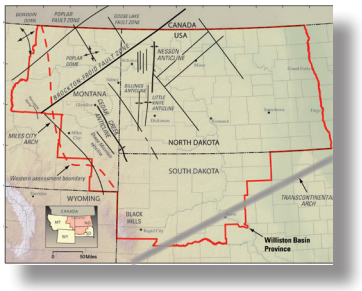
Chapter 1

Executive Summary—Assessment of Undiscovered Oil and Gas Resources of the Williston Basin Province of North Dakota, Montana, and South Dakota, 2010



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By U.S. Geological Survey Williston Basin Province Assessment Team

Chapter 1 of 7

Assessment of Undiscovered Oil and Gas Resources of the Williston Basin Province of North Dakota, Montana, and South Dakota, 2010

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U.S. Geological Survey Digital Data Series DDS–69–W

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
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U.S. Geological Survey, Reston, Virginia: 2013

Suggested citation:
U.S. Geological Survey Williston Basin Province Assessment Team, 2013, Executive summary—Assessment of undiscovered oil and gas resources of the Williston Basin Province of North Dakota, Montana, and South Dakota, 2010, chap. 1 *of* U.S. Geological Survey Williston Basin Province Assessment Team, Assessment of undiscovered oil and gas resources of the Williston Basin Province of North Dakota, Montana, and South Dakota, 2010 (ver. 1.1, November 2013): U.S. Geological Survey Digital Data Series 69–W, 4 p.

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Executive Summary—Assessment of Undiscovered Oil and Gas Resources of the Williston Basin Province of North Dakota, Montana, and South Dakota, 2010

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Using a geology-based assessment method, the U.S. Geological Survey estimated mean undiscovered volumes of 3.8 billion barrels of undiscovered oil, 3.7 trillion cubic feet of associated/dissolved natural gas, and 0.2 billion barrels of undiscovered natural gas liquids in the Williston Basin Province, North Dakota, Montana, and South Dakota.

Introduction

The U.S. Geological Survey (USGS) completed an assessment of the undiscovered oil and gas resources in conventional and continuous accumulations of the Williston Basin Province of North Dakota, eastern Montana, and northwestern South Dakota (fig. 1). The assessment is based on geologic elements of a total petroleum system (TPS) that include (1) source-rock distribution, thickness, organic richness, maturation, petroleum generation, and migration; (2) reservoir-rock type (conventional or continuous), distribution, and quality; and (3) character of traps and time of formation with respect to petroleum generation and migration. Detailed framework studies in stratigraphy and structural geology and the modeling of petroleum geochemistry, combined with historical exploration and production analyses, were used in estimating the undiscovered, technically recoverable oil and gas resources of the entire stratigraphic section in the U.S. part of the basin. Using this framework, the USGS defined 10 TPSs and 19 assessment units (AUs) within them, and undiscovered oil and gas resources were quantitatively estimated within each AU (table 1; Anna and others, 2008). The assessment of the Bakken Formation is included here, and it was also published previously as USGS Fact Sheet 2008–3021 (Pollastro, and others, 2008).

Resource Summary

The USGS estimated means of 3,844 million barrels of oil (MMBO), 3,705 billion cubic feet of gas (BCFG), and 202 million barrels of total natural gas liquids (MMBNGL) for undiscovered continuous and conventional resources in the Williston Basin Province (table 1).

The assessment indicates that most of the undiscovered oil and gas resides within the Bakken Formation as a continuous reservoir with a mean of 3,645 MMBO, whereas undiscovered oil from conventional reservoirs has a mean of 197 MMBO. All of the undiscovered continuous gas resides in the Bakken with a mean of 1,848 BCFG and in coalbed gas with a mean of 882 BCFG.

Most of the undiscovered conventional oil resides in the Mission Canyon–Charles AU with a mean of 45 MMBO and the Red River Fairway AU with a mean of 30 MMBO. The remainder from Paleozoic AUs is estimated to contain a mean of 122 MMBO. Undiscovered conventional gas resources reside in Paleozoic and shallow biogenic gas AUs with a mean of 976 BCFG.

