

NORTH DAKOTA STRATIGRAPHIC COLUMN



WINNIPEGOSIS SUMMARY

DRILL STEM TESTS AND PRODUCTION MAPPING

Travis D. Stolldorf
2020

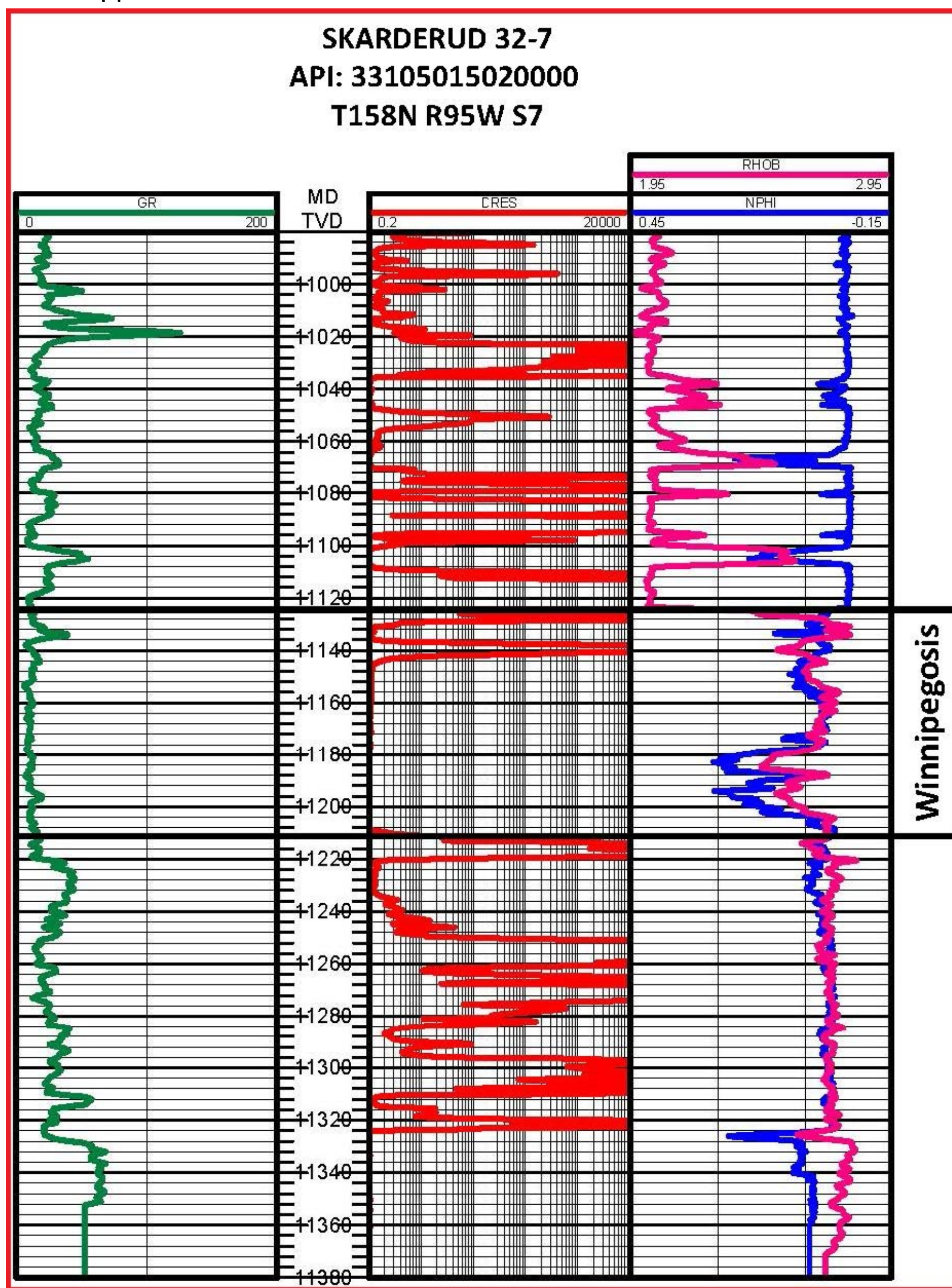
In order to better facilitate petroleum exploration and development in the Williston Basin, the North Dakota Geological Survey (NDGS) has published a series of production-related maps and corresponding data sets. These maps sets include production and drill stem test (DST) results with an accompanying 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 Winnipegosis 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 Winnipegosis Formation is highlighted by the red box on the North Dakota Stratigraphic Column on the left. A representative log of the Winnipegosis Formation is shown below along with a map showing the well's approximate location.

