

PS The AB Basin Bakken/Exshaw Resource Play of Northwest Montana: Where Did All the Oil Go?*

William B. Hansen¹

Search and Discovery Article #51230 (2016)**

Posted March 7, 2016

*Adapted from poster presentation given at AAPG 2015 Annual Convention and Exhibition, Denver, Colorado, May 31 – June 3, 2015

**Datapages © 2016 Serial rights given by author. For all other rights contact author directly.

¹Jireh Consulting Services, Great Falls, Montana, United States (wbhansen@mcn.net)

Abstract

Northwest Montana experienced a flurry of exploratory drilling activity between 2010–2013, in an attempt to establish a "Bakken-type" oil resource play in Northwest Montana. Companies were lured to the so-called "Alberta Bakken" oil resource play by the prospect of shallower drilling than North Dakota, and the availability of large lease blocks. Some 40 tests drilled by four companies were scattered over 5000+ square miles in an area of northwest Montana, which had few previous deep wells. Many of these tests produced some oil from the Middle Bakken, but all of them have since been plugged or shut-in. In some cases, duplicating the horizontal completion practices perfected in the North Dakota Bakken, have been ineffectual in northwest Montana due to marked changes in the stratigraphy. One company successfully established the first horizontal oil production west of the Sweetgrass Arch from the Devonian Nisku Formation, but the well is currently shut-in. A recent study by Wood McKenzie estimated that the Bakken/Exshaw petroleum system of Montana/Alberta has generated 2.6 billion barrels of oil. If the majority of Bakken-generated oil is no longer in-place, where did it go? Good oil shows from the few scattered deep tests on the Blackfoot Indian Reservation, indicate there may be a bypassed pay zone in the Mississippian, which occurs in the lower Lodgepole Formation. Some of the Bakken-generated oil may have migrated upward into this tight, fractured, carbonate reservoir. Additional oil may have migrated downward into the Devonian Nisku Formation. Future exploration efforts in northwest Montana should focus on the search for traps containing "migrated" Bakken oil, rather than attempting further completions in the Bakken Formation itself. A Bakken-sourced oil resource play may still be feasible if the right trapping conditions can be found.

THE AB BASIN BAKKEN/EXSHAW RESOURCE PLAY OF NORTHWEST MONTANA: WHERE DID ALL THE OIL GO?

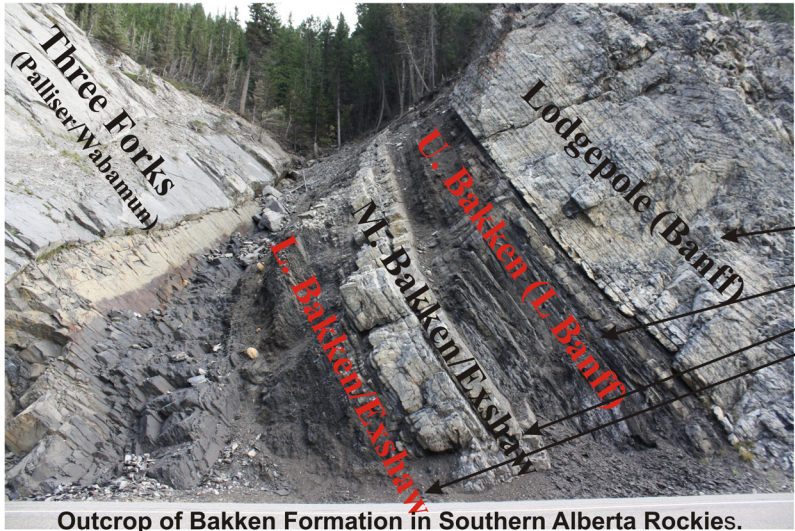
William B. Hansen

ABSTRACT: Northwest Montana experienced a flurry of exploratory drilling activity between 2010-2013, in an attempt to establish a "Bakken-type" oil resource play in Northwest Montana. Companies were lured to the so-called "Alberta Bakken" oil resource play by the prospect of shallower drilling than North Dakota, and the availability of large lease blocks.

