Kukersites of the Williston Basin Red River Formation in North Dakota

Sencer L. Wheeling[1] and Richard LeFever[1]

[1]University of North Dakota, Grand Forks, ND

ABSTRACT

The Red River Formation is a stratigraphic unit located in the central part of North America; being recognized as a formal unit in North Dakota, Manitoba and Saskatchewan, portions in South Dakota, and unit equivalents in Montana and Wyoming. According to the Oil and Gas Division of the North Dakota Industrial Commission Department of Mineral Resources, the Red River Formation is North Dakota's third largest hydrocarbon producing unit, trailing only the Bakken Formation (first) and the Madison Group (second). The Red River Formation produces hydrocarbons in many fields, but there was uncertainty as to the origin of the oil and gas found in the formation. Winnipeg shales were originally proposed to be the source of oil in the Red River Formation, but the Red River was later interpreted to be self-sourced. These source beds are called kukersites. Kukersites are kerogenous, lime mudrock composed predominantly of the Ordovician microfossil Gloeocapsomorpha prisca alginate, which is the dominant component of many Ordovician-aged organic rich hydrocarbon source rocks and oil shales around the world. Previous studies have stated kukersite beds were not deposited uniformly across the basin, but can be laterally continuous over distances of tens of kilometers. They are common in the southern and western parts of the Williston Basin where there is an abundance of Red River oil fields, but they are also common in the northern part of the basin where relatively few fields have been found. Kukersites are best developed in the upper part of the "C" burrowed member (Upper Yeoman Formation). This study's purpose was to thoroughly examine kukersite bed distribution in North Dakota. Previous works have expressed the regional distribution of kukersite source beds remains poorly documented. Because past studies have shown kukersite beds to be the source of hydrocarbons for the Red River Formation, but no one has made a strong effort to regionally map out the source beds, especially within North Dakota borders; this study examined 161 cores (16119 total feet (4913 meters)) across 23 counties in North Dakota and created a regional distribution map of the kukersite source beds.