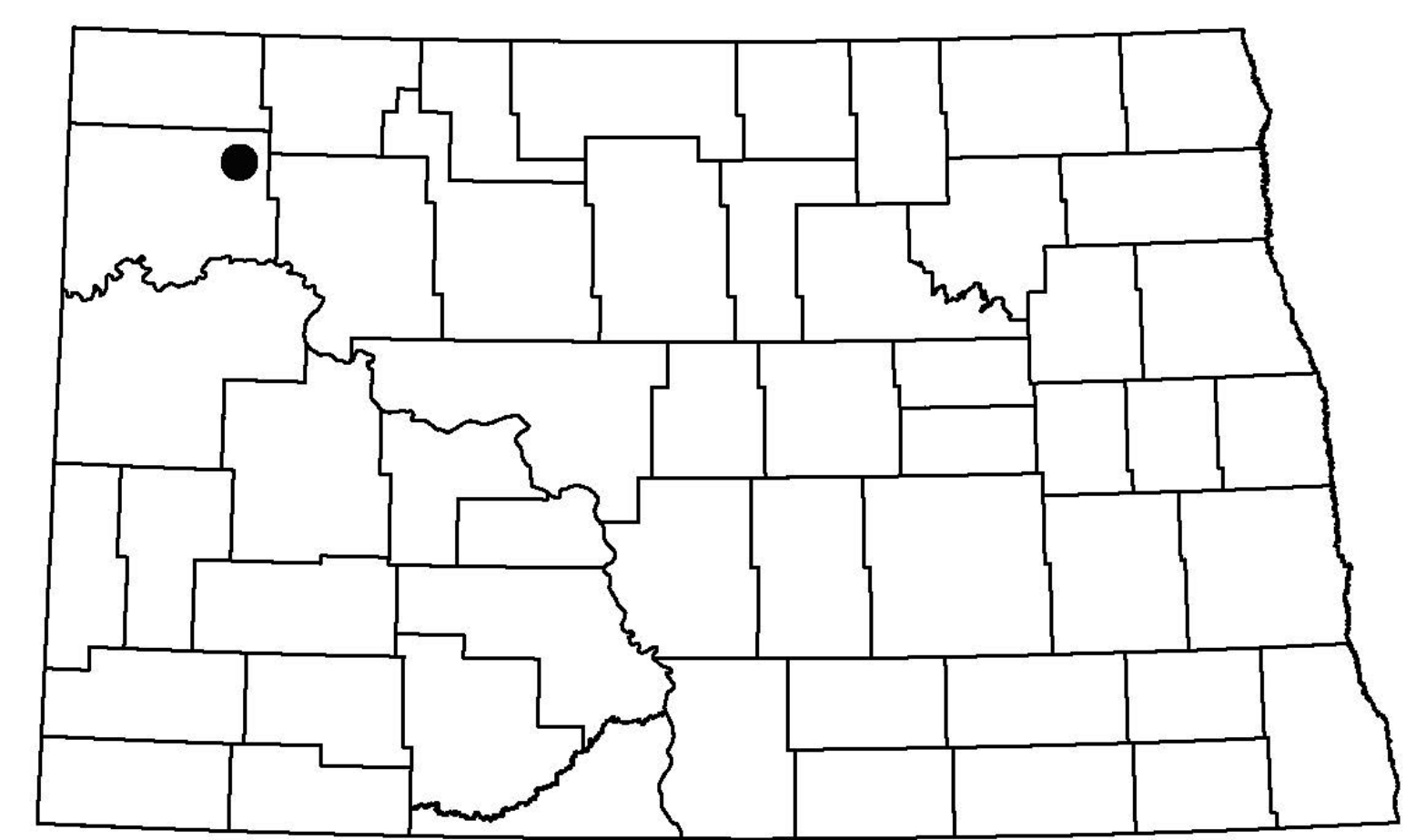
AGE MAY BE MILLIONS OF YEARS BEFORE PRESENT	ERATHEM	SYSTEM	SEQUENCE	ROCK UNIT				
				GROUP	FORMATION	MEMBER		
0.01	QUATERNARY	Holocene	TEIAS	OAHE	RIVERDALE PICK CITY AGUE BROWN MELBARY ISLAND			
		Pleistocene		COLEHARBOR	WEST CENTRAL EASTERN RED RIVER VALLEY SIBERIAN FORDA RIVER BROOK FALCONER BEET ARCHVILLE SNOW SCHOOL DUMLEN HOBBSHORN VALLEY BIRDSONG HILL CROUCH PERRY CAMPBELLTON CANDON			
				(Unnamed Unit)				
2.6	CENOZOIC	Pliocene	TEIAS	ARIKAREE				
5.3		Miocene		WHITE RIVER	BRULE			
23.0		Oligocene			CHADRON	SOUTH HEART CHALBY BUTTES		
33.5	CENOZOIC	Eocene	TEIAS		GOLDEN VALLEY	CAMELS BUTTE BEAR DEN		
55.8								
65.5	CENOZOIC	PALEOGENE	ZUNI		FORT UNION	SENTINEL BUTTE BULLION CREEK SLOPE CANNONBALL LUDLOW		
99.6	MESOZOIC	CRETACEOUS	ZUNI		MONTANA	HELL CREEK BREEN COLGATE 2 LINTON BULLHEAD TIMBER LAKE TRULCITY		
145.5	MESOZOIC	CRETACEOUS	ZUNI		DAKOTA	NIORRARA CARLILE GREENHORN BELLE FOURCHE MOWRY NEWCASTLE SKULL CREEK INVAN KARA		