Over 40 tests drilled by four companies were scattered over 5000+ square miles in an area of northwest Montana which had few previous deep wells. Many of these tests produced some oil from the Middle Bakken, but almost of them have since been plugged or shut-in. In some cases, duplicating the horizontal completion practices perfected in the North Dakota Bakken, have been ineffective in northwest Montana due to marked changes in the stratigraphy. One company successfully established the first horizontal oil production west of the Sweetgrass Arch from the Devonian Nisku Formation, but the well is now plugged. A recent study by Wood McKenzie estimated that the Bakken/Exshaw petroleum system of Montana/Alberta has generated 2.6 billion barrels of oil. If the majority of Bakken-generated oil is no longer in-place, where did it go?

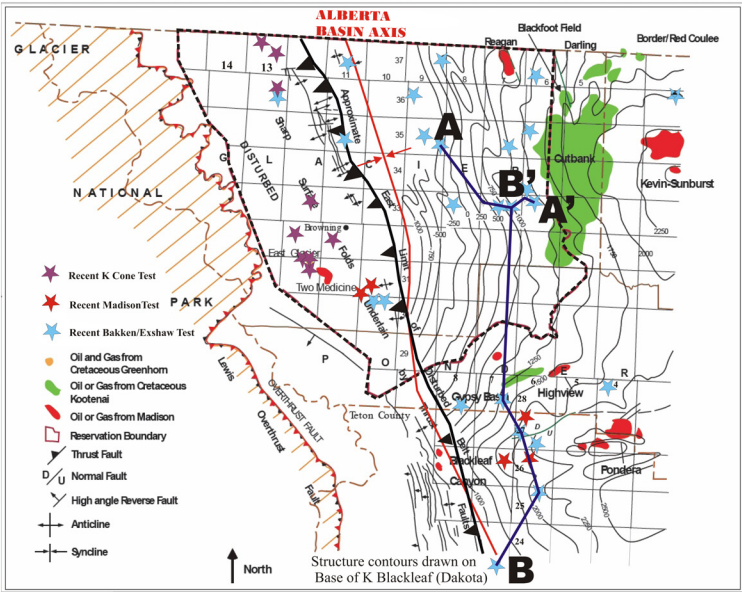
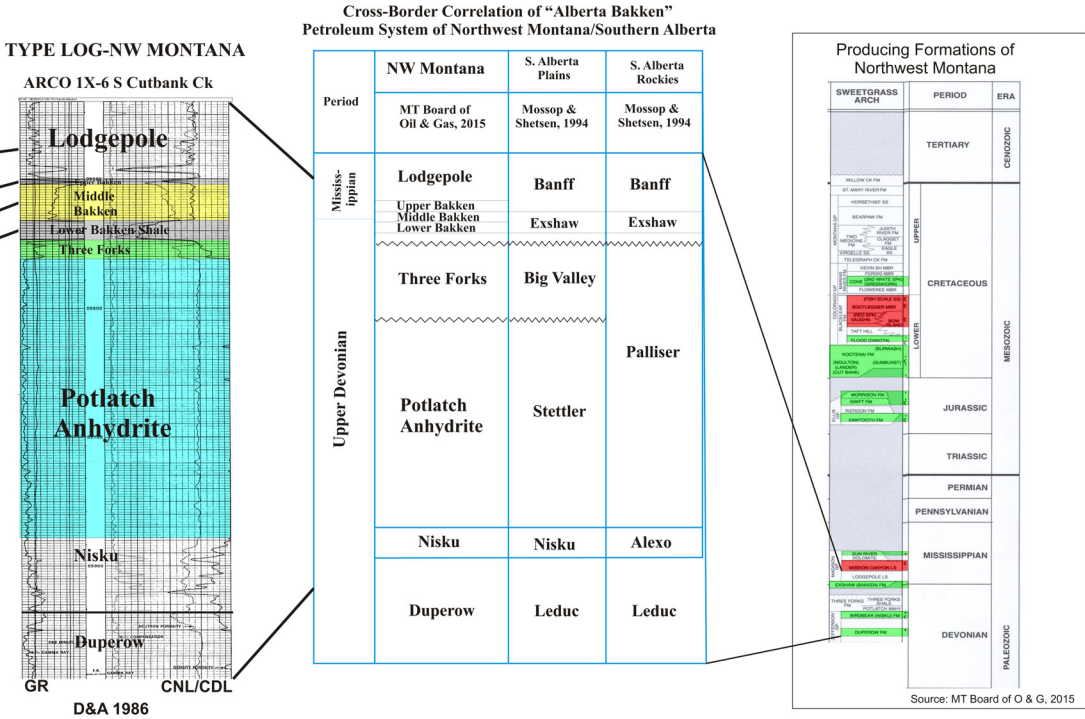
Good oil shows from the few scattered deep tests on the Blackfoot Indian Reservation, indicate there may be a bypassed pay zone in the Mississippian which occurs in the lower Lodgepole Formation. Some of the Bakken-generated oil may have migrated upward into this tight, fractured, carbonate reservoir. Additional oil may have migrated downward into the Devonian Nisku Formation. Good shows have also been encountered in the Devonian Three Forks (Big Valley equivalent) Formation. Future exploration efforts in northwest Montana should focus on the search for traps containing "migrated" Bakken oil, rather than attempting further completions in the Bakken Formation itself. A Bakken-sourced oil play still is feasible if the right trapping conditions can be found.

