds for all agencies.

We have a number of projects underway. These include surface studies, subsurface studies, and environmental studies.

Geochemistry of Shales Project. Chemical analyses of Cretaceous cores from the southeastern part of the state that we have stored in our core library indicate high levels of arsenic. Here, glacial material directly overlies arsenic-rich Cretaceous-age shales. The glacial material of this area is composed primarily of reworked shale. Aquifers occurring within the glacial material appear to cause arsenic to be leached into the groundwater. Preliminary results of a few samples show elevated levels of arsenic in widely separated areas along the eastern subcrop of the Cretaceous shales. The U.S. Geological Survey-Branch of Analytical Chemistry is cooperating with us in the analysis of the cores and samples. We expect to be joined in the study by the Geological Surveys of South Dakota and Minnesota because the shales extend into both of these states.

Radon. The NDGS will cooperate with the State Department of Health in a radon project. The Health Department will supply the data to the Survey, and the Survey will study these data to determine what geological reasons may be causing elevated radon readings.

Tordon Project. The NDGS will also participate in a study of an area in McHenry County to determine whether Tordon, which was used on leafy spurge, has entered the groundwater. This study is in cooperation with the BLM and State Health Department and is scheduled for the summer of 1987.

County Geologic Studies. Only two studies remain to be published in our county studies series, which has been underway since 1960. Work is underway in Dunn County and in Renville and Ward Counties (which will be published as a single report). These studies should be completed in the 1987-89 biennium.

The first of our new one-degree by one-degree studies has now been published (see note on new publications). Work is continuing on several other areas.

Paleontological Studies. The NDGS has entered into formal agreements with the U.S. Forest Service and the N.D. Historical Society for managing the state's fossil resources. Through these agreements, the NDGS plays an active part in the permitting process by reviewing the permit applications and providing recommendations to those agencies.

Subsurface Studies. We have recently published several subsurface studies and are currently working on a detailed study of the Nesson Anticline area. This is expected to be published in the 1987-89 biennium. Also nearing completion is an isopach map of the Inyan Kara (Dakota) Formation, with accompanying electric-log cross sections. Drafting on the Lodgepole study in eastern North Dakota should be completed and ready to publish in the 1987-89 biennium. We expect to have available early in the next biennium a listing of the cores and samples stored in our core library.

Wilson M. Laird Core and Sample Library

The Wilson M. Laird Core and Sample Library has, in spite of the downturn in oil activity, had a busy year. Over 700 geologists visited our core library in 1986, compared with 480 the

previous year. The amount of core examined also increased, from 23,455 feet in 1985 to over 48,500 feet. It appears that oil company geologists, independents, and consultants are taking advantage of the slack time to do the research that will enable them to be ready when the next "boom" comes.

FIFTH INTERNATIONAL WILLISTON BASIN SYMPOSIUM

--Julie LeFever and F. D. Holland

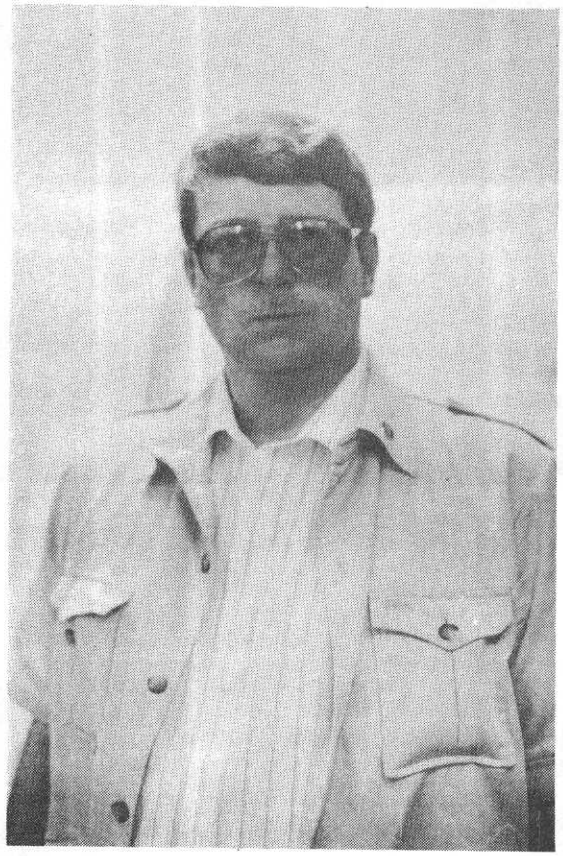
The Fifth International Williston Basin Symposium, co-sponsored by the North Dakota Geological Society, Bismarck, and the Saskatchewan Geological Society, Regina, was held June 14 - 17, 1987 at the Ramada Inn, Grand Forks, North Dakota. The conference began with a pre-meeting field trip led by Hugh McCabe, Manitoba Department of Energy and Mines, Winnipeg, and Donald Kent, University of Regina. On this well-attended field trip, 50 geologists from the United States and Canada visited outcrops and learned about the Lower Paleozoic formations of the Williston Basin, which crop out in western Manitoba. The field trip ran very smoothly, thanks to Robert Post Johnson of the firm of Harris, Brown, and Klemer, Bismarck, who organized the trip and made all of the arrangements.

The symposium began on Sunday night, June 14, with an ice breaker attended by most of the 250 registered symposium attendees. The actual sessions began Monday morning with a welcome by Roger Borchert, vice-president of the North Dakota Geological Society and General Chairman of the Symposium, and two keynote speakers, the Honorable George A. Sinner, Governor of North Dakota, and Bernold M. (Bruno) Hanson, then President of the forty-thousand member American Association of Petroleum Geologists. Over the next three days, 31 technical papers were presented on various aspects of the Williston Basin.

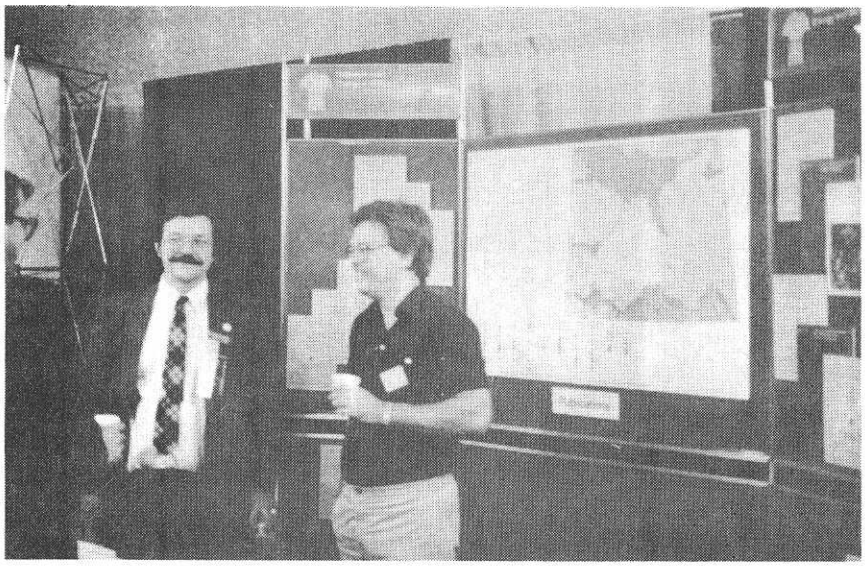
A core workshop was held in addition to the Symposium. This began Wednesday afternoon, following the morning session. Four papers were presented in conjunction with the core workshop. At the close of these papers, the meeting was adjourned to the North Dakota Geological Survey's Wilson M. Laird Core and Sample Library on the University of North Dakota campus, where specialists discussed displays of representative Williston Basin cores with the Symposium participants.