201.4	MESOZOIC	TRIASSIC	ZUNI		JURASSIC	SWIFT RIERDON BOWEN FLEMING TAMPECO KLINE PICARD FOX DUNHAM		
251.0	MESOZOIC	PERMIAN	ABSAKONIA		TRIASSIC	SPEARFISH MINNEKAHTA MINNEKAHTA OPECHE BROOM CREEK		
299.0	MESOZOIC	PENNSYLVANIAN	ABSAKONIA		PERMIAN	MINNELUSA AMSDEN ALASKA BENCH TYLER OTTER KIBBEY		
318	MESOZOIC	CARBONIFEROUS	KANSASIA		CARBONIFEROUS	CHARLES MISSION CANYON LODGEPOLE		
359	PALEOZOIC	DEVONIAN	KANSASIA		DEVONIAN	BARKEN THREE FORKS BIRDBEAR JEFFERSON DUPEROW MANITOBA SOURIS RIVER DAWSON RAY PRAIRIE MOUNTAIN BELL BLAINE ESTERHAZY		
416	PALEOZOIC	SILURIAN	TIPPECANOE		SILURIAN	WYNNIPEGOSIS ASHERN INTERLAKE		
444	PALEOZOIC	ORDOVICIAN	TIPPECANOE		ORDOVICIAN	STONEMOUNTAIN GUSTON STONEMOUNTAIN BIG HORN RED RIVER ROUGHLICK ICEBOX WINNIPEG BLACK ISLAND		
488	PALEOZOIC	CAMBRIAN	SASK		CAMBRIAN	DEADWOOD		
542	PRECAMBRIAN	PRECAMBRIAN	SASK		PRECAMBRIAN	WYOMING PROVINCE STRUCTURAL PROVINCES TRANS-HUDSON OROGEN SUPERIOR PROVINCE		



