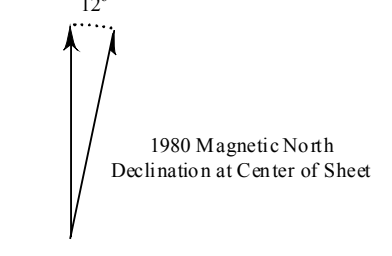


Uranium

Mott 100K Sheet, North Dakota

Belfield	Dickinson	Glen Ullin
Bowman		Elgin
Camp Crook		Lemmon
		McIntosh

Adjoining 100K Maps



Edward C. Murphy 2006

Rocks exposed at the surface of the Mott 100K sheet are primarily sandstones, siltstones, claystones, mudstones, and lignites of the Fort Union Group (Paleocene). This includes the Ludlow, Cannonball, Slope, Bullion Creek, and Sentinel Butte Formations. The lower member of the Chadron Formation (Eocene) of the White River Group caps the Whetstone Buttes (T132N, R98W, sections 20, 21, 28, 29, and 32). This member (Chalky Buttes Member) consists of 20 feet of pebbly sandstone (Murphy et al., 1993). The Golden Valley Formation is present at the base of East Rainy Butte, but is absent from the rest of the area. East Rainy Butte is capped by the White River Group (Chadron and Brule Formations) and the Arkaroo Formation. Lithologies of the Chadron Formation (Eocene) include conglomerates, claystone, and marlstone. The Brule Formation (Oligocene) contains beige colored sandstones, siltstones, and mudstones. The White River Group is about 200 feet thick in the Rainy Buttes (Murphy et al., 1993). The Fort Union Group has a maximum thickness of approximately 1,000 feet in this area (Murphy, 2006).

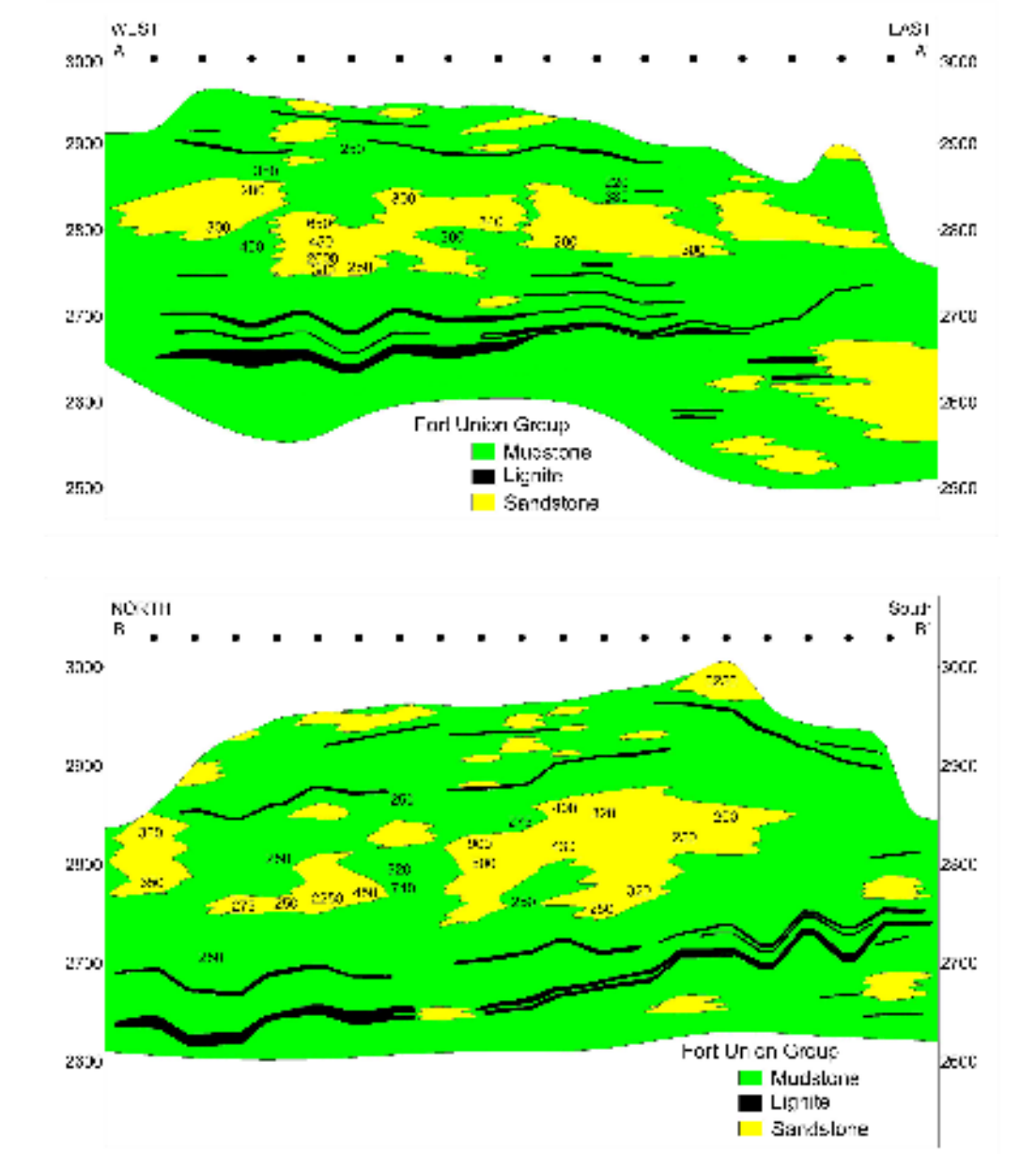
Volcanic-rich White River strata are the likely source rocks for uranium in this area (Denson and Gill, 1965). Over millions of years, groundwater has leached uranium from this strata and deposited it in the underlying carbonaceous rocks and sandstones. According to this model, uranium should be concentrated in the stratigraphically highest lignite or carbonaceous zone beneath the White River unconformity. As expressed in the gamma logs within this map sheet, and demonstrated in the enclosed cross sections, this is not always the case.