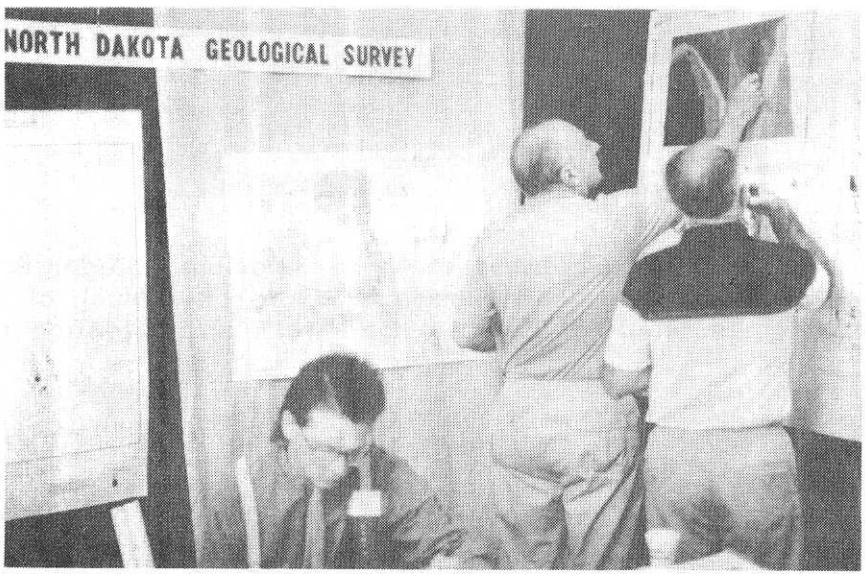
At the end of this article, we have included a listing of the papers presented during the Symposium and of the four core workshop presentations.

(Editor's note: I've included several pictures of activities during the Symposium on the next few pages).

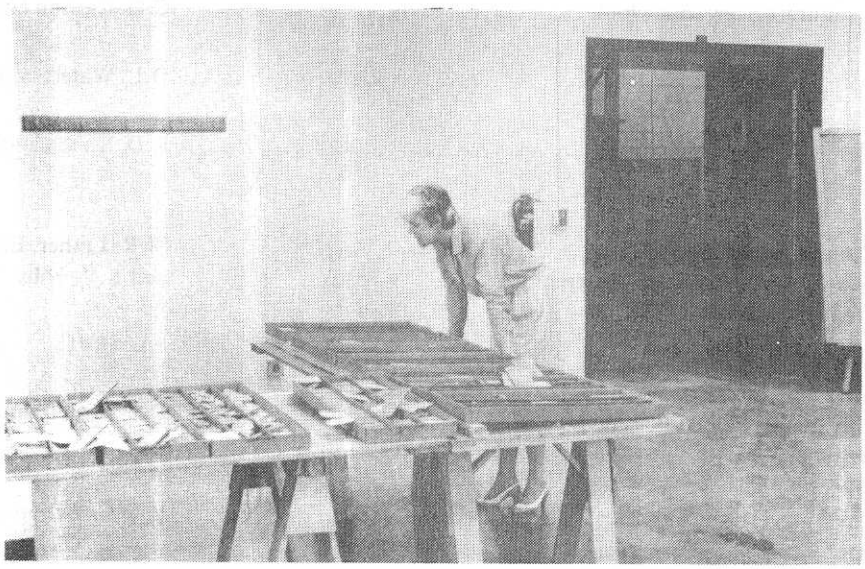


1. Roger Borchert, General Chairman of the Symposium. Roger is with the consulting firm of Harris, Brown, and Klemer in Bismarck. Much of the success of the symposium was the result of Roger's hard work and attention to detail.





2. In addition to the talks, several agencies had information booths at the symposium. Here is the Saskatchewan Energy and Mines booth and the North Dakota Geological Survey booth.



3. The Core Workshop, which immediately followed the Symposium on Wednesday afternoon, was also successful. In the picture (on the left?) people are looking at a display of Winnipegosis Platform Margin and Pinnacle Reef Reservoirs (presented by James Ehrets and Don Kissling). On the lower photo, Esther Megathan is shown, just prior to the Core Workshop, readying her core for her presentation, Silurian Interlake Group, a Sequence of Cyclic Marine and Freshwater Carbonate Deposits in the Central Williston Basin.

Papers Presented during the Williston Basin Symposium

General Papers

Stratigraphic Papers

Structural Papers

Oil Habitat Papers

Abstracts

OIL & GAS ACTIVITY DURING 1986

We have usually included a summary of the previous year's North Dakota oil and gas activity in the June Newsletter. Even though the information used in compiling this summary is preliminary, I'll include it in this Newsletter. Please let us know if you note any errors.

First, some of the more obvious statistics (all of these figures must be considered to be unofficial as the NDGS does not compile official oil and gas statistics for North Dakota): oil production in North Dakota during 1986 totaled 45.6 million barrels, down from 50.9 million barrels in 1985. Production during the first three months of 1987 is running about 12% behind that recorded during the same period last year (14.0 million barrels,

compared to 15.9 million barrels during the first three months of 1985). There were 4452 wells capable of producing oil or gas in North Dakota at the end of 1986. The average well produced 28 barrels of oil per day during 1986, down from the 31 barrels in 1985. The value of North Dakota crude oil produced in 1986 was approximately $685 million.

The State Industrial Commission issued 161 drilling permits in 1986, nearly 400 less than the 557 permits issued in 1985. Our unofficial figures indicate that a total of 242 wells were drilled for oil and gas in North Dakota during 1986, less than half as many as the 508 wells drilled in 1985. Of these, 133 (55 percent of them) were listed as being capable of production. The 55 percent "success ratio" compares to 52 percent in 1985, 54 percent in 1984 . A total of 18 new oil or gas pools were discovered during 1986 (table 1); currently (as of March), 17 of these are still producing oil or gas.

The average number of drilling rigs operating in North Dakota during 1986 was 14. Currently (mid June), about 18 drilling rigs are operating in the state. This compares to only 7 rigs operating last year at this time, 39 rigs two years ago.

TABLE 1. 1986 DISCOVERIES

(Current status is as of March, 1987)

Canterra--#2-16 State #11527 Chateau-Madison	Case 3743	Order 4271 Currently shut in	Comp. 1/2/86
Sinclair Oil--#6-18 Federal #11619 Rough Rider-Duperow	Case 3746	Order 4274 Producing	Comp. 2/11/86
Missouri Resources--#34-1 Volesky #7466 Ukraina-Madison	Case 3752	Order 4280 Producing	Comp. 1/1/86
CSX Oil & Gas Corp.--#41-35 Nygaard #11908 Hamlet-Winnipegosis	Case 3778	Order 4309 Producing	Comp. 2/27/86
John L. Cox--#34-1 MTS Bowline Federal #11856 North Branch-Birdbear	Case 3744	Order 4310 Producing	Comp. 1/14/86
A & M Oil & Gas--#1 Hill #10550 Clear Water-Madison	Case 3912	Order 4449 Producing	Comp. 1/27/86
Armadillo Oil Co.--#1 Northrup #11667 Ice Caves-Bakken	Case 3774	Order 4515 Producing	Comp. 2/5/86

