The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

The Bakken Boom - A Modern-Day Gold Rush

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Topic: Supply/Production

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"That men do not learn very much from the lessons of history is the most important of all the lessons that history has to teach." Aldous Huxley

In 2009, U.S. oil production began to climb after declining for 22 of the previous 23 years. The shale oil production of the Bakken formation, which straddles the Montana-North Dakota border and stretches into Canada, has been a significant contributor to this temporary uptick in oil production.

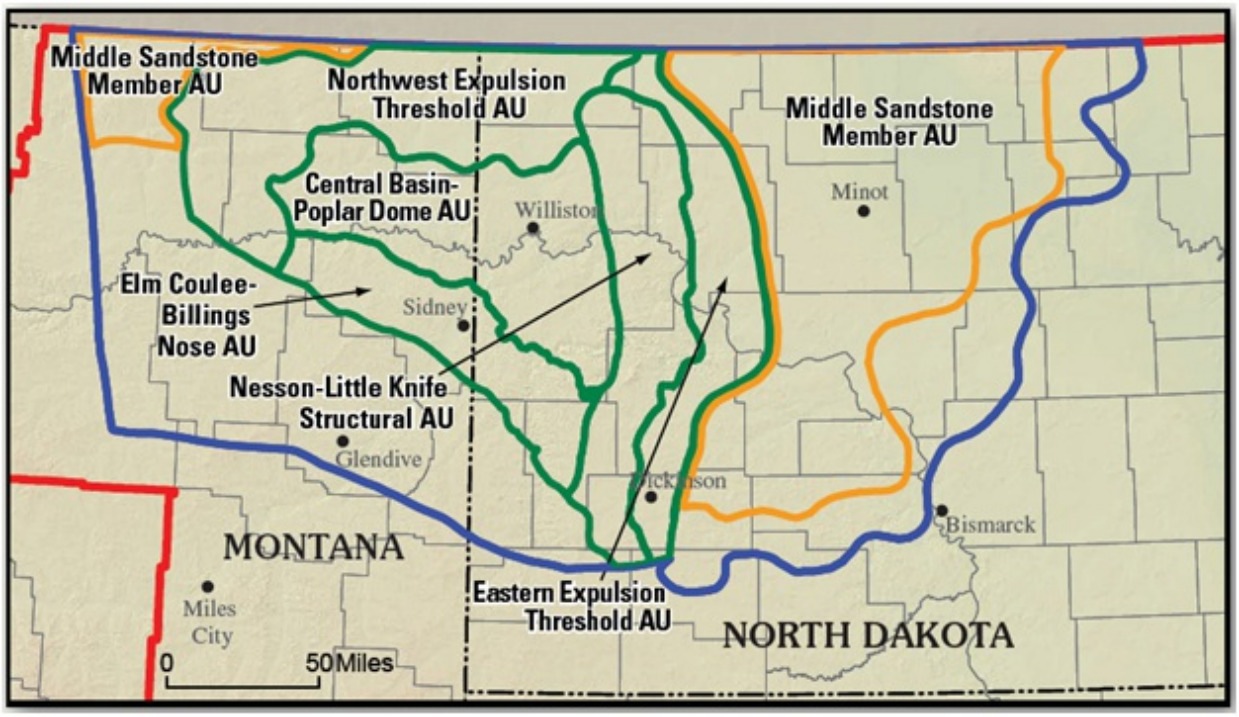


Figure 1: Map of the U.S. Bakken-Lodgepole Total Petroleum System (blue), five continuous assessment units (AU) (green), and one conventional assessment unit (yellow) (Source: USGS[1])

The *Bakken boom* has inspired a number of prominent commentators to resurrect the energy independence meme. Daniel Yergin was first at bat, asserting in an essay published by *The Wall Street Journal* that rising prices and emerging technologies (especially hydraulic fracturing) will significantly drive up world liquid fuels production over the coming decade(s). Ultimately, Mr. Yergin argues that tight supplies lead to high fuel prices, and high fuel prices will bring previously inaccessible oil to the market. The trouble with this line of thinking is that high prices aren't

merely a symptom of the supply problem; high prices *are* the problem.

After Mr. Yergin stole first base through this apparently convincing display of contortionist logic, the next up to bat was Ed Crooks who recently penned an analysis piece for the *Financial Times*. In this piece, Mr. Crooks declares that "the growth in U.S. and Canadian production from new sources, coupled with curbs on demand as a result of more efficient use of fuel, is creating a realistic possibility that North America will be able to declare oil independence."

Mr. Crooks thus 'balances' rising production from shale oil and Canadian tar sands against declining consumption, which he mistakenly chalks up to efficiency gains rather than the deleterious effects of the greatest recession since the Great Depression. Beyond this obvious blunder, Mr. Crooks manages an even greater and far more common gaffe by neglecting to integrate decline rates of mature fields into his analysis.

But in a game where the media is the referee and the public doesn't know the rules, Mr. Crooks manages to get on base by knocking a foul ball into the bleachers. With Yergin on second and Crooks on first, Edward Luce steps up to plate and takes a swat at the energy independence meme, directing the 'greens' to look away as "America is entering a new age of plenty". And while the greens looked away, Mr. Luce took a cheap shot at clean energy through an attack on the federal government's support for the now bankrupt solar panel manufacturer, Solyndra. Luce thus willingly employs the logical fallacy of hasty generalization to sway his audience. Of course the Solyndra bankruptcy is no more generalizable to the solar energy industry than BP's Macondo oil spill is to all offshore oil production, but in a game of marketing one-upmanship one should not expect a balanced and rigorous evaluation of the possibilities.

With the bases loaded and oil prices remaining stubbornly high as tensions in the Middle East and North Africa persist, the crowd is getting anxious. And the crowd should be anxious. After all, tight supplies and rising oil prices strain personal finances and threaten to send our fragile economy back into recession. It is, therefore, unsurprising that the public is as eager to consume the myth of everlasting abundance, as they are eager to consume these scarce resources.

While the *Bakken boom* offers a hopeful story in which American ingenuity and nature's endless bounty emancipate us from energy oppression and dependence on evil and oppressive foreign dictators, musings of energy independence are premature, misguided, and misleading. The problem with the Bakken story as told by Crooks and others is that it lacks historical context. Referring to recent developments as an energy revolution implies that there are no lessons to be learned from history. But as Mark Twain put it, "history doesn't repeat itself, but it does rhyme."

Figure 2: U.S. Oil Production showing significant uptick in production and the contribution of Alaska's North Slope (source: EIA)

Lessons from the California Gold Rush

In 1848, John Marshall discovered gold while constructing John Sutter's sawmill in Coloma, California. Sutter and Marshall attempted to keep the discovery secret, but savvy newspaper publisher and merchant Samuel Brannan soon learned the news. Brannan hurriedly set up a store to sell prospecting tools and provisions and began promoting the discovery in much the same way that the media has been promoting the Bakken. As the news of Marshall's discovery spread, the California Gold Rush grew to international proportions.

