

A pair of Dakota, Missouri Valley & Western GP35s (left) tiptoe toward an oil train they'll shove to interchange with Canadian Pacific at Flaxton, N.D. At dawn, a BNSF customer at Bowbells, N.D., unloads a car of sand for hydraulic fracturing. Two photos, Fred W. Frailey



OIL TRAINS

in the

wheat fields

The bonanza in North Dakota and what it means to railroads

by Fred W. Frailey



Soo Line constructed its Flaxton, N.D., to Whitetail, Mont., branch in 1913. Whitetail was the farthest west Soo's network reached.



The best sand for hydraulic fracturing comes in large, round grains. It needs the tensile strength to resist compacting under pressure.

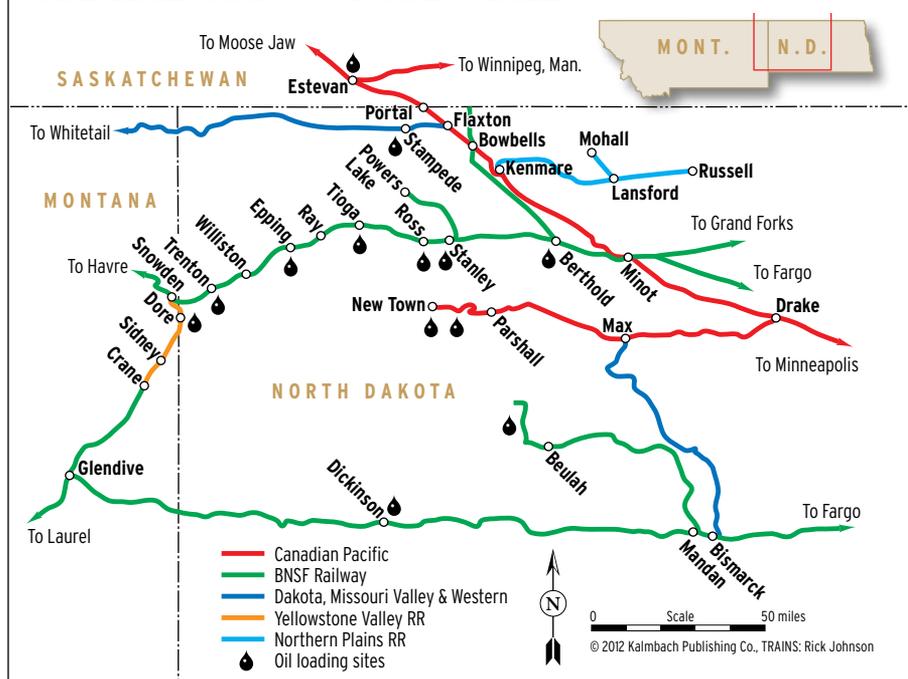


Ottawa sand, named for a city in North Central Illinois, is regarded as some of the world's best fracturing sand.

From a far distance, the two GP35s slowly crossing a snow-speckled farm field could as easily be ants crawling over a gray carpet. It's just after dawn on a bitter North Dakota winter morning, almost within sight of Canada. Moving east 2 miles to a ghost town named Stampede, the locomotives couple onto a train fronted by two other GP35s, also belonging to the regional railroad Dakota, Missouri Valley & Western. Now 103 tank cars of crude oil are ready to be delivered to Canadian Pacific. One problem: The mile-long train faces west, whereas the Canadian Pacific interchange at Flaxton, N.D., lies 15 miles to the east. So the crew responds creatively. The locomotives simply shove the train those 15 miles, the conductor and brakeman preceding it in a van to protect road crossings. It takes a while, but they get there.