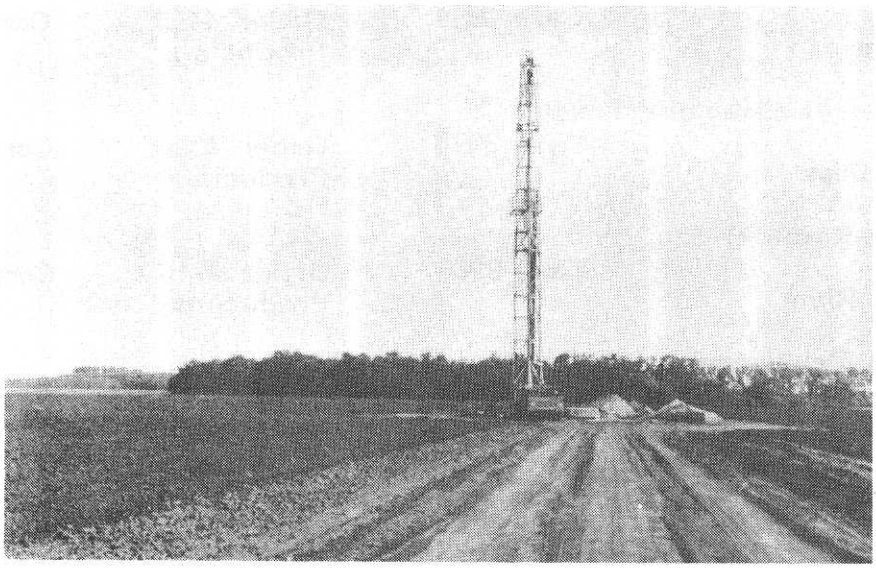
TABLE 1. 1986 DISCOVERIES--continued

Flying J., Inc.--#4 Bear Den Unit #11913 Bear Den-Red River	Case 3997	Order 4552 Producing	Comp. 3/20/86
Meridian Oil, Inc.--#31-33 MOI #11847 Hay Draw-Birdbear	Case 3408	Order 4555 Producing	Comp. 3/2/86
Citation Oil & Gas--#1-12 Christensen #11916 Kanu-Madison	Case 3911	Order 4448 Producing	Comp. 2/27/86
Texaco, Inc.--#1 Eisenlohr Trust #11794 Pershing-Silurian	Case 3974	Order 4524 Producing	Comp. 3/7/86
Tenneco Oil--Karst #1-5 #11918 Harding-Red River	Case 3980	Order 4740 Producing	Comp. 3/26/86
Columbia Gas Development Corp.--Zimmerman #10-1 #11466 Buford-Red River	Case 4197	Order 4773 Producing	Comp. 11/14/86
Cox Oil & Gas, Inc.--Froholm #1-18 #11935 Elm Tree-Bakken	Case 4153	Order 4777 Producing	Comp. 3/29/86
Tenneco Oil--#24-32X Thorson #10463 Assiniboine-Madison	Case 4212	Order 4796 Producing	Comp. 11/25/86
Raymond T. Duncan #1--Bakken #12017 Dolphin-Dawson Bay	Case 4211	Order 4826 Producing	Comp. 11/10/86
Meridian Oil--Federal-Crighton #31-24 #11832 Snowcover-Birdbear	Case 4239	Order 4844 Producing	Comp. 12/18/86
Armadillo Oil Co.--#1 Northrup #11667 Ice Caves-Bakken	Case 3774	Order 4415 Producing	Comp. 2/5/86

WILDCAT DRILLING IN GRAND FORKS COUNTY

--David Brekke

Grand Forks County was the location of a wildcat oil test this spring. The Midboe #1 was spudded on April 29, with a projected depth of 1,300 feet. The operator, Lyle Germundson of Williston, located the well 3½ miles south of Northwood in the northeast quarter of the southeast quarter of section 33, Township 149 North, Range 54 West. Verplancke Drilling Company of Williston was the drilling contractor on site using a water well rig. A workover rig moved in the first week of June and moved off site a week later. The well is currently on tight-hole status.



OIL PRODUCTION

--John Bluemle

Does it feel like the good old days to drive into a gas station, fill the tank (self-service nowadays), and get change from a ten-dollar bill? It ought to, because in terms of real value, compared to just about everything else you can buy, prices for gasoline are about as low as they have been at any time since the end of World War II. Unfortunately, the collapse of world oil prices has resulted in severe economic hardship in western North Dakota and virtually everywhere else in the oil patch. Unemployment has risen by 200,000 or more and the increased imports have added, perhaps, 10 billion dollars to the national budget deficit. Some economists expect economic stimulation from an extended period of low oil prices, but it is probably more likely that the current unstable price situation will more than cancel any positive effects. Certainly, we are painfully aware of the effect the price collapse has had on the collection of tax revenues in North Dakota.

With fuel prices down and gasoline shortages a faded memory, it might be tempting to conclude that our oil problems are behind us. Reality is much more complicated. Oil production in the United States has declined about 10 percent from its peak in 1970. The drop in production would be more than 30 percent except for

the flood of oil from Prudhoe Bay on the North Slope of Alaska that began in 1977. This one field now accounts for one in every five barrels of oil produced in the United States. Production from Prudhoe Bay will probably reach its highest level this year and show a decrease each year from now on. Production in North Dakota is dropping too, from a high of 52.6 million barrels in 1984 to 45.6 million in 1986, and likely less than 42 million barrels in 1987. It's probably unlikely that another field the size of Prudhoe Bay in Alaska will be found, but if the current rate of U.S. exploration continues, it almost certainly won't. Even the record 1981-1982 exploratory efforts failed to find enough oil to match the amount we use. In addition to effectively terminating our exploration program in the United States (now lower than at any time since the 1930s), low oil prices have resulted in the permanent closure of hundreds of old, low-production stripper wells, leaving large amounts of oil in the ground that will never be recovered. The exploratory effort in North Dakota has suffered even more than that in the rest of the United States; in 1981, between 140 and 150 rigs were drilling for oil and gas in North Dakota and today about 18 rigs are drilling. In 1981 and 1982, new oil discoveries totaled 83 and 102, respectively. Last year, about 18 new pools were discovered in North Dakota. Not much oil is going to be found in North Dakota given our present exploration effort; certainly our production will continue to drop until the price of oil is high enough to warrant exploring for new resources.

So--we can expect our oil problems to remain. Warnings from a variety of technical analysts are increasingly urgent. The World Energy Conference, the International Energy Agency, the U.S. Geological Survey, as well as reports from within the oil industry and various economists, all carry essentially the same message: oil prices will increase again. While there is probably no technical reason that oil prices could not continue for a year or two at or near the current low rate below $20 a barrel (as long as the supply of Saudi Arabian oil keeps flowing), by about 1990 we should expect prices to start up again, irrespective of the Saudi's actions. The longer the price increase is held off, the more dramatic will likely be the rise. It might be a good idea to think about how we are going to cope with the inevitable.

THE MINERAL INDUSTRY IN NORTH DAKOTA IN 1986

North Dakota's nonfuel mineral production in 1986 was valued at $21.2 million, a decrease of about 12 percent compared with 1985 figures, according to preliminary estimates by the U.S. Bureau of Mines. North Dakota ranked 48th in the nation in value of nonfuel mineral production, accounting for less than one percent of the U.S. total.

All commodities produced in the state decreased in value except for clays and lime. In descending order of value, construction sand and gravel, lime, and salt contributed the greatest amount to the state's total mineral value.

