MONTHLY REVIEW

Contents:

FEDERAL RESERVE BANK OF MINNEAPOLIS

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2 edges of technological progress: the case of Lake Superior iron mining

The steel industry's current investment spending boom is reshaping — and revitalizing — the iron ranges of the Lake Superior district. Spending is being overwhelmingly ticketed for facilities to process large deposits of low grade (taconite) ore (20 to 40 per cent iron) into high grade, uniform ore pellets (60 to 65 per cent iron). More than $420 million is represented by the current spending splurge — this on top of more than $700 million laid out for the initial phase of taconite plant construction during the period 1952-57.

Estimated annual wage distribution under the current capital spending program (1964-67) appears in Table 1. Plant construction outlays, of course, have both immediate and longer term employment implications. Construction employment, while temporary, swells demand for housing and for a broad array of products and services in many communities near the plant sites. Roughly assuming that about one-fourth of total plant expenditures goes into on-site construction wages, the following pattern of payroll payments is indicated:

	Estimated construction wages for Table I projects	Equivalent annual employment at $8,000 per man year
1964	$ 3,500,000	440
1965	$29,500,000	3,700
1966	$42,300,000	5,300
1967	$30,000,000	3,750

Given the relatively small economic base of the district's iron range communities, the payroll infusion from construction employment alone is one to be strongly felt. Permanent employment associated with the operation of the new facilities, once constructed, also is clearly substantial: the projects cataloged in Table 1 (locations depicted in Chart 1) represent over 4,000 permanent new jobs. These are added to some 5,640 jobs created by the initial phase of taconite plant expansion in three states (Michigan, Minnesota, and Wisconsin) that share the Lake Superior district's six major iron ranges.

TABLE 1 — ESTIMATED DISTRIBUTION, 1964-67, OF COMMITTED CAPITAL SPENDING ON MAJOR TACONITE AND PELLET PLANT FACILITIES AFFECTED BY THE CURRENT BOOM IN CONSTRUCTION

Project	Approx. amount (millions)	Location	Estimated calendar year project outlay 1964	1965	1966	1967
Reserve*	$ 25	Silver Bay, Minn.		$ 5	$ 20	
Erie*	50	Hoyt Lakes, Minn.		10	20	$ 20
Ford	45	Eveleth, Minn.	$ 9	36		
U.S. Steel	120	Mt. Iron, Minn.		20	40	60
National	70	Keewatin, Minn.		15	35	20
Butler	56	Cooley, Minn.		12	24	20
Pioneer	15	Eagle Mills, Mich.	5	10		
Empire*	40	Palmer, Mich.		~~10~~ ~~30~~		
	$421		$14	$118	$169	$120

*Expansions to existing plants; all others are new facilities.

The target of all this spending is the production of iron ore pellets, a product which has already revolutionized blast furnace operations in the nation's steel mills. In fact the productivity impact of pellets has so shaken demand for iron ore that markets virtually have dried up for dozens of district iron mines, and so they have closed down — also by the dozens. Thus while the new technology has opened fresh employment opportunities, its other "edge" has pared away many jobs that depended on more traditional methods. Two events reported in the news of 1966 constitute historical landmarks in the general process of mine attrition.

End of operations on Gogebic, Vermilion iron ranges

Of the six iron ranges recognized in this district (see Chart 1), two will be closed out of operations by the end of next year after continuous production for the better part of a century. Both are the sites of deep underground mining.

The last operating mine on the Gogebic range, the Peterson mine, closed in January of this year, and scheduled shipments from a stockpile of about 500,000 tons of ore will finish off by the end of this season all iron ore activity on the range. The near-dozen Michigan and Wisconsin communities that span, shoulder-to-shoulder, some 30 miles of Gogebic iron range, could boast, as recently as 1952, of 3,500 year-around iron mining jobs. As one mine after another succumbed to the new economics, job numbers in iron mining were steadily reduced:

