NORTH DAKOTA STRATIGRAPHIC COLUMN

AUE MILLIONS OF YEARS BEFORE PRESENT	HEN	SYSTEM			INCE	ROCK UNIT		
	ERATHEM			SERIES	SEQUENCE	GROUP	FORMATION	MEMBER
0.01-		5	X	Holocene			OAHE	RIVERDALE PICK CITY AGGIE BROWN MALLARD ISLAND
		QUATERNARY		Pleistocene	TEJAS	COLEHARBOR	WEST CENTRAL EAST SNOW SCHOOL DAHLEN HORSESHOE VALLEY CHURCH MEDICINE HILL CANDO	FERN RED RIVER VALLI POPLAR RIVER BRENAA PALCONER HUOT ARGUSVILLE WYLIE RED LAKE FALLS S FERRY S S FERRY ST. HILAIRE LATON MARCOUX
-2.6 —			NEOGENE	Pliocene	TE		(Unnamed Unit)	
- 5.3 —		TERTIARY		Miocene			ARIKAREE	
23.0 -				Oligocene			BRULE	
33.9 - 55.8 -	CENOZOIC		PALEOGENE			WHITE RIVER	CHADRON	SOUTH HEART CHALKY BUTTES
				Eocene		~~~~~	GOLDEN VALLEY	CAMELS BUTTE
				Paleocene		FORT UNION	SENTINEL BUTTE	BEAR DEN
							BULLION CREEK	
							SLOPE	
							CANNONBALL	
							LUDLOW	
65.5-							HELL CREEK	BREIEN
							FOX HILLS	COLGATE ≥ LINTON BULLHEAD TIMBER LAKE
		CRETACEOUS		Upper	ZUNI	MONTANA	PIERRE	DEGREY
								GREGORY
								PEMBINA
								GAMMON
							NIOBRARA	
	IC						CARLILE	
	ZO				-	COLORADO	GREENHORN	
	MESOZOIC						BELLE FOURCHE	
99.6 -	MF						MOWRY	
							NEWCASTLE	
				Lower		DAKOTA	SKULL CREEK	
							INYAN KARA	
145.5-				URASSIC			SWIFT	
			J				RIERDON	BOWES
								FIREMOON TAMPICO
							PIPER	KLINE PICARD POE



BIRDBEAR SUMMARY

DRILL STEM TESTS AND PRODUCTION MAPPING

Prepared by Travis Stolldorf

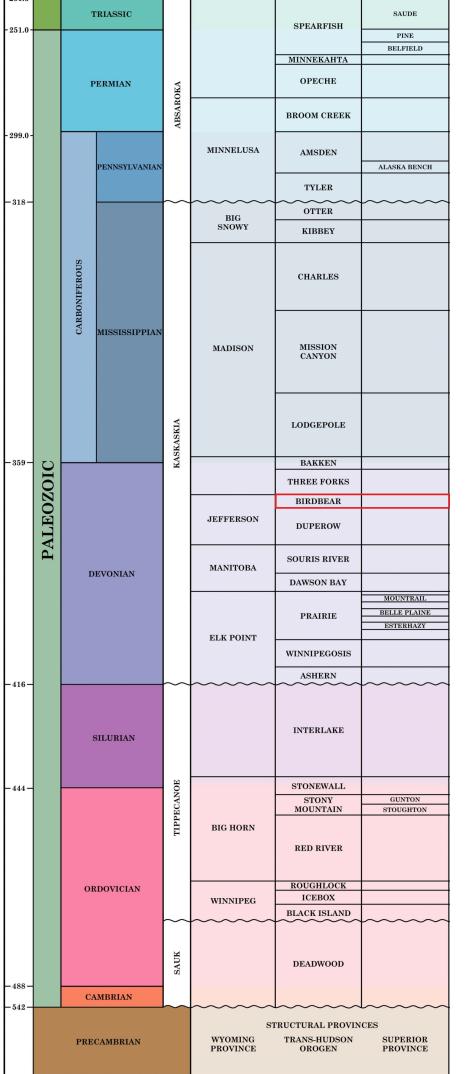
In order to better facilitate petroleum exploration and development in the Williston Basin, the North Dakota Geological Survey (NDGS) has published a series of production-related maps and corresponding data sets. These maps sets include production and drill stem test (DST) results with an accompanying spreadsheet for easy data extraction. The primary goal of this project is to create a database showing the distribution of hydrocarbons within each productive unit.