Forty-niners rushed to *The Golden State* in search of riches, and California's population exploded from 8,000 in 1848 to 93,000 in 1850, a quarter of a million in 1852, and 350,000 by 1860. With

the majority of the influx of humanity employed in prospecting, precious few engaged in support activities. But with the rapid accumulation of mineral wealth, imports were easily acquired. Timber, for instance, was sourced from the Pacific Northwest, and the small town of Seattle, which was only settled in 1852, entered a sustained period of rapid exponential growth.

Despite the low productivity of the labor-intensive process of gold panning, annual production grew from just over 1,400 ounces in 1848 to more than 3.9 million ounces by 1852. To put this into perspective, prior to 1848, cumulative U.S. gold production amounted to just over 1 million ounces.

Figure 3: Forty-niners panning for gold during the early years of the California Gold Rush (source: no copyright)

The rapid growth in output was driven not by the backbreaking extraction of gold dust so much as by the discovery of colossal gold nuggets like the twin 25-pounders found in Downieville (1850) and on the banks of the Mokelumne River (1848). By comparison, one could spend decades panning and toiling over rockers and sluices manually sorting flakes of gold from stream sediments and never accumulate such an amount.

Of course nuggets are easier to find than flakes, and the great majority were discovered in the first few years. By 1852, only four years after gold was first discovered, California gold production began a rapid descent. Production declined 50% by 1862 and 80% by 1872.

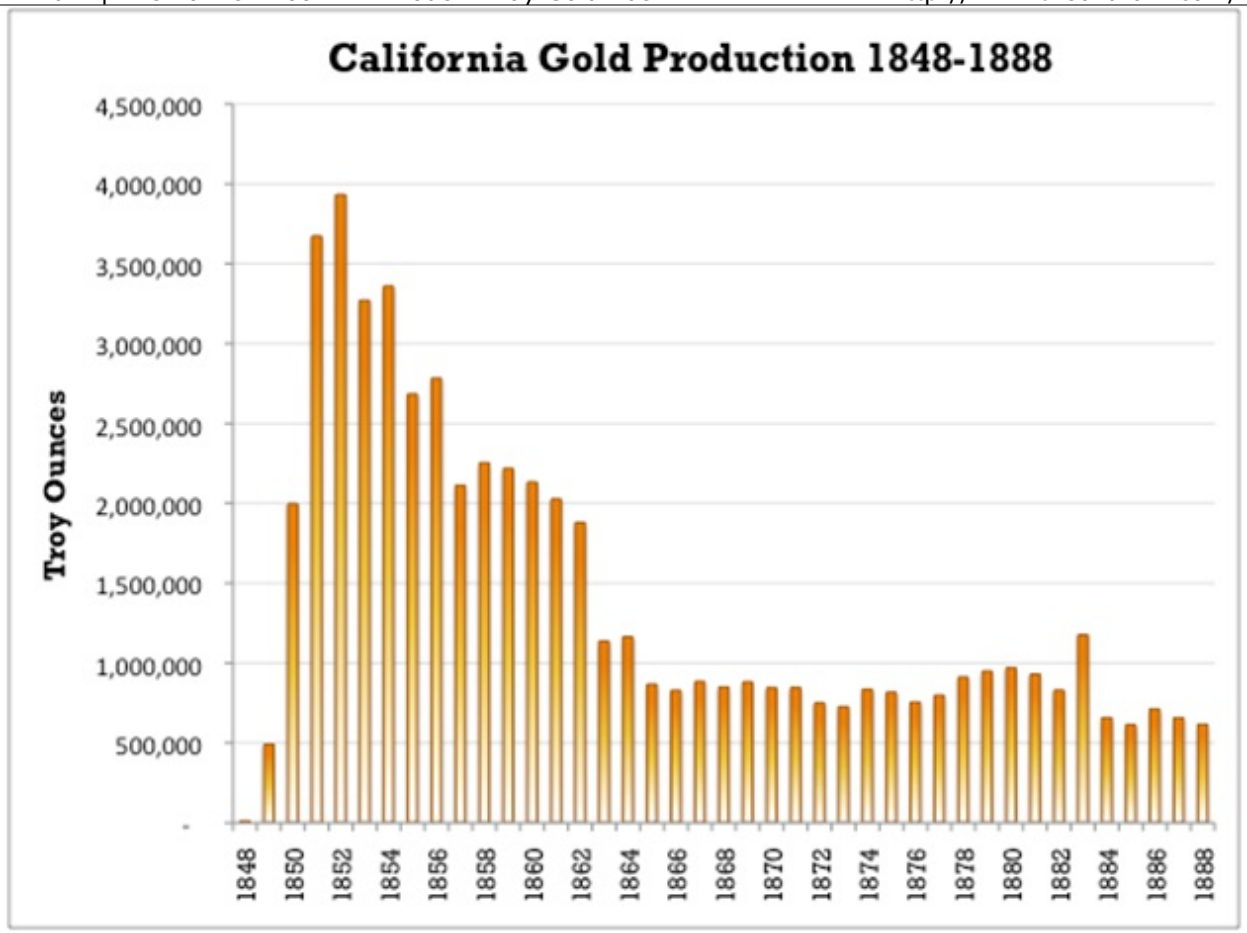


Figure 4: California gold production showing peak in 1852 followed by rapid decline (Source: Western Mining History – westernmininghistory.com)

The decline was only barely checked by the adoption of 'hydraulic mining' – a process by which massive amounts of water under intense pressure is used to disintegrate entire hillsides. At the North Bloomfield mine, for example, 60 million gallons of water per day eroded more than 41 million cubic yards of debris between 1866 and 1884. (http://www.sierranevadavirtualmuseum.com/docs/galleries/history/mining/hydraulic.htm)

The runoff from 'hydraulicking', as it was called, was directed to sluice boxes where dense gold dust was separated from the other detritus. The displaced earth eventually came to rest in California's fertile valleys in massive quantities. It has been estimated that hydraulicking generated eight times the amount of 'slickens' (tailings) than was removed during construction of the Panama Canal, which, by the way, employed the same process.

Figure 5: Miners employing the process of hydraulic mining – a process which is prohibited in many gold-rich areas (Source: no copyright, but for more images go here – http://www.sierracollege.edu/ejournals/jsnhb/v2n1/monitors.html)

The redirection of such massive amounts of water generated conflict. "Legal ledgers dating back to the early years of the California Gold Rush record complaints that existing water rights were being impinged by the diversion ditches for, and the resultant pollution from, mining operations, especially hydraulic mines." (http://centerwest.org/wp-content/uploads/2011/01/Graduate-There-sGold.pdf)

These challenges were consistently defeated on the basis of the 1857 California Supreme Court decision that gold production provided a greater good for the leading interest of the State and its citizens than would have been achieved had water not been diverted.

This all changed in January 1884 when Judge Lorenzo Sawyer issued the nation's first environmental injunction after presiding over the case of *Woodruff v. North Bloomfield*. Judge Sawyer was swayed by Woodruff's claim that not only was gold production from the North Bloomfield mine *not* the leading interest of the State, but that the 1857 decision did not supersede laws that protected agriculture and property owners. And with the scratch of a pen, hydraulic mining operations around Marysville were ordered to halt the discharge of tailings into the Yuba River. Other areas were soon to follow.