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/>

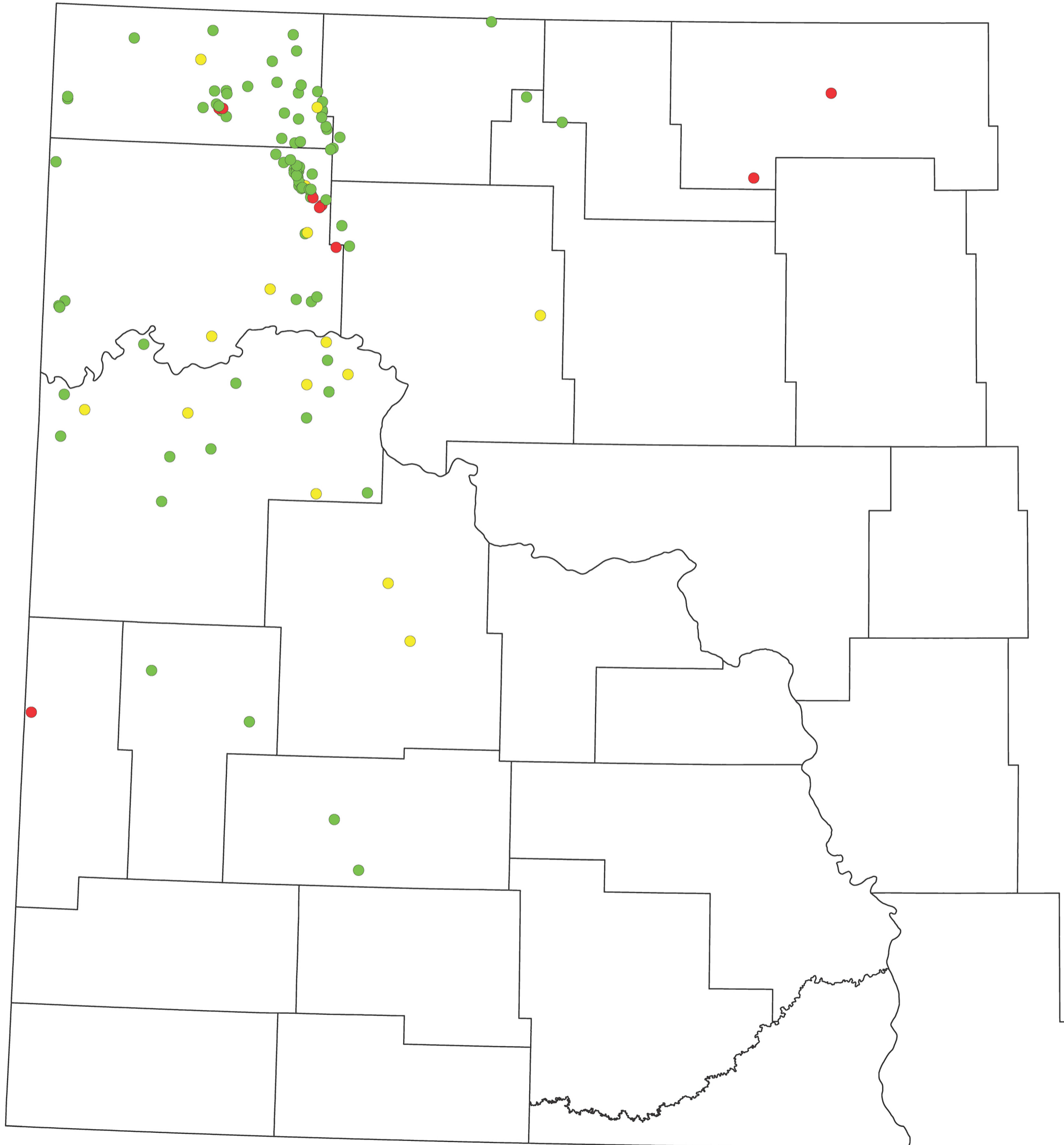
NORTH DAKOTA LOCATION MAP





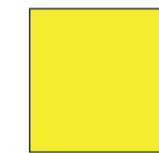
WINNIPEGOSIS DRILL STEM TEST RESULTS

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POSITIVE DSTa

- (1) Oil or gas recovered in sampler and/or pipe (e.g. 275' Free Oil)
- (2) Description with oil or gas as the primary component of fluid/gas mixture (e.g. 150' mud cut Oil)



POSITIVE DSTb

- (1) Description with oil or gas as the secondary component of fluid/gas mixture (e.g. 150' Gas cut mud)
- (2) Hydrocarbons present but a weak indication in DST