The saga of DMV&W train 134 is a metaphor for North Dakota railroading going into 2012. The state, still synonymous with its wheat crops, is in the midst of an epic oil-drilling boom, and this time, railroads large and small are in the thick of it. Trainloads of supplies come in; trainloads of light, sweet crude oil go out. Those drilling supplies could keep coming well into the next decade and even beyond. Drilling tycoon Harold Hamm swears 20 billion

THE RAIL THROUGH THE SHALE



Yellowstone Valley Railroad conductor Robert Carr (left) checks his train list outside the railroad's Sidney, Mont., headquarters. BNSF conductor Ron Randle (center) poses for a photo amid falling snow. It's his first day on the job, and he's working BNSF local L-MON8331, which peddles oilfield supplies to shippers west of Minot. BNSF engineer Del Hust (right) creatively spots his setout at Stanley, N.D. Below, TRAINS: Andy Cummings; others, Fred W. Frailey



Yellowstone Valley prospered on sugar shipments from an American Crystal plant in Sidney, plus grain, prior to the Bakken boom.



Yellowstone Valley conductor Robert Carr relocated to Sidney from Florida during the boom. His engineer this day is from Texas.

barrels of oil lie inside rock formations beneath this little piece of the planet, and his company, Continental Resources, is the biggest explorer in North Dakota.

But when pipeline capacity ramps up, will oil trains like the one you just saw still be needed? Nobody knows. In the meantime, everything about this new business franchise is so new, so different, that the only way any railroad can cope is to stay loose and, yes, think creatively.

UNLOCKING TREASURES FROM ROCK

In the words of oil expert and author Daniel Yergin, the center of the global oil map is shifting from the Middle East to the Western Hemisphere. Brazil has discovered off its southern coast an oilfield rivaling those of Arabia. In Canada, engineering advances permit oil to be extracted from molasses-like deposits in northern Alberta, and that province could become a bigger oil producer than Iran, Yergin says.

And in the U.S., undreamed-of quantities of both oil and natural gas are being discovered and brought to the surface from more than half a dozen vast expanses of

hitherto-impermeable layers of shale rock.

For that, thank a stubborn Texan named George Mitchell. The founder of Mitchell Energy & Development, he doggedly experimented with a process called hydraulic fracturing, in which water mixed with super-hard sand is injected into shale formations under high pressure. The water opens fractures in the rock and the sand holds them open, enabling oil and gas to escape. Fracking wasn't new, but what Mitchell did was apply it successfully in oil and gas fields.

Combine fracking with directional drilling, in which a well is drilled down and then turned in any desired direction, and you create an economical and almost foolproof way to mine oil and gas deposits from the rock. The result is a drilling frenzy, as energy companies explore the Marcellus shale in Pennsylvania and New York, the Barnett in North Texas, the Eagle Ford in South Texas, the Permian Basin in West Texas and New Mexico, the Niobrara in Colorado and New Mexico, and a host of smaller shale "plays." What's different this time is that railroads are needed to get the wells drilled, and often, to get the oil to buyers.

Nowhere is this more evident than in the biggest shale play of them all, the Bakken formation in the northwest quadrant of North Dakota, northeastern Montana, and southern Saskatchewan.

RON RANDLE'S BIG DAY

On his first morning as a BNSF Railway conductor, Ron Randle draws one of the toughest jobs on the railroad's Great Northern Corridor west from Minot, N.D. The mission of local freight L-MON8331 is to peddle fracking sand, drilling pipe, and other oilfield supplies (together with grain and chemical empties) 94 miles west to Ray, N.D., and then work its way back to Minot, picking up cars as it goes.

Most days, the hardest part is just getting out of Minot. On duty at 6 a.m. in Gavin Yard, today's train is held for Amtrak's *Empire Builder* and two westbound intermodal Z hotshots, and doesn't depart downtown Minot at Soo Tower until after 10 a.m. Seldom is a single crew able to complete the turn. One conductor in 2011 relieved the first crew of L-MON8331 just a few miles out of Minot, and finally



Though BNSF run-through power is common, Yellowstone Valley operates a fleet of black-and-yellow Geeps with bear logos.



James J. Hill pushed his "Manitoba Road" from Minot to Great Falls, Mont., in 1887.



Watco's Yellowstone Valley launched operation on BNSF's Sidney and Scobey lines under lease on Aug. 15, 2005.



Cold-weather gear is necessary in the Bakken. The average daily February low temperature in Minot is -2 degrees.

brought the train home two days later as a member of that trip's seventh crew.