During California's successive gold rushes more than a few prospectors became rich, but the vast majority spent more cash purchasing claims and supplies than they earned from the gold dust they sold. The main beneficiaries were the businessmen who profited from the search for gold, rather than the discovery of gold; men like Samuel Brannan and Thomas Craig, the manufacturer of the 'Monitor' nozzles used in hydraulic mining.

Lessons from the Klondike Gold Rush

A half-century later, a similar story unfolded in the Yukon. In 1897, the nation was suffering through the Long Depression, which, ironically, was in large part the result of the decision to revert to the gold standard upon the conclusion of the Civil War. As 'greenbacks' – notes which were not explicitly backed by gold – were pulled from circulation in order to bring the number of dollars back to par with gold reserves, deflation set in. Deflation hit laborers and farmers the hardest and proved to be a significant force behind the populist call for bimetallism.

Figure 6: These two cartoons illustrate a debate that lingers to this day. On the left, greenbacks are produced to pay debts. On the right, a worker and a farmer struggle for existence as the reversion to the gold standard elevates their debts and devalues their services. (Sources: Left: no copyright; Right: Klondike Gold Rush National Historic Park – a.k.a. The Gold Rush Museum, Seattle, WA)

As a result of the Long Depression, people were desperate for work, but even more desperate for a reason to maintain hope in the face of despair. Much as the Bakken has provided hope for contemporary society, the *SS Portland* provided hope when it arrived in Seattle in the summer of 1897 with a half a ton of Yukon gold on board. The conditions were primed for an outbreak of gold fever, and just as Samuel Brannan advertised the discovery of gold at Sutter's mill, the *Seattle Post-Intelligencer* eagerly hyped the Klondike 'prospects' to not only sell newspapers but the entire town as the launch site for stampeders.

THE SEATTLE POST-INTELLIGENCER.

VOL. XXXII. NO. 62. SEATTLE, WASHINGTON, SATURDAY, JULY 17, 1897. EIGHT-PAGE EDITION.

KLONDYKE

COOPER & LEVY

A few more of those excellent Lawn Mowers on hand. 16-inch, $2.85; 18-inch, $3.15.

Going camping? Take a look at those Folding Camp Beds at $2.15 each.

Received yesterday, 10 cases Fresh Ranch Eggs, 20c per dozen.

Another shipment of Butter just arrived—
Fine Dairy, 25c per brick.
Choice Creamery, 35c per brick.

Store Open Until 9 O'clock Tonight.

COOPER & LEVY

LATEST NEWS FROM THE KLONDIKE.

9 O'CLOCK EDITION.

GOLD! GOLD! GOLD! GOLD!

Sixty-Eight Rich Men on the Steamer Portland.

STACKS OF YELLOW METAL!

Some Have $5,000, Many Have More, and a Few Bring Out $100,000 Each.

THE STEAMER CARRIES $700,000.

Special Tug Chartered by the Post-Intelligencer to Get the News.

BRINGING BACK GOLD.

Figure 7: The newspaper that heralded the Klondike Gold Rush (Source: University of Washington digital archives)

The next day the Klondike gold rush commenced as the steamship *Al-Ki* departed with a full deck of stampeders and 350 tons of supplies, including foodstuffs, pack animals, prospecting equipment, and clothing, like C.C. Filson oiled canvas jackets and pants. These garments, which were impregnated with a mixture of paraffin wax and other oils, proved to be as waterproof as they were stiff – the stiffness resulting from the fact that the paraffins, which are solid at 'normal' temperatures, are nearly impenetrable under arctic conditions.

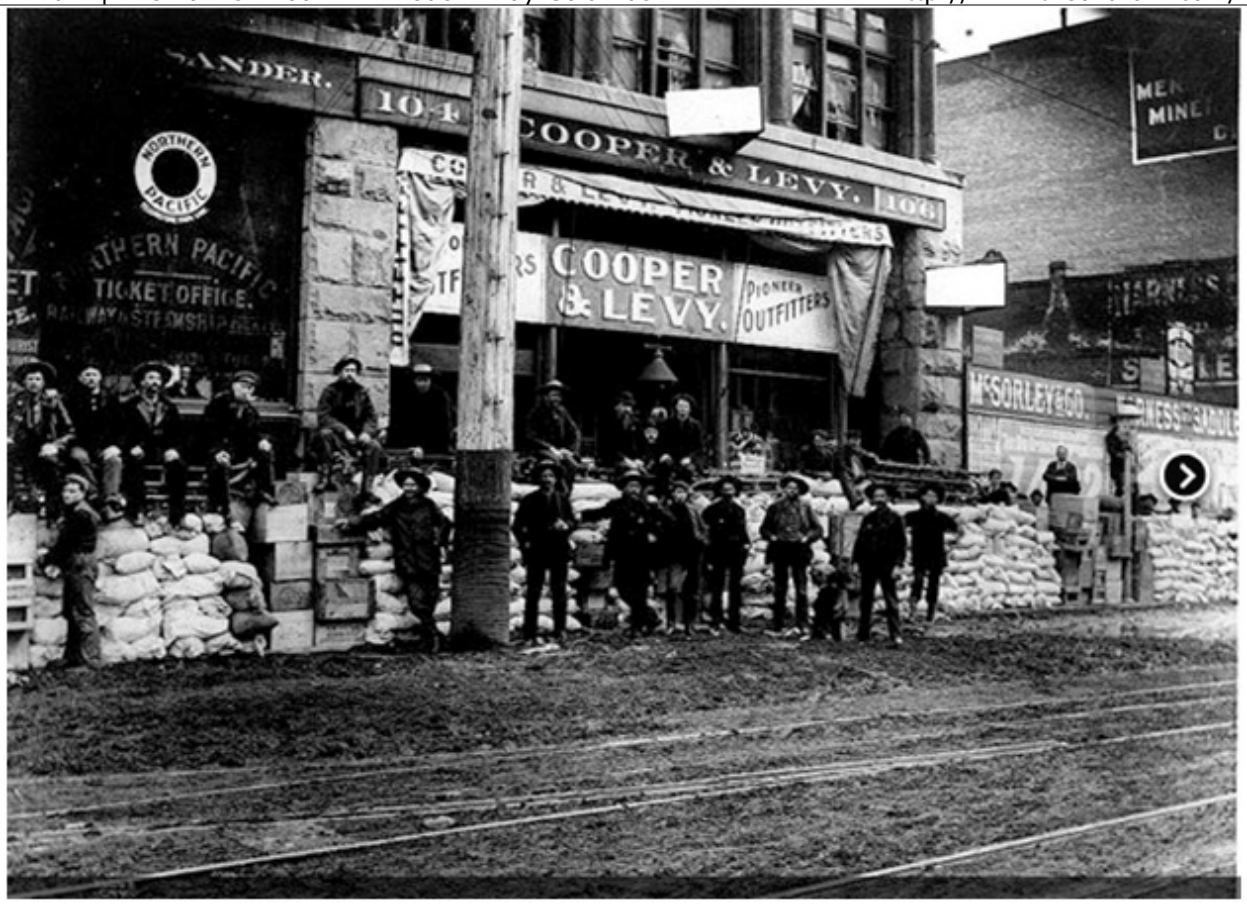
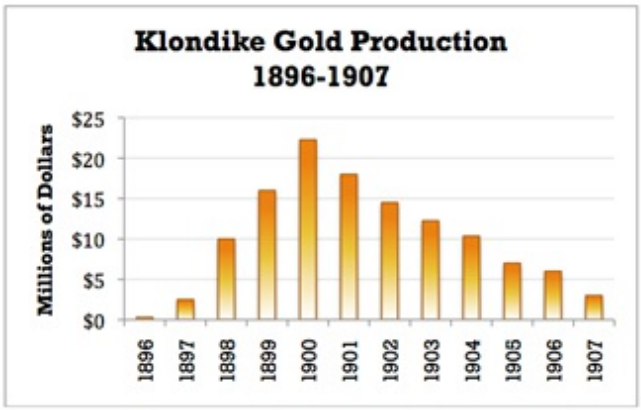


