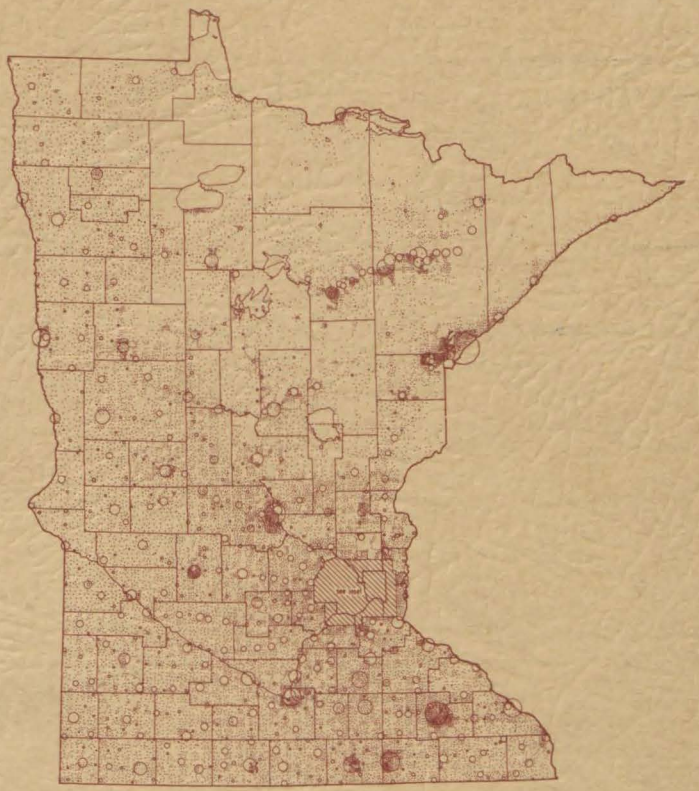
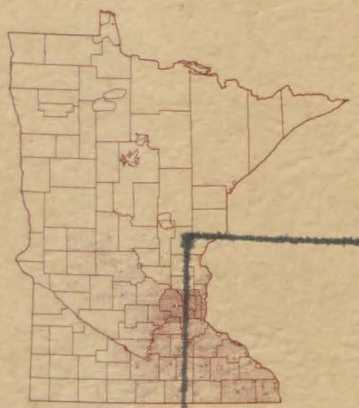
Atlas of MINNESOTA

1900



1960



1870

RESOURCES AND SETTLEMENT

Atlas of MINNESOTA RESOURCES AND SETTLEMENT

Prepared for the Minnesota State Planning Agency

by

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1968

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PREFACE

This atlas is a by-product of a seminar sponsored by the Minnesota State Planning Agency and conducted at the University of Minnesota, Department of Geography, from the fall of 1967 through the spring of 1968. Seminar participants included planning or research staffs from six state agencies, faculty, and graduate students from several fields.

Topic of the seminar was Population Estimates and Projections for State Planning. Exploration of this topic quickly pointed up the great variation, from one part of the state to another, in the numbers of people, their wealth, occupation, and other characteristics – hence, variation in the need and ability to pay for state services.

Questions frequently arose, in the seminar, about the reasons behind these geographical variations in population numbers and characteristics. Out of these questions grew the assembly and preparation of many background maps of the resources and settlement of Minnesota. These maps are brought together in this atlas.

It is appropriate that an atlas be available to agencies of the state. State government decisions help to shape the physical and human geography of the state. They alter the patterns of resource use, settlement, and circulation. Conversely, knowledge of those changing patterns helps to evaluate past decisions and shape those yet to come.

A truly vast amount of information is available from which to map the major spatial dimensions of Minnesota's resources and settlement. This atlas suggests the range and variety of information sources – U. S. Census, Forest Service, Geological Survey, Corps of Engineers, State Departments of Highways, Health, Economic Development, Conservation, private business and industrial records. Many others could be added. The atlas also illustrates one way in which to synthesize and display this mass of information so it can be comprehended and interpreted. It illustrates a method of data display and interpretation which is essential not only for general background, but also for strategic planning.

The atlas is not complete. Much social data and interpretation, in particular, are omitted. Nor is the atlas elaborate. It is meant to be a working document which can be produced relatively quickly and inexpensively.

Finally, the atlas should be only the first in a series. New decisions will be made by government, business, and individuals. Minnesota's geographic structure will continue to change, and the data will continue to pour in. This kind of synthesis and interpretation could well be regularly up-dated as part of the state's developing strategic information system. In connection with the regular updating, it might also be expanded to integrate topics which are omitted from this initial effort.

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Chapter I

LAND RESOURCES

Minnesota stands astride one of the major physical geographic boundaries on the map of the world – the sharp transition from forest to prairie in the heart of North America (p. 3).

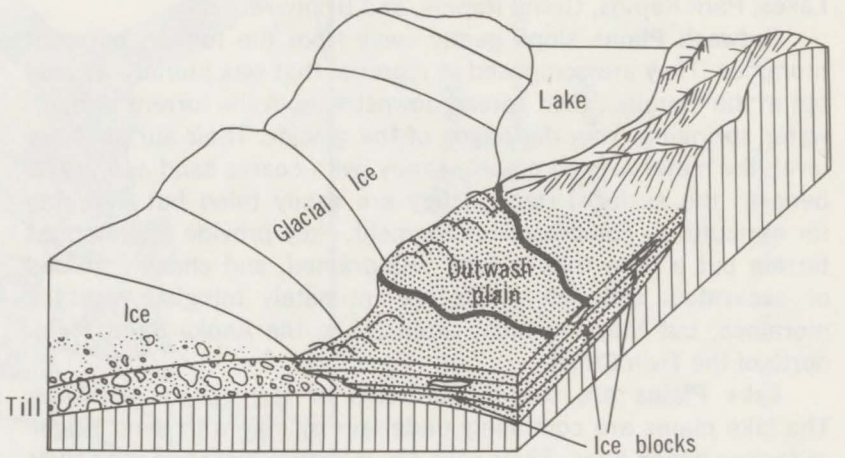
The state also straddles three "continental" divides (p. 4). The northern uplands slope gently northwestward toward the Red and Rainy Rivers into Hudson Bay, gently southward into the Mississippi basin, and steeply southeastward to Lake Superior and the St. Lawrence basin. The high Prairie Coteau, in the southwestern corner of the state, divides the Missouri and Upper Mississippi basins.

Against the background of these major features, Ice Age activity has given the local terrain great variety (p. 5). Till plains, moraines, outwash plains, and lake plains are distinctive features on the surface of the thick mantle of **drift** – sand, gravel, boulders, and clay – which was left to cover the face of Minnesota when the glaciers melted (see diagram).

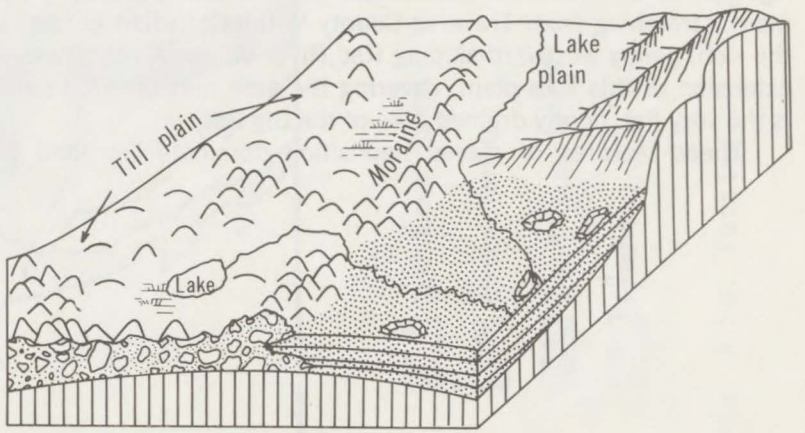
Till Plains, deposited under glacial ice or during rapid ice melting, are slightly undulating. Slopes are long and gentle; the material is a random mixture grading from fine clay to boulders as large as an automobile. The surface material – **glacial till** – is usually fine and moisture-retentive. **Newer till plains** have been clear of ice for only about 10,000 years or less. They have few natural streams. Unless they are ditched, the low places tend to have extensive, shallow flooding in the spring melt and rainy periods. **Older till plains** are in areas which have been clear of ice much longer. There has been time for natural stream channels to form, carving shallow valleys and tributaries in the soft till. Because of better drainage, these areas have few natural wetlands compared with the newer till plains.

Moraines mark the zones along which the front of the glaciers remained for long periods of time. The sheets of ice kept pushing into warmer country from the North and Northeast. But the leading edge of the sheet did not move appreciably because, at that point, the ice was melting as rapidly as the advance from the colder regions could replenish it. As ice melted along the leading edge of the glacier, its burden of sand, pebbles, clay, and boulders piled

FORMATION OF GLACIAL FEATURES



DURING ICE AGE



PRESENT LANDSCAPE

up. Much of the finer material washed away. The residue was hummocky heaps of coarse and bouldery material, studded with countless lakes, ponds, and bogs. These zones are usually potentially poor farm land, but have some of the state's most scenic and varied terrain. Greatest moraine development is the "Big Moraine" belt – shaped like a reverse question mark on the map – stretching from Albert Lea through the Twin Cities to Detroit Lakes, Park Rapids, Grand Rapids, and Brainerd.

Outwash Plains slope gently away from the higher, adjacent moraines. They are composed of material that was literally washed out of the moraine, then spread downstream in the torrent of meltwater springing from the edges of the glacier. Their surfaces are level; the material is commonly sandy, with coarse sand and gravel beneath the surface. Hence, they are easily tilled but droughty for agriculture. For urban development, they provide monotonous terrain but a base that is firm, well-drained, and cheaply graded or excavated. Outwash plains are intimately mingled with the moraines, but they are most extensive in the Anoka Sand Plain, north of the Twin Cities.

Lake Plains are the flat bottoms of former glacial lakes. The lake plains are commonly underlain by clay with sand ridges at former beach lines. Their soils are moisture retentive, and their surfaces are naturally poorly drained because there are few streams. Greatest of the Lake Plains is the bottom of glacial Lake Agassiz, in northwestern Minnesota. The western portion of this plain, stretching from Traverse County to the Canadian border, is the rich, gently westward-sloping Red River Valley. A northeastern extension of this lake plain, covering the area north of Red Lake, is the very flat, poorly drained area of the Big Bog.

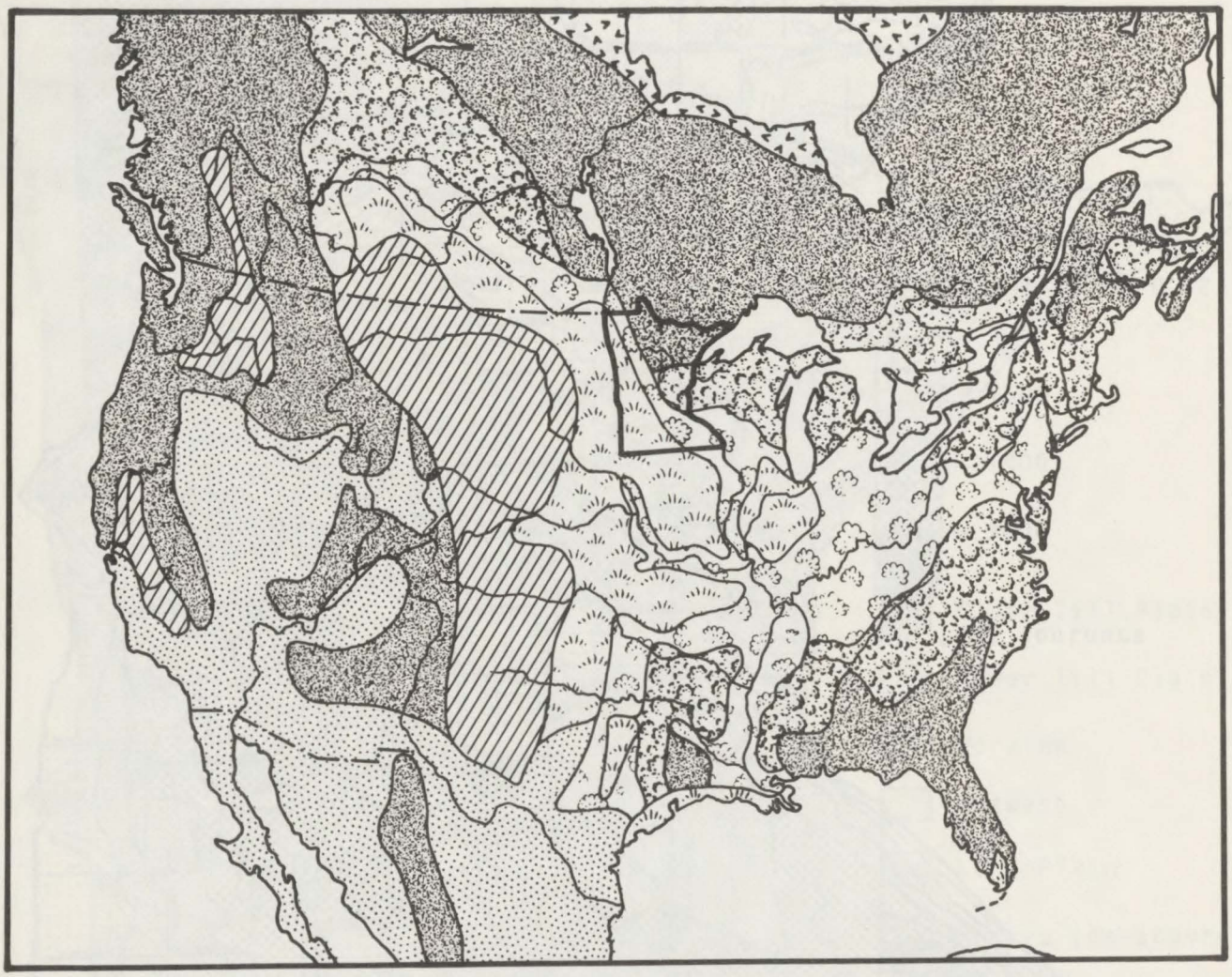
These features of glacial deposition dominate the land resource everywhere except three regions in the state: the northeast, the southeast and the Minnesota River valley. Along the North Shore of Lake Superior, in the Border Lakes, and on the Mesabi Range, the advancing glaciers scoured away much of the surface material to expose bare rock. They left only thin and scattered patches of drift when they melted. In the Southeast – down the valleys of the Mississippi and its larger tributaries – the glaciers were very thin or absent in the last phase of the Ice Age. The Minnesota River trench, cut by a river as large as the present-day St. Lawrence, was eroded at the close of the last glacial period.

