

Analysis of Well Completion Data for Bakken Oil Wells

By Roger Blanchard

The following analysis uses “well completion information” contained in a newspaper called the Bakken Weekly, a paper covering western North Dakota. The Bakken Weekly started providing well completion information for North Dakota counties in the Bakken region in early 2012. The analysis below is for 2012/2013 from the week of April 1, 2012 through the week of Oct. 28, 2013.

Figure 1 is a map of North Dakota counties so that the reader can relate the data below to the counties within North Dakota.

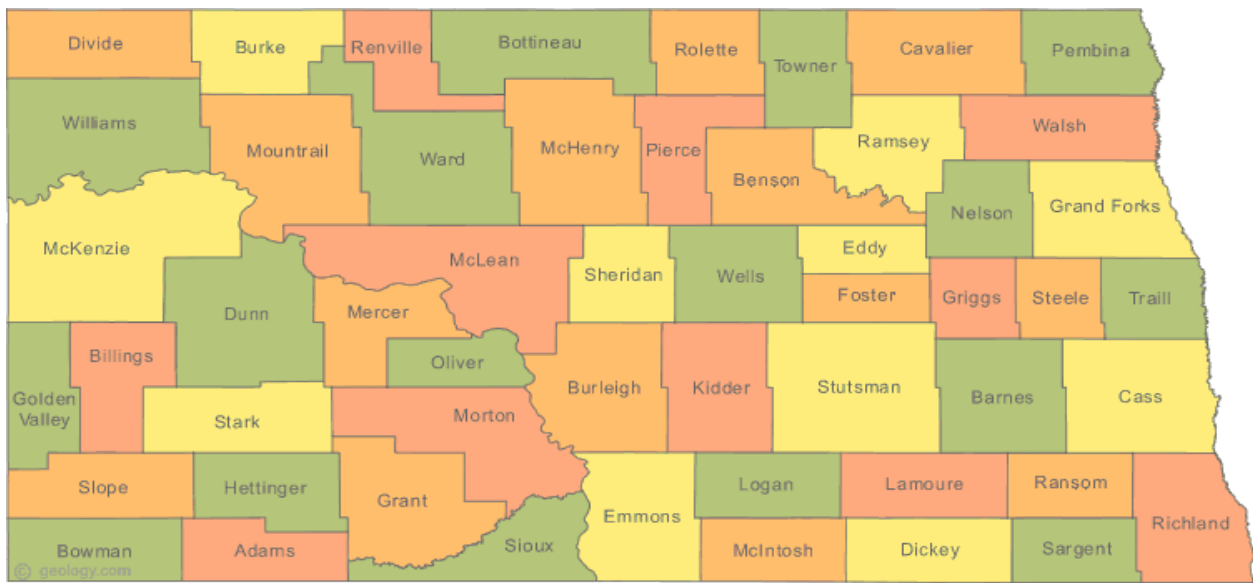


Figure 1-Map of North Dakota

The well completion information in the Bakken Weekly includes initial production data for approximately 50% of wells. I suspect that many wells don't have initial production data because there was little or no initial production, although that is generally not stated. There are a few cases where either 0 b/d is given or it is stated that the well was dry, but that is rare.

A fact that suggests that many of the completed wells don't produce oil is that the sums of well completions in the Bakken Weekly increases significantly more rapidly than the number of producing wells provided by the state of North Dakota. In this analysis, I will assume that initial production was 0 b/d for wells in which initial well production data was not included.

Based upon oil production data from the state of North Dakota, the counties of Dunn, McKenzie, Mountrail and Williams made up 89.0% of the Bakken region oil production in 2013 through August. Based upon well completion data, it's easy to see why oil companies have concentrated on those 4 counties: initial production/well values are considerably higher in those 4 counties compared to the values for other Bakken counties, excluding Stark. Table I contains initial well

production data for the 4 main counties based upon all wells drilled within the counties in 2013, through the week of Oct. 28.

Average Initial Well Production for Top 4 Counties

County	Dunn	McKenzie	Mountrail	Williams
Initial production/well (b/d)	658	924	716	643

Table I

Compare the values in Table I with the values for other counties, excluding Stark, contained in Table II.

Average Initial Well Production for other Counties in the Bakken Region

County	Billings	Bottineau	Burke	Divide	Others*
Initial production/well (b/d)	104	53	262	269	60

Table II

*Bowman, Golden Valley, Ward, Renville, McLean, McHenry and Slope counties combined

I combined and separated out Bowman, Golden Valley, Ward, Renville, McLean, McHenry and Slope counties because there have been few wells drilled in those counties. Based upon the initial production/well data, it's not surprising that far fewer wells have been drilled in the counties contained in Table II relative to the 4 main counties.