L-MON8331 gets to Stanley, N.D., milepost 54 from Minot, at 11:26 a.m. in a driving snowstorm. The 16-car setout must be shoved onto a forward-facing spur, and getting the dispatcher's permission to run around the train on the siding could take an hour or two because of congestion. On an average day, 32 trains pass Stanley, most on their way between the Midwest and the Pacific Northwest.

Engineer Del Hust, one of the seniority roster's graybeards, decides to improvise. He separates the first of his two SD40-2 locomotives and runs it into the setout track. Then, from the other unit, he pulls his train past the switch. Back in the first engine, Hust gets behind his train, pulls back with the setout cars, and shoves them into the spur. Again in the second unit, he backs up until clearing the setout switch, and the two locomotives reunite. As this goes on, an eastbound intermodal hotshot crawls by in the siding. In just over an hour, L-MON8331 is ready to go west to Ross, MP 62.

As the afternoon ticks by, Randle and brakeman Dick Severson buck the snow, blown by 30-mph winds. The train switches Ross, meeting another eastbound intermodal train, and then Tioga (MP 82). There, Randle manages a broad grin, declaring this to be an exciting day. But the dogcatchers will come for his train, too, which won't get back to Gavin Yard until almost 3 the next morning.

Fracking is resource-intensive. For every well you drill (and 1,800 were drilled in North Dakota in 2011), you need at least two-dozen covered hoppers of fracking sand from far-away places like northern Illinois, western Wisconsin, Texas, and even Russia and China. You also need half a dozen cars of drilling pipe and a couple of tank cars of chemicals. Virtually all of this gets to North Dakota by rail.

BNSF is easily the biggest rail beneficiary of the Bakken play. Every day it assembles a train at Northtown Yard in Minneapolis, M-NTWDOR, to bring oilfield loads to Minot and Williston, N.D., to be distributed by locals. At Snowden, Mont., near the confluence of the Missouri and

Yellowstone rivers, M-NTWDOR heads south on Watco's Yellowstone Valley Railroad before terminating on that railroad in Dore, N.D. Meanwhile, as quickly as it can, BNSF is organizing sand bound for the Bakken shale region onto unit trains in an effort to reduce turnaround times.

OIL BY RAIL

Union Tank Car Co. was founded in 1866 expressly to move John D. Rockefeller's oil to market. But the coming of pipelines pushed railroads out of the crude oil business after World War II. Now two circumstances are driving oil companies and railroads back into each other's arms, at least for a while. The first is that pipelines in northwest North Dakota lack capacity to get all the oil out of the state. Without transportation, oil has little value.

The other is that even if capacity were adequate, the pipelines don't always reach the right places. Most major pipelines head north-south to the Midwest, specifically to Cushing, Okla., where the domestic oil price is set (called the WTI price, for West Texas Intermediate). A glut of oil in Cush-

CP's Max-New Town job (top left) passes Prairie Junction, N.D., on Sept. 23, 2011. New tank cars (bottom left) head for New Town with 1267 (crude oil) placards. A westbound BNSF Z train passes a "man camp" taking shape near Tioga, N.D. (center). Oil makes a truck-to-rail transfer at New Town (top right). DMV&W and CP trains meet at Max (bottom right). Two photos at left, Chris Guss; center and bottom right, Fred W. Frailey; top right, Charles L. Bohi



In late 2011, Canadian Pacific lifted a four-axle restriction from its New Town Subdivision. Big power can now travel the length of the line.



Forecaster Economic Planning Associates Inc. estimates builders will deliver more than 48,000 tank cars to railroads in 2012.

ing caused oil recently to fetch almost \$16 a barrel less than it could at U.S. coastal cities and in world markets (the Brent price).

TransCanada's Keystone XL pipeline from Alberta to the Gulf Coast would siphon away up to 100,000 barrels per day of Bakken oil as it passes through North Dakota. But the XL is captive to U.S. politics, and anyway, that's just 100,000 of the 1 million barrels a day expected to flow from North Dakota by 2015 (versus half that amount in late 2011).

