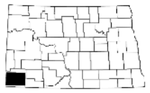
North Dakota Geological Survey
Edward C. Murphy, Acting State Geologist

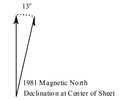
Uranium

Bowman 100K Sheet, North Dakota



Williams	Bottineau	Rolette
Mountrail	Ward	Renville
McKenzie	Burke	Divide

Adjoining 100K Maps



Edward C. Murphy
2005

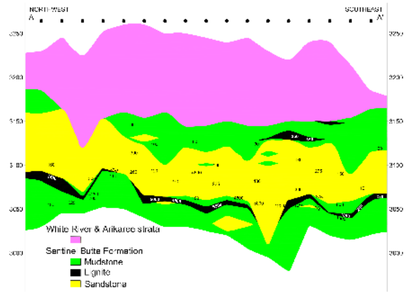
Rocks exposed at the surface of the Bowman sheet range from 80 million year old shales of the Pierre Formation (Upper Cretaceous) along the Little Missouri River Valley in the southwestern corner of the sheet to 25 million year old sandstones, marlstones, and conglomerates of the Arikaree Formation (Oligocene and Miocene) which form the caprock for White and Chalky Buttes south of Amidon (Carlson, 1979 and 1983). The White River Group (Eocene and Oligocene) and Arikaree Formation are approximately 300 feet thick in this area (Murphy et al., 1993). Most of the surface of this map is underlain by coal-bearing strata within the Fort Union Group (Ludlow, Slope, Bullion Creek, and Sentinel Butte Formations). The Fort Union Group has a maximum thickness of approximately 1,300 feet in this area. The majority of coals are less than 5 feet thick, but two coals (T Cross and Harmon) are more than 30 feet thick in this area (Murphy et al., 1999).

The volcanic-rich White River and Arikaree strata are the likely source rocks for radioactivity found in lignites within the Fort Union Group (Denson and Gill, 1965). Over millions of years, groundwater has leached uranium from this younger strata and deposited it in carbonaceous rocks within the Fort Union Group. According to this model, when uranium is present, it should be concentrated in the stratigraphically highest lignite. However, this was often found not to be the case in this area. Typically, the highest concentrations of radioactive minerals were found in thin coals (2 to 4 feet thick) situated beneath fluvial channel sandstones or within the channel sandstones themselves.

The North Dakota Geological Survey database for the Bowman Sheet contains 1,076 holes that have been logged to the surface. These electric logs are typically suites of gamma, resistivity, density, and to a lesser degree spontaneous potential or sp. The gamma probe passively measures the natural radioactivity in the borehole. All of the gamma logs in this database were examined for spikes or indicators of increased radioactivity on the log traces. A total of 271 holes in this sheet contain gamma logs with spikes. Background radioactivity in the Fort Union strata ranges from 20 to 60 gamma counts per second (gcps). However, levels of radioactivity in Fort Union coals, carbonaceous mudstones, and sandstones in and around the Chalky Buttes were as high as 5,500 gcps.

Denson and others (1959) and Zeller and Schopf (1959) explored the Medicine Pole Hills area and discovered uraniferous lignites beneath the buttes. Their drillholes are part of this database. Moore and others (1959) obtained a number of samples of uraniferous lignites in the Chalky Buttes, Black Butte, and Slide Butte areas. Those samples have been incorporated into the database.

References
Carlson, C.G., 1979, Geology of Adams and Bowman counties: North Dakota Geological Survey Bulletin No., 65, Part 1, 29 p.
Carlson, C.G., 1983, Geology of Billings, Golden Valley, and Slope counties: North Dakota Geological Survey Bulletin No., 76, Part 1, 40 p.
Denson, N.M., Bachman, G.O., and Zeller, H.D., 1959, Uranium-bearing lignite in northwestern South Dakota and adjacent states: in Uranium in coal in the western United States, U.S. Geological Survey Bulletin 1055, pp. 11-57.
Denson, N.M., and Gill, J.R., 1965, Uranium-bearing lignite and carbonaceous shale in the southwestern part of the Williston Basin – a regional study: United States Geological Survey Professional Paper 463, 75 p.
Moore, G.W., Melin, R.E., and Kepferle, R.C., 1959, Uranium-bearing lignite in southwestern North Dakota: in Uranium in coal in the western United States, U.S. Geological Survey Bulletin 1055, pp. 147-166.
Murphy, E.C., Kruger, N.W., and Goven, G.W., 1999, The major coals of Bowman, Slope, Adams, and Hettinger counties, North Dakota: North Dakota Geological Survey Open-File Report No. 99-1, 56 p.
Murphy, E.C., Hoganson, J.W., and Forsman, N.F., 1993, The Chadron, Brule, and Arikaree Formations in North Dakota; the buttes of southwestern North Dakota: North Dakota Geological Survey Report of Investigation No. 96, 144 p.
Zeller, H.D. and Schopf, J.M., 1959, Core drilling for uranium-bearing lignite in Harding and Perkins counties, South Dakota, and Bowman County, North Dakota: in Uranium in coal in the western United States, U.S. Geological Survey Bulletin 1055, pp. 59-146.



A cross-section through Arikaree, White River, and Fort Union strata in White and Chalky Buttes. The numbers within the diagram are gamma counts per second (gcps). The gcps are plotted to the right of the corresponding borehole and at the stratigraphic position they were detected. The highest gamma counts are generally found in carbonaceous mudstones or lignites situated immediately beneath 30-to 100-foot-thick channel sandstones.

Geologic Symbols

- Geophysical logs that contain one or more gamma spikes.
- Geophysical logs that do not contain gamma spikes. Data points include coal exploration and subsurface mineral drill holes, oil and gas wells, and ND State Water Commission drill holes.

Other Features

- Water
- Water - Intermittent
- River/Stream - Perennial
- River/Stream - Intermittent
- Section Corners
- County Boundary
- US Highway
- State Highway
- Paved Road
- Unpaved Road

Scale 1:100,000

0 1 2 3 4

Miles

Mercator Projection 1927 North American Datum
Standard parallel 46°00 Central meridian 103°30
Shaded Relief - Vertical Exaggeration 9x

Cartographic Compilation: Elroy L. Kadrmas