In the **Ice-Scoured** "Arrowhead" region, hilltops and upper slopes are often bare rock, and intervening basins are filled with clear, rock-rimmed lakes or dark bogs. Hundreds of short, swift streams spill from one basin to another. A 500- to 1,000-foot escarpment, broken by countless short, steep valleys, marks the south edge of this region, bordering Lake Superior.

In the **Stream-dissected** Southeast, gently-sloping, long ridge tops stand between deep valleys of the main streams. Flat flood plains form the valley floors. Steep valley walls, with many rocky bluffs, rise from the flood plains 100 to 500 feet upward to the ridge tops.

The development of the Minnesota River trench began as a series of outwash plains along the course of the present valley. As the glacial ice retreated behind the continental drainage divide, glacial Lake Agassiz filled to the outlet level at Browns Valley. Tremendous amounts of water cut a trench 100 to 250 feet deep in glacial deposits and bedrock. Since the time when a new outlet of Lake Agassiz was opened in the North, soil eroded from the uplands has been filling the bottom of the trench because of the low water volumes in the present Minnesota River.

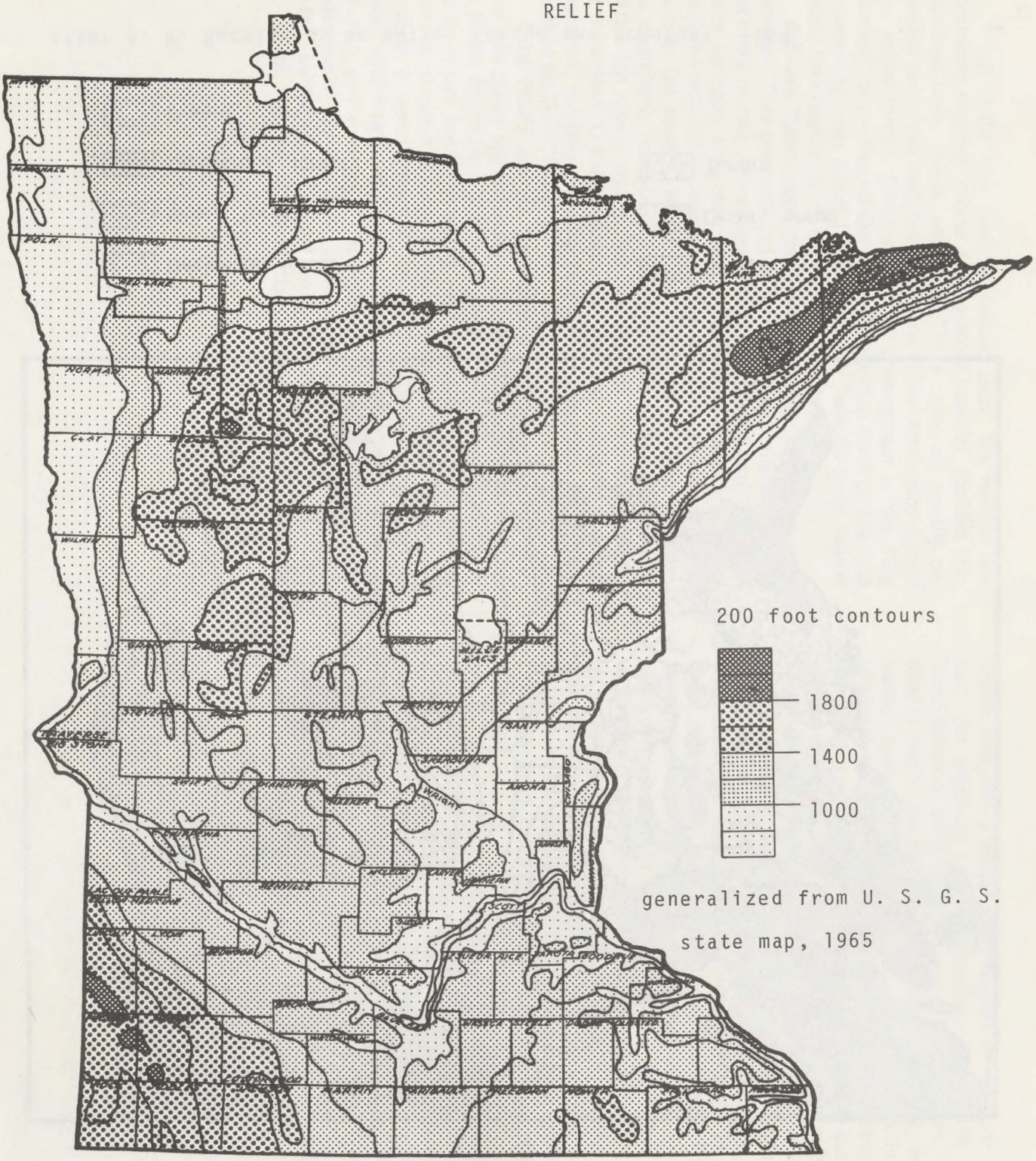
NATURAL VEGETATION



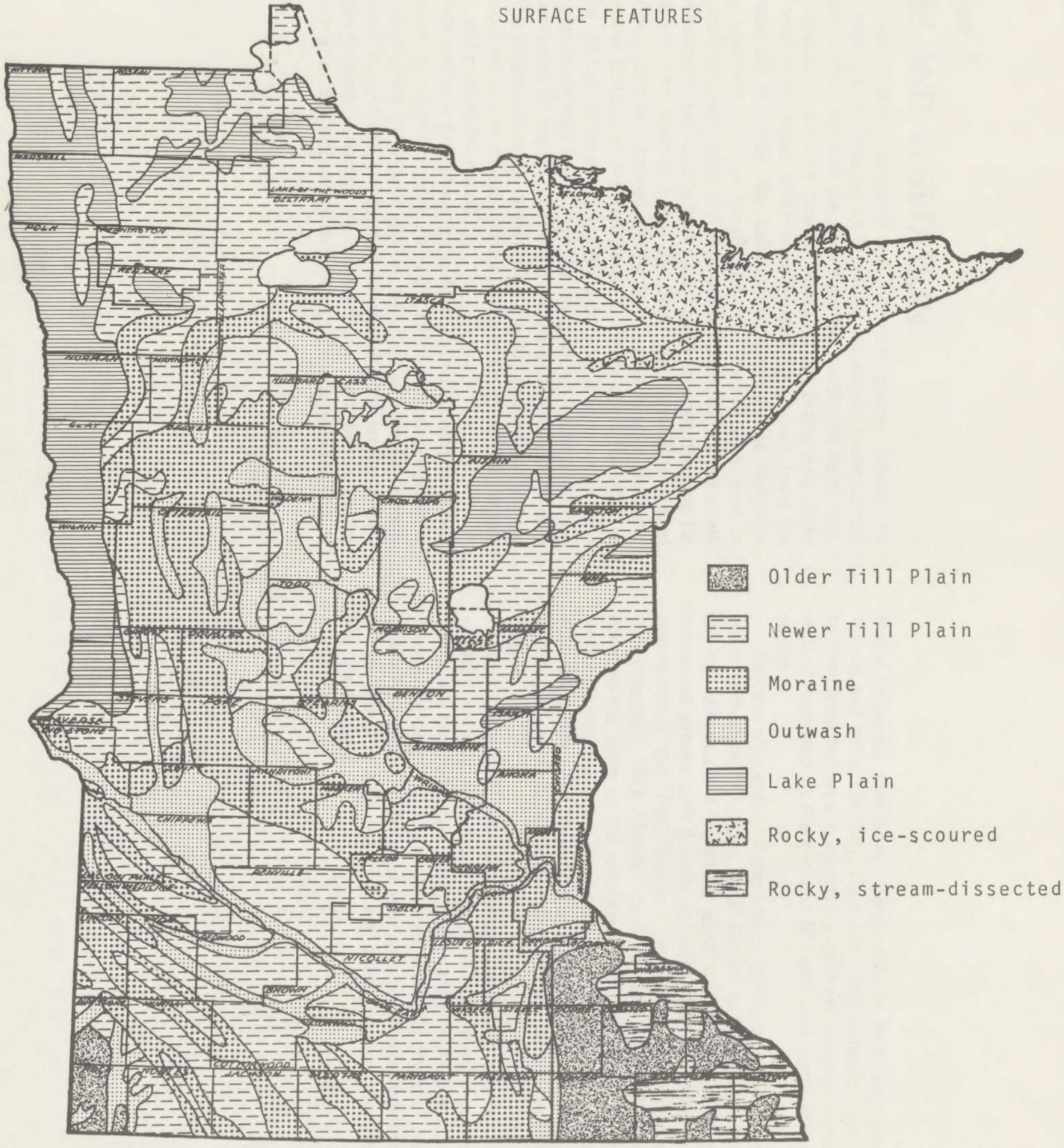
Deciduous forest
Mixed forest
Coniferous forest
Prairie
Steppe
Desert shrub
Tundra

after A. W. Kuchler as in White, Foscue and McKnight, 1964.

RELIEF


200 foot contours
1800
1400
1000
generalized from U. S. G. S.
state map, 1965

SURFACE FEATURES



Chapter 2

SOILS AND VEGETATION

As with surface features, soil materials greatly reflect the glacial history of an area (p. 8). Moraines, especially those formed by glaciers which entered the state from the North and Northeast, are composed of sand or coarser material. Till plains and those much smaller moraines which were formed by glaciers from the Northwest are primarily clay. Lake plains, composed of lake sediments, have very fine materials and are covered with peat in cool, poorly drained areas. Outwash plains, because of their mode of development, are usually well sorted sand patches covering till or bedrock. The Northeast and the Southeast have little glacial deposition; soils are derived mostly from weathering of bedrock.

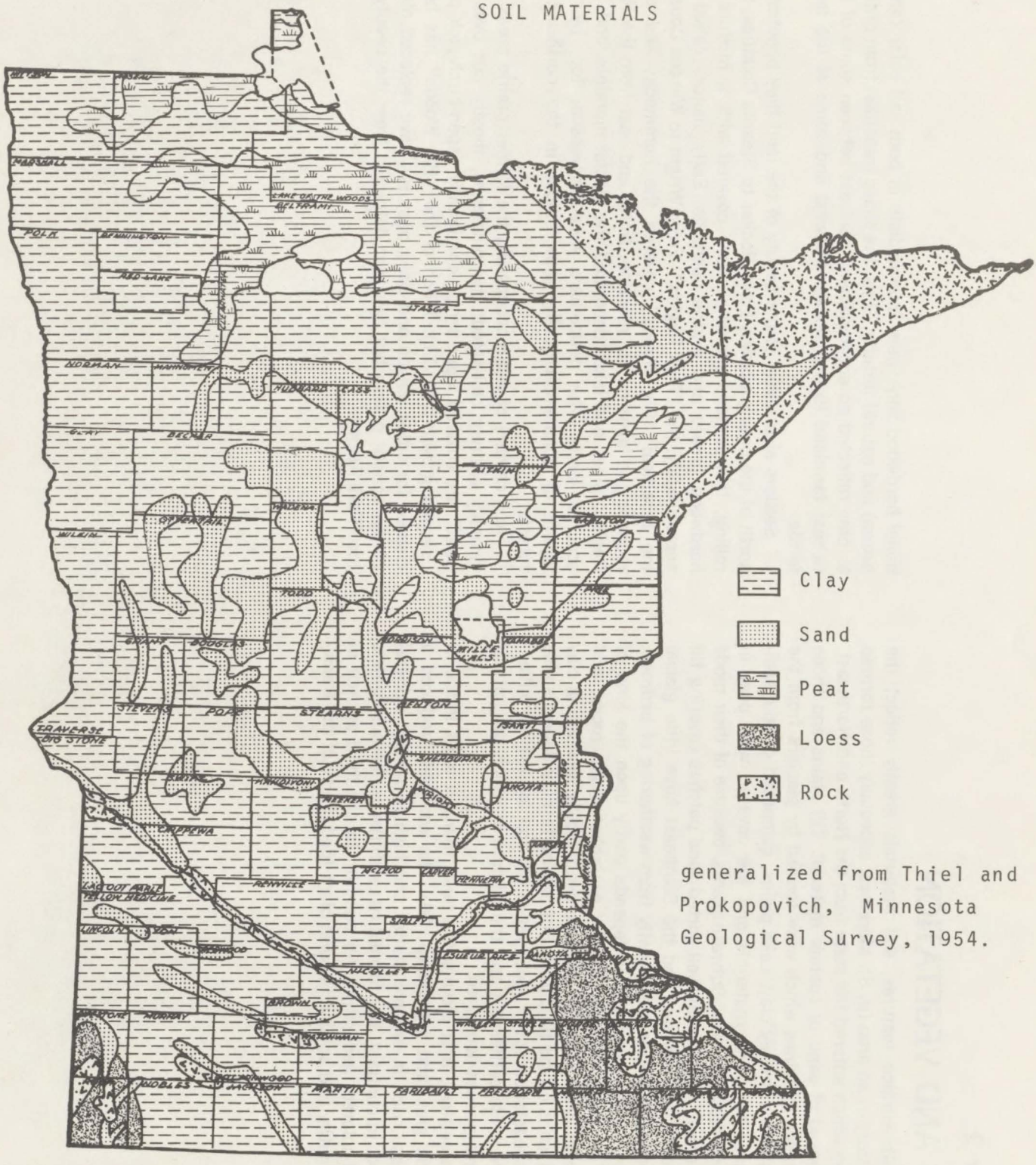
Natural fertility of the soil depends partly upon the kind of material at the surface (p. 9). For example, rough, rocky, and sandy places are less fertile than the deep, slowly weathering clay and loam lands on the till plains. But natural fertility depends also upon the vegetation cover under which the soil formed for millennia before white settlement and the climate in which the natural forests and grasses flourished.