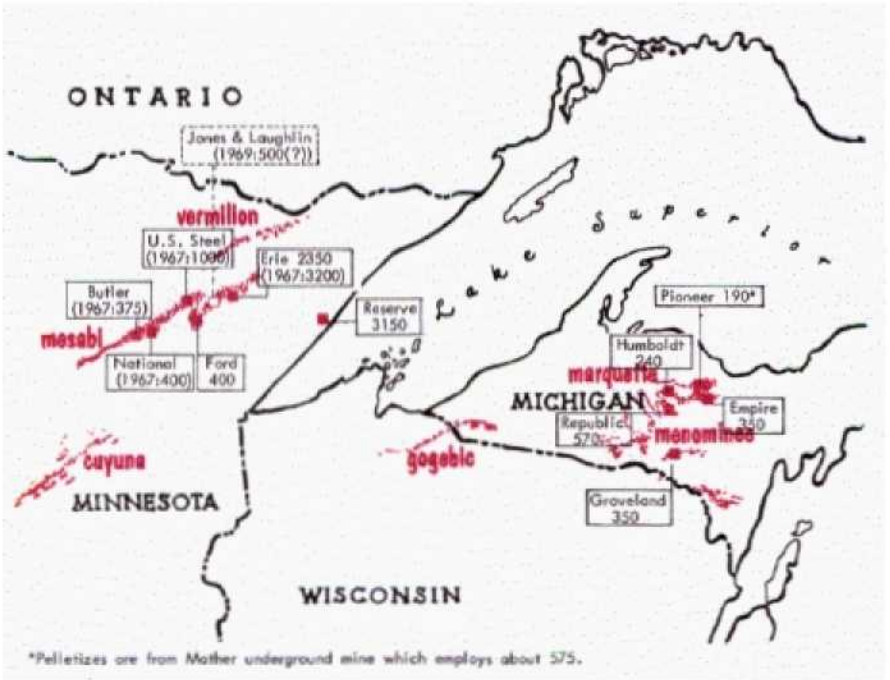
Average number of iron mining jobs, Gogebic range mines

	Michigan portion	Wisconsin portion	Total Gogebic
1952	2,500	1,000	3,500
1957	1,800	950	2,750
1962	480	550	1,030
1967*	0	0	0

*anticipated

In similar fashion, the Vermilion range in northern Minnesota, though with fewer active mines and lesser annual shipments than the Gogebic, will also be phased out with the closing of its sole remaining mine, the Pioneer, effective April 1, 1967. The Vermilion range tallied about 1,000 jobs in three mines as of 1952, with only gradual reductions occurring until 1963 when two of the three mines were shut down:

Chart 1 — Lake Superior mining district, major pellet plants with approximate current or projected employment



*Pelletizes ore from Mather underground mine which employs about 575.

Average number of iron mining jobs Vermilion range mines, Minnesota

1952	1,000
1957	950
1962	870
1967*	0

*anticipated

Neither the Peterson nor the Pioneer mines were exhausted of ore of the grades they had been shipping for decades: they were closed because they could not be made to respond to the changed demands of a new technology. As of 1965, in fact, iron ore reserves of Gogebic county, Michigan, were totaled on property tax

rolls at nearly 10 million tons (or about a 4- to 5-year supply at recent shipment rates) with an indicated "full and true" valuation of about 40 cents per ton. For that same year, the two nonexhausted Vermilion range mines (Pioneer and Soudan) had combined reserves of 9,600,000 tons or about a 9- to 10-year supply at recent shipment rates; the corresponding "full and true" value (Pioneer only) could be estimated for real estate tax purposes at about 56 cents per ton.