Figure 8: Supplies lining the sidewalk outside Seattle-based Klondike outfitter, Cooper & Levy (Source: The Gold Rush Museum)

The Klondike Stampede caused demand for steamships to mushroom and Seattle quickly rose to become one of the nation's preeminent ship building communities. And as the demand for steamships spiked, so too did demand for timber and coal, two of the Puget Sound's most dominant industries. To this day, Alaska depends almost exclusively on the Puget Sound for the delivery of groceries, consumer goods, manufactures, and other commodities.

Figure 9: Steamships under construction in Seattle's Moran Bros. shipyard (Source: University of Washington digital collections and MOHAI – Museum of History and Industry)

As was the case in California, Klondike gold discoveries fell just as quickly as they had climbed. Between 1896 and 1900, annual discoveries rose from $300,000 to more than $22 million, but by 1904 production had fallen to less than half the peak value, and by 1907 production had declined more than 80%. And just as the new and ecologically disruptive technology of hydraulic mining failed to arrest or reverse declining production in California, the introduction of hydraulic mining and large scale dredging failed to maintain the pace of discovery made by the first few waves of stampeders who employed far less technologically advanced and capital intensive processes.



GOLD PRODUCTION OF YUKON TERRITORY.	
1896	$300,000
1897	2,500,000
1898	10,000,000
1899	16,000,000
1900	22,275,000
1901	18,000,000
1902	14,500,000
1903	12,250,000
1904	10,350,000
1905	7,000,000
1906	6,000,000
1907 (Estimated)	3,000,000

Figure 10: Klondike gold production (Source: Data from J.P. Hutchins, January 4, 1908, "Klondike District", The Engineering and Mining Journal)

After studying dredging operations in the Klondike, mining engineer J.P. Hutchins concluded, "The most satisfactory returns were from a dredge working an unfrozen area in the flood-plain of the Klondike River; this was installed before the large corporation, now so prominent in the Klondike, became interested. The dredges installed since that time have been very disappointing in returns. Three powerful dredges began operation on the lower Bonanza Creek, but the experience there has been most discouraging." (J.P. Hutchins, January 4, 1908, "Klondike District", Engineering and Mining Journal on January 4, 1908)

While dredging was not able to arrest declining production, the process certainly made an impression on the landscape. Tailings moraines provide a lasting visual testament to the efforts made by dredge operators, who quite literally left no stone unturned.

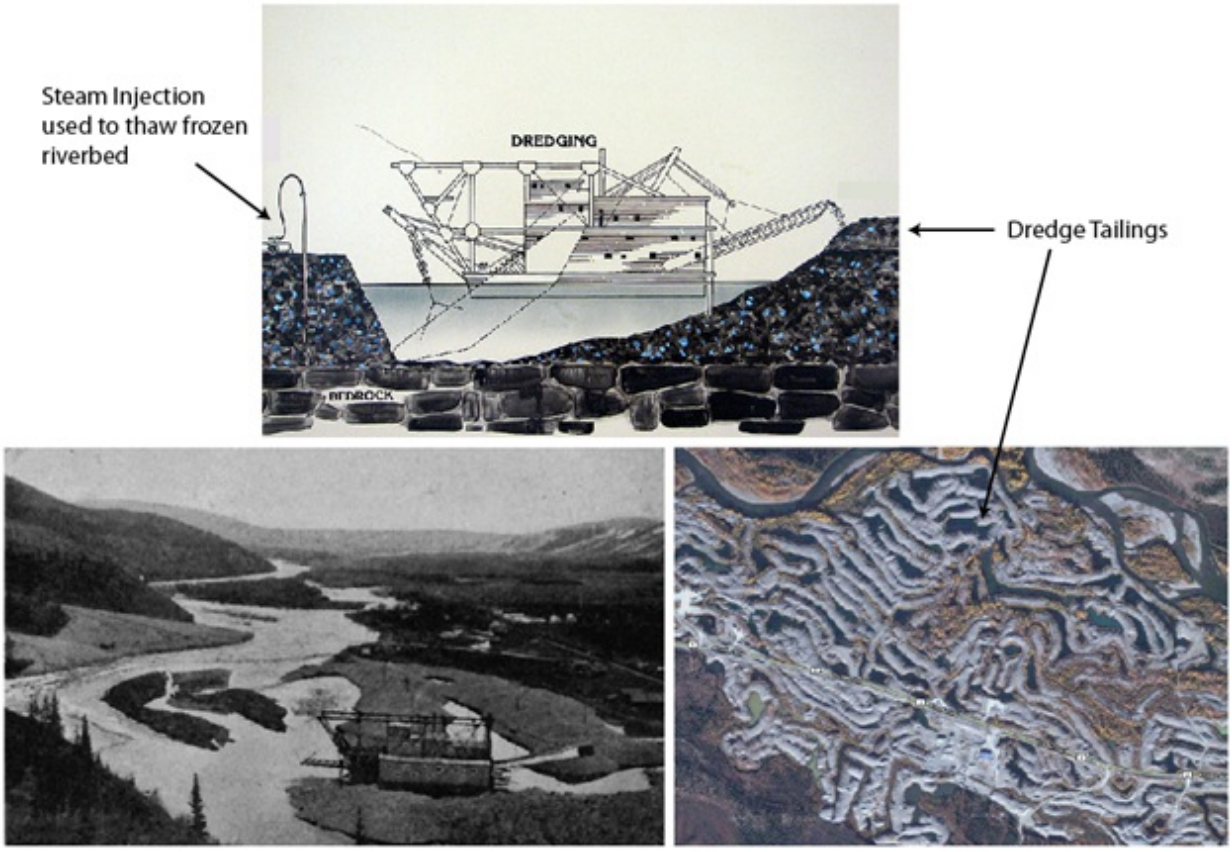


Figure 11: In order to dredge in the Yukon, steam had to be injected into the frozen earth. The thawed sand and gravel was then dredged to the bedrock, sorted in the floating dredge, and deposited into immense tailings that can be seen from space (Sources: Clockwise from top: http://www.flickr.com/photos/capncanuck/2972017631/; State of Alaska Guide (http://www.stateofalaskaguide.com/alaska-and-yukon.htm); Google Maps)

The similarity in California and Klondike gold production curves was not lost on Mr. Hutchins who further wrote, "[Klondike] figures reveal a marked similarity between this and other placer districts not only in respect to the rapid increase of the annual output to a maximum a few years after the discovery of the placers, but also in the rapid decrease in the output after the maximum figure had been reached. It is of passing interest to note that in both California and Klondike, the annual production reached a maximum the fourth year after discovery. These figures were more than $80,000,000 for California and more than $22,000,000 for Klondike."