White settlers, first plowing the land, found it most fertile in the prairie grassland regions (p. 10). The sod had produced a dark topsoil, rich in organic matter and high in soluble mineral plant food. In contrast, soil formed beneath the coniferous forests was light-colored, generally from one-fifth to one-third as rich in organic matter and soluble mineral plant food. Parts of the transitional hardwood zone were intermediate in both soil color (gray-brown) and natural fertility. Thus, the sharp transition from prairie to pine reflected an accompanying contrast between some of the richest farmland in the pioneer Midwest and some of the least fertile.

Settlers also spoke of the beauty of the land they penetrated north of the prairie border. From Becker to Stearns Counties, the rolling, lake-studded moraines were covered with a mixture of hardwood groves and prairie openings. Early visitors called it, appropriately, the "Park Region." From Wright to Waseca County, the broadleaf "Big Woods" covered the hummocks and surrounded the lakes on the moraine. North and east from the Park Region, pines and lakes decorated the glacial moraines and ice-scoured lands. The newcomers were impressed, too, by the wealth of commercial-quality pine timber in the northeastern forests.

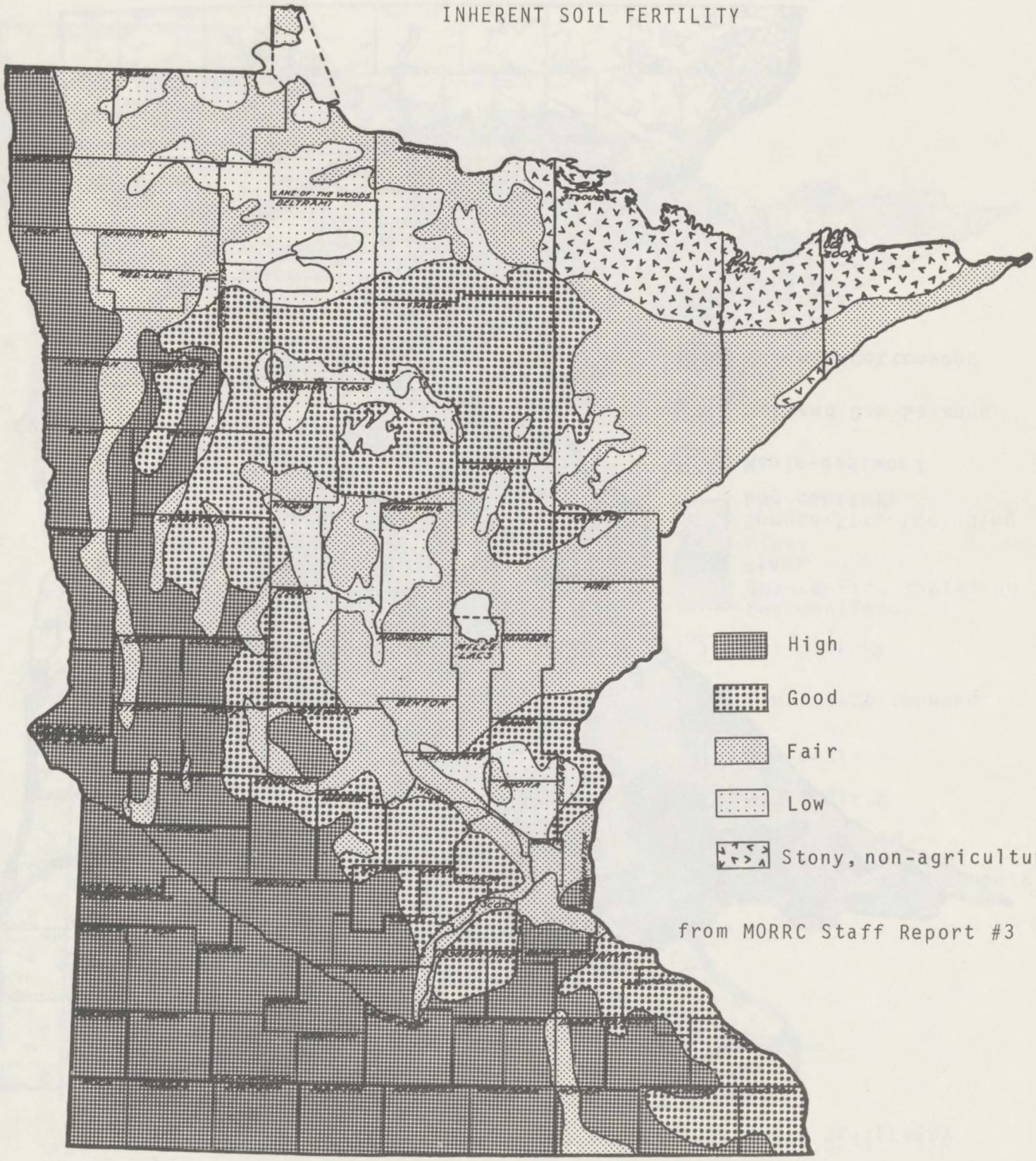
In a century of white occupance, the former prairie areas are virtually entirely cultivated; the pinelands, mostly cut over by 1920, are covered again by predominantly aspen-birch-jack pine "second growth" (p. 11). Much of the "Big Woods" has been cleared for crops. Fields and sown pastures have replaced much of the natural prairie but have not detracted from the beauty of the "Park Region."

SOIL MATERIALS

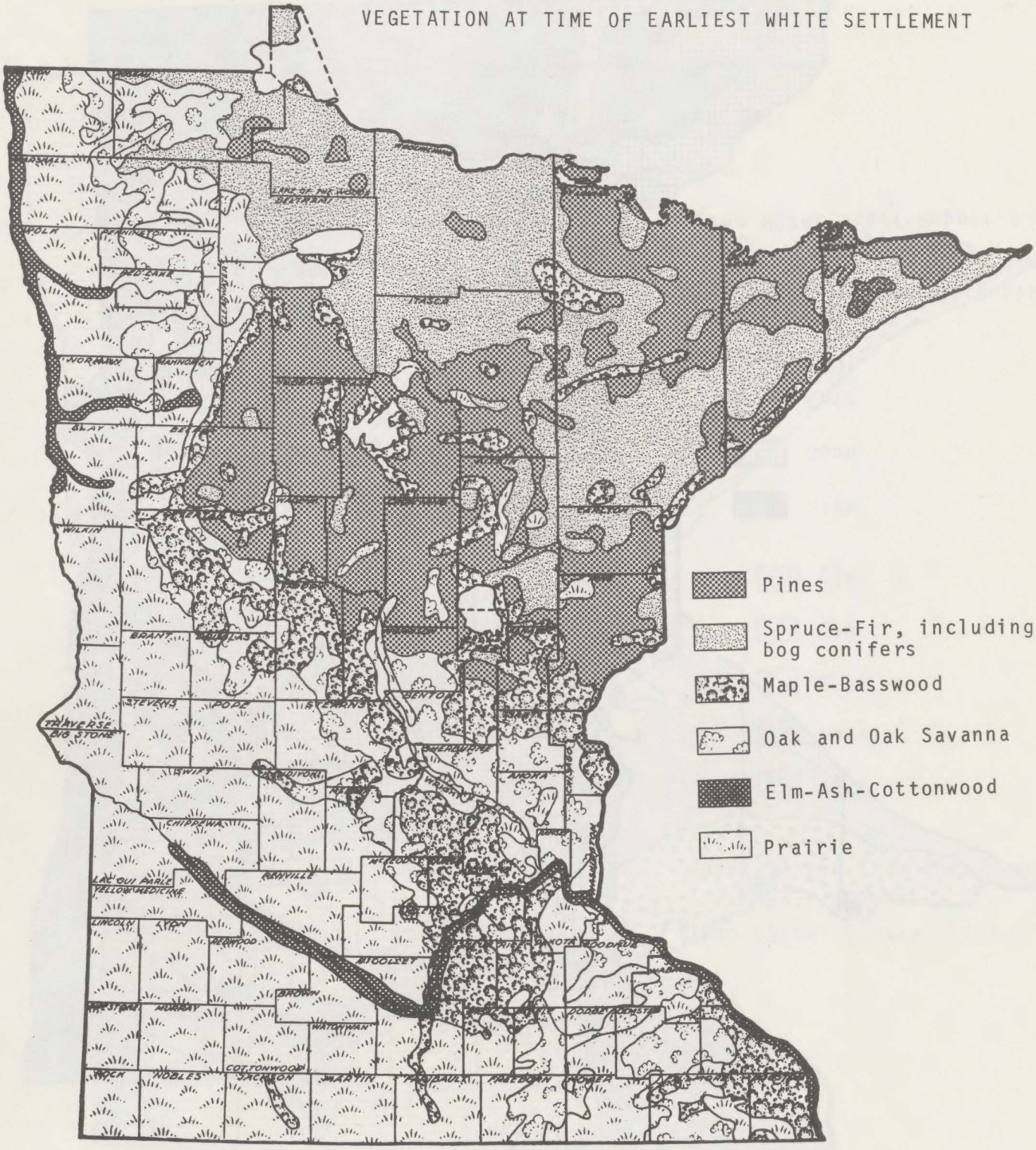


generalized from Thiel and Prokopovich, Minnesota Geological Survey, 1954.

INHERENT SOIL FERTILITY

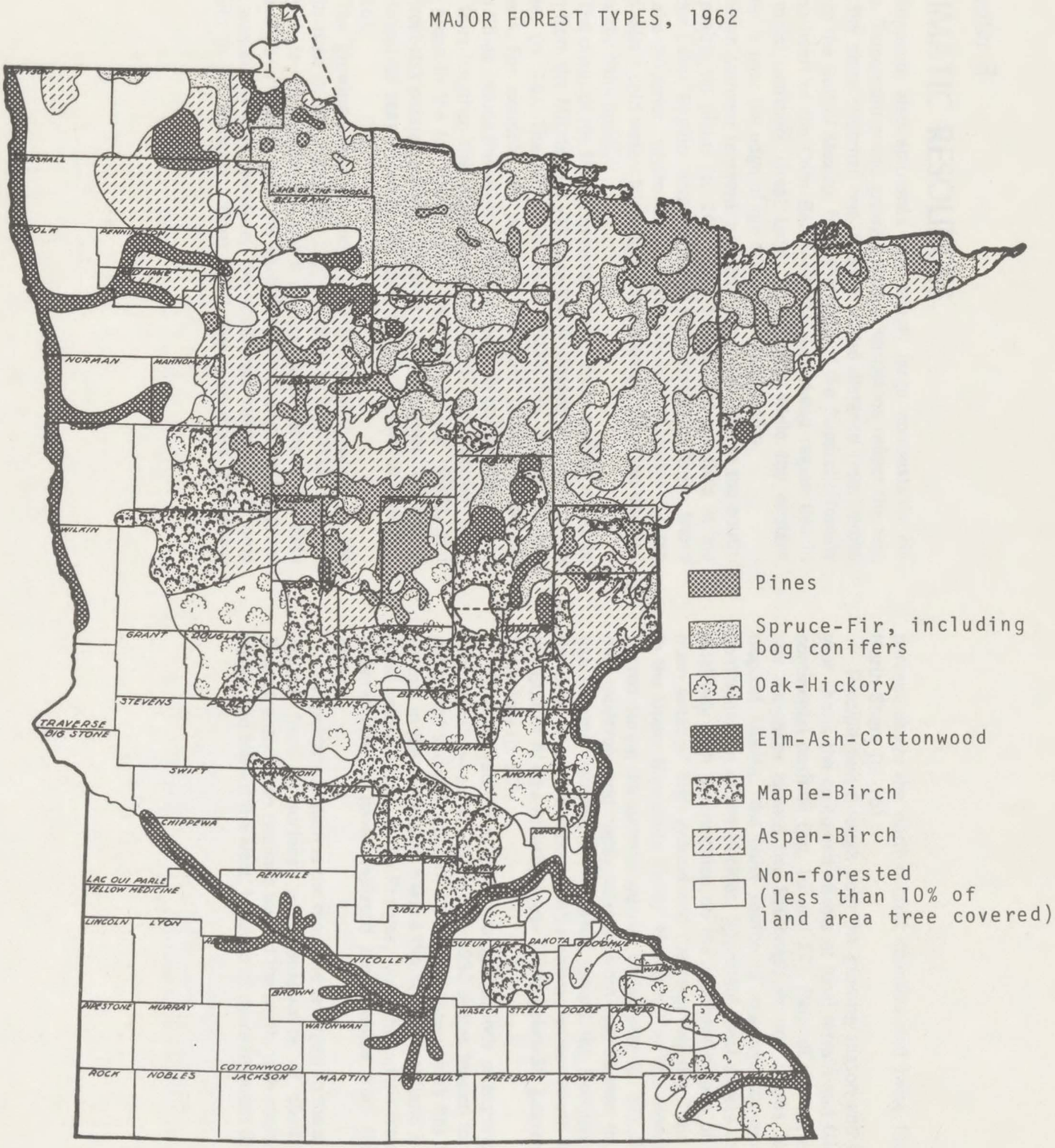


from MORRC Staff Report #3



from USDA-SCS 1965 map after F. J. Marschner, USDA, 1930

MAJOR FOREST TYPES, 1962



from A Third Look At Minnesota's Timber by Robert N. Stone, USFS, 1966

Chapter 3

CLIMATIC RESOURCES

Minnesota also embraces surprisingly large contrasts in climate. Temperature and growing season variations reflect the fact that the state stretches one quarter of the distance from James Bay to the Gulf of Mexico, from the edge of the Subarctic forests to the heart of the Corn Belt. And the Arrowhead region lies in the moist, northern Great Lakes storm belt; while the western border is near the edge of the semi-arid Great Plains.