NEGATIVE DST

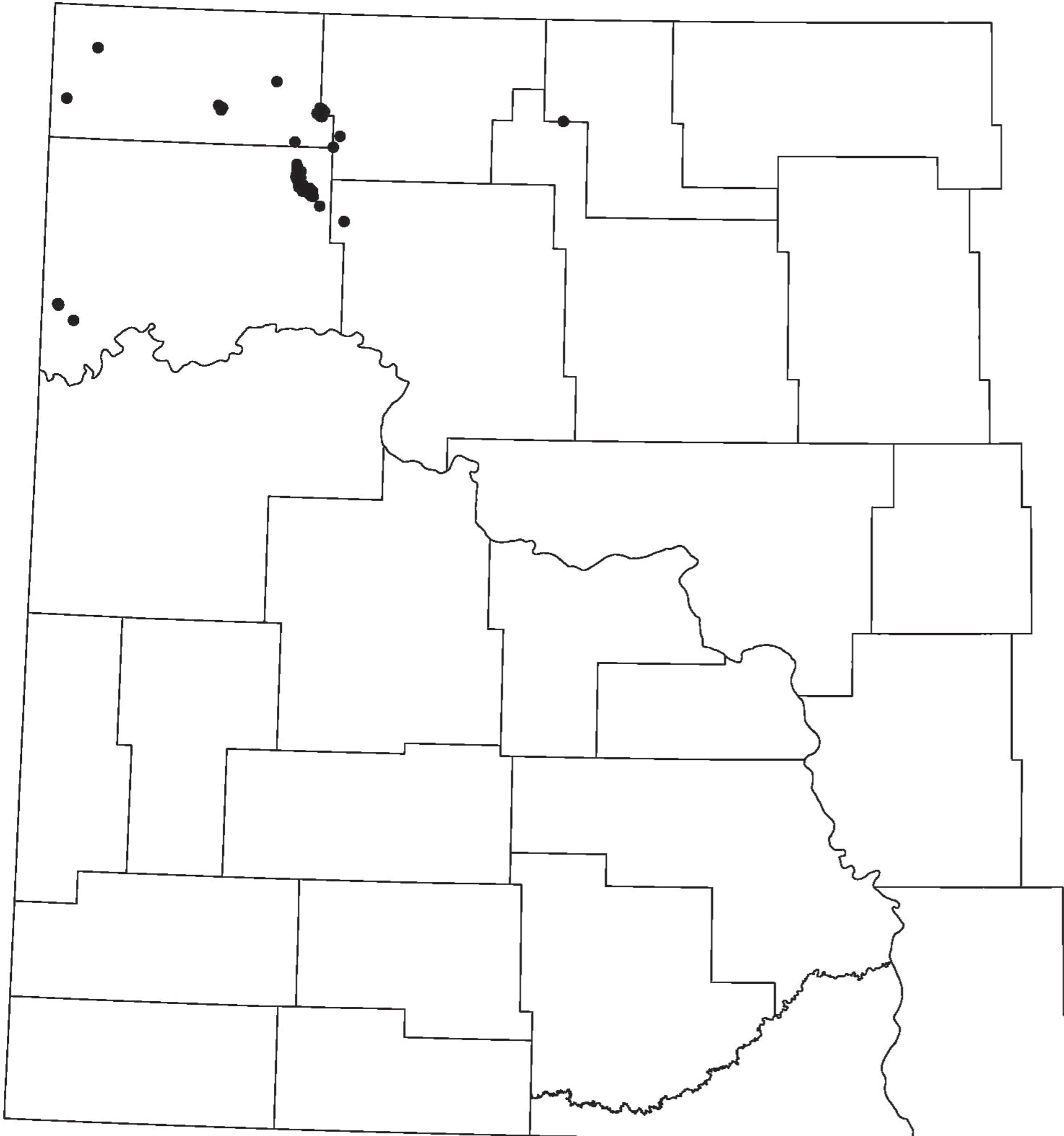
- (1) No Oil or Gas reported





WINNIPEGOSIS OIL PRODUCTION

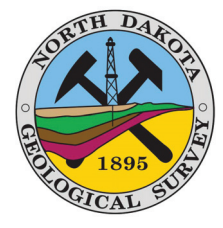
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● Winniepegosis Production