The North Dakota Geological Survey's database for the Mott Sheet contains exploration holes and monitoring wells that have electric logs 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. Zones or horizons of increased radioactivity are recognizable as spikes on gamma logs. All gamma logs in this database were examined for radioactive spikes or indicators of increased radioactivity on the log traces. Background radioactivity in the Fort Union strata ranges from 20 to 60 gamma counts per second (gps). The magnitude of most gamma spikes or deflections in this area was less than 200 gamma counts.

Gamma spikes were primarily concentrated in the extreme western edge of this map sheet (T131N, R98W). This pattern follows an east-west trend from the adjacent Bowman map sheet. The zones of increased radioactivity in this area generally occur at either the top or base of fluvial channel sandstones that are located 100 to 200 feet beneath the surface. In most of these cases, there are one or two lignites overlying these sandstones that are not uraniumiferous. In the Whetstone Buttes, the White River unconformity is at an elevation of approximately 3,050 feet above sea level. A gamma count of 1,200 gps was recorded 150 feet below this level from a hole in the area (T132N, R98W, section 28). One of the highest, if not the highest, gamma values in this sheet (3,250 gps) occurs in a near-surface sandstone within the Sentinel Butte Formation (section B), about five miles south of the Whetstone Buttes. In this general area (T131N, R98W), gamma counts were found to exceed 2,000 gps near the base of sandstones about 200 feet beneath the surface (sections A and B). This horizon occurs about 250 to 300 feet beneath the White River unconformity in the Whetstone Buttes.

According to the records of the North Dakota Public Service Commission, no uraniumiferous lignite mines have operated within this map sheet.

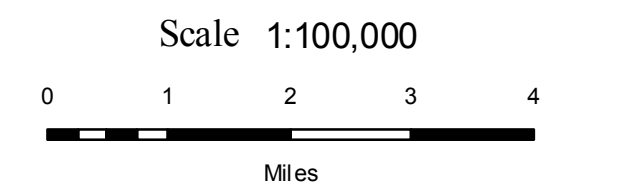
References: Denson, M. and Gill, J.R., 1965. Uranium-bearing lignite and carbonaceous shale in the southwestern part of the Williston Basin - a regional study. United States Geological Survey Professional Paper 463, 75 p.
Murphy, E.C., Hargrove, J.W. and Farnham, N.F., 1993. The Chalky Butte, and Arkaroo Formations in North Dakota, the buttes of southwestern North Dakota. North Dakota Geological Survey Report of Investigation No. 96, 144 p.
Murphy, E.C., 2006. The lignite resources of North Dakota. North Dakota Geological Survey Report of Investigation No. 104, 141 p.



Cross sections through Fort Union strata in the Mott map sheet. The numbers in the diagram are the gamma counts per second (gps) obtained from spikes on gamma logs. The gps correspond to the stratigraphic position within they were detected.

- Geologic Symbols**
- Orange circle: Geophysical logs that contain one or more gamma spikes.
 - Black circle: 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.
- A—A' Cross-Section

- Other Features**
- Blue area: Water
 - Blue hatched area: Water - Intermittent
 - Blue wavy area: Marsh
 - Blue line: River/Stream - Perennial
 - Blue dashed line: River/Stream - Intermittent
 - Black cross: Section Corners
 - Orange line: County Boundary
 - Black line with shield: US Highway
 - Black line with circle: State Highway
 - Black line: Paved Road
 - Black dashed line: Unpaved Road



Merator Projection 1927 North American Datum
Standard parallel 46°00' Central meridian 102°30'
USGS NED Shaded Relief - Vertical Exaggeration 9x