Mean summer temperatures are in the low 70's in the southern prairie till plains (p. 14). They drop to the low 60's in the Border Lakes Region, and the upper 50's along the North Shore of Lake Superior, where warm south winds are chilled by the deep lake's cold water. Nighttime lows average about ten degrees below the daily mean.

The onset of the frost-free season takes three to four weeks to push from the Mississippi Valley in the Southeast to the Canadian border (p. 14). The effects of local terrain are evident in this pattern. For example, air pollution and heat radiated from the Twin Cities reduce the effect of local cooling on chilly, clear nights and thus lengthen the growing season in the metropolitan area. Low areas in the far North collect cold air on clear nights, and the frost-risk persists most stubbornly in those places. The end of the frost-free season shows the same pattern in reverse direction (p. 15).

The growing season is more than ten percent longer in the South than in the North (p. 15). But that is less than half the story. It is not only longer, but it is also much warmer. "Growth Degree Days" reflect both the warmth and the length of the growing season. By that measure, the total heat resource for crop growth in the southern "Corn Belt" region is more than thirty percent above the north-central counties and twice that on the North Shore (p. 16).

Precipitation through both the growing season and the whole year shows the combined effects of local terrain and Minnesota's continental position (pp. 16 and 17). Rainfall amount and intensity increases toward the Southeast as one moves toward the tropical Atlantic, the chief source of moisture for most of the continent east of the Rockies. Important local effects include the relatively high precipitation on the southern slopes of the three main areas of high ground and the relatively dry "rain shadow" in the Upper Minnesota Valley. Nearly half of the moisture is delivered during the summer quarter of the year (p. 17). Snowfall is only moderate and highly variable from year to year (p. 18). Unlike summer rainfall, it increases toward the Northeast, toward the path of most frequent winter storms across North America — the Gulf of Alaska-Alberta-Upper Great Lakes-St. Lawrence Valley Trajectory (p. 18).

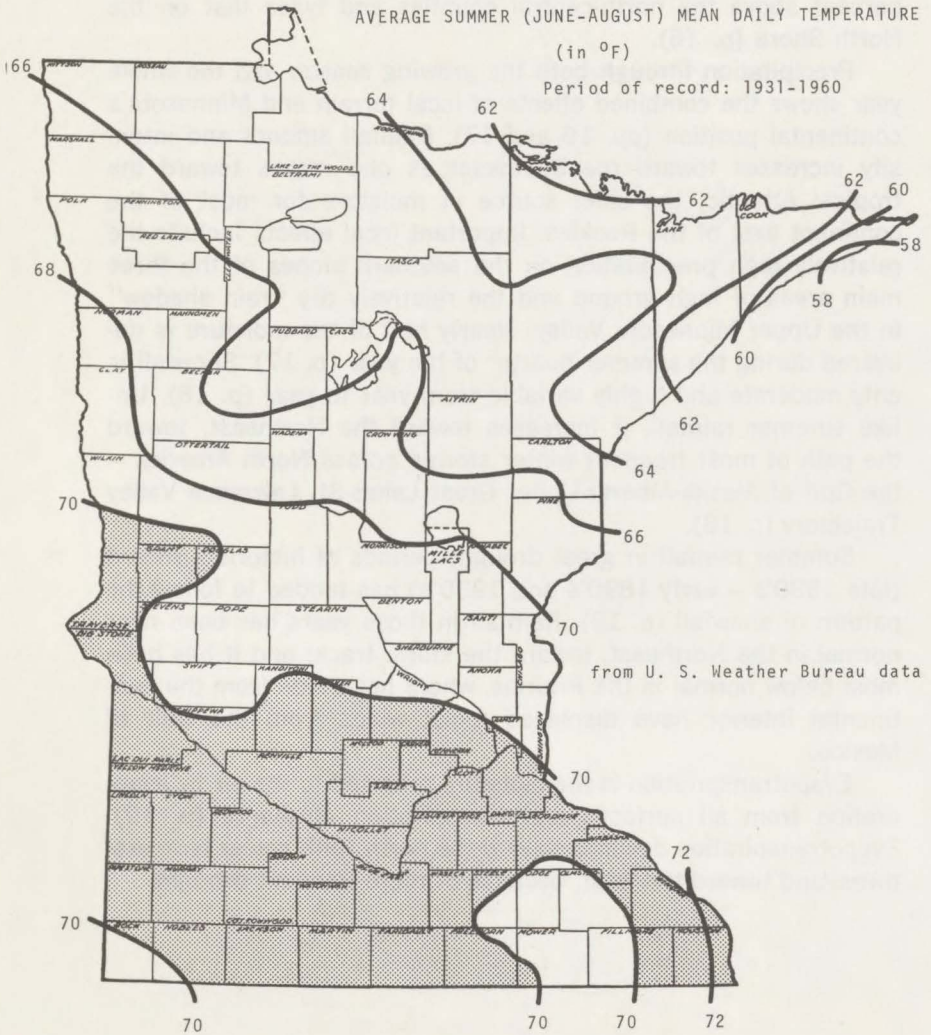
Summer rainfall in great drought periods of historical record (late 1880's — early 1890's and 1930's) has tended to follow the pattern of snowfall (p. 19). Rainfall in those years has been near normal in the Northeast, toward the storm track; and it has been most below normal in the Prairies, where hot winds from the continental interior have displaced moist winds from the Gulf of Mexico.

Evapotranspiration is the moisture returned to the air by evaporation from all surfaces and transpiration of plants (p. 19). Evapotranspiration declines toward the north, with cooler temperatures, and toward the west, because of more frequent drought.

AVERAGE SUMMER (JUNE-AUGUST) MEAN DAILY TEMPERATURE

(in ^{o}F)

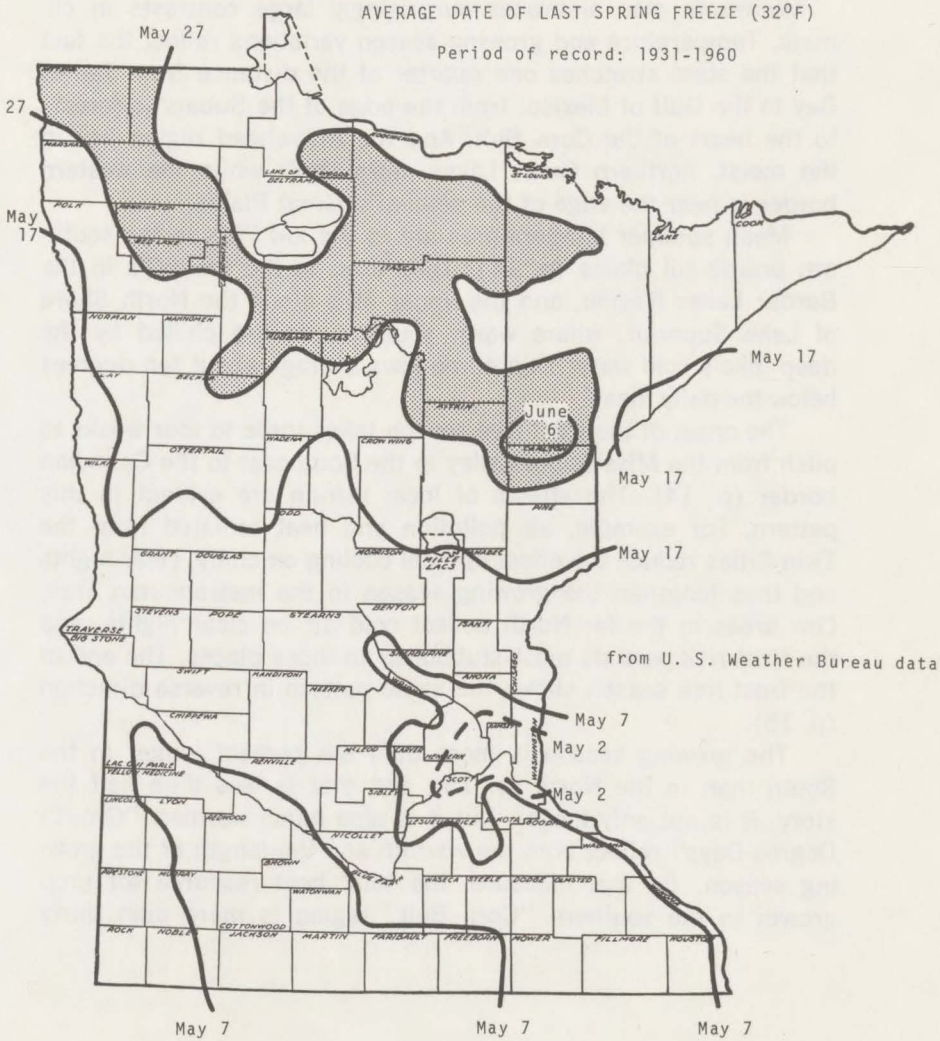
Period of record: 1931-1960



from U. S. Weather Bureau data

AVERAGE DATE OF LAST SPRING FREEZE (32^{o}F)

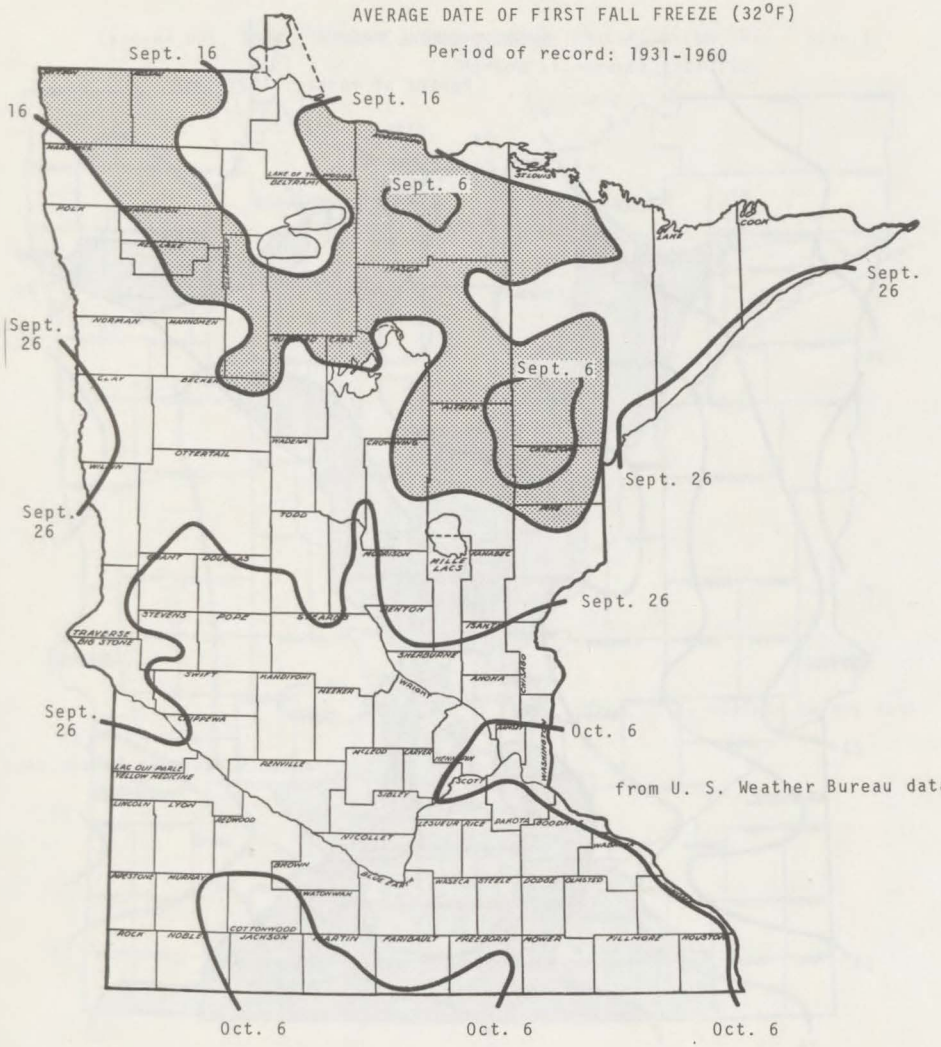
Period of record: 1931-1960



from U. S. Weather Bureau data

AVERAGE DATE OF FIRST FALL FREEZE (32°F)