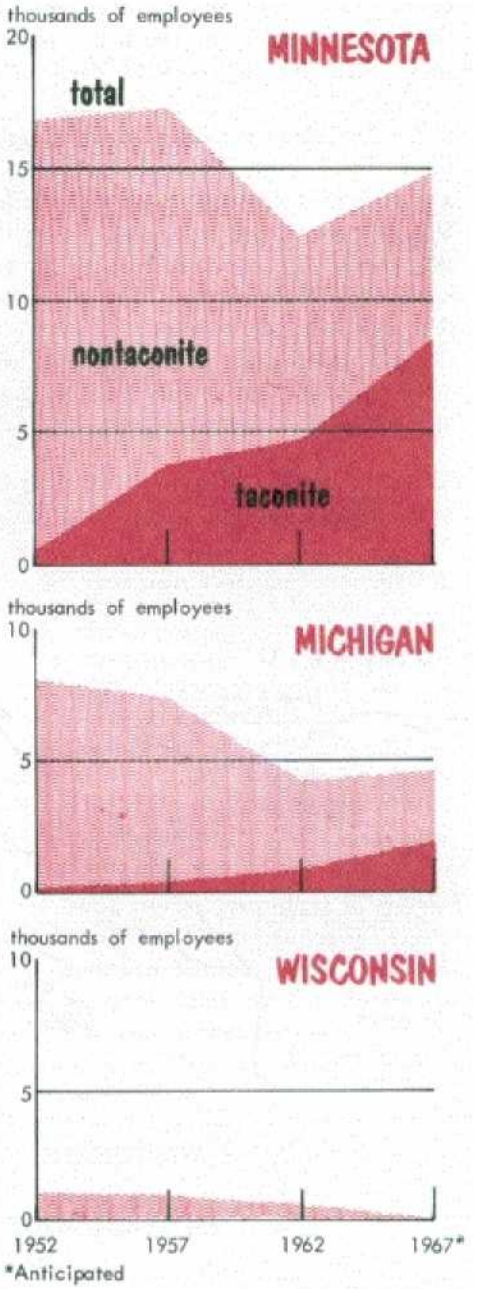
Underground mines have been particularly vulnerable to the declining market price for conventional iron ore that has occurred since 1961. One reason, of course, is that underground mining is highly labor intensive and, generally speaking, not the ready beneficiary of the great advances in machinery and technology such as has been the case with open pit mining practice. In fact underground mines are far more labor consuming than are the modern day taconite plants. Based on representative recent data, the numbers of workers (man years) required to produce 1 million tons of annual product are:

Annual product	Man year labor requirements
1,000,000 tons Gogebic range ore (underground)	700
1,000,000 tons Vermilion range ore (underground)	830
1,000,000 tons taconite pellets (open pit)	300

Thus for operations of the type carried on recently for the Gogebic and Vermilion ranges, a ton-for-ton displacement of underground ores by pellets from taconite plants would have the effect of reducing total labor requirements. To some considerable extent this phenomenon has dominated employment trends in the district's iron mining region over the past decade. The current plant expansion phase, however, promises a much more nearly balanced trade-off between gains from new taconite jobs and losses from the economic submersion of older iron mining operations.

What's more, the "third" phase of taconite expansion, when it occurs (most experts now do not seem to say "if"), promises to create more new iron mining jobs than are displaced by eventual elimination of remaining con-

Chart 2 — Average iron mining employment by state and phase of industry for selected years, 1952-67



ventional operations. The amount of "offset" in job numbers that taconite processing has been able to offer over the 15 years since construction was begun on the first commercial taconite plants is depicted in Chart 2.

Intradistrict impact sharply differential

While pellet producing operations have helped over-all to offset recent job losses in Lake Superior iron mining, the degree of adjustment required of communities and their residents is perhaps better measured by the gross change in job numbers rather than in net change. This is because neither geographic locations nor employment skills have been matched very closely between old and new phases of the industry.

The Gogebic range is one case in point. Locations mapped in Chart 1 show that no taconite plant construction has taken place in the Gogebic — in fact none within about 100 miles of any Gogebic range community. Because of its geologic structure and make-up, the Gogebic range has been much less attractive as a source locale for large-scale taconite-type operations than, for example, the Mesabi or the Marquette ranges where nearly all of the new installations have been placed.

The Vermilion range is in much the same boat as the Gogebic as far as plant construction prospects are concerned. One difference is that Vermilion range towns (Ely and Tower) are located within feasible commuting distances of large Mesabi range taconite plants. Both personal and community adjustments tend to be simplified when workers released from closed mines can be absorbed into the growing taconite work force without relocating places of residence. Retraining and absorption by the taconite sector was possible for only part of the unemployed miners, however. Intracompany transfer to other mining locations, retirement (sometimes early), and acceptance of work in other (sometimes distant) industries are other avenues of adjustment to the recent mining industry changes.

In connection with the announced closing of U.S. Steel's Pioneer underground mine at Ely, modes of adjustment are indicated as follows:

"About 500 people are currently employed at the Pioneer mine. They will be offered available employment elsewhere in U.S. Steel's operations, or, a majority will be eligible for and may elect to take advantage of pension benefits when operations cease."[1]

In this case the possibilities for relatively "painless" intracompany transfer may be somewhat enhanced by the fact that U.S. Steel's taconite plant at Mountain Iron, scheduled for completion in 1967, will require 1,000 or more permanent employees.