I did not include Stark County in the tables above because Stark County is unique. Relative to the 4 main counties, not very many wells have been drilled in Stark County. There appears to be an area within the county where wells are quite productive but outside of that area, well production is minimal. Oil companies appear to be delineating where the sweet spot is within Stark County and concentrating on that sweet spot. The average initial production per well in Stark County is 676 b/d in 2013. For all Stark County wells drilled thus far in 2013 through Oct. 28, 28.6% had an initial production >1000 b/d while 44.0% were <300 b/d.

Table III contains data for the percentage of wells that had initial production of >3000 b/d, >2000 b/d, >1000 b/d and <300 b/d in the four main counties.

Percentage of Wells per Initial Well Production Rate for Top 4 Counties

County	Dunn	McKenzie	Mountrail	Williams
>3000 b/d	0.4	4.9	0.4	1.7
>2000 b/d	8.0	15.7	6.1	7.3
>1000 b/d	23.9	29.6	24.9	17.9
<300 b/d	58.8	53.6	50.2	48.3

Table III

The high numerical values for <300 b/d in Table III is largely due to the large number of wells without production data.

The other counties, excluding Stark, have few wells with initial production >1000 b/d and a high percentage of wells that have initial production of <300 b/d (see Table IV):

Percentage of Wells per Initial Well Production Rate for Other Bakken Counties

County	Billings	Bottineau	Burke	Divide	Others*
>1000 b/d	1.5	0.0	3.7	0.9	0.0
<300 b/d	86.3	100	64.8	44.0	95.8

Table IV

Oil companies are high-grading their drilling, drilling in the most favorable locations first. In 2013, McKenzie County has become the prime location to drill as seen in the data of Table V (The number of wells without initial production data are included in Table V):

Well Completion Data for Top 4 Counties

County	Dunn	McKenzie	Mountrail	Williams
Number of well completions in 2013 through week of Oct. 28	524	905	478	480
Number of Wells Without Production Data	291	464	230	218

Table V

I attribute the high drilling rate in McKenzie County to the higher probability that a highly productive well will be drilled there, based upon data in Table III.

Table VI contains the high and low reported initial production rates for the 4 main counties so far in 2013 (This excludes wells for which initial production data was not provided):

High and Low Initial Well Production Rates for Top 4 Counties

County	Dunn	McKenzie	Mountrail	Williams
High Rate (b/d)	4,331	12,248	8,683	4,174
Low Rate (b/d)	53	23	52	23

Table VI

Promoters of the oil industry who claim that production in the Bakken region will continue to increase for many years to come appear to assume that the area outside of the 4 main counties will be as productive as within the 4 main counties. The data above provides compelling evidence that future production outside of the 4 main counties will not be comparable to present production within the 4 main counties. At some point in the not-too-distant future, the 4 main counties will be saturated with oil wells. It's reasonable to assume that production within the 4 main counties will decline fairly rapidly after that point is reached.

The average yearly percent declines for wells in the Bakken region, based upon data in a presentation by geologist David Hughes, Tight Oil: A Solution to U.S. Import Dependence?, given at the Geological Society of America meeting on Oct. 28, 2013, are given in Table VII.

Average Decline Rates for Bakken Oil Wells Based Upon the Hughes Report

Year	% Decline
1	70
2	34
3	23
4	21

Table VII

Based upon the values in Table VII, the rate of drilling in the Bakken region has to be maintained at a high level to prevent a rapid decline in Bakken region oil production. It also means that much of the production from new wells is replacing declining production from older wells.

How does the 2013 data compare to 2012 data? Because the Bakken Weekly does not have well completion information for the early part of 2012, the data in Table VIII for 2012 is from the first week of April through the end of 2012. I've also included data for July-October 2013.

Average Initial Well Production Comparison between 2012 and 2013 for Top 4 Counties

County	Dunn	McKenzie	Mountrail	Williams
Average Initial Well Production 2012 (b/d)	700	928	883	760
Average Initial Well Production in 2013 (b/d)	658	924	716	643
Average Initial Well Production for July-Oct. 2013	680	844	606	677

Table VIII

Another interesting aspect of drilling activity in the Bakken region is that the number of well completions and the sum of initial well production in the Bakken region during the period April-August 2013 has been substantially higher than in the same period of 2012, as seen in Table IX:

**Bakken Oil Production Relative to Well Completions
and Initial Well Production**

Year	2012	2013	Percent Increase
Well Completions (April-August)	868	1,302	50.0
Sum of Initial Well Production in b/d (April-August)	674,207	923,728	37.0
Bakken Oil Production Increase in b/d (August relative to March)*	123,072	125,950	2.3

Table IX

*Data from the State of North Dakota

The data in Table IX indicates that far more effort has been required in 2013, compared to 2012, to obtain a comparable production increase for Bakken region oil production.