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

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# **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 Blackfeet 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.

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

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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 Blackfeet 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.



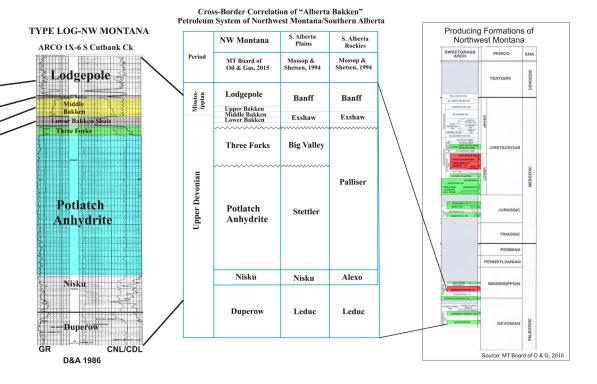
Outcrop of Bakken Formation in Southern Alberta Rockies.

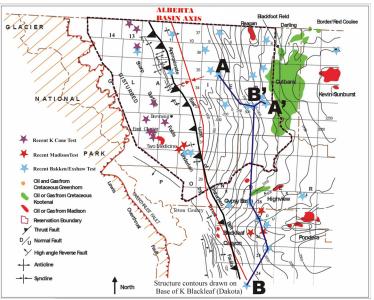
# AB BASIN BAKKEN/EXSHAW RESOURCE ESTIMATES

Rosetta Resources (2010): 13-15 MBOE/sq mile

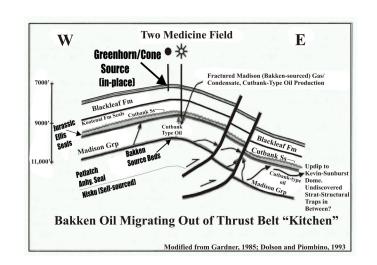
Wood McKenzie (2011): 2.6 Billion Barrels, AB/MT

DRILLING RESULTS RESULTS TO DATE				
	Wells I	Orilled H	Cumulative Best Productive Well	Current Status
Rosetta	7	11	$2207\ BO, 8263\ MCF,\ 1135\ BW\ \text{-}\ Sim.\ Farms\ 3608\text{-}34\text{-}01HB\ (Middle\ Bakken)}$	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





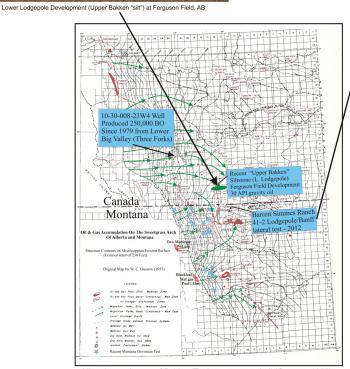
Recent drilling in NW Montana. (Base modified from Just and others, 2013.