Unemployment rates reached very high levels throughout the district's iron range communities after the strike-stimulated ore production spurt of 1960. Yet several factors, including (1) new jobs at new or expanded taconite plants, (2) generally growing levels of ore demand, (3) local growth in nonmining activity, (4) extra-district movement of unemployed workers, (5) retirement, and (6) fortuitous developments unrelated to taconite,[2] have combined to reduce iron range unemployment to modest levels as of the 1966 season. Thus the local economies on the iron ranges — including the Gogebic — appear today relatively robust. On the Gogebic range this has come about without an offsetting gain from taconite employment.

Gogebic range recovery: a tradition of adaption, and a 'fortuitous' development

Based on relatively detailed data compiled by the Ironwood district office of the Michigan Employment Security commission, the following pro-

[1]Skillings Mining Review, April 9, 1966.

[2]One fortuitous development near Ely with potential to create an appreciable number of new jobs for underground miners, but unrelated to taconite, is embodied in current plans by International Nickel Company to undertake extensive development of copper-nickel deposits in the Ely area.

file of the adjustment experience of Gogebic county, Michigan, can be sketched:

The year 1960 was an especially well-marked turning point for Gogebic range mines and for many others like them throughout the Lake Superior district. By dint of the prolonged 1959 steel strike, ore demand held up artificially well in 1960, and Gogebic range iron mining enjoyed its last "good" year of production. But the year 1960 also marked the steel industry's verdict on taconite pellets: productivity gains from blast furnace use of pellets were so startling that the so-called natural ores shipped for decades from the Gogebic and other ranges of the Lake Superior district were no longer suitable. The fate of the Gogebic's mines was thus sealed, and the onset of generally sagging levels of iron ore demand in 1961 merely speeded the inevitable demise of Gogebic range mines. By the end of 1965 the last of some 2,400 mining jobs existing in 1960 had been eliminated.[3]

Unemployment became a severe problem during the 1961 season. With some 1,140 miners unemployed by mid-1961, total unemployment in Gogebic county climbed above 25 per cent of the county's labor force of 6,800. In contrast, monthly unemployment rates during the previous year had hovered mostly in the 3 to 6 per cent range. Yet by June 1966, Gogebic county unemployment rates had worked down to the 7 to 9 per cent range, with only 115 experienced mine workers tallied at the Ironwood office as unemployed.

[3]Mine closing chronology as reported by the Michigan Employment Security commission and V. F. Lemmer, Ironwood, was as follows:

Date of closing	Mine	Number of employees released at closing
2-16-61	Sunday Lake	237
11-30-61	North Range Penokee	325
8-10-62	Montreal	600
1-28-65	Cary	215
2-19-65	Geneva-Newport	268
1-31-66	Peterson	220

The economic adjustment demanded of the Gogebic community between 1961 and 1966 has been, of course, severe. But adjustment to declining job numbers is nothing new for Gogebic range towns. Production and employment at iron mines here reached historical peaks at about the time of World War I. Since 1920, in fact, Gogebic county population has undergone almost steady decline.[4] Thus one measure of adjustment in rather long-standing tradition for the Gogebic has been out-migration. That mechanism has been at work in the recent experience, too. Estimates locally compiled from state employment office records suggest that about 120 families moved away from the county between January 1, 1962 and July 1, 1965. Additional to this at mid-1965 were an estimated 170 partial relocations in which the family breadwinner worked in other states (mostly Wisconsin and Minnesota) and commuted on weekends or at other intervals to be with families still residing in Gogebic county. Many of the unemployed miners undertook vocational training, some retired, and a few remain unemployed today; but a very considerable number have obviously been successful in finding other employment.

The major factor in the opening of job opportunities for Gogebic miners, however, was a purely fortuitous development. Successive expansions at the nearby White Pine copper mining project of Copper Range Company, White Pine, Michigan, provided employment opportunities in large numbers and at critical times. Moreover, since White Pine is located within feasible commuting distances, and, at the same time, has rela-

[4]Official census data for Gogebic county, Michigan, is as follows:

U.S. census date	Gogebic county population
1890	13,166
1900	16,738
1910	23,333
1920	33,225
1930	31,577
1940	31,797
1950	27,053
1960	24,370

tively limited community facilities, most of the relocated workers have preferred to commute from Gogebic range towns. Indeed, hundreds of them do commute distances 60 miles or more (as short as 30 miles for some) as Chart 3 indicates.