DRILLING RESULTS RESULTS TO DATE					
	Wells Drilled		Cumulative Best Productive Well		Current Status
	V	H			
Rosetta	7	11	2207 BO, 8263 MCF, 1135 BW - Sim. Farms 3608-34-01HB (Middle Bakken)		P & A
Newfield	3	4	6905 BO, 21,362 MCF, 33,886 BW - Sheriff 1-11H (Nisku)		P & A
Anschutz	8	7	16,003 BO, 4936 MCF, 6945 BW - Anschutz Two Medicine 1-2 (Cone) 688 BO, 16,217 MCF, 9660 BW - Whitecalf 1-3 (Sun River) 0 BO, 2552 MCF, 515 BW - Pine Ridge 1-26 (Bakken)		Prod. P & A P & A
Primary/Oxy	10	3	1158 BO, 1904 BW - Highview 16-5 (K Sunburst) 153 BO, 2113 BW - Springhill 27-6HZ (Lodgepole)		P & A P & A

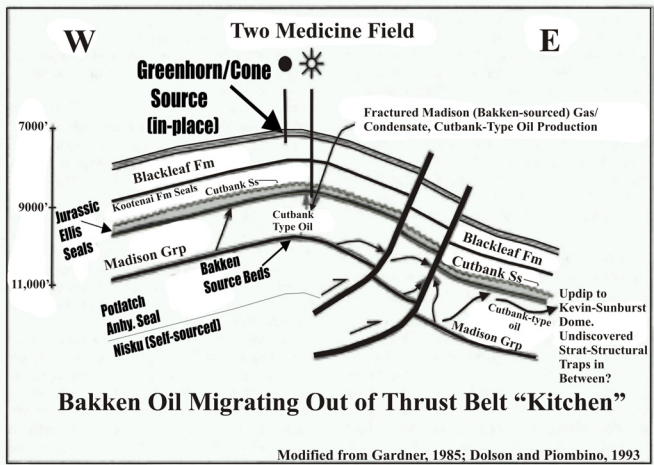


Outcrop of Bakken Formation in Southern Alberta Rockies.

AB BASIN BAKKEN/EXSHAW RESOURCE ESTIMATES	
Rosetta Resources (2010):	13-15 MBOE/sq mile
Wood McKenzie (2011):	2.6 Billion Barrels, AB/MT



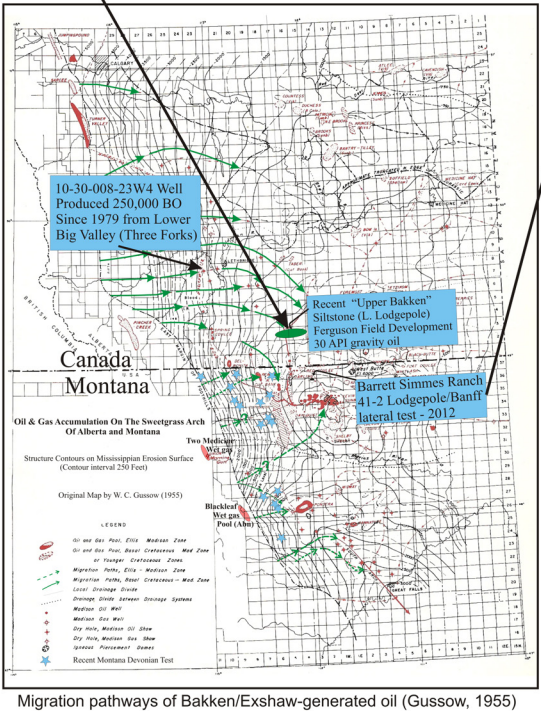
Recent drilling in NW Montana. (Base modified from Just and others, 2013.)