Period of record: 1931-1960

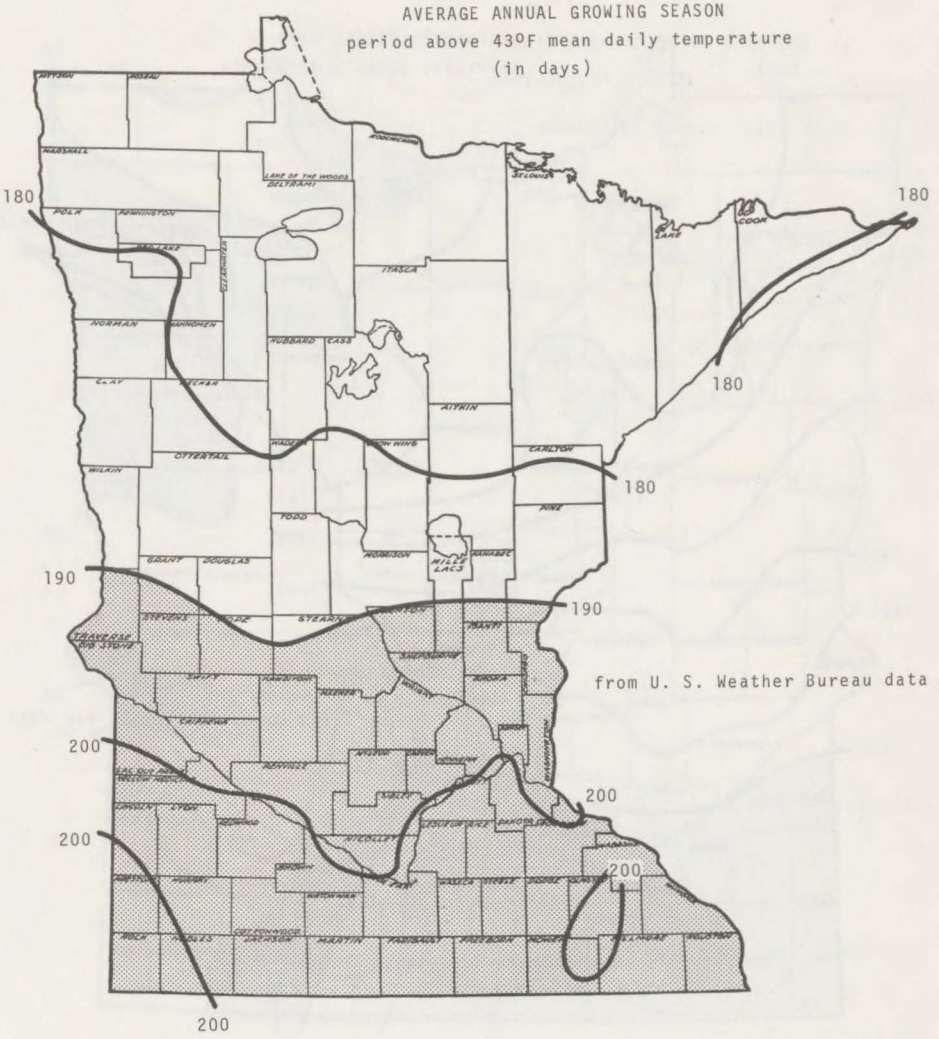


from U. S. Weather Bureau data

AVERAGE ANNUAL GROWING SEASON

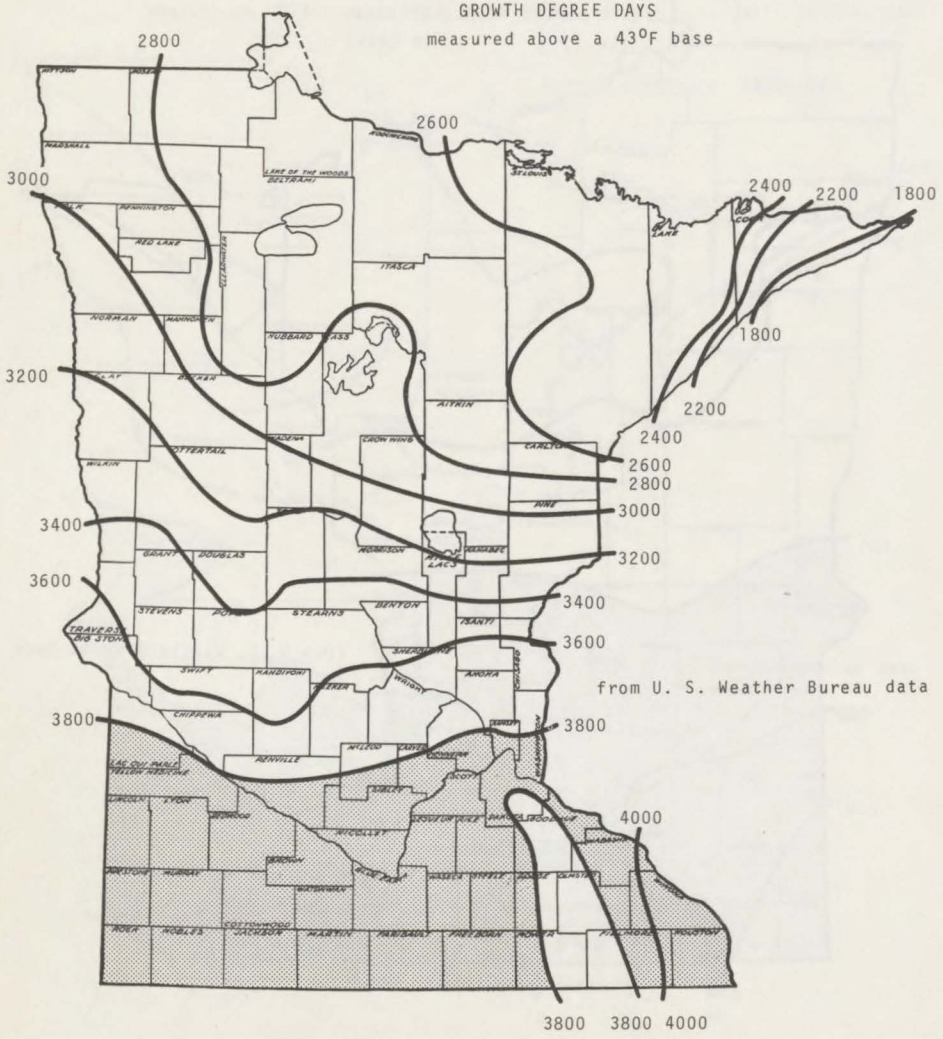
period above 43°F mean daily temperature

(in days)



from U. S. Weather Bureau data

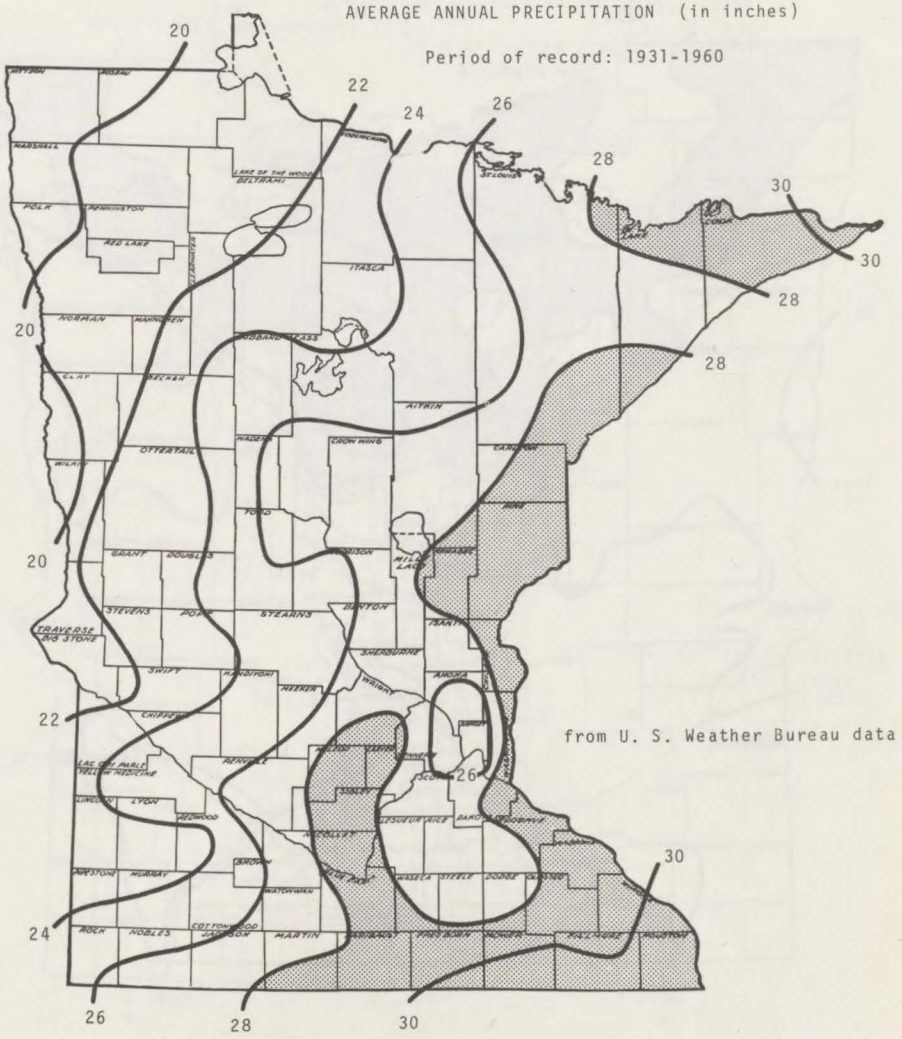
GROWTH DEGREE DAYS
measured above a 43°F base



from U. S. Weather Bureau data

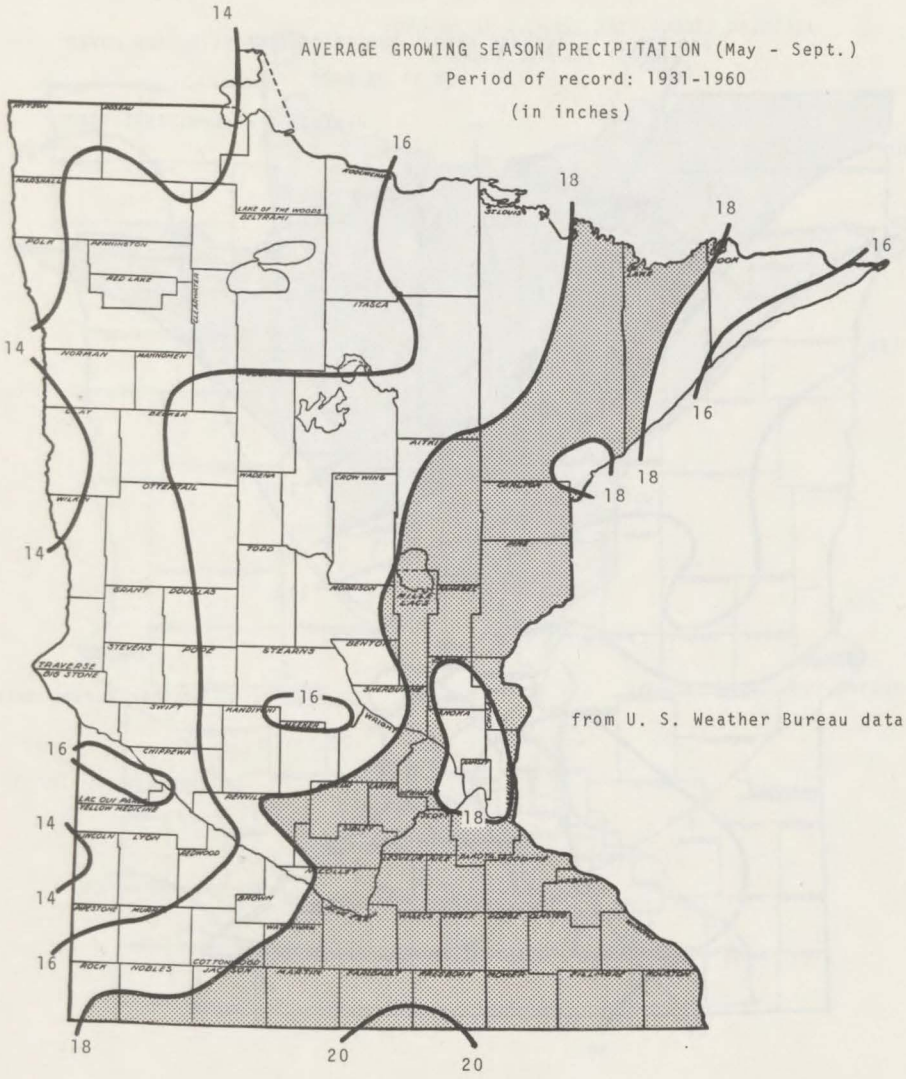
AVERAGE ANNUAL PRECIPITATION (in inches)

Period of record: 1931-1960



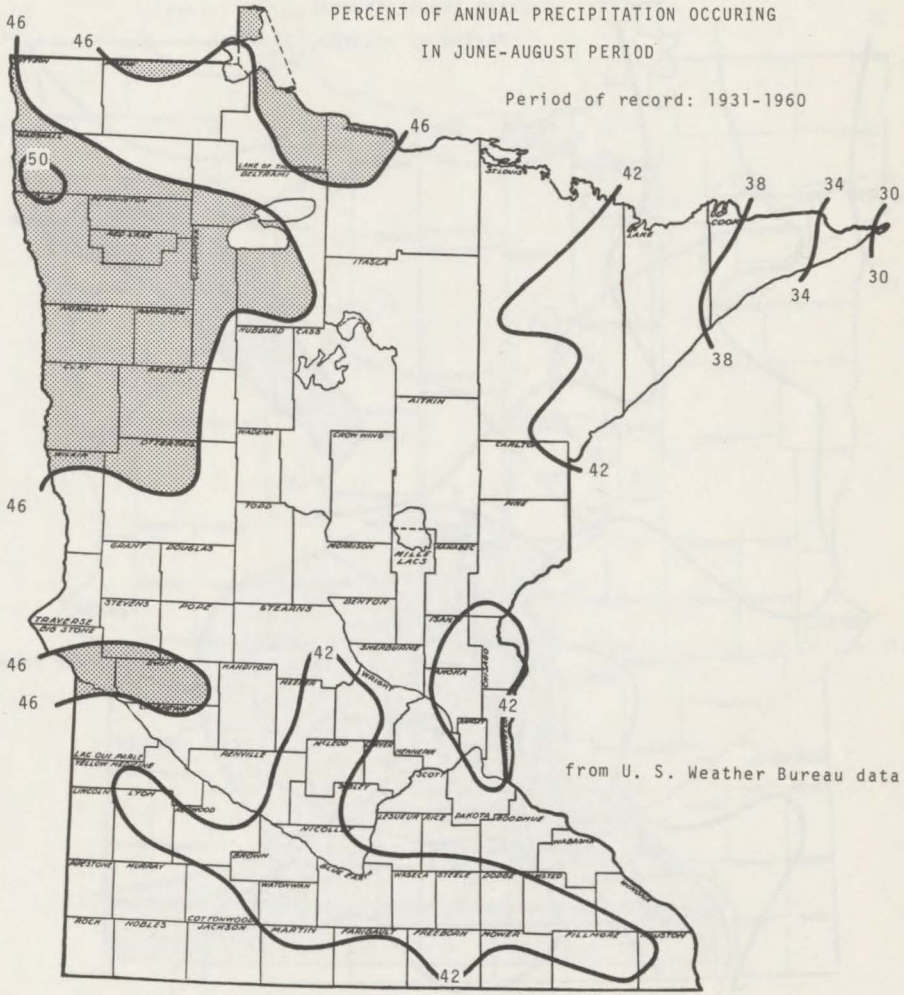
from U. S. Weather Bureau data

AVERAGE GROWING SEASON PRECIPITATION (May - Sept.)
Period of record: 1931-1960
(in inches)