Finally, by way of illustrating the degree to which the White Pine development has helped stabilize basic employment for Gogebic county, the following selected employment estimates are presented:

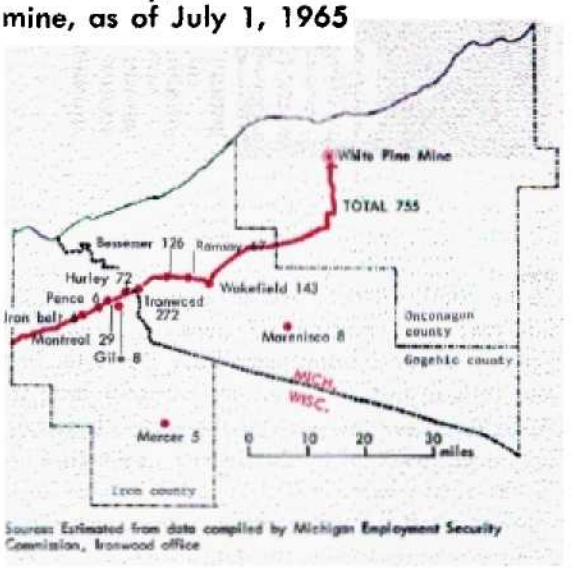
	Gogebic County, Michigan		
	Iron mining employment	Commuters to White Pine Copper	Total mining, iron plus copper
July 1, 1962	570	400	970
July 1, 1965	230	775	1,005
Jan. 1, 1966	230	910	1,140
July 1, 1966	0	960	960

Thus total mining employment for Gogebic county, Michigan, as of mid-1966 stood virtually at the level of mid-1962. Moreover the current phase of White Pine's expansion program, begun a year ago, may add about 500 employees over the next three years, many of whom will likely come from and reside in Gogebic range communities.

Someday taconite operations may come to the Gogebic. There's no assurance now that this will occur soon, nor that the road ahead will be paved with smooth expansion in employment. Yet sentiment in this historic mining locale cannot help but note that from this juncture the only way to go is "up."

— C. W. NELSON

Chart 3 — Estimated number of commuters from Gogebic county, Michigan and Iron county, Wisconsin to White Pine mine, as of July 1, 1965



Sources: Estimated from data compiled by Michigan Employment Security Commission, Ironwood office

Current conditions . . .

The Ninth district's statistical indicators at the mid-year point continued to measure strength in general business conditions. Data for both June and July, in fact, indicated improvement from the April-May pause of some of the series. Industrial output as measured by the district's industrial use of electrical power showed impressive gains in industries such as the minerals. Gains in manufacturing were led by the fabricated metals and machinery industries.

Employment in all nonagricultural categories during June exceeded month- and year-earlier comparisons, with over-all employment up 3.8 per cent from June 1965. The wage and salary component of total employment was increasing at a 4 per cent annual rate.

The district's unemployment rate dropped to 3.5 per cent (seasonally adjusted) in the second quarter, and registered a 3.6 per cent rate in July.

Retail spending in the district has continued substantially above year-earlier levels — around 11 per cent — and recently has shown a somewhat stronger trend than in the nation as a whole. This may be due partly to a substantial increase in the purchasing power of agriculture in 1966.

Although the number of construction contracts let in the district has increased some in recent months, there is evidence of a continuing slowdown as credit has steadily tightened. The valuation of building permits issued during the first six months of this year was about 7 per cent below the same period of 1965. The weakness was primarily centered in residential building. Construction employment continues to exceed year-earlier levels, but the rate of increase appears to be moderating. Early July data indicate that construction employment is running about 6 per cent ahead of last year with sharp decreases showing up in some areas such as in construction work on missile complexes in North Dakota.

District cash receipts from the marketing of farm production totaled $1.6 billion during the first half of 1966, up 15 per cent from the year-earlier and a record high for the period. The bulk of the increase was in livestock and livestock products, with crops showing only modest improvement. The outlook for cash farm incomes during the last half of 1966 is seen as favorable in view of good 1966 crops and favorable farm product prices. The September 1 U. S. Department of Agriculture crop report estimated total district wheat production at 305 million bushels — the third largest on record. A record high soybean harvest is estimated. Corn production may exceed that of a recent 5-year average.