As historian Pierre Burton put it, "The statistics regarding the Klondike stampede are diminishing ones. One hundred thousand persons, it is estimated, actually set out on the trail; some thirty or

forty thousand reached Dawson. Only about one half of this number bothered to look for gold, and of these only four thousand found any. Of the four thousand, a few hundred found gold in quantities large enough to call themselves rich. And out of these fortunate men only the merest handful managed to keep their wealth. The Kings of Eldorado toppled from their thrones one by one."

While gold production continues to this day, the Klondike gold rush ended in the summer of 1899, when over the course of a single week, more than 20,000 'sourdoughs' left the Yukon on news that gold had been discovered on the beaches of Nome, Alaska. The Nome gold rush, which was similarly short-lived, is widely cited as the last gold rush of importance, but only by those whose narrow definition excludes black gold.

The Rush for Black Gold on Alaska's North Slope

In 1902, Alaska produced its first barrel of oil, and in 1953, the discovery of oil in a small town West of Fairbanks ushered in the modern era of oil production. In 1957 oil was discovered on the Kenai Peninsula, and in 1959, one hundred years after Colonel Drake produced the first barrel of oil in Pennsylvania, British Petroleum (BP) began prospecting for oil along Alaska's expansive North Slope.

BP was soon joined by Atlantic Richfield Company (ARCO), who in 1968 discovered Prudhoe Bay, the oilfield equivalent of a 25-pound gold nugget. The Prudhoe Bay field is estimated to have had 25 billion barrels of crude before extraction commenced in 1977, making it the largest field in North America. Another major US field, Kuparuk with reserves of 6 billion barrels is also on the North Slope and was discovered in 1969 by Sinclair Oil.

In order to transport oil from the remote North Slope, the Trans Alaska Pipeline System (TAPS) was proposed, but construction did not begin until 1974, after 515 federal permits and 832 state permits were approved. Construction was completed in 1977. At peak construction, in October 1975, 51,000 direct and contract employees were at work on various aspects of the 800-mile pipeline. With construction costs totaling roughly $8 billion, small fortunes were made long before the first barrel of North Slope oil was produced, and once again the Puget Sound economy benefitted as nearly all equipment and supplies were shipped through Washington's seaports.

Figure 12: Milepost 562 along the 800-mile TransAlaska Pipeline System (Source: Wikipedia)

Production from the Prudhoe Bay field peaked in 1988, and production from the Kuparuk field peaked in 1992. With these two fields dominating North Slope production, the black gold flowing through the TAPS then fell into decline after only 11 years of operation.

Eleven years after the peak, North Slope production had declined to less than half the peak volume. To use Mr. Hutchins's words, it is of passing interest to note that in California, the Klondike, and Alaska, production had declined to roughly half the maximum value within the same period of time it took to reach the peak. Today, production is only slightly more than 24% of the peak, and it continues to decline. Through June this year production was 35,000 barrels per day less than the average production rate in 2010.

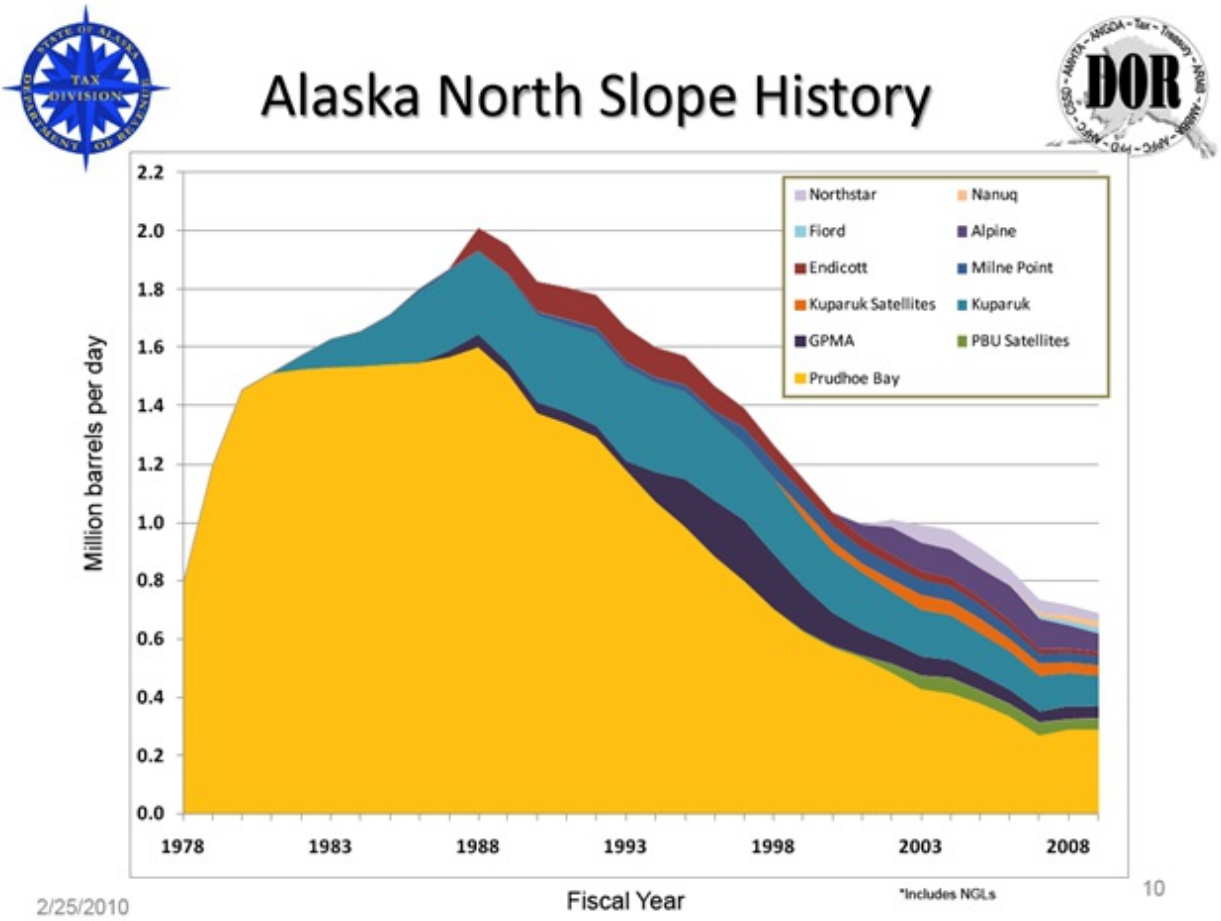


Figure 13: Source: Oil and Gas Production Forecasting: Presentation to the Senate Finance Committee, February 16, 2010, Alaska Department of Revenue.