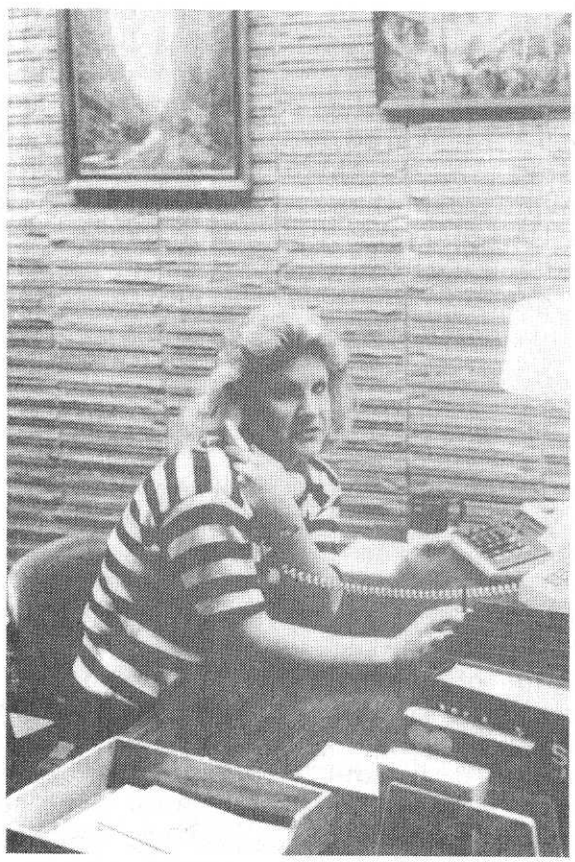
The reported value of major nonfuel minerals produced in North Dakota during 1986 is as follows: lime: $6,268,000; sand and gravel: $10,600,000; and others (clays, peat, salt, crushed stone, and gem stones): $4,323,000. According to the North Dakota State Soil Conservation Committee, the amount of sand and gravel mined during 1986 was 2.5 million

cubic yards, compared to 3.0 million cubic yards in 1985. A total of 85,000 cubic yards of scoria was mined, along with 56,000 cubic yards of clay and 16,000 cubic yards of rock.

PERSONNEL CHANGES

Linda Carlson recently replaced Marvelyn Bohach as Receptionist for the Survey. Marvelyn has not left, but was promoted to the position of information processor. Linda is a 1986 graduate of Red River High School in Grand Forks and she attended the East Grand Forks Area Vocational Technical Institue, from which she received a Secretarial Degree. She has also been employed as a sales person in several Grand Forks retail businesses.

Anne Behl, who had worked for the NDGS since 1981 as a publication clerk and as an information processor, recently left the Survey to move to Minneapolis. Dr. Robert E. Seidel, who was with the NDGS since 1982 and served as Deputy State Geologist since 1983, is leaving the Survey as of June 30, 1987. Luke Savoy, Drafting Technician with the Survey since 1979, will be leaving at the end of August.



Linda Carlson

FIELDTRIPS PLANNED

--John Bluemle

North Dakota Natural Science Society Fieldtrip. The NDNSS is planning a two-day trip on Saturday and Sunday, July 25 and 26. The trip will convene at the Denbigh Experimental Forest, about 3 miles west of Denbigh, on Saturday morning. It will leave there at 12:30, and participants will visit three fens in eastern McHenry County. These peatlands, along the Souris and Wintering Rivers, include an interesting and unique array of plant and animal life and unusual geologic conditions, which have allowed the peat to accumulate. Experts on the biology will be along on the trip to explain the natural science of the areas. The group will continue to the J. Clark Salyer Wildlife Refuge for a picnic and evening program on the natural science of the area. Camping will be available at the Refuge Headquarters on Saturday night. On Sunday, the group will have a chance to look at the biology and geology of the Wildlife Refuge area.

North Dakota Geological Society Fieldtrip--The North Dakota Geological Society is planning a two-day fieldtrip, August 29 and 30, through central North Dakota to look at glacial landforms and stratigraphy. This trip will convene in Bismarck at 8:00 a.m. at the North Dakota Water Commission Parking Lot on Saturday morning, August 29. The group will travel north, examining a variety of glacial landforms and glacial and glaciofluvial stratigraphy in McLean, Ward, McHenry, Pierce, Wells, Kidder, and Sheridan Counties. This trip is being led by John Bluemle, of the North Dakota Geological Survey. The group will stay in Harvey on Saturday night. We plan to travel by private vehicles, coordinating between drivers and passengers. Cost will be $15.00, which will include two box lunches, refreshments, and a guidebook.

Anyone interested in either of these two trips can contact me (John Bluemle) at the North Dakota Geological Survey.

ATLAS SERIES UPDATE

--Ken Harris

We have just published the first map in our new Atlas Series (see item on new publications). The map is designated AS-15-A1 and it displays the surface geology of the Sheyenne River Map Area. Some explanations of the Atlas Series and the naming and numbering system we are using is necessary, so here is what we have in mind.

The Atlas Series consists of geologic maps displaying various aspects of the geology of the state. In order to convey a useful level of detail, as well as feeling for the regional geology, a map scale of 1:250,000 (4 miles per inch) and a map area of 1 degree of latitude by 1 degree of longitude was chosen. Consequently, there are twenty-one individual Atlas Series Map Areas in the State (fig. 1).

For convenience, each map area is given a name. The names used are the names of significant rivers, lakes, topographic features, or historical sites within the map areas. For example, map area 15 is called the Sheyenne River Map Area. Figure 1 shows the names we plan to be using for the twenty-one map areas.

The map showing the surface geology of the Sheyenne River Map Area is labeled AS-15-A1. The A1 designation will always be used for maps displaying the surface geology of any map area. Figure 2 shows the coding