Bank loans at district member banks advanced sharply during June, fell off somewhat more than seasonally in July, and then bounded up again in early August. In terms of usual seasonal patterns, recent business loan demand has continued relatively strong. Deposits, too, have grown, sparked by an upsurge in time deposits at country banks. Liquidity and reserve positions of city banks remained relatively tight in July, however, with loan-

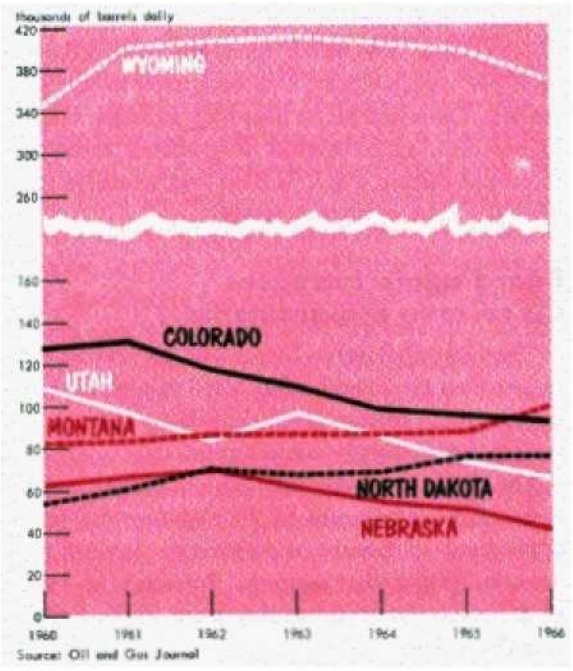
to-deposit ratios of 67.2. (A year ago this ratio was 63.9.) At country banks the loan-to-deposit ratio was 56.8 (56.7 in July 1965). In general, banks, particularly those in the larger cities, are experiencing a liquidity squeeze which has forced many into the federal funds markets and also has increased their requests for borrowings from the Federal Reserve bank.

The following selected topics describe particular aspects of the district's current economic scene:

2 states move ahead in oil production

The Ninth district's two most important oil producing states have moved ahead in production while declines are being registered in other states of the nation's Rocky Mountain oil producing region.

Chart 1 — Rocky Mountain crude oil production by state, 1960-first six months of 1966



Early this year Montana moved into second place in crude oil production behind Wyoming, and North Dakota continued production sufficient to maintain a hold on fourth place (Chart 1). Montana's output jumped to 97,000 barrels per day for the first six months of 1966, up from 90,000 barrels per day in 1965. North Dakota's crude production averaged 76,000 barrels per day during the first six months of 1966, 6,000 barrels per day more than the 1964 rate. Wyoming, Colorado, Utah, and Nebraska, other significant oil producing states in the Rocky Mountain area, all registered declines.

According to the Montana Oil and Gas Conservation commission, production reached an all-time high of 32,778,000 barrels of oil in 1965 compared to a previous high of 31,647,000 barrels in 1962 (Chart 2). Most of the production gain

Chart 2 — Montana crude oil production by areas

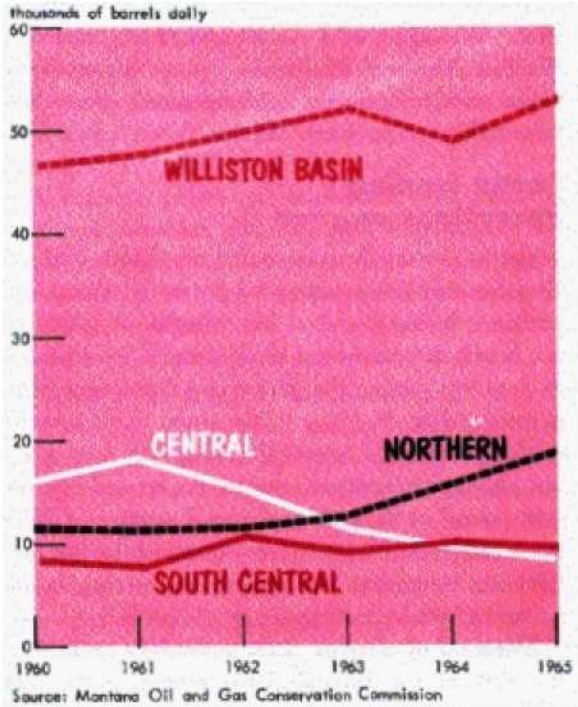
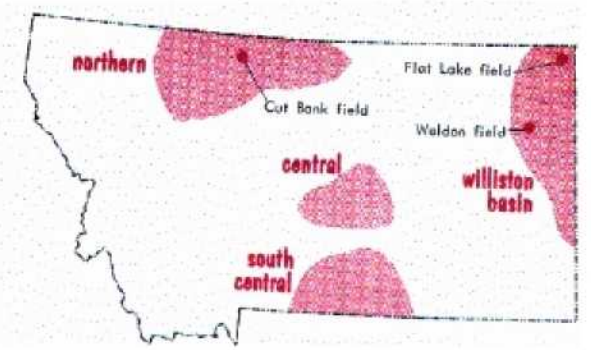