Without some type of North Slope game-changer, production will by decade's end decline to the minimum TAPS operating capacity of 350,000 bpd.[2] Currently, it is believed that a flurry of new projects including projects that are already under development and those that are under evaluation will significantly slow the rate of decline.[3]

One such project is BP's Liberty project, which is currently a couple of years behind schedule and delayed indefinitely. If or when the Liberty project comes online, North Slope production will be goosed by an estimated 40,000 bpd, which will essentially add one year to the operating life of the TAPS. There is a danger associated with making hasty generalizations from the performance of just one field, but *if* the technologically challenging Liberty project is indicative of challenges that will be encountered elsewhere, it stands to reason that other new projects may encounter similarly long delays. And if this is the case, production will decline more quickly than is currently being anticipated.

The problem of declining rates of North Slope production is compounded by the engineering specifications of the pipeline system. At lower flow rates, the length of time required for a barrel of oil to make the trip from Prudhoe Bay to Valdez lengthens. In 2008, the trip took 12.9 days, and the temperature of the crude, which entered the TAPS at 110 degrees Fahrenheit, fell to just over 55 degrees by the time it reached Valdez. Longer transport times subject the oil to low ambient temperatures for longer periods, and as the temperature of the crude in the pipeline falls, paraffins begin to precipitate at ever increasing rates. The paraffins, which were once used (and still are used) to waterproof Klondikers' jackets, behave much like arterial plaque when they precipitate in pipelines.

Longer transit times also allow emulsified water to separate from the crude. As the water separates it collects in low spots where it greatly accelerates pipeline corrosion. Under the right/wrong circumstances the water can freeze, thereby constricting flow, or worse yet, breaking free and damaging pumps.

Additionally, the Low Flow Study Project Team hired by Alyeska Pipeline Service Company explains that, "Lower crude oil temperatures will permit soils surrounding the buried portions of the pipeline to freeze, which will create ice lenses in certain soil conditions. Ice lenses could cause differential movement of the pipe via frost heave mechanisms. Assuming no heating of the crude oil, ice lens formation is predicted to occur at a throughput of 350,000 BPD. Unacceptable pipe displacement limits and possible overstress conditions in the pipe would be reached at a flow volume of 300,000 BPD."[4]

If the long-term rate of decline remains fixed at 35,000 bpd, *and* it makes financial sense to re-engineer the TAPS to handle lower volumes, only 239,000 bpd will be produced in 2020. If it does not make financial sense, and the decline is not significantly slowed by production from new fields, North Slope output will fall to zero. Under this worst case scenario, the annualized rate of decline would be roughly 70,000 barrels per day.

Consequently, in order for U.S. oil production to remain flat in the face of North Slope declines, which have persisted for 22 years despite the fact that no fewer than nine significant fields have been brought online over this period, production elsewhere in the U.S. needs to increase by 35,000 or 70,000 bpd. This will be a challenge because the oilfield equivalents of colossal gold nuggets have, by and large, already been discovered.

There are exceptions, of course. It was estimated that the 1 billion barrel Thunder Horse field in the Gulf of Mexico would produce at a maximum rate of 250,000 bpd. Unfortunately, production peaked within 10 months and then fell into rapid decline.

The Rush for Shale Oil

The Bakken formation is estimated by the USGS to have an impressive 4 billion barrels of technically recoverable oil in place. (3 to 4.3 Billion Barrels of Technically Recoverable Oil Assessed in North Dakota and Montana's Bakken Formation—25 Times More Than 1995 Estimate—) While this is a significant amount, it should be pointed out that the Prudhoe Bay field was more than 6 times the Bakken's size, and Kuparuk was 1.5 times larger. It also bears mentioning that the Bakken oil is trapped in two layers of impermeable shale and a layer of 'tight' sandstone. In order to extract oil from the middle sandstone layer, producers utilize the process of hydraulic fracturing pioneered by natural gas producers. The process of hydraulic fracturing should not be confused with hydraulic mining, though similarities abound.

Hydraulic fracturing, or fracing, involves pumping millions of gallons of fracing fluid (a mixture of water, propants, and chemicals) per well into the earth under pressures great enough to fracture rock and release the oil. As a consequence of the process, flow rates from shale oil wells are low compared to the high flow rates of wells tapped into large conventional fields.

Whereas conventional wells like those in the Thunder Horse reservoir produce at a rate of 40,000 bpd, only 14 of the nearly 9,000 wells in the Bakken produce more than 800 barrels per day, and the average well produces only 52 bpd. Even at 800 barrels per day, 50 Bakken wells would need to be drilled for each Liberty/Thunder Horse size well, and nearly 800 of the average size Bakken wells would be required.

In order to arrest North Slope declines, 700 average size Bakken wells will need to be completed each and every year.

Due to the massive quantity of water required by the hydraulic fracturing process, the chemical cocktail that is added to the water to create fracing fluid, and the massive amount of dangerous wastewater generated by the process, environmental activists, or 'fractivists' as I like to call them, oppose hydraulic fracturing. Thus far, fractivists have turned a blind eye to Bakken production, choosing instead to focus on natural gas fracing in the far more populated areas along the Marcellus Shale formation that runs along the East Coast.

Fractivists have attained some level of success in New York, Pennsylvania, and France. The fractivists' success has engaged the oil and gas industry's fight or flight response, and elicited a relentless pro-fracing propaganda campaign. It appears as if this campaign has successfully enlisted prominent boosters who hold court in the Wall Street Journal and The Financial Times.

Regardless of whether or not fractivists target the Bakken, there is no escaping the fact that the Bakken wells are merely flakes of gold dust, and Prudhoe Bay and Kuparuk are the oilfield equivalents of colossal nuggets. And history teaches us that replacing nuggets with dust is at best a stopgap measure. While gold production in California continues to this day, production will never climb to anywhere near the peak reached in 1852 despite the fact that gold now trades at $1,800 per ounce and extraction technologies have improved by leaps and bounds.

Within this historical context we can sift the Bakken hope from the hype. The good news is that Bakken output rose from 130,000 bpd in June 2003 to over half a million barrels per day today, and is well on its way to producing a 750,000 barrels per day of high quality shale oil. Of course an analogous statement could have been said of California gold production in 1853, Klondike gold production in 1899, and North Slope oil production in 1987, so the danger of extrapolating past trends into the future is clear. That said, the growth rate *is* impressive.