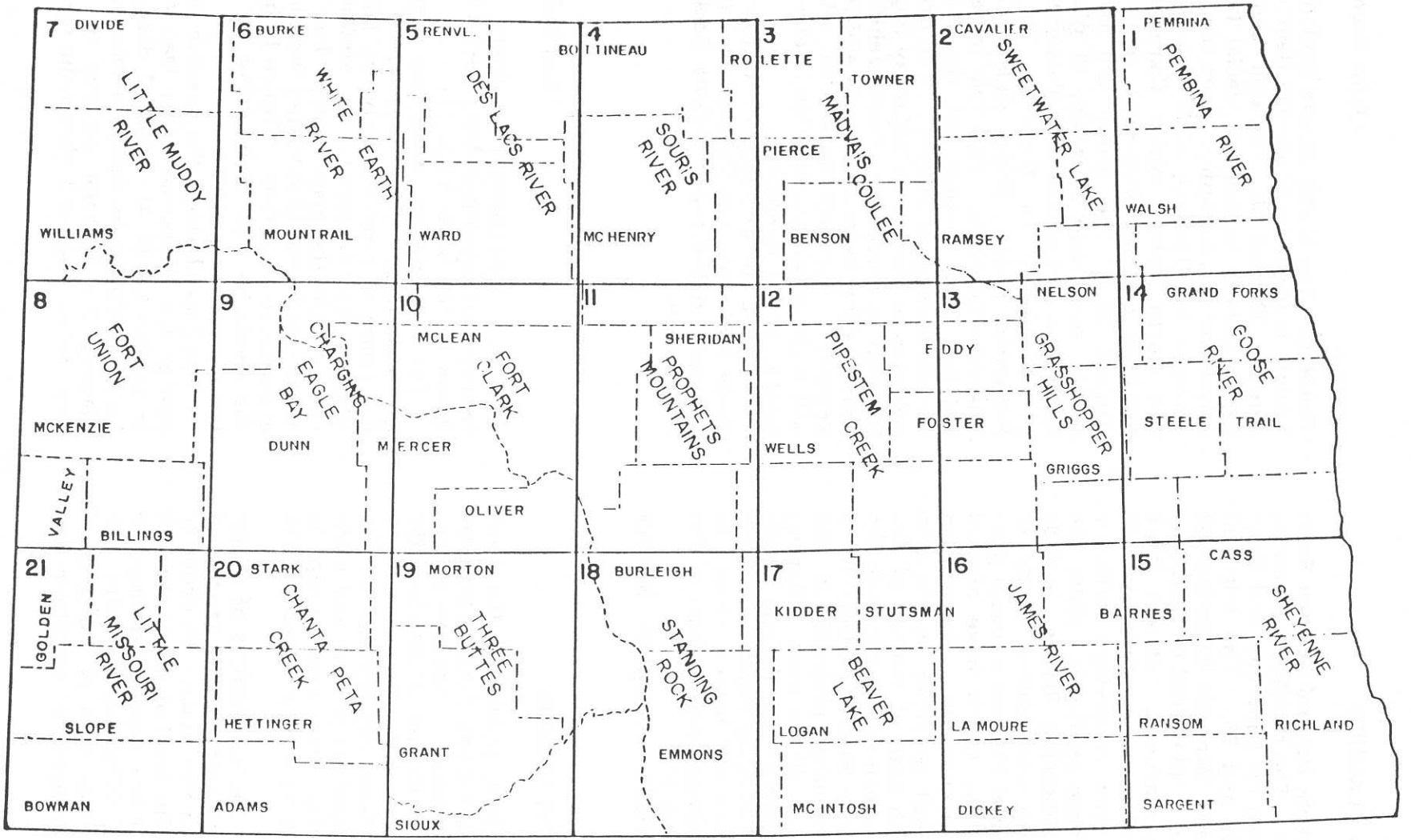


Figure 1. Index map showing the location and names of the twenty-one Atlas Series Map Areas.

A) Surface Geology:
   1) Surficial Geology
   2) Drift Thickness
   3) Quaternary Stratigraphy
   4) ----

B) Subsurface Geology:
   1) Structure Map, Devonian Winnipegosis Fm.
   2) Isopachous Map; Dev. Prairie Fm. to Sil. Interlake Fm.
   3) ----

C) Groundwater Geology:
   1) Nearsurface Aquifers
   2) Water Quality of Nearsurface Aquifers
   3) ----

D) Mineral Resources: (Economic Geology)
   1) Oil and Gas Fields
   2) Strippable Lignite Reserves
   3) Kitty Litter Deposits

E) Applied Geology:
   1) Suitability for Landfills
   2) Engineering Characteristics of ----

F) Miscellaneous:
   1) Paleontology
   2) Camping
   3) History
   4) Fish'n Holes ----

Figure 2--Six possible aspects of the geology of North Dakota that might be presented in the Atlas Series.

scheme we plan to use to designate the various geologic and derivative maps that might be generated for any of the map areas.

Work is currently underway on the next three maps in the Atlas Series. Mark Lord, a Ph.D. candidate in geology from the University of North Dakota, is now compiling a map of the surface geology of the Souris River Map Area (AS-4-Al). Mark's dissertation deals with the stratigraphy, sedimentology, and drainage history of Glacial Lake Souris. The Lake Souris Basin is the dominant geologic feature in this map area, and Mark's knowledge of this area will result in a very interesting and useful geologic map.

Ed Murphy, NDGS staff geologist, is compiling a map showing the surface geology of the Charging Eagle Bay Map Area (AS-9-Al). Ed is mapping the geology of Dunn County and he will be presenting his interpretations in the form of a Dunn County Bulletin and also as an Atlas Series map.

I (Ken Harris) am now working on the surficial geology of the Goose River Map Area (AS-14-Al).

Some of the map sheets we are now working on should be available in the spring of 1988.

AMENDMENTS TO SURFACE OWNER'S NOTICE

--David Brekke

The 50th Legislative Assembly recently enacted legislation that amended North Dakota Century Code Chapter 38-11.1 relating to surface owners' rights and oil and gas operations. The law provides that all persons should be justly compensated for personal injury, property damage, and interference with the use of their property caused by oil and gas exploration (geophysical and seismic), drilling, production, and completion operations. The state geologist is charged with issuing a notice to surface owners advising them of their rights and options. This notice must be given to the surface owner by the mineral developer along with a notice of drilling operations. The law was first enacted in 1979, then amended in 1983 and 1987. The following is a general discussion of the recent amendments.

One amendment redefines "surface owner" as any person who holds record title to the land surface. The name and address is that recorded in the appropriate county register of deeds office. Previously, surface owner was defined as the person who has possession of the land surface either as an owner or as a tenant. However, both the owner and the tenant have the right to be compensated for damages. If there isn't a pre-existing agreement between the surface owner and tenant as to dividing the payment, the tenant is entitled to recover from the surface owner a portion of the payment according to his damages sustained.

Another amendment relates to hydrogen sulfide. The surface owner may request the North Dakota Department of Health to inspect or monitor a well site on his land for the presence of hydrogen sulfide gas. If the gas is present, the department of health will issue appropriate orders to protect the owner's health, welfare, and property.

Another amendment relates to protection of surface and groundwater supplies. If the surface owner's water supply is disrupted or diminished in quality or quantity, he may have a claim for damages from the mineral developer provided certain conditions are met. The conditions relate to property ownership, distance from oil and gas activities, preexisting certified water tests, and filing of the claim within a certain time. However, the law does not apply if water can reasonably be acquired under the changed conditions and those conditions were the result of the legal appropriation of water by the mineral developer. In addition, a tract of land is not obligated to receive contaminated water. The owner may have a claim against the mineral developer for damages resulting from the natural drainage of waters contaminated by drilling operations on another tract of land.

The remainder of the notice relates to determining compensation, procedures, and options for gaining compensation, the right to be notified in advance of any drilling operations by the mineral developer, and the right to be given this notice. The surface owner is responsible for negotiating the terms of any settlements. If advice or assistance is needed in making a settlement, private counsel should be consulted. Copies of the "Notice to Surface Owners Concerning the Right of Compensation for Damages Caused by Oil and Gas Operations" are available free of charge from the Survey.

NEW PUBLICATIONS

The following publications were issued recently by the North Dakota Geological Survey:

Miscellaneous Series 68--"A Synoptic Overview of Winnipegosis Pinnacle Reefs in North Dakota," was written by David W. Fischer and Randolph B. Burke. The 15-page report provides background information on the pinnacle reef facies of the Devonian Winnipegosis Formation in the North Dakota portion of the Williston Basin. Two important Winnipegosis wells were recently discovered in Saskatchewan, just across the international boundary, and since it appears that the same potential for prolific Winnipegosis production exists in northwestern North Dakota, we are providing this collection of pertinent information for the benefit of people interested in knowing more about the Winnipegosis pinnacle reefs in North Dakota.

Miscellaneous Series 68 is available from the Survey for $5.00.