Chart 3 — Montana oil production areas



was in the Williston basin and in the northern part of the state. After declining in 1964 crude production in the Williston basin reached 53,000 barrels per day in 1965. Northern Montana showed a bigger percentage increase: oil output jumped to 18,700 barrels per day in 1965 from 15,600 barrels per day the previous year.

The Williston basin rebound is credited primarily to two 1964 field discoveries, Flat Lake and Weldon. Northern Montana's resurge is essentially based on a revival in one of the state's oldest big-time fields — Cut Bank (Chart 3).

Cattle feeding operations expand

Cattle feeding operations in the Ninth Federal Reserve district experienced a fairly sharp expansion during the first six months of 1966. In all, nearly 500 thousand head of cattle were placed in feed lots during the period, up 9 per cent from a year earlier. Holding to the usual pattern, most of the placements occurred during the first quarter, although placements during the second quarter were ahead of those of the second quarter of 1965 by 4 per cent. The relative expansion in the district was somewhat less than that occurring in the 32 major cattle feeding states of the U.S.

The total number of cattle and calves on feed in the district on July 1, 1966 amounted to 804 thousand head, up 8 per cent from a year earlier. Gains in Minnesota and South Dakota, the district's major feeding states, were 8 per cent and 10 per cent respectively. For the 32-state feeding area, the number of cattle and calves on feed was 11 per cent above that of July 1, 1965.

Cattle marketings from district feed lots during the second quarter of the year were up 12 per cent from that of 1965, 1 per cent higher than the gain for the 32 states. District marketings are expected to run 1 per cent above last year in the third quarter and 14 per cent in the final quarter.

CATTLE AND CALVES ON FEED, BY QUARTERS
(thousands of head)

	July 1, 1965	April 1, 1966	July 1, 1966	July 1, 1966 as a % of year earlier
Minnesota	360	505	389	108
North Dakota	90	119	91	101
South Dakota	245	343	270	110
Montana	51	89	54	106
Total	746	1,056	804	108
32 States	7,515	7,545	8,347	111

District swine production also expanded during the spring months. The number of hogs and pigs on farms in Minnesota and South Dakota, the only district states for which data are provided, was up 8 per cent on June 1 as compared to the year earlier. The number of breeding animals was up 11 per cent, an indication of a further expansion in output during 1967. Market hog numbers were up 7 per cent in district states.

Board again increases CD reserve requirements

The Federal Reserve Board, for the second time in less than two months, has acted to restrain bank issuance of certificates of deposit by raising the reserve requirements behind them.

The Board on August 17 announced an increase from 5 per cent to the statutory ceiling of 6 per cent in reserve requirements against time deposits (other than savings deposits) in excess of $5 million at each member bank of the Federal Reserve System.

To permit orderly adjustments by banks, the effective date of the increase was set for the reserve computation period beginning September 8 for reserve city banks and for the period beginning September 15 for other member banks.

"It is estimated that the action will increase required reserves by about $450 million — approximately $370 million at reserve city banks and $75 million at other member banks," the Board said.

The increase is expected to affect mainly the few hundred larger banks issuing savings certificates and other certificates of deposit (CDs) in substantial volume.

The August action by the Board follows a similar increase of from 4 per cent to 5 per cent in reserve requirements on the same categories of deposits that was announced in June.

NATIONAL BUSINESS CONDITIONS

From the
National Summary of Business Conditions
released by the Board of Governors,
September 16, 1966

INDUSTRIAL PRODUCTION. Industrial production rose in August to 158.3 per cent of the 1957-59 average compared to 157.4 per cent in July and 144.5 per cent a year earlier. Output of business equipment and consumer goods other than autos increased. Auto assemblies, after allowance for the model changeover, declined 7 per cent.

Schedules for September indicate a rise in production. Output of television sets recovered partially from the reduced July level and production of most other consumer goods, durable and nondurable, increased further. Output of industrial and commercial equipment continued to advance. Production of iron and steel declined slightly and output of construction materials changed little.