Supporting geologic studies and reports on the assessment method used in the Williston Basin Province assessments are included as additional chapters in this CD-ROM. Assessment results and interactive maps of assessment boundaries are available at the USGS Central Energy Resources Science Center website at *http://energy.cr.usgs.gov/oilgas/noga.*

Williston Basin Province Assessment Team

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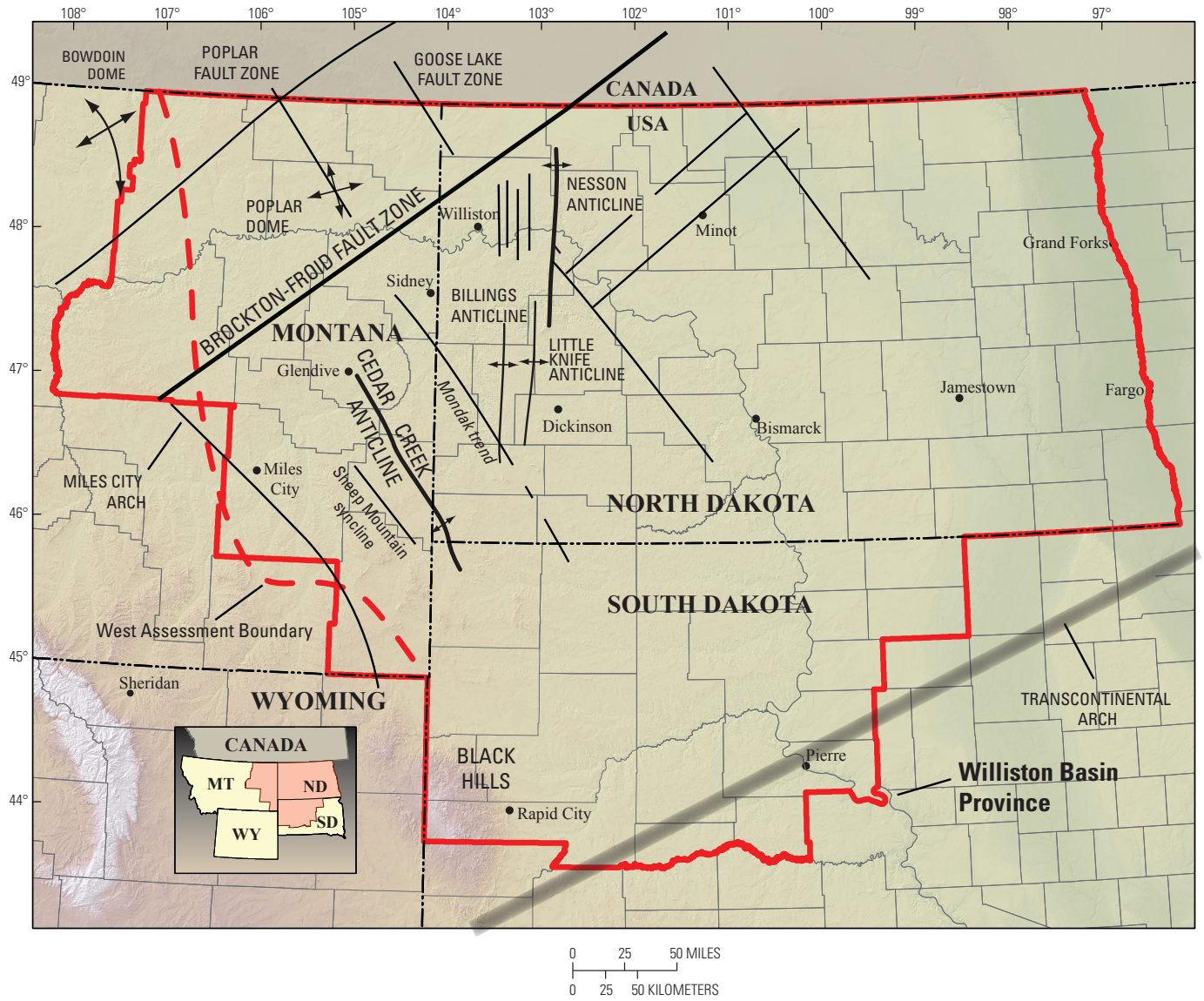

Figure 1. Location and physiographic features of the Williston Basin Province. Black lines not labeled are major lineaments or faults. Solid red line is province boundary; dashed red line represents the western boundary for assessment units. Lineaments and structure locations are from Gerhard and others (1982) and Anna (1986).