"Catalog of North Dakota Water Chemistries" was compiled by the NDGS staff. This is a compilation of chemical data for water analysis from oil and gas wells on file with the North Dakota Geological Survey. The information is listed by formation and includes information on the type of sample (production tests or drill-stem tests), and the test data, including the interval sampled, specific gravity, the concentration of various ions, the pH of the tested fluid, the resistivity and temperature, and the total dissolved solids.

The information in this Catalog will be useful to people in the petroleum industry. The Catalog of North Dakota Water Chemistries can be obtained for $10.00 from the Survey.

Bulletin 71, Part 1--"Geology of Ramsey County, North Dakota," was written by Howard C. Hobbs and John P. Bluemle. Reports are also available on groundwater basic data and on the hydrology of Ramsey County. The report describes the subsurface and surface geology, the geologic history, and the economic geology of Ramsey County. It emphasizes the stratigraphy of the near-surface glacial deposits in the county.

This report on Ramsey County should be useful to anyone interested in knowing more about the physical nature of the materials underlying the area. Such people may be water-well drillers or hydrologists interested in the distribution of sediments that have potential to produce usable groundwater; civil engineers and contractors interested in such things as the gross characteristics of foundation materials at possible construction sites, criteria for selection of and evaluation of waste disposal sites, and locations of possible sources of borrow material for concrete aggregate; industrial concerns looking for possible sources of economic minerals; residents interested in knowing more about the area; and geologists interested in the physical evidence for the geologic interpretations.

A colored geologic map of the county at a scale of a half inch to a mile is included along with colored geologic cross-sections throughout the county. The 69-page report can be obtained without charge from the NDGS.

Atlas Series Map 15--"Surface Geology of the Sheyenne River Map Area," was drawn by Kenneth L. Harris. The map covers the southeastern corner of North Dakota, the area south of 45 North Latitude, and east of 98 West Longitude. Each map in the series covers an area of one degree of longitude by one degree of latitude; however, because the eastern boundary of North Dakota is located along the Red and Bois De Sioux Rivers, an additional area east of 97 West Longitude has been included on

this map. Consequently, this map covers slightly more than one degree by one degree of area. The total area covered by the map is about 4,600 square miles.

This colored Atlas map shows the composition of the surface materials and their origin. Four elements of the surface geology of the Sheyenne River Map Area are shown on the map: (1) the lithologies of the surface materials; (2) an interpretation of the age of the sediment; (3) an interpretation of the origin of the sediment; and (4) a description of the topography of the area. Lithologies are shown by the use of color. The age and origin of the sediment are shown by the use of map-unit numbers. A detailed description of the map unit and line symbols is also included.

The Sheyenne River Map Area can be divided into five areas based on the occurrence of similar or genetically related landforms. These areas include the Lake Agassiz Basin, the Sheyenne "delta," the Lake Dakota Basin, the Glaciated Plains, and the Prairie Coteau. Each of these areas contains a unique set of landforms determined by the geological processes responsible for depositing or modifying the sediment in the area.

The map is the result of a compilation of previous work, and interpretation of the geology based on aerial photographs, and field studies. The base used in making the map was prepared by the U.S. Geological Survey. It includes roads, towns, drainage, and topography. The Sheyenne River Atlas Map 15 is drawn at a scale of 1: 250,000 (1 inch to 4 miles).

The map is provided in a 9 1/2" x 12" envelope which includes title and other information. As work on our Atlas Mapping Project continues, we will provide additional maps and other information from time to time. These will be added to the Atlas Series as they become available.

Sheyenne River Atlas Map 15 can be obtained for $3.00 from the North Dakota Geological Survey.

NEW OIL AND GAS MAPS

--Marvin Rygh

I have recently constructed two new maps that deal with the oil and gas industry in North Dakota. The first map is a remake of the old Oil and Gas Fields Map of North Dakota. The major change in the new map is the addition of field names, which are now printed directly beside each respective field. The old map had a numbering system with an accompanying index. It is much easier to locate and identify oil fields on the new map on which all of the North Dakota oil and gas fields are plotted. The approximate extent of each field is shown by a darkened area (fig. 1) and is based on proven production in each field.

The overall size of the new North Dakota Oil and Gas Fields map is smaller (30" x 42") than the previous map, making it more convenient to store and handle. Producing intervals are not listed on the new map, but a separate printout of all fields and respective producing formations is available on request. The cost of the map remains at $1.50 for a Diazo print.

The second map I have compiled is titled Distribution of Hydrogen Sulfide in Associated Natural Gas. Four major producing horizons were zoned according to the concentrations of hydrogen sulfide, which occurs in produced natural gas. The mapped horizons were: Madison Group, Duperow Formation, Interlake Formation, and Red River Formation. Data compiled from gas