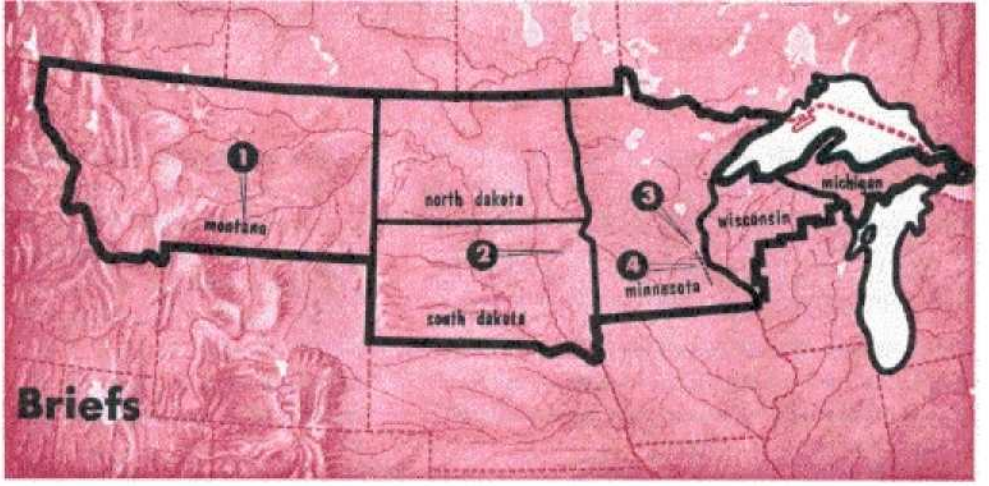
EMPLOYMENT. Nonfarm employment continued to increase quite vigorously in August. In manufacturing, gains were concentrated in the defense and capital goods oriented industries. Employment continued to rise in government, but declined in construction and was unchanged in trade. The average workweek of manufacturing production workers rose 0.2 hours to 41.3, but was slightly below the peak level of 41.5 hours reached in February this year. The unemployment rate was unchanged again in August at 3.9 per cent.

COMMODITY PRICES. The wholesale price index for industrial commodities declined slightly from mid-July to mid-August when market prices of raw cotton fell by one-fourth as a result of the new federal program for this year's crop. Decreases were registered for hides, lumber, and scrap metals, but increases for certain steel products, machinery, and fuels. Since mid-August hides and scrap metals have declined further, but increases have been announced for many chemicals, paper and glass containers, furniture, appliances, color television sets, and machinery.

Wholesale prices of foodstuffs rose about 2 per cent between mid-July and mid-August, reflecting widespread increases. Since mid-August, however, the average has decreased somewhat as prices of livestock and meats have declined in response to expansion in marketings of hogs.

SECURITY MARKETS. Yields advanced sharply in all sectors of the bond market in the latter half of August, but part of this advance was eliminated by the market turnaround early in September. Treasury bills rates rose through most of this period, with the 3-month bill bid at nearly 5.5 per cent in mid-September compared with 5.0 per cent a month earlier. Common stock prices declined further in late August but recovered somewhat in mid-September.

Economic Briefs



1. Ground broken for steam plant

Coal from Montana's rich beds will be used to fuel the Montana Power Company's No. 2 steam-electric plant in Billings, Montana, when it is completed in 1968. Two and one-half trainloads of coal will be shipped over the Northern Pacific railroad weekly from Colstrip to Billings to supply the 180,000-kilowatt, $18 million plant now under construction.

2. Rubber products plant opens

A plant for the manufacture of molded rubber seals has been opened in Watertown, South Dakota. A division of Minnesota Rubber Company of Minneapolis, the firm, known as Quadee Rubber Company, will initially employ 50 persons.

3. Univac builds new facility

A new 2-story engineering office and laboratory is being constructed by the Univac division of Sperry-Rand Corporation in Eagan township, south of St. Paul, Minnesota. The $3.5 million facility will house up to 1,200 employees and is situated on a 200-acre tract adjacent to proposed Interstate Highway 35E.

4. Pipe line extended

Williams Bros. Pipe Line Company is constructing a 73-mile, 8-in. line from Rosemount, Minnesota, to Rochester, Minnesota, along with a 132,000-barrel storage terminal at Rochester. The new line is part of a $10 million expansion program by the company in Missouri, Iowa, and Minnesota.