from U. S. Weather Bureau data

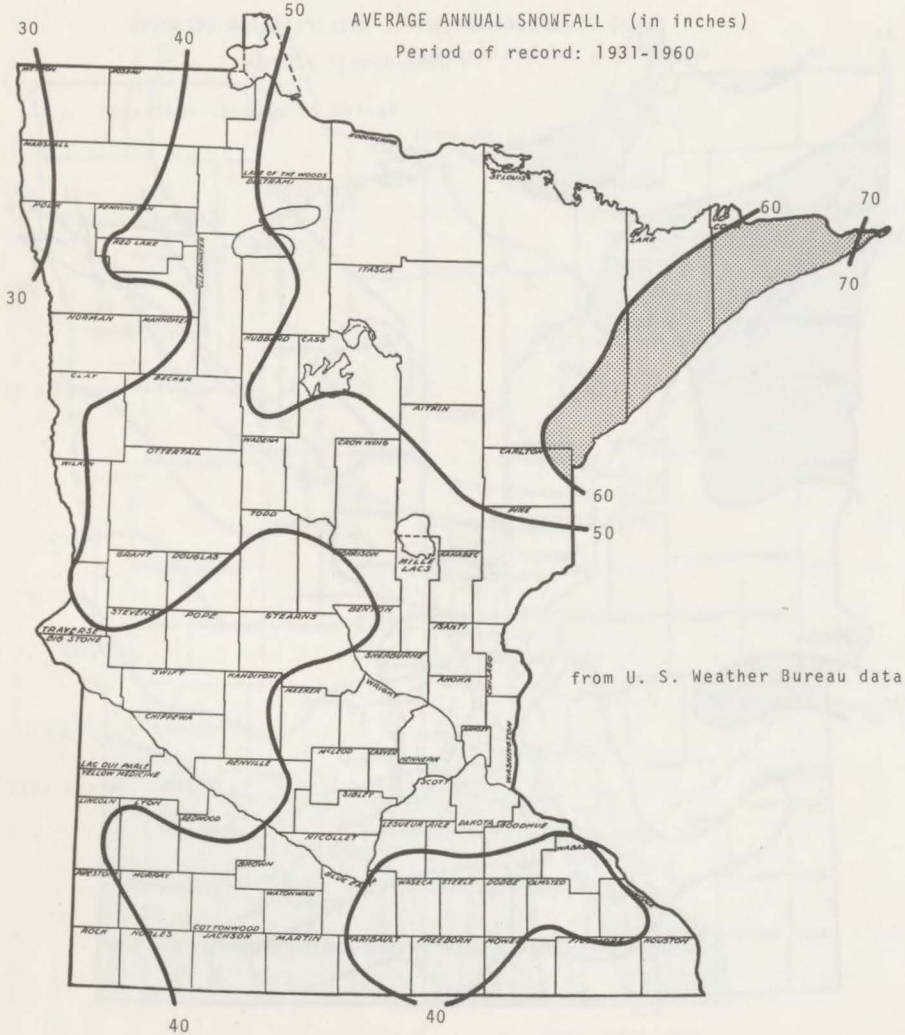
PERCENT OF ANNUAL PRECIPITATION OCCURING
IN JUNE-AUGUST PERIOD
Period of record: 1931-1960



from U. S. Weather Bureau data

AVERAGE ANNUAL SNOWFALL (in inches)

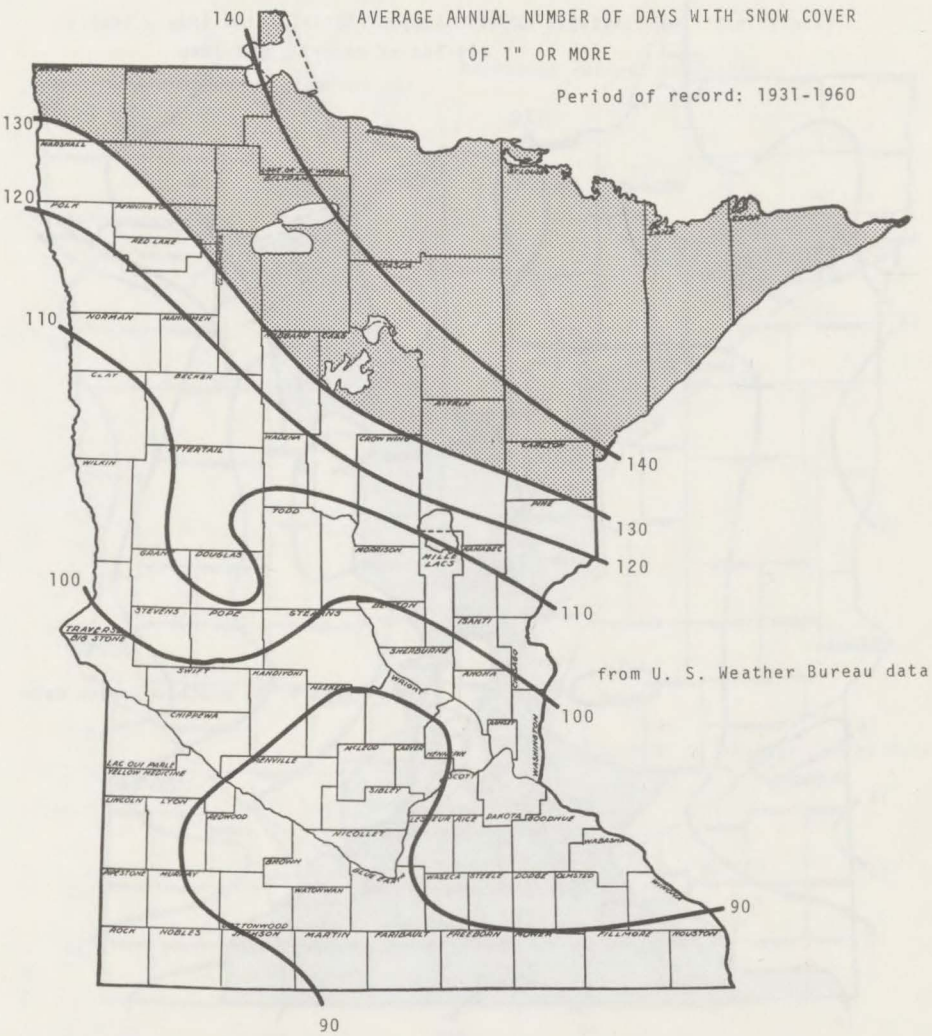
Period of record: 1931-1960



from U. S. Weather Bureau data

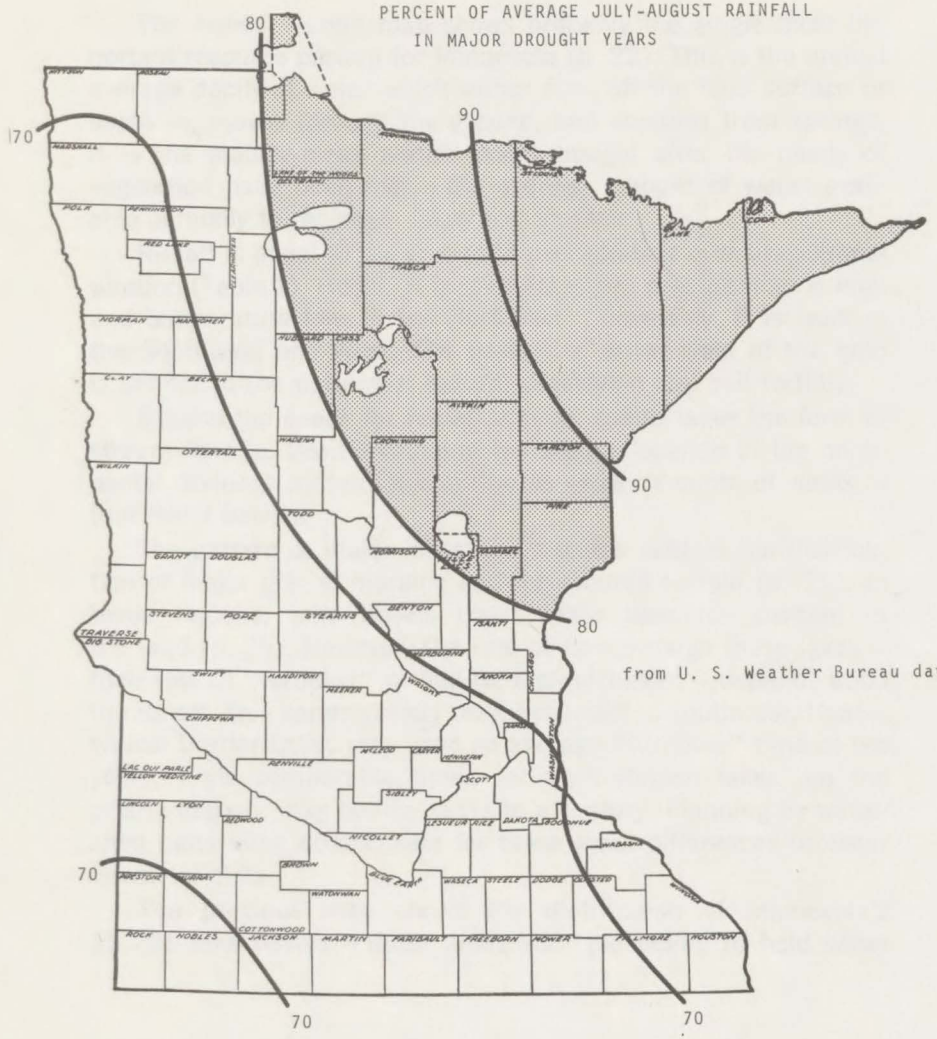
AVERAGE ANNUAL NUMBER OF DAYS WITH SNOW COVER OF 1" OR MORE

Period of record: 1931-1960



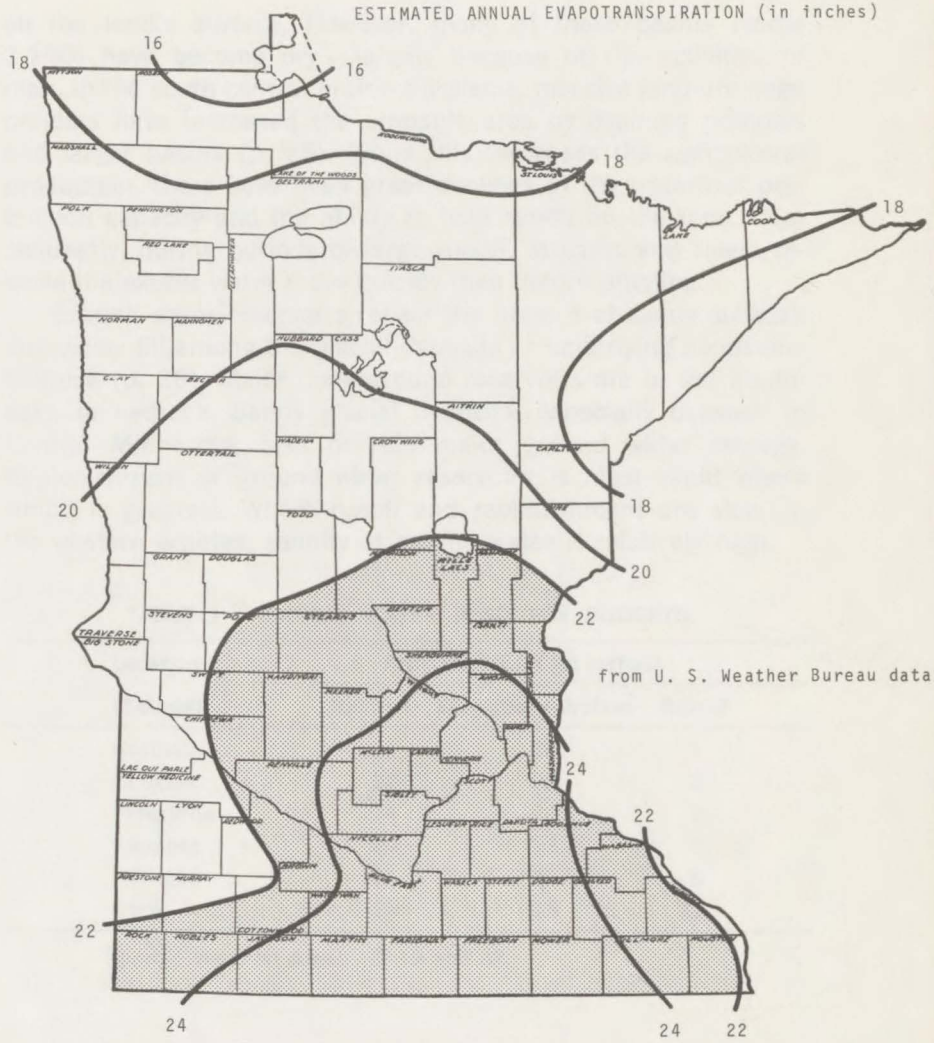
from U. S. Weather Bureau data

PERCENT OF AVERAGE JULY-AUGUST RAINFALL
IN MAJOR DROUGHT YEARS



from U. S. Weather Bureau data

ESTIMATED ANNUAL EVAPOTRANSPIRATION (in inches)



from U. S. Weather Bureau data

Chapter 4

WATER RESOURCES

The Annual Runoff map shows probably the single most important resource pattern for Minnesota (p. 22). This is the annual average depth of water which either runs off the land surface or soaks in, moves through the ground, and emerges from springs. It is the state's mean annual water budget after the needs of vegetation have been met – the average amount of water available annually to replenish lakes and streams.