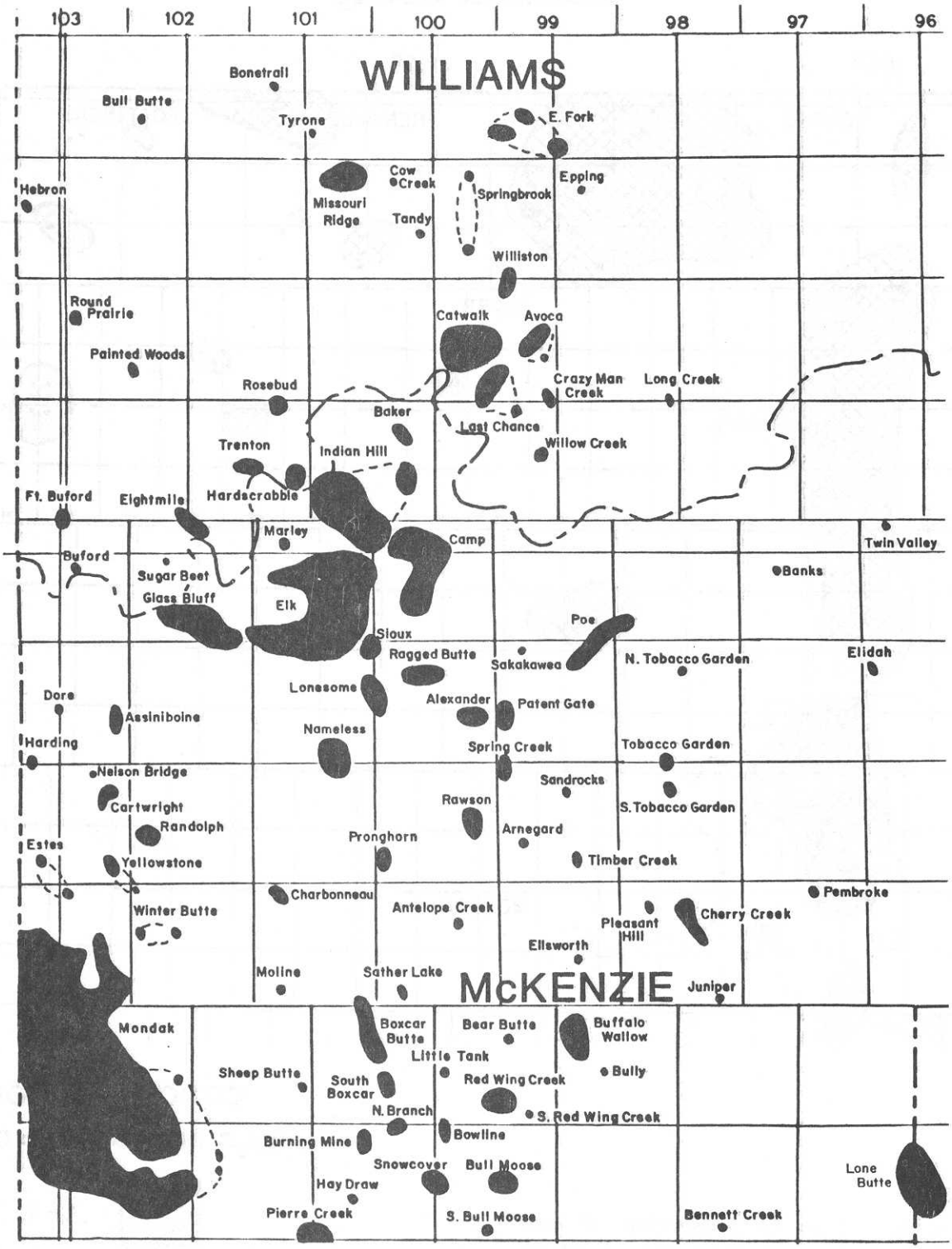


Figure 1. This is a portion of our new North Dakota Oil & Gas Fields Map, reproduced here at actual size. Parts of Williams County and McKenzie County are shown. All the fields are shown with their respective names.

Madison Group

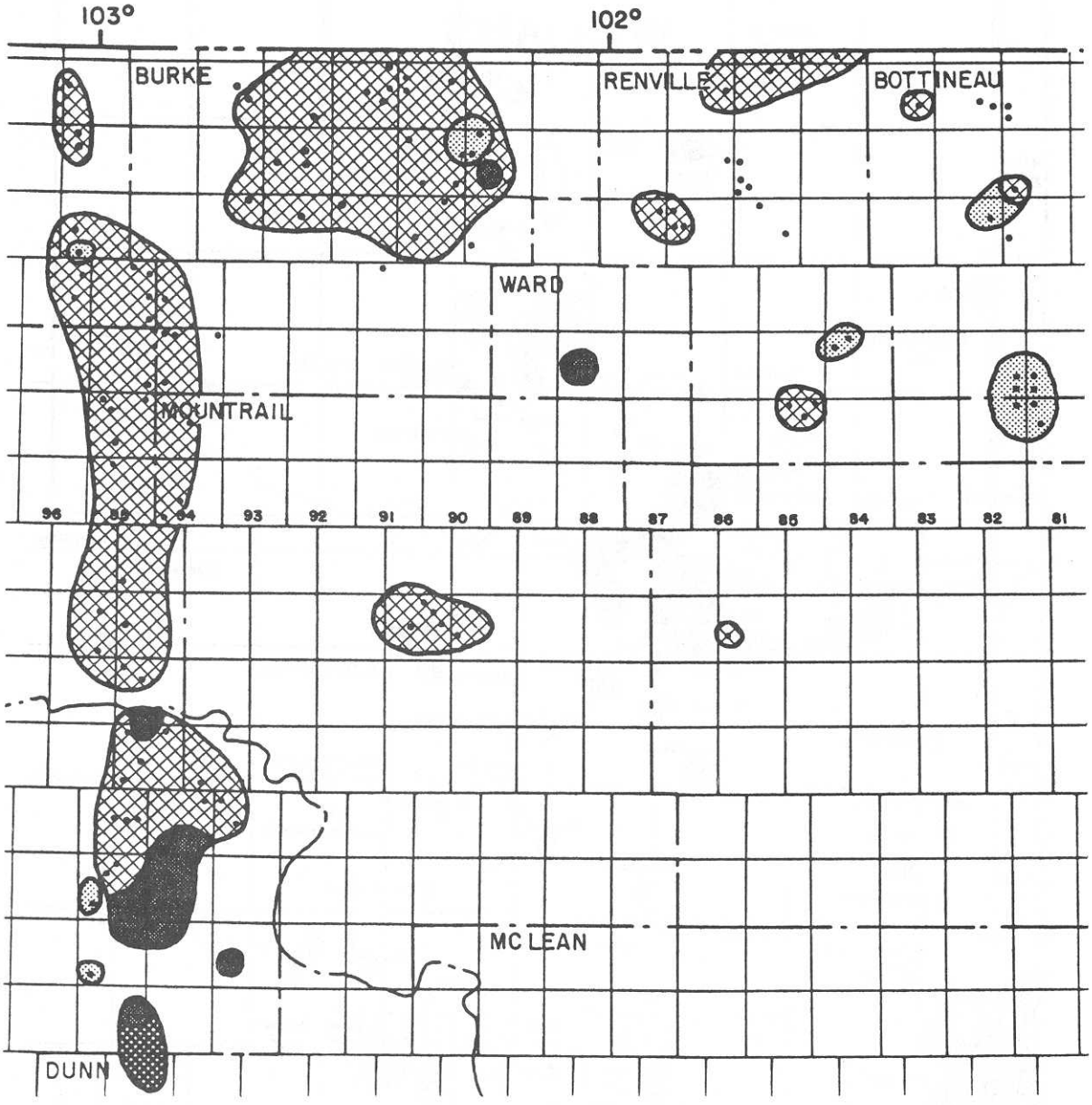


Figure 2. This is a portion of our new Distribution of Hydrogen Sulfide in Associated Natural Gas Map, reproduced here at actual size. This particular example shows only the Madison Group.

analyses of over 1,600 wells was obtained from the North Dakota Department of Health. An example of the map, given in figure 2, shows a portion of the Madison Group in North Dakota.

The overall size of the Distribution of Hydrogen Sulfide map is 30" x 42" and the cost is $1.50 for a Diazo print.

THE GEOLOGY BUILDING

--Wilson M. Laird

(Editor's note: I asked Dr. Laird for an article for our newsletter and he gave me this summary of the events that led to the building of Leonard Hall, which houses the North Dakota Geological Survey and the UND geology department. I appreciate Dr. Laird's contribution and hope that he will be providing more items for future issues).

The Early Years

When I first arrived at UND, the Geology Department was housed in a suite of rooms and offices on the east side of the basement of Merrifield Hall. Merrifield Hall, which was built about 1929, was solidly constructed and was probably the finest building on the campus at the time. Our part of it consisted of three offices: one on each end of the aforementioned suite of rooms and one (much smaller) in the middle. The smaller one is the one I got first when I came to the Department. It wasn't a bad office, but it was less luxurious than the other two, which were fitted out with a small washroom containing a wash basin and a toilet. This type of office was much coveted by other members of the faculty, some of whom had to share one small office with several other people.

In addition to the offices, we had a small room holding our geologic library--a room about 12' x 20'--which could not begin to hold all the publications that we got on exchange from other geological surveys and from the federal government. Other rooms included two small labs for the general geology people as well as a room for mineralogy that was fitted out more or less like a chemistry lab. There was also a small room for the North Dakota Geological Survey office.

I forget the exact year (I think it was about 1944) when the University was getting surplus buildings from the Sioux Falls Air Base in South Dakota. The buildings were dismantled there, carried to Grand Forks, and reerected at United States Government expense. Industrial Arts had already secured such a building and had it erected east of the then Chemistry building. The University Press got one too, which was erected near the Industrial Arts building.

It occurred to me that such a building might be obtained for the Geology Department and the Survey, so I asked Dean Harrington if he could try to arrange it. The Dean was more or less in charge of getting government surplus materials for the University, so he was the logical person to ask about it.