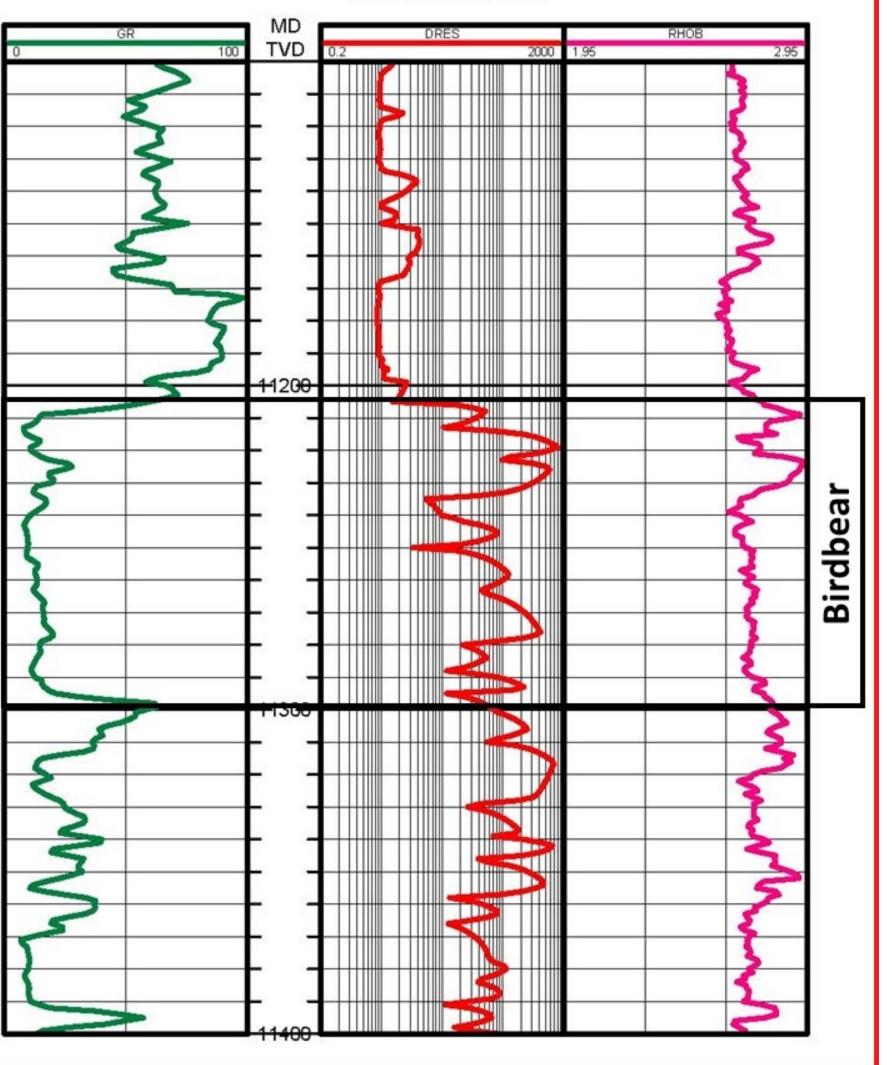
Prior to this project, over 55% of the DST results in the state did not have an associated geologic interval. The NDGS utilized a series of filters in Petra and Excel to unite formation tops with DST results. Now over 95% of DST results are associated with a geologic interval. After removing failed (misrun) DSTs, the remaining DST results were then separated into three groups. The first group (Positive DSTa) contains wells that have recovered oil or gas (in either the drill pipe or the sampler), or those that list oil or gas as the primary component of the fluid/gas mixture (e.g. 10' mud cut oil) in the description. Secondly, Positive DSTb wells display results for oil or gas as the secondary component of the fluid/gas mixture (e.g. 50' gas cut mud). Although Positive DSTb wells do show signs of hydrocarbons, the hydrocarbon signal is considered weaker than those in the Positive DSTa group. Lastly, the Negative DST results have no indication of hydrocarbons. Detailed information for each DST (time-pressure data, interval depths, fluid and gas recovery information) can be accessed through the well file database maintained by the North Dakota Industrial Commission (NDIC) Oil and Gas Division.

Production for each well was determined using the NDIC's Production Pools and associated monthly production totals. The production pools utilized are shown on the Production Map for each interval. Cumulative production for each well was calculated through September 2019.

This project is a summary of the Birbear Formation's production and drill stem test results. Map sets include a production map, cumulative production map and DST results in North Dakota's portion of the Williston Basin. The Birbear Formation is highlighted by the red box on the North Dakota Stratigraphic Column on the left. A representative log of the Birbear Formation is shown below along with a map showing the well's approximate location.

ZABOLOTNY 1-3-4A API: 33007002210000 T144N R98W S3





References

Murphy, E.C., Nordeng, S.H., Juenker, B.J., and Hoganson, J.W., 2009, North Dakota Stratigraphic Column, North Dakota Geological Survey, MS-91, 1p.

North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Statistics, retrieved October 2019, https://www.dmr.nd.gov/oilgas/

NORTH DAKOTA LOCATION MAP