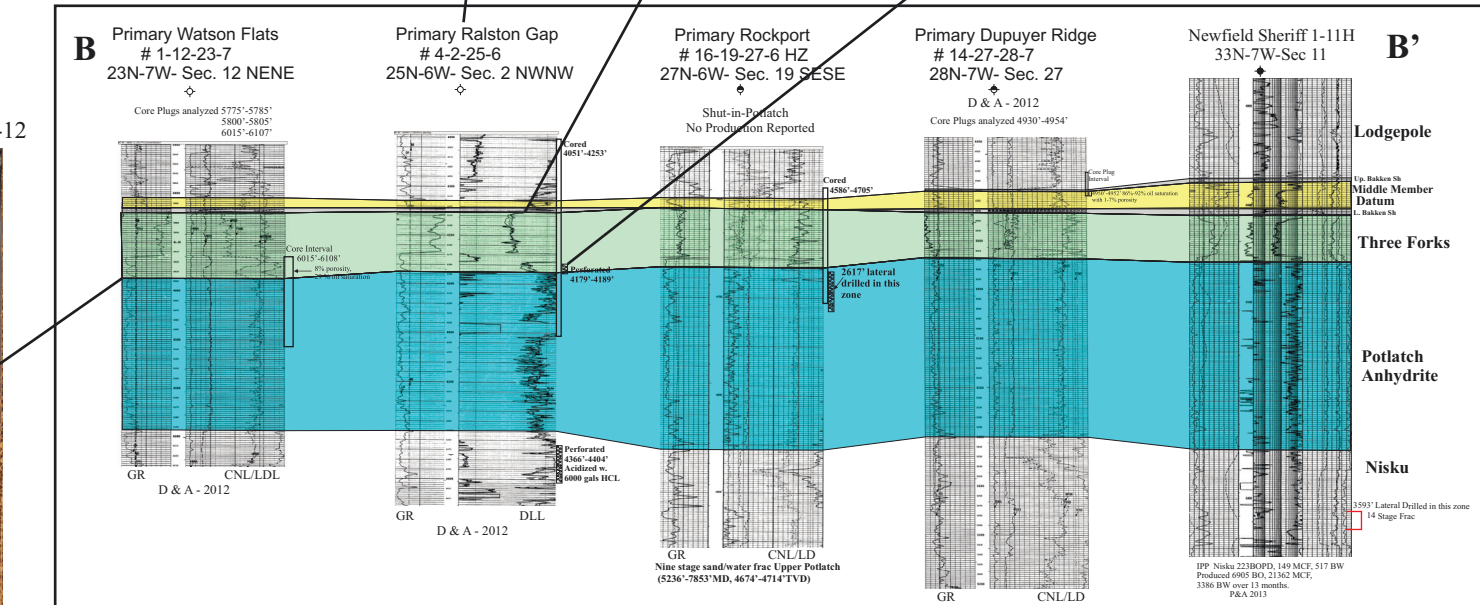
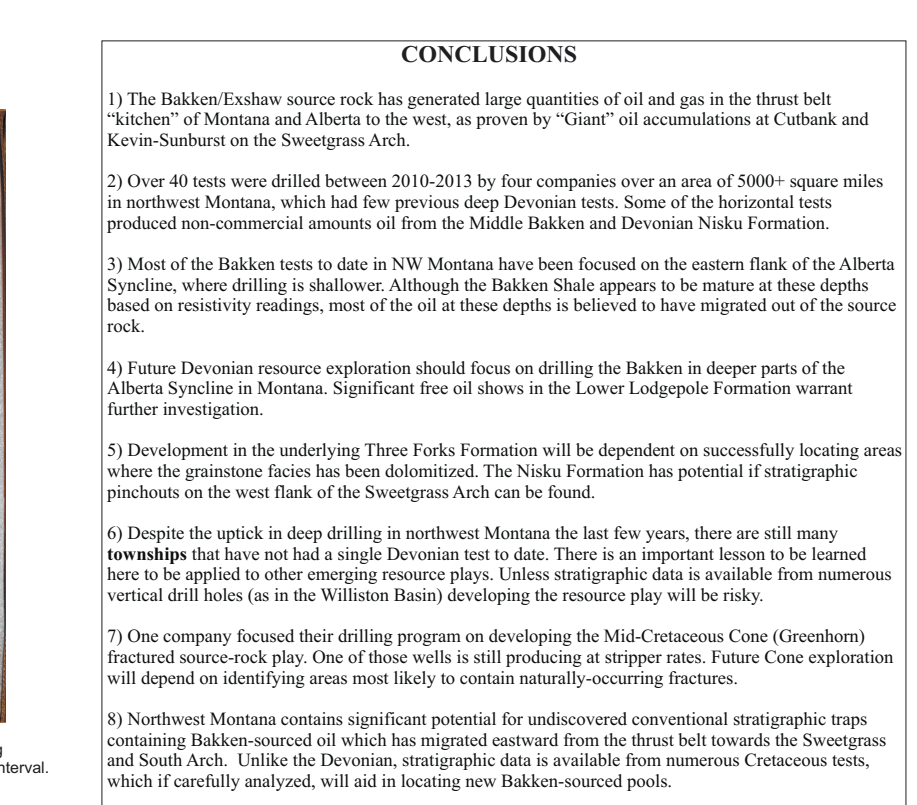
Lower Lodgepole Development (Upper Bakken "silt") at Ferguson Field, AB