Runoff is equal to the excess of precipitation over evapotranspiration (Table 1). Hence, it is greatest where precipitation is high and temperature low, in the Northeast. Conversely, it is least in the Southwest and West. The pattern of water yield of the land is similar to the pattern of natural vegetation and soil fertility.

Beyond the needs for replenishment, runoff takes the form of stream flow (p. 23). Because of the state's location in the continental drainage system, it contributes great amounts of water to four major basins.

The pattern of major lakes and streams reflects the distribution of major glacial moraine and ice-scoured terrain (p. 24). In those regions, lake basins cover more than ten percent of the land (p. 25). However, the rate of flow through these lakes – their rate of "turnover" or natural replenishment – depends upon the runoff. This varies greatly from northeast to southwest. Hence, typical Border Lakes may have an average "turnover" time of ten years, while comparable times for Park Region lakes, on the prairie margin, may be fifty years to a century. Planning by watershed units must compensate for these great differences in water characteristics.

The previous map shows the distribution of Minnesota's 15,291 lake basins – those areas with the ability to hold water on the land's surface. However, many of these basins (some 3,100) have become dry – largely because of the activities of man. In the south central prairie till plains, massive land drainage projects have increased the cropable area by draining potholes and larger basins (p. 25). While this increases the agricultural production, there have been great declines in the waterfowl production capacity and the ability to hold runoff on the land. Consequently, during periods of large runoff, streams and rivers receive the excess water more quickly than before ditching.

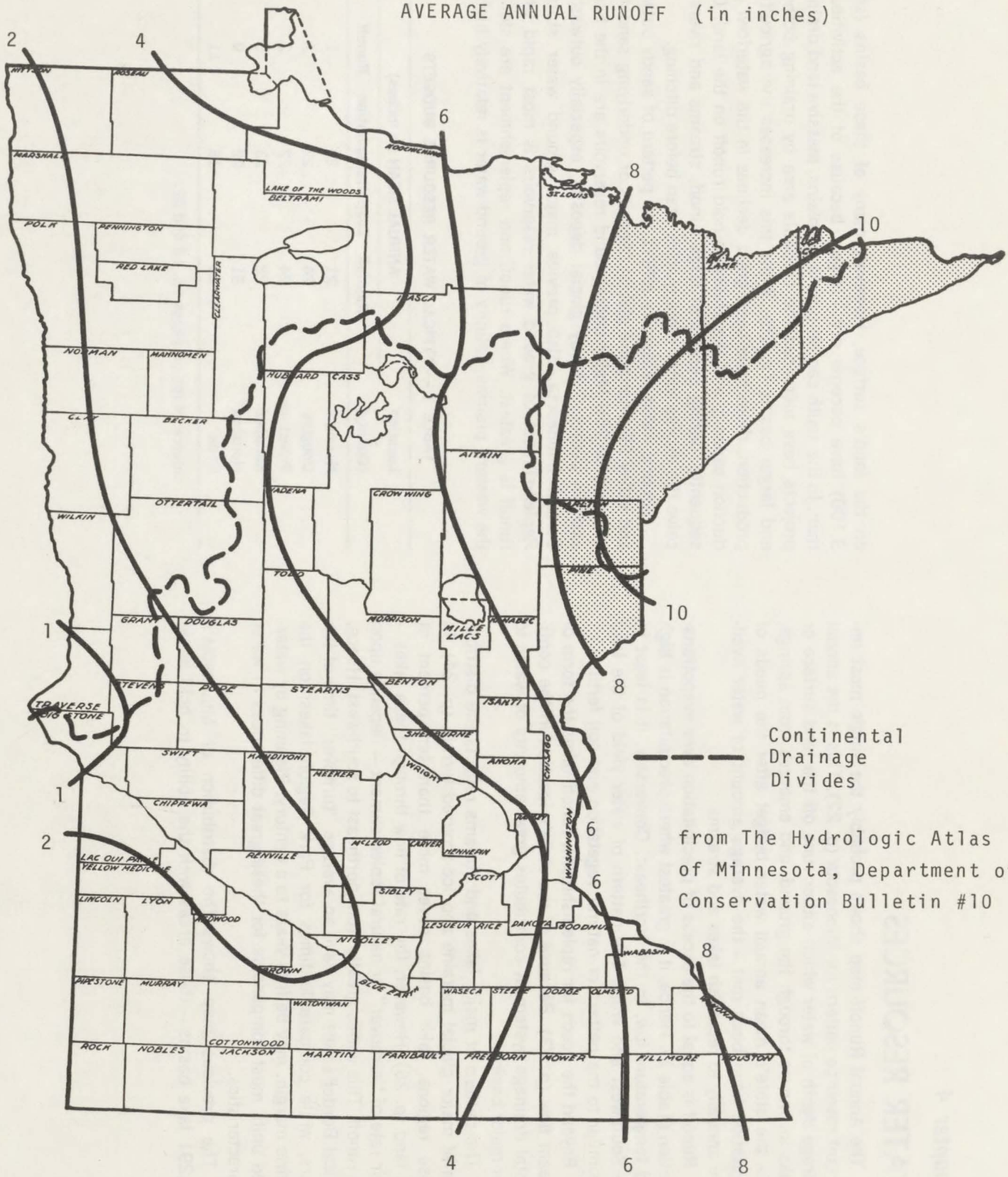
Ground water reservoirs reflect the pattern of sandy outwash and valley fill among the glacial deposits or underlying sandstone bedrock (p. 26). Major underground reservoirs are in the Southeast, in bedrock. Sandy glacial deposits, especially outwash in Central Minnesota, also provide major ground water storage. Replenishment of ground water reservoirs is most rapid where runoff is greatest. Where runoff and replenishment are slow, in the western prairies, salinity of ground water is relatively high.

TABLE 1 — TYPICAL WATER RESOURCE BUDGETS

Location (County)	ANNUAL MEAN (in inches)		
	Rainfall	Evapotranspiration	Runoff
Norman	21	20	1
Douglas	24	22	2
Pipestone	24	22	2
Kanabec	28	23	5
Houston	31	22	9
Cook	29	18	11

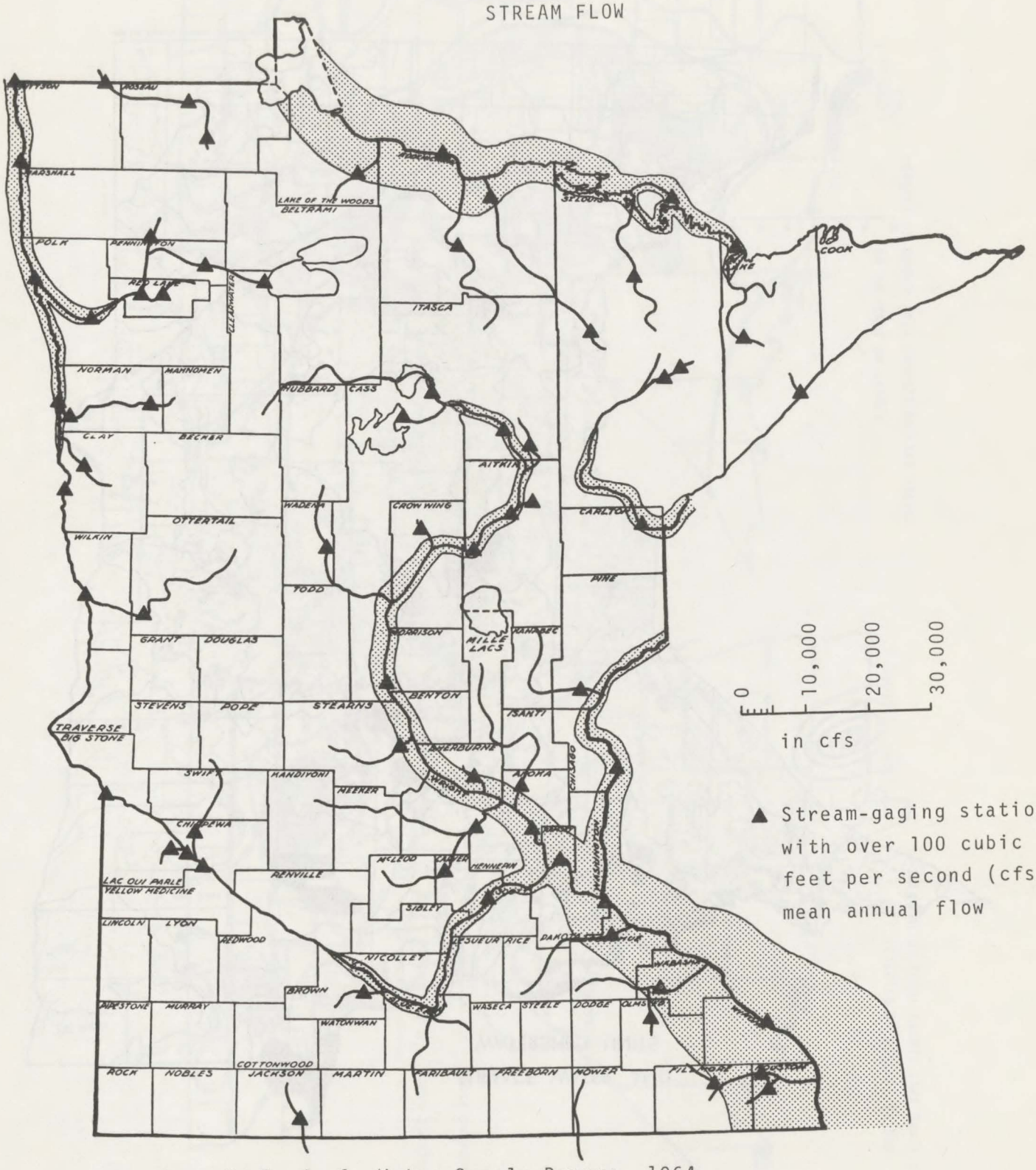
Source: maps on pages 16, 19 and 22.

AVERAGE ANNUAL RUNOFF (in inches)