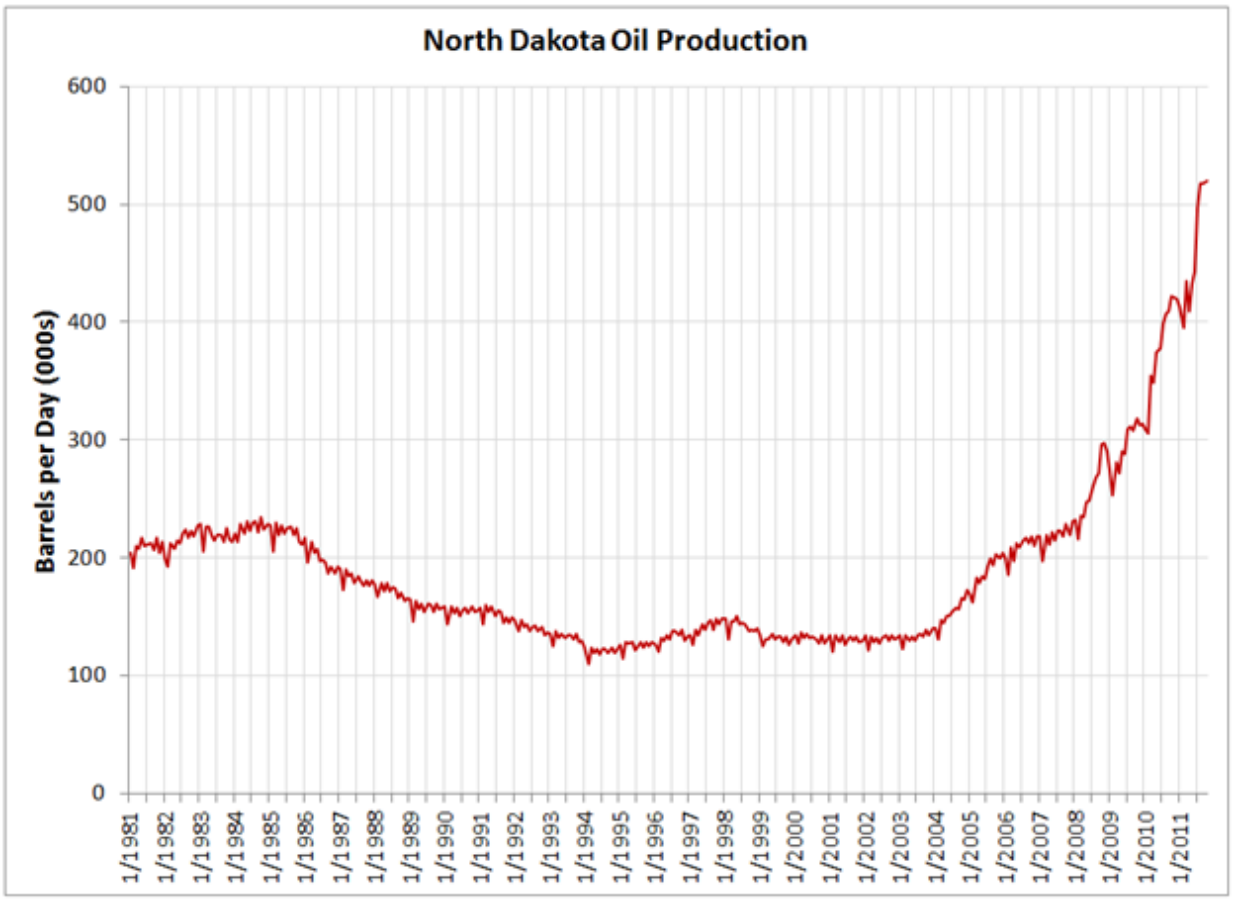


Figure 14: North Dakota oil production showing the effect of unconventional oil production

from the Bakken formation (Sources: EIA and the North Dakota Department of Mineral Resources)

Every silver lining has a cloud, and the bad news is that Montana production peaked in December 2006 and has already declined to 62% of the peak volume. This decline in Montana's production indicate that what is commonly billed as a homogeneous geologic formation is in fact heterogeneous. The pattern of production suggests that the region of economically viable and productive wells is not ubiquitous, but rather concentrated in a few important areas. (Link for more on this topic)

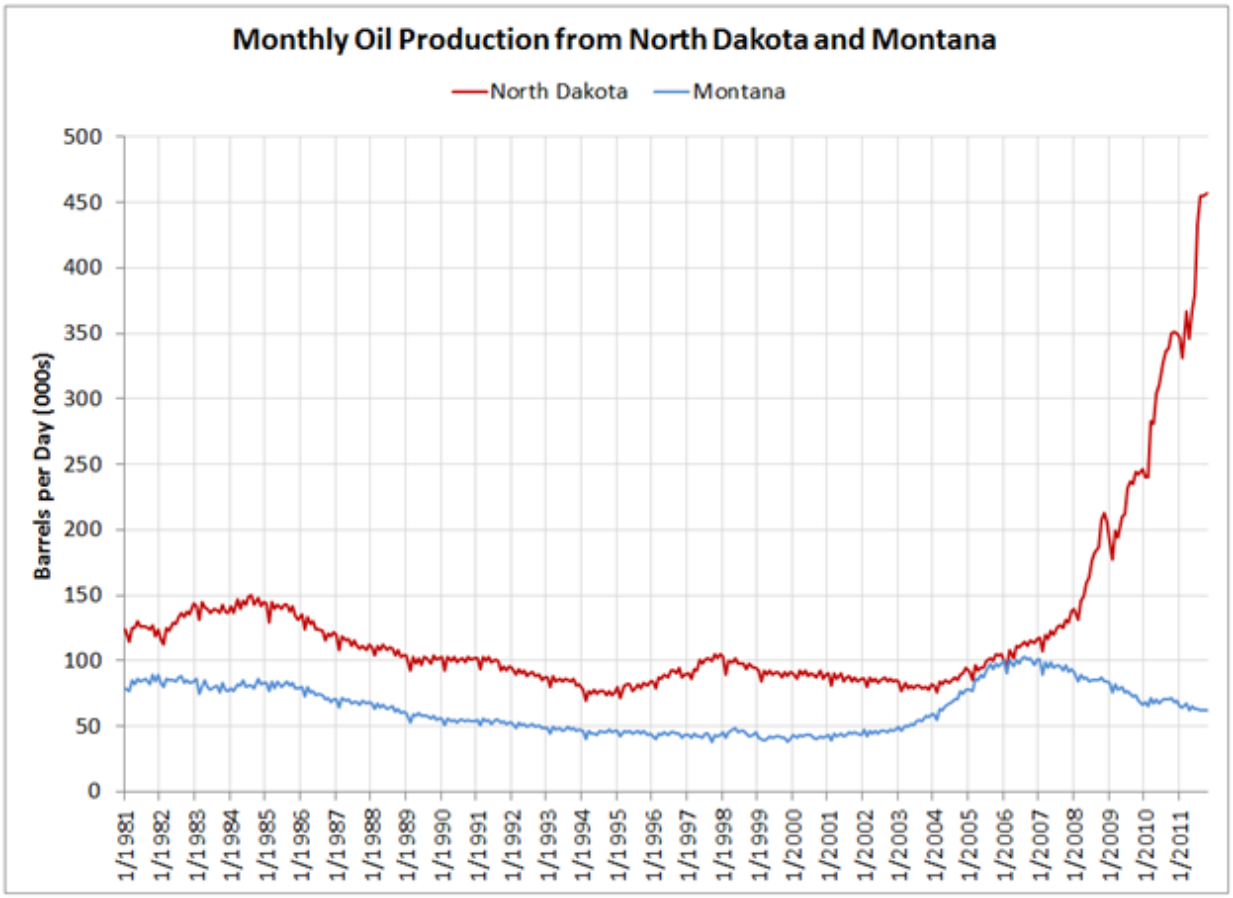


Figure 15: North Dakota and Montana oil production – one formation, diverging trends (Sources: EIA and the North Dakota Department of Mineral Resources)

The Bakken narrative being constructed by the likes of Yergin, Crooks, and Luce is hopeful, yet incomplete. Production from North Dakota is climbing rapidly, but production in Montana and, more importantly, Alaska's North Slope is declining. When taken together, a picture resembling the shadow of truth emerges. The Bakken boom has simply hidden a much more troubling trend; it has nearly perfectly balanced out the decline in North Slope output.