Until more pipelines to the outside world appear, says A. Warren Henry, head of investor relations for Continental Resources, "Every incremental barrel of oil we produce has to leave by rail." Forty percent of Continental's output from the Bakken now goes by train.

Small wonder then that the order books of tank car builders are bulging. At a time when 264,000 freight cars sat in storage, the backlog of tank car orders recently stood at 27,000. For example, the second-biggest player in North Dakota, Hess Co., whose exploration team first found oil in the state in 1951, is taking delivery of 900

cars to divide into 100-car trainsets for loading at its new oil terminal in Tioga.

Real and proposed oil-loading depots are proliferating in North Dakota at an eye-popping rate. Going west from Minot on BNSF's Great Northern Corridor, you'll find them in operation or under construction at Berthold (MP 23), Stanley (MP 54), Ross (62), Tioga (82), Epping (105), and Trenton (122), and on the connecting Yellowstone Valley Railroad in Dore, 160 rail miles from Minot.

By far the busiest is EOG Resources' loop loadout in Stanley, which opened New Years Eve 2009, and in 2011 dispatched more than 100 unit trains of crude oil to the Cushing area (via Watco Cos.-owned Stillwater Central beyond Stroud, Okla., near Cushing) or to a transfer station in St. James, La. The number of unit trains could rise dramatically in 2012, as most of these loading depots come on line and several already running expand their loading capacity.

BNSF also loads unit oil trains at a terminal near Dickinson, N.D., on the former Northern Pacific main line, and at

Beulah, on a branch line in central North Dakota. The loading capacity of all rail terminals in the state reached 300,000 barrels per day in 2011, and is expected to climb to 750,000 in 2012 — more than the state's total output. In other words, overbuilding may be occurring.

The beauty of oil by rail is that it can go anywhere rails do. You can't move a pipeline; if it's built to Cushing, it stays there. Getting it to a coastal market where oil fetches the world price can more than offset the higher cost of rail transportation which, depending upon circumstances, can amount to \$7 to \$10 a barrel. Lately, the destination of choice has been St. James, which can unload one train a day (by mid-2012, two trains) and pipe the oil into the system. But there aren't a lot of choice destinations. Few refineries or pipeline terminals are equipped thus far to accept unit oil trains.

BNSF doesn't seem to feel the need to make big capital investments to handle its bonanza of oil-related business. The trains that suffer are the locals, but that's always the case. Where BNSF sees weak links, it spends money.



BNSF's Great Northern Corridor handles intermodal shipments from the Pacific Northwest to Midwest destinations.



The 1953 completion of the Garrison Dam flooded two towns in Mountrail County. Residents relocated to form a "New Town."



One-third the population of Mountrail County, N.D., lives in temporary housing.



Dakota, Missouri Valley & Western launched in 1990. Its fleet includes ex-Wisconsin Central SD45s and ex-Canadian National SD50Fs.

Lately, the majority of BNSF unit oil trains have been headed to New Jersey (handed off to Norfolk Southern in Chicago) or Louisiana (interchanged with Union Pacific in East St. Louis, Ill., via Minneapolis-St. Paul and Galesburg, Ill.). Cushing-area oil trains run via Willmar, Minn.; Sioux City, Iowa; Omaha; and Kansas City. The standard train is 100 cars plus a buffer car behind the engines.

Its biggest struggle? Maintaining the crew base at places like Minot, in the face of high wages being paid in the oilfields.

CP'S MIGHTY BRANCH LINE

Easily the most congested portion of Canadian Pacific, in the U.S. or Canada, must be the New Town Subdivision, its 111-mile incursion into the belly of the Bakken beast. At its western end lies New Town, N.D., a.k.a. Boom Town. Imagine Virginia City, Nev., in 1860, or Ranger, Texas, in 1920. Oil, sand, and water trucks clog the highways. ("Back up," warns a sticker on the rear of one truck's oil trailer at New Town. "We ain't hauling milk.") So-called "man camps," flung-together temporary housing for oil-

field workers, sprout up everywhere.