Table 1. Williston Basin Province assessment results.
[MMBO, million barrels of oil; BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included as NGL (natural gas liquids). F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. TPS, total petroleum system; AU, assessment unit. Gray shading indicates not applicable]

	Total Petroleum System and Assessment Unit	Field Type	*Total Undiscovered Resources*											
			Oil (MMBO)				*Gas (BCFG)*				*NGL (MMBNGL)*			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Continuous Oil and Gas Resources	**Bakken–Lodgepole TPS**													
	Elm Coulee–Billings Nose AU	*Oil*	374	410	450	410	118	198	332	208	8	16	29	17
	Central Basin–Poplar Dome AU	*Oil*	394	482	589	485	134	233	403	246	10	18	35	20
	Nesson–Little Knife Structural AU	*Oil*	818	908	1,007	909	260	438	738	461	19	34	64	37
	Eastern Expulsion Threshold AU	*Oil*	864	971	1,091	973	278	469	791	493	20	37	68	39
	Northwest Expulsion Threshold AU	*Oil*	613	851	1,182	868	224	411	754	440	16	32	64	35
	Coalbed Gas TPS													
	Fort Union Coalbed Gas AU	*Gas*					368	791	1,701	882	0	0	0	0
	Total Continuous Resources					**3,645**				**2,730**				**148**
Conventional Oil and Gas Resources	**Bakken–Lodgepole TPS**													
	Middle Sandstone Member AU	*Oil*	1	4	8	4	0	1	3	2	0	0	0	0
		Gas					0	0	0	0	0	0	0	0
	Lodgepole AU	*Oil*	2	7	18	8	1	4	11	5	0	0	1	0
		Gas					0	0	0	0	0	0	0	0
	Winnipeg–Deadwood TPS													
	Winnipeg–Deadwood AU	*Oil*	1	4	10	5	3	9	24	11	0	0	1	0
		Gas					56	161	358	178	3	8	20	9
	Red River TPS													
	Red River Fairway AU	*Oil*	12	29	51	30	11	28	55	30	1	3	6	3
		Gas					58	155	314	167	11	30	67	33
	Red River East Margin AU	*Oil*	0	2	4	2	0	0	1	0	0	0	0	0
		Gas					0	0	0	0	0	0	0	0
	Interlake–Stonewall–Stony Mountain AU	*Oil*	9	22	44	24	8	22	47	24	1	2	5	2
		Gas					0	0	0	0	0	0	0	0
	Winnipegosis TPS													
	Winnipegosis AU	*Oil*	4	11	22	11	2	6	14	7	0	1	1	1
		Gas					0	0	0	0	0	0	0	0
	Duperow TPS													
	Dawson Bay–Souris River AU	*Oil*	2	5	12	6	1	3	6	3	0	0	0	0
		Gas					0	0	0	0	0	0	0	0
	Duperow–Birdbear AU	*Oil*	13	26	44	27	9	20	38	22	1	2	4	2
		Gas					0	0	0	0	0	0	0	0
	Cedar Creek Paleozoic Composite TPS													
	Cedar Creek Structural AU	*Oil*	6	19	41	20	3	12	28	13	0	1	2	1
		Gas					0	0	0	0	0	0	0	0
	Madison TPS													
	Mission Canyon–Charles AU	*Oil*	13	43	85	45	9	33	72	36	1	3	7	3
		Gas					0	0	0	0	0	0	0	0
	Tyler TPS													
	Tyler Sandstone AU	*Oil*	4	14	31	15	1	3	7	3	0	0	0	0
		Gas					0	0	0	0	0	0	0	0
	Shallow Biogenic Gas TPS													
	Shallow Biogenic Gas AU	*Gas*					48	418	1,091	475	0	0	0	0
	Total Conventional Resources					**197**				**976**				**54**
	Total Undiscovered Oil and Gas Resources					**3,844**				**3,705**				**202**

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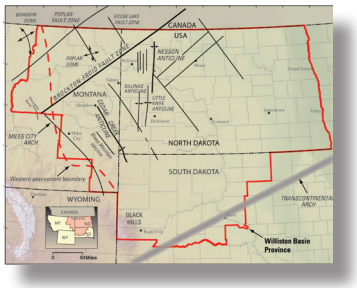

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