Barrett Simmes Ranch 14-6 drilling in 2012



Migration pathways of Bakken/Exshaw-generated oil (Gussow, 1955)



REFERENCES

Colborn, J., R.M. Bustin, G. Reinson, and N. Bruder, 2013., Depositional and diagenetic controls on reservoir development, Big Valley Formation ("Alberta Bakken"), tight oil play, Southern Alberta: CSPG Convention 2013 Integration, Core Conference Abstracts, p. 59-64.

Dolson, J., and J. Piombino, 1994, Giant proximal foreland basin non-marine wedge trap: Lower Cutbank Sandstone, Montana, in John C. Dolson, ed., Unconformity-Related Hydrocarbons in Sedimentary Sequences: Rocky Mountain Assoc.of Geologists, p. 135-148.

Gardner, J. W., 1985, Two Medicine (East Glacier) Field, in J. T. Tonnson, Montana Oil and Gas Fields Symposium: Montana Geological Society, Vol. 2, p. 1139-1143.

Hartel, T. H. D., B. C. Richards, C. W. Langenberg, 2014, Wabamun, Bakken Equivalent Exshaw and Banff Formations in core, cuttings and outcrops from Southern Alberta: AAPG Search and Discovery Article #50952 adopted from extended abstract presentation at CSPG/CSEG/CWLS Geoconvention 2012

Just, B., R. Lloyd, and P. Mohseni, 2013, Oil and gas development opportunities on the Blackfeet Indian Reservation, Montana: Bureau of Indian Affairs, 9 p. <http://www.bia.gov/cs/groups/xieed/documents/document/ide1-026003.pdf>

Montana Board of Oil and Gas, 2012, Online data site: <http://bogc.dnrc.mt.gov/onlineadata.asp>

Mossop, G. And I. Shetsen (compilers), 1994, Atlas of Western Canada Sedimentary Basin: Canadian Society of Petroleum Geologists and Alberta Research Council, p. 501.

Peterson, J. A., 1996, Bakken and other Devonian-Mississippian petroleum source rocks, Northern Rocky Mountains-Williston Basin: Depositional and burial history and maturity estimations, in RMS-AAPG Expanded Abstracts Volume: Montana Geological Society, p.127-132.