After a winter storm, mud is omnipresent. Amid all this, Canadian Pacific's 8 a.m. crew, which started work 62 miles east in Max, N.D., is busy drilling the four-track, stub-ended oil-loading terminal operated by Dakota Transport Solutions. Opened in August 2010 with two 40-car tracks, the facility doubled in size in 2011 with the addition of two more tracks.

Before the expansion, and until CP built a run-around track just short of the terminal in 2011, switching the loadout was difficult. An inbound train of empty tanks would cut off half its locomotives and stow them on a loading track. The remaining locomotives hauled the empties past the loadout on the main line. Returning to the locomotives on the loadout track, the crew then coupled to the rear of its train and spotted the cars. Forget spotting 80 empties and leaving with 80 loads; there was no room.

It's a lot easier now. Today's 8 a.m. crew leaves an 80-car train of empties on the run-around track. It pulls 80 loads out of two tracks in New Town and takes them back on the main line and stops beside the

run-around track. Now the locomotives couple to the empties, push them to a spot on the two tracks just emptied, and return to the loads. Then it's couple on and perform an air test. Soon this train will get underway to CP's Chicago-Portal, N.D., main line at Drake, N.D., en route to Chicago and a handoff to Union Pacific, which will take the train to St. James.

CP has spent \$90 million the past two years buttressing its infrastructure in North Dakota. Most of it went into the New Town Sub. Besides that run-around track, CP added trackage at Max, laid 17 miles of welded rail, and put snow fencing in place. What that accomplished was to make the New Town line barely manageable, which in North Dakota these days is a major victory for any railroad.

Consider what's occurring on this branch line. Every other day or so, a train of empty tanks arrives in Harvey, N.D., the crew-change town 23 miles southeast of Drake, ready to go to New Town. While it's on the branch, nothing can move in the opposite direction unless there's room to get out of the way at Max, which is often

A newly constructed oil well looms over the countryside west of Parshall, N.D., as CP's New Town-Max job passes with 20 loads on July 2, 2011. TRAINS: Andy Cummings



The construction of the Garrison Dam and creation of Lake Sakakawea led Soo to relocate 15 miles of what's now the New Town line.



In November 2011, North Dakota boasted 6,300 oil wells producing enough oil to offset U.S. imports from Colombia or Iraq.

not the case. Every morning, Dakota, Missouri Valley & Western delivers 100 or so cars to Max, mostly loads from an ethanol refinery; a CP crew takes this train to Harvey. Harvey sends a train back to the DMV&W as well. And every town along the branch line seems to have a grain elevator whose tracks bulge with cars. Besides the 8 a.m. crew at Max, another goes on duty an hour later, and a third crew in the evening. Drake has day and evening road-switcher crews, too.

You watch all of this play out one afternoon at Max. On the DMV&W line sits a 120-car train with locomotives belonging to the regional railroad, waiting to go east with a CP crew. On the main line, also waiting to go east, is train 694, 100 cars of oil, crewed by the 8 a.m. Max job. In front of both trains is the 9 a.m. Max job, switching the grain elevator. And in front of it, a track gang has equipment on the main line while it installs a new crossover.

After an hour or so, the gang clears to let the oil train depart. The 9 a.m. job finishes switching, parks its locomotives, gets paperwork in the Max yard office, and

boards the DMV&W train. Departure is almost at the last light of day. Both Max crews will be taxied home from Harvey, if they make it that far. When both trains clear Drake, CP can send the DMV&W train to Max. And those online elevators still need to be switched.

But CP people by now are masters of improvisation and creative thinking.

SHORT LINES GET IN THE ACT

Canadian Pacific's other substantial source of crude oil is located on the Dakota, Missouri Valley & Western, at Stampede. You won't find this town on any map; it's a few miles east of the town of Columbus, on a 136-mile line orphaned from the rest of the DMV&W. The two DMV&W crews assigned to this line (one works nights, the other days) cobble together a unit train every couple of days, while also switching the grain customers in the extreme northwest corner of the state and into Montana.