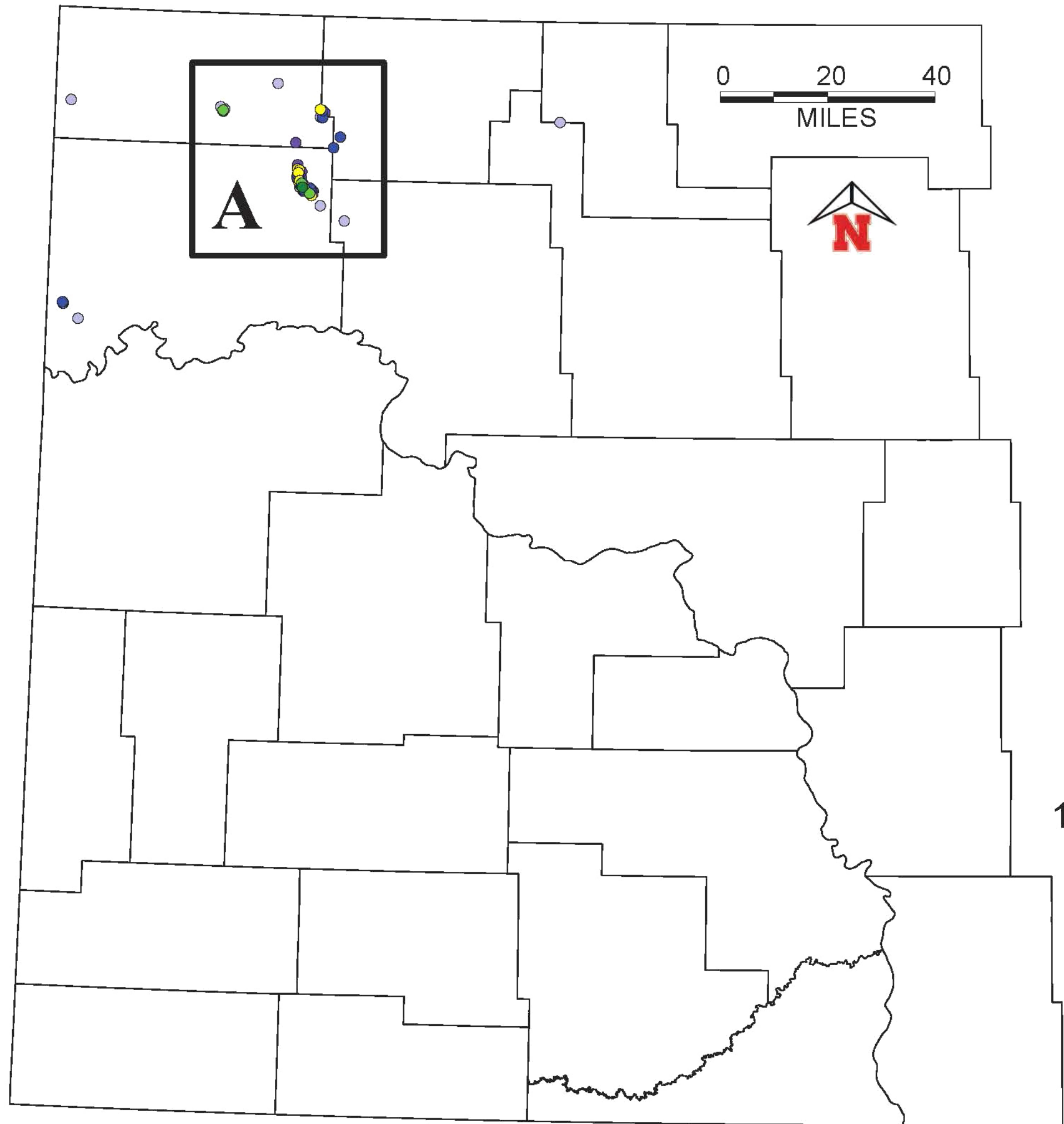
NDIC Production Pools Utilized
Winniepegosis





WINNIPEGOSIS CUM OIL PRODUCTION

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**CUM OIL
(BBLs)**