The Dean called Sioux Falls and found that they had such a building, but that if the University got it, the University would have to pay for the reerection costs. In addition, because the building in question had been an officer's club, it had no interior partitions and material for partitions would have to be purchased by UND. Further, we had to have a floor plan to present before Monday and it was already Wednesday when we got the go-ahead that we could get the building. The Dean and I talked to Ernie Wenner, who was Head of the Engi-

neering Drawing Department, and he agreed to get something out if I would tell him what I wanted. This was a challenge as I had never done such a thing before, but that didn't prevent me from going ahead with the plans. We did manage to get the plans ready by Monday, and Ernie went to bed for the first time in several days.

We knew what the external dimensions of the building were, so we could plan within those parameters. The building turned out to be an L-shaped structure and it was located east of the Industrial Arts Building. Twenty years later, when we moved into Leonard Hall, the Industrial Arts Department moved in along with some other departments. Both buildings, Geology and Industrial Arts, along with the old Press building, are now gone. While they were so-called temporary buildings, they served our purposes for many years. A lot of happy memories are recalled when I think of that building as it was the building that was a home to a large number of veterans who started their geologic careers there. Many an all-night session getting papers prepared for stratigraphy took place and then there was the Friday afternoon poker club in the library, which lasted longer hours than I officially knew about.

This old (new) building gave us about three times as much space as we had had in Merrifield Hall, and we were by ourselves so that we were our own bosses. In fact, it was a constant worry to me for a time that part of our building would be taken over by some other department. Ed Buckingham, who was Head of Buildings and Grounds at the time, came over and was looking around and asked me what I was going to do with all the space. I told him that I was already overcrowded (even though all I had in one room was a table and a chair).

The Later Years

After many years in the old wood building, it was apparent with the increase in enrollment and the expansion of the teaching faculty and staff and increased work of the Survey that more space was necessary. A new building was needed as soon as possible and the Board of Higher Education put it on the list of needed buildings for the institutions of higher learning in the state.

Money for a new building became available in 1963 and planning began immediately. One of the first things I did was to ask each professor what he thought he would ideally like to have for his area of operation in the Department. Needless to say, everyone asked for more than he expected to get. The next decision was the choice of an architect, which was made by the administration and the Board of Higher Education. The architect chosen was Myron Denbrook of the firm of Wells and Denbrook of Grand Forks. This was a most fortunate choice.

President West had the firm conviction that the campus should look like a great university and that the exterior of the buildings should all have the "Collegiate Gothic" look. This meant red brick with Indiana limestone trim around the windows and doors. Many apparently don't like this look, but I think it was a good idea and showed a long-range vision on the part of President West. The result, in any case, is that the campus looks beautiful, even though some of the newer buildings do not entirely conform to President West's ideal.

Wells and Denbrook had planned a number of other newer buildings on the campus, and were familiar with President West's idea of external appearance. Ted Wells had, by that time, pretty well retired, so Myron Denbrook was the head honcho with

the firm. Myron was an unusual person in many ways. He was very artistic and made sincere efforts to make the building look good. He would say, "This building, by its external appearance, must say 'I am a Geology Building.'" He also made a sincere effort to find out exactly what each of the professors did, how he did it, and what he needed to do his particular job. After a number of interviews with the department personnel, he came to the reluctant conclusion that geologists, as a whole, were pack rats and need much storage space.

About this time, it became obvious that with all the administrative matters that I had to attend to, both in the Department and in the Survey, that I needed someone to assist in the planning and supervision of the new structure. I chose Dr. F. D. ("Bud") Holland, Jr., who was an associate professor and a specialist in paleontology. This was a fortunate choice as Bud was, and is, a bearcat for detail. I can truthfully say that, without his ability to see needs and supervise the builder, the building would not have been done nearly so well and would not have had all the fine touches it has, features that make it one of the finest geology buildings in the country today.

In planning the building, Bud and I, as well as Myron, thought that we should look at buildings on other campuses. We chose to go to the University of Wyoming, Colorado School of Mines, Colorado College (mainly for their science auditorium), University of New Mexico, Tulsa University, and the University of South Dakota. So we took a Survey car and started on a trip lasting approximately one week.

Myron investigated all of the structures in detail, including hallways, restrooms, and other auxiliary service areas. He made a point of talking to the custodians to find out what was wrong with the buildings from their viewpoint. Things such as the locations of the light switches, etc. did not escape his notice.

From all the information gathered on the trip, Myron, Bud, and I were prepared to get serious with the planning of the Geology Building at the University of North Dakota. In the drawing of the plans, Myron also called on other members of his staff for ideas and help in the planning of the colors to be used throughout the building.

On the exterior of the building, it was Bud's idea to insert limestone bas reliefs of geologic subjects. Thus we included a Triceratops dinosaur, a mammoth, and a volcano. Governor Guy, being a Democrat, kidded me about placing the GOP elephant on the building along with Barry Goldwater's dog, the dinosaur.

There wasn't much thought of ever naming the building anything but Leonard Hall, after Dr. A. G. Leonard, who had been with the Department and the State Geological Survey from 1902 until 1932. Much of the early fundamental geologic work, especially with the lignites in the western part of the state, had been done by him. At the time of the completion of the building, Mrs. Leonard was still living, and we sent a copy of a colored drawing of the building to her. We also, of course, invited her to attend the dedication of the building, but as she was very old and feeble at the time, she was not able to come. She lived at that time in La Jolla, California. She did send a nice letter thanking us for thinking about her husband who had done so much for the University and for the State.

The cornerstone of the building was laid with Masonic ceremonies in October of 1965. We moved into the building in January, 1965 and the use of the building started in the second semester of the 1964-65 academic year.

Now, some 22 years later, the building which Bud and I thought would last for many years longer as

far as space is concerned, is full to overflowing. It shows that you cannot plan for very long into the future.

I am proud of the building and the many people who have been affected by its presence. I am sure that the building has materially added to the teaching of geology at the University and that it has added greatly to the knowledge of the geology of the State through the work of the State Geological Survey.

CORRECTION

Our December, 1986 Newsletter included an article on page 23 ("The NDGS Compared to Other State Geological Surveys") that has a number of errors. In that article, which compared the output and productivity of the North Dakota Geological Survey to that of the other state geological surveys, a table was included listing the number of publications of each survey between 1963 and 1980. This table was based on incomplete and incorrect data and, as a result, it is not accurate. I used the table, as it was given to me, without checking its accuracy. I apologize for any misunderstandings that may have resulted from the inclusion of the table in the newsletter article.

COMMENTS

Do you have questions, comments, or suggestions regarding the Newsletter or North Dakota Geological Survey services? For additional information on any of the items mentioned in the Newsletter, please contact John Bluemle, NDGS Newsletter Editor, North Dakota Geological Survey, University Station, Grand Forks, ND 58202-8156.

CHECKLIST OF NEW PUBLICATIONS

See pages 17 and 18 of this Newsletter for descriptions of publications.

____MS-68 ($5.00)	A Synoptic Overview of Winnipegosis Pinnacle Reefs in North Dakota
____($10.00/volume)	Catalog of North Dakota Water Chemistries
____(Bull. 71, pt. 1)	Geology of Ramsey County, North Dakota
____(AS-15-A1)($3.00)	Surface Geology of the Sheyenne River Map Area
____($1.50/map)	North Dakota Oil & Gas Fields Map
____($1.50/map)	Distribution of Hydrogen Sulfide Map

ADDRESS CORRECTION

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(June, 1987)

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