The Stampede terminal, opened in 2008, is the state's first railroad oil loadout, able to spot 32 cars at a time. But the unit

train era here didn't begin in earnest until October 2011. Once a unit train is ready, it is usually backed those 15 miles to the CP at Flaxton. From there it enters Canada at Portal, 10 miles away, reenters the U.S. at Rouses Point, N.Y., and terminates alongside the Hudson River in Albany, N.Y.

Business must be booming on the DMV&W, which leases or owns 522 miles of former Soo Line branches. The railroad late in 2011 traded six of its GP35 locomotives for five former Kansas City Southern SD40-3 diesels.

Another CP connection, at Kenmare, N.D., northwest of Minot, is the Northern Plains Railroad, which leases former Soo Line trackage. Right now, says President Larry Jamieson, a fracking sand terminal at Lansford is adding "substantially" to the 5,500 carloads of mostly grain business handled annually. An oil loadout on his railroad is in the planning stage, Jamieson says.

Be careful what you wish for, however. In 2005, BNSF leased to Watco Cos. two lines totaling 134 miles it believed to be of little importance, to become the Yellowstone Valley Railroad. One connects



Agriculture remains North Dakota's biggest industry, with crop production topping \$5.8 billion from 32,000 farms in 2010.



This piece of a pumpjack is known in the industry as a "horse head." The beam to which it's welded is the "walking beam."



Storage tanks hold the extracted oil until a truck can pick it up. Excess gas is burned off at the stack (far left).

BNSF's Northern Pacific line at Glendive, Mont., to the Great Northern Corridor at Snowden, 79 miles north. The other meanders another 55 miles into eastern Montana. All went well until Musket Corp. announced it would build an oil-loading station for unit trains at Dore. Then BNSF invoked a clause of the lease allowing it to renegotiate the terms. In the new agreement, reached last September, the Yellowstone Valley cedes the crude oil business to BNSF, as well as all business between Crane, Mont., and Glendive, 43 miles. Concedes Ed McKechnie, Watco's chief commercial officer: "To be good partners, you have to realize when things change."

WHAT THE FUTURE HOLDS

The fracking sand and pipe is railroad traffic that could last 10 or 30 years, until drilling rigs plumb the entire formation. What's not known is whether unit oil trains will enjoy long lives. Will oil companies desert railroads once pipeline capacity is great enough to take it all away? Answers Brent Dornian, Canadian Pacific's general manager marketing and sales, energy, and

chemicals: "As long as customers see growth through continued production, we will align our investments and resources accordingly." In other words, show us the money and we're there.

CP is also exploiting its presence in the Bakken formation that lies within southern Saskatchewan. It is taking oil from a trans-load facility in Estevan, Sask., the first city north of Portal. It is also moving oil from a facility in Dollard, Sask., located on the Great Western Railway.

Denis Smith, BNSF's vice president of industrial products marketing, is convinced that come what may, his railroad and CP will hold onto the 20-25 percent market share they now possess on oil shipments from North Dakota. "We don't demand a 20-year commitment, and we'll take your oil anywhere you can get the best price," he says. "Pipelines can't do that."

CP's chief executive, Fred Green, said last October that he'd view even a 5-10 percent market share as a "major opportunity."

The people who really worry about whether railroads have a future hauling oil are the tank car leasing companies. They

own the tank cars. So far, these companies are willing to make bets. One leasing executive puts it this way: "The question I fight with is whether a railroad market can sustain itself. What we are being told is that in the future, because of the flexibility that rail brings, it will be a viable mode of transport for crude. I believe that, too. But railroads will be niche players. Pipelines aren't going away."

Amazing, isn't it? In North Dakota, Pennsylvania, Texas, and half a dozen other states where hydraulic fracturing occurs, railroads created a franchise where none existed before. And not just the big boys prosper. The little Gulf, Colorado & San Saba in South Texas did 680 carloads in 1992, its first year independent of the Santa Fe Railway. Owner Richard McClure expects 15,000 carloads in 2012, thanks to 10 sand plants located on his railroad. Iowa Pacific's two railroads in the Permian Basin, the Texas-New Mexico and West Texas & Lubbock, went from 5,000 carloads in 2002 to 17,000 in 2011, because of oil drilling.

Let's hear it, therefore, for creative thinking. **I**