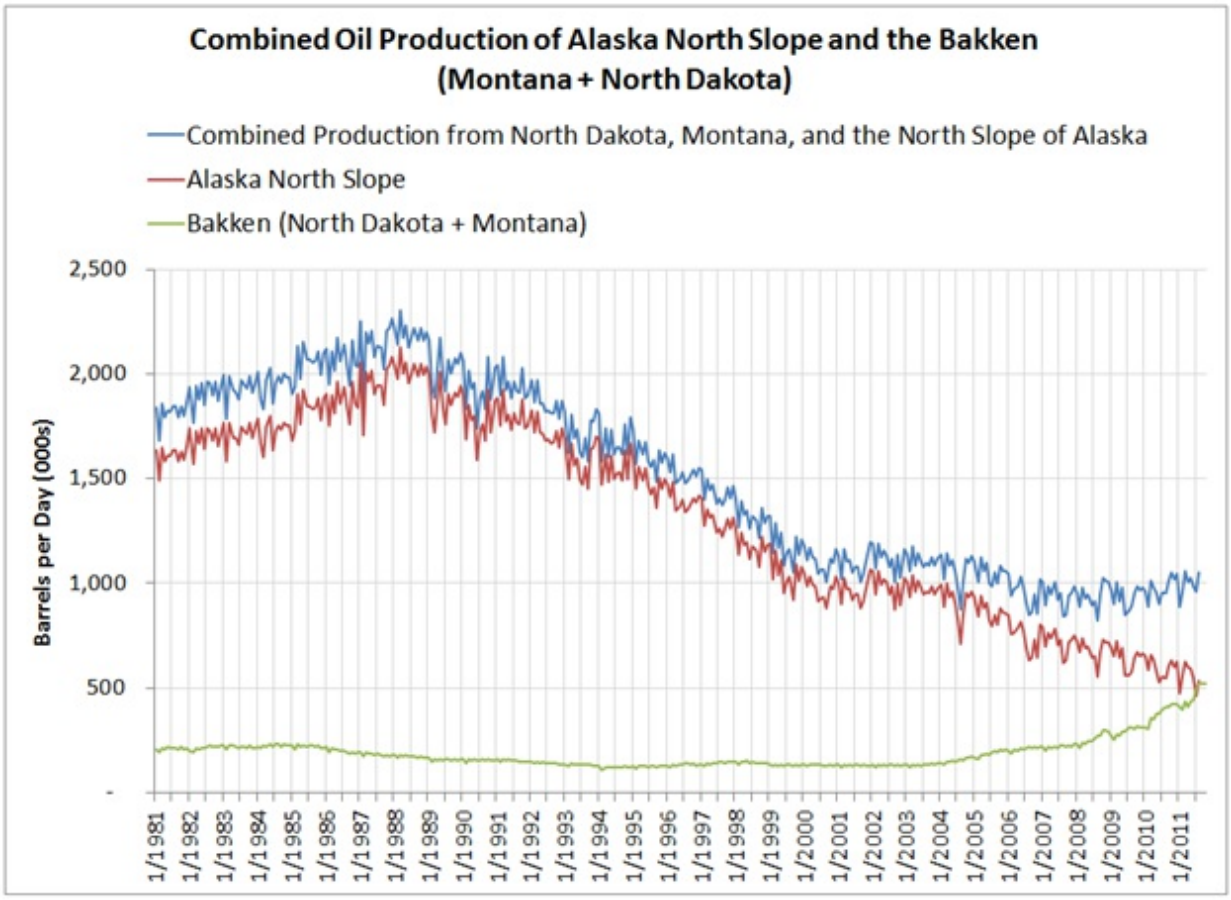


Figure 16: Aggregate oil production from Alaska's North Slope and the Bakken (Source: EIA and the North Dakota Department of Mineral Resources)

Parting Thoughts

George Orwell wrote that, "He who controls the present, controls the past, and he who controls the past, controls the future." There is more than a nugget of truth in this statement. The future is guided by the stories which shape our imagination and our perception of what is possible, and therefore what is pursued.

Just like Samuel Brannan marketed the California gold rush and the *Seattle Post-Intelligencer* marketed the Klondike gold rush, the Bakken boom is being boosted by those that stand to benefit from production, namely the oil and gas producers, oil field services companies, and the producers of inputs consumed during the process. These entities recognize their vulnerability to fractivism, and I suspect that they are behind the recent surge in boosteristic promotion of the energy independence meme.

The Bakken narrative being constructed by its proponents thrusts forth two main points. First, recent technological advances have opened the door to bountiful energy supply, so much so, that talk of energy independence has re-emerged. Second, alternative/renewable/clean energy requires subsidies that we (i.e. the U.S.) can't afford, that the public doesn't want, and that go against the free market ideology that Milton Fiedman chipped into the impenetrable stone walls that fortify the Chicago School. From these propositions it is concluded that shale oil and gas are not simply the *best* option for our non-negotiable way of life, they are the *only* option.

This narrative is enticing to many politicians and much of the public because it fits into a greater national narrative that holds at its core the primacy of market-led American ingenuity. When faced with a challenge, American entrepreneurs always emerge victorious, resource limits be

damned! Or so the thinking goes.

A sober reading of history, however, suggests that the Bakken success story fits a well-established pattern in which every natural resource boom is followed by an inevitable decline.

Sometimes history provides us with lessons that we don't want to learn. Gold dust can't replace colossal nuggets, shale oil can't replace giant conventional oil fields, and wishful thinking and ideological fortitude is no substitute for dispassionate analytical rigor.

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1. USGS National Assessment of Oil and Gas Factsheet: Assessement of Undiscovered Oil Resources in the Devonian-Mississippian Bakken Formation, Williston Basin Province, Montana and North Dakota, 2008 [↩]
2. Low Flow Impact Study. FINAL REPORT. June 15, 2011. Prepared by the Low Flow Study Project Team at the request of Alyeska Pipeline Service Company [↩]
3. Duvall and Molli, February 16, 2010, "Oil and Gas Production Forecasting: Presentation Given to the Senate Finance Committee, Alaska Department of Revenue" [↩]
4. Low Flow Impact Study. FINAL REPORT. June 15, 2011. Prepared by the Low Flow Study Project Team at the request of Alyeska Pipeline Service Company [↩]