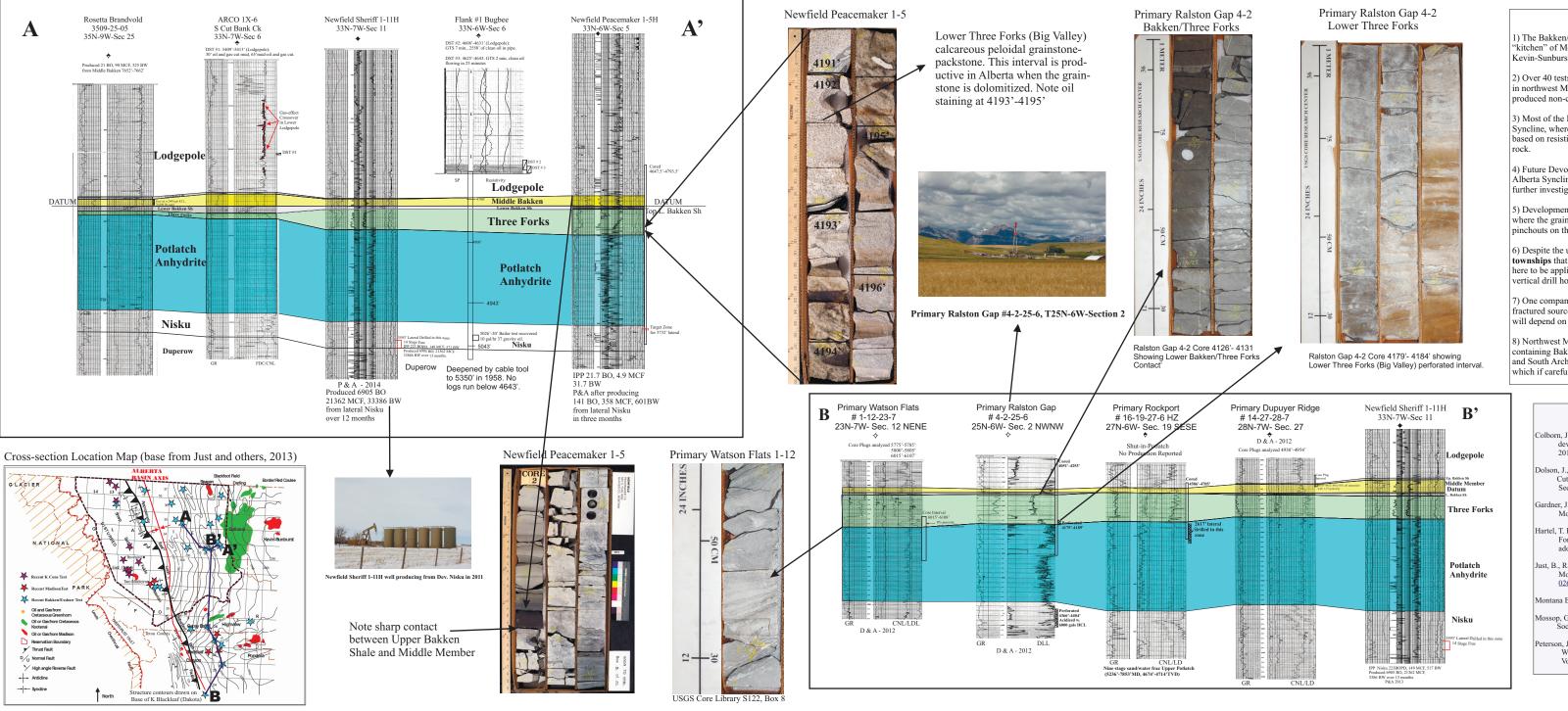




Barrett Simmes Ranch 14-6 drilling in 2012



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



## CONCLUSIONS

- 1) The Bakken/Exshaw source rock has generated large quantities of oil and gas in the thrust belt "kitchen" of Montana and Alberta to the west, as proven by "Giant" oil accumulations at Cutbank and Kevin-Sunburst on the Sweetgrass Arch.
- 2) Over 40 tests were drilled between 2010-2013 by four companies over an area of 5000+ square miles in northwest Montana, which had few previous deep Devonian tests. Some of the horizontal tests produced non-commercial amounts oil from the Middle Bakken and Devonian Nisku Formation.
- 3) Most of the Bakken tests to date in NW Montana have been focused on the eastern flank of the Alberta Syncline, where drilling is shallower. Although the Bakken Shale appears to be mature at these depths based on resistivity readings, most of the oil at these depths is believed to have migrated out of the source rock
- 4) Future Devonian resource exploration should focus on drilling the Bakken in deeper parts of the Alberta Syncline in Montana. Significant free oil shows in the Lower Lodgepole Formation warrant further investigation.
- 5) Development in the underlying Three Forks Formation will be dependent on successfully locating areas where the grainstone facies has been dolomitized. The Nisku Formation has potential if stratigraphic pinchouts on the west flank of the Sweetgrass Arch can be found.
- 6) Despite the uptick in deep drilling in northwest Montana the last few years, there are still many **townships** that have not had a single Devonian test to date. There is an important lesson to be learned here to be applied to other emerging resource plays. Unless stratigraphic data is available from numerous vertical drill holes (as in the Williston Basin) developing the resource play will be risky.
- 7) One company focused their drilling program on developing the Mid-Cretaceous Cone (Greenhorn) fractured source-rock play. One of those wells is still producing at stripper rates. Future Cone exploration will depend on identifying areas most likely to contain naturally-occurring fractures.
- 8) Northwest Montana contains significant potential for undiscovered conventional stratigraphic traps containing Bakken-sourced oil which has migrated eastward from the thrust belt towards the Sweetgrass and South Arch. Unlike the Devonian, stratigraphic data is available from numerous Cretaceous tests, which if carefully analyzed, will aid in locating new Bakken-sourced pools.

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