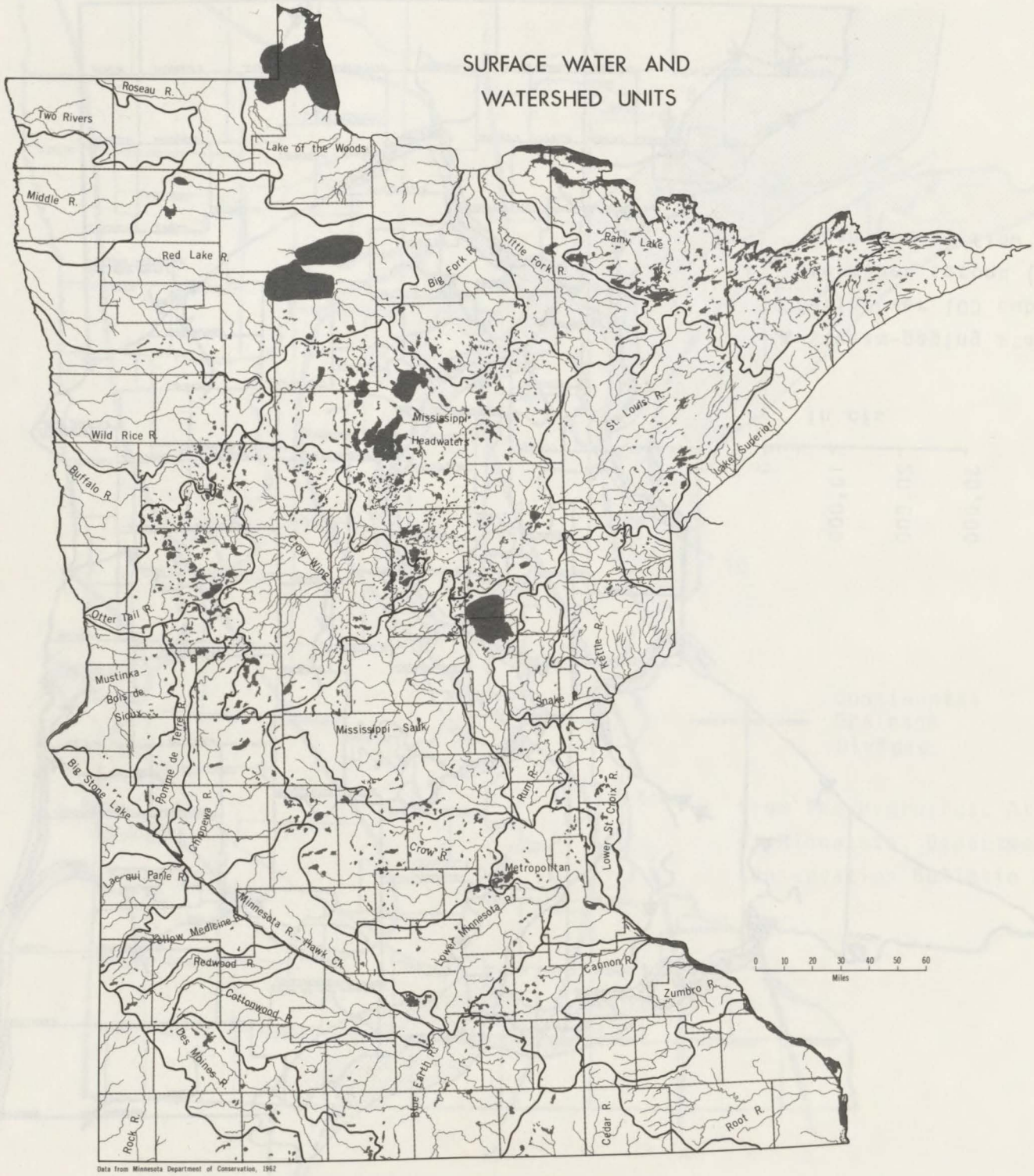


from The Hydrologic Atlas of Minnesota, Department of Conservation Bulletin #10

STREAM FLOW

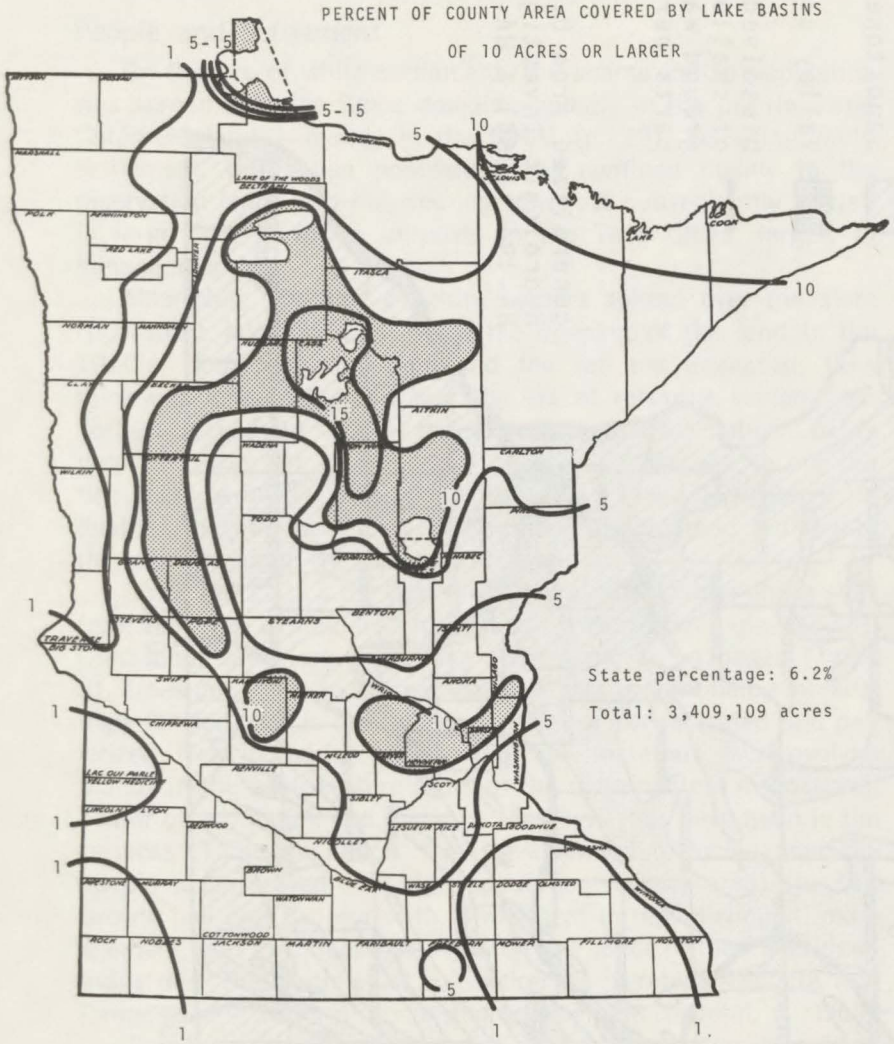


from U. S. G. S. Water Supply Papers, 1964



Data from Minnesota Department of Conservation, 1962

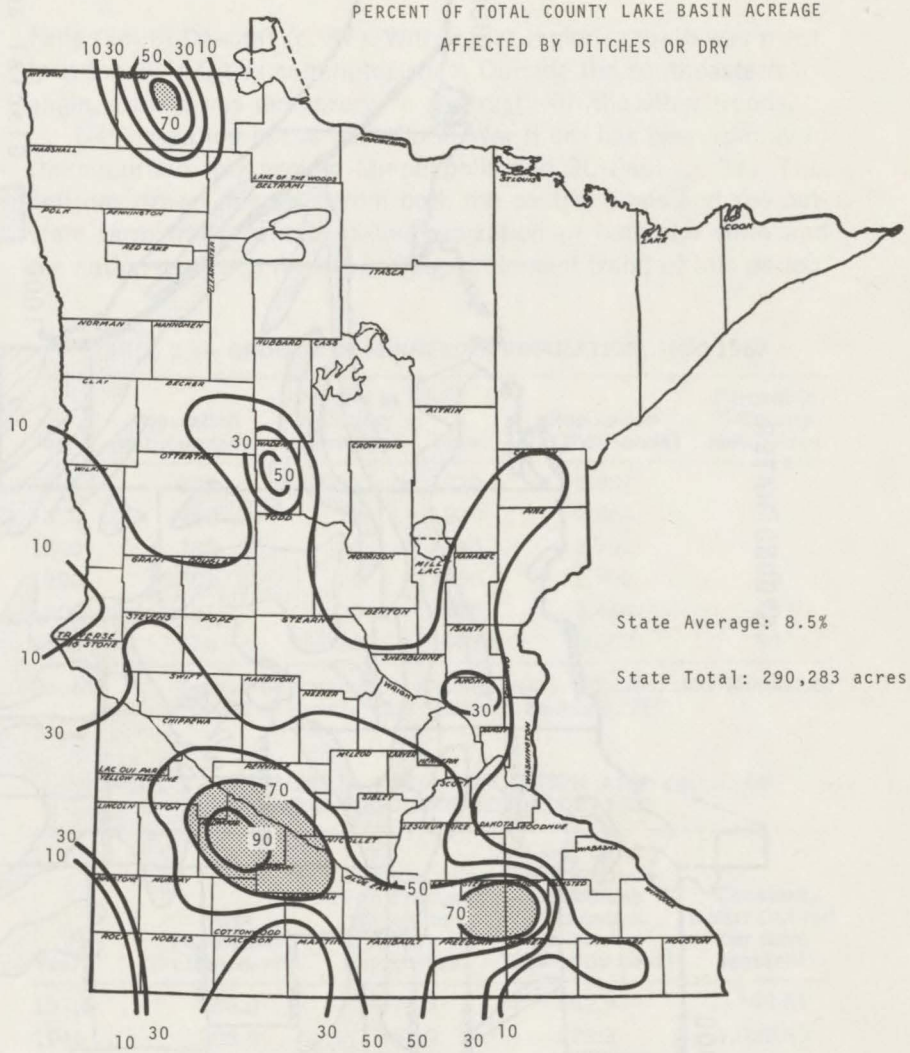
PERCENT OF COUNTY AREA COVERED BY LAKE BASINS
OF 10 ACRES OR LARGER



State percentage: 6.2%

Total: 3,409,109 acres

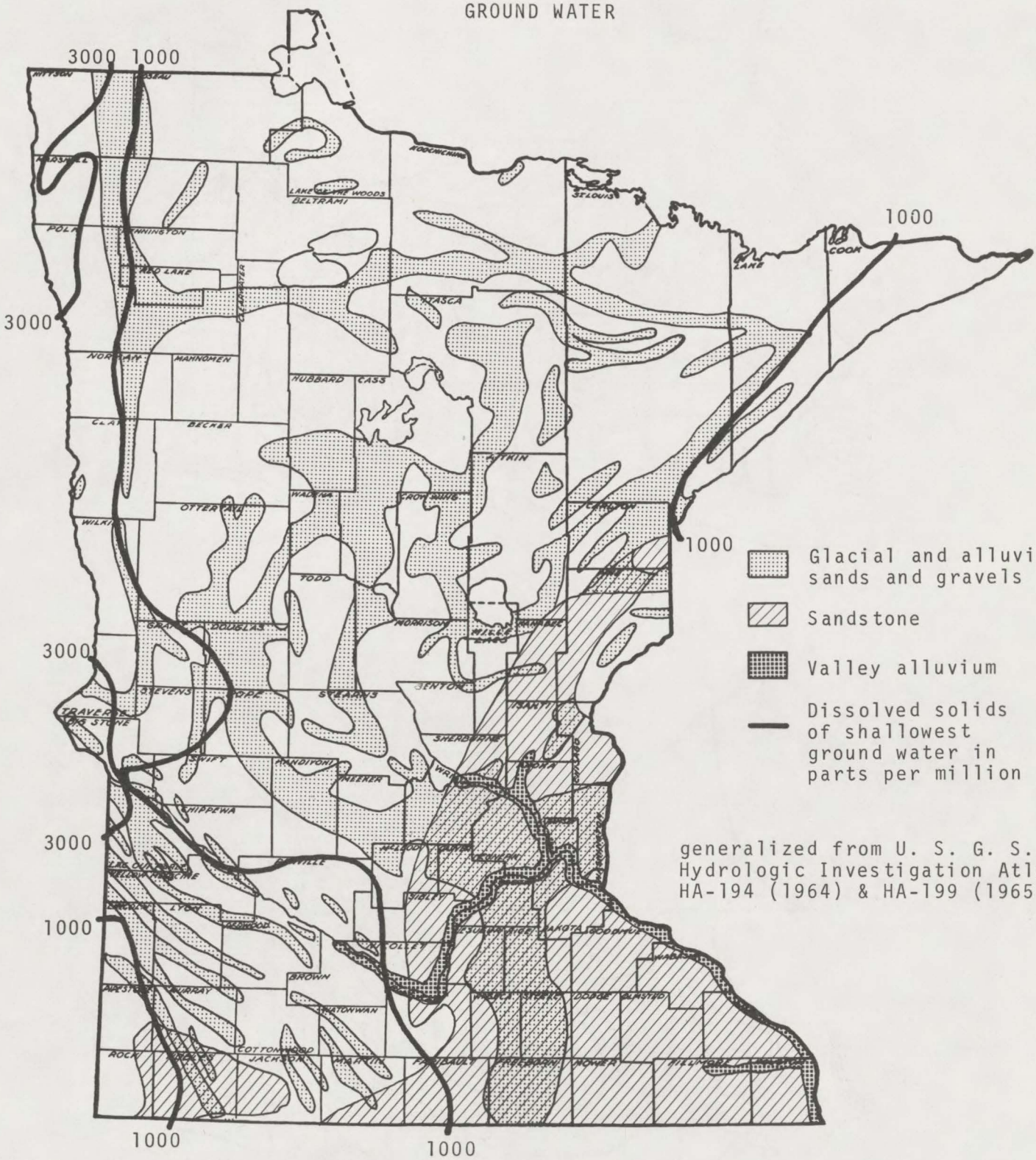
PERCENT OF TOTAL COUNTY LAKE BASIN ACREAGE
AFFECTED BY DITCHES OR DRY



State Average: 8.5%

State Total: 290,283 acres

GROUND WATER



generalized from U. S. G. S., Hydrologic Investigation Atlas, HA-194 (1964) & HA-199 (1965)

Chapter 5

PEOPLE, SETTLEMENT, AND INCOME

People and Settlement

On the eve of white settlement, the sparse Indian population was spread over the Sioux domain – mostly in the prairie – and Chippewa lands – mainly in the forest (p. 29). Following white settlement, the Indian population was confined mainly to the reservation lands and neighboring towns. It subsequently shifted in large part to urban outposts in the Twin Cities, largely in Minneapolis.

Meanwhile, the tide of white settlers spread over the state (pp. 30-31 and Table 2). From the opening of the land to the 1910's, both the population and the rail net advanced, then thickened in density. This was the era of resource exploitation. Settlers spread out to plow the land or harvest the natural, ready crop of timber; or they focused on the Iron Ranges to dig the rich, natural ore. Towns and cities served these exploitative industries, assembled and processed their output, and fed it into the main stream of the national economy.

Since the 1920's the theme has been urbanization and a shift from resource exploitation to resource management (pp. 32-33). Crop lands are more productive and intensively managed (Table 3). Trees are harvested more systematically and are being increasingly farmed. Ore is mostly beneficiated or concentrated and pelletized. New industries, using exotic raw materials, have evolved mainly in the southeastern parts of the state nearest the national center of population and markets. Most new jobs have been in the services (Table 4); hence, they have tended to locate near the people to be served – in high population density areas (p. 34). Growth has bred more growth. Investment in replenishment, management, and machines has replaced raw labor in the "resource" industries. The "frontier of cultivation" is in retreat (p. 35). Iron Range mining and ore processing employment, in total, is stable.

Population growth in the most recent census decade reflects the forces of change in the automobile-tractor era (p. 36). Counties which gained population were mostly in the industrializing southeastern one-third of the state – south of a line approximately joining Eau Claire (Wisconsin), Brainerd (Minnesota), and Sioux Falls (South Dakota) (p. 37). Within that region, growth was mainly in the Twin Cities commuter shed. Outside the southeastern triangle, growth was temporary, in contrast with the other trends.

Net migration in the post-World War II era has been mainly to the suburban ring around Minneapolis and St. Paul (p. 37). This belt has drawn migrants from both the central cities and the outstate farm trade centers. Suburbanization of both the state and the nation has been the over-riding settlement trend of this period.

TABLE 2. — GROWTH OF MINNESOTA POPULATION, 1860-1967

Year	Population (in thousands)	Percent in 5-County Metro Area	Year	Population (in thousands)	Percent in 5-County Metro Area
1860	172	24	1920	2,387	31
1870	440	19	1930	2,564	34
1880	780	20	1940	2,792	34
1890	1,302	29	1950	2,982	39
1900	1,751	26	1960	3,414	43
1910	2,076	30	1967 Est.	3,582	50

Source: U.S. Census of Population, Census years indicated and Minnesota Department of Health, Vital Statistics Section, 1967.

TABLE 3 — MINNESOTA FARM POPULATION AND VALUE OF ALL FARM PRODUCTS SOLD 1930-1960

Year	Farm Population (in thousands)	Value of All Farm Products (in millions of dollars — unadjusted)	Value of All Farm Products (in millions of constant dollars — 1957-1959 base)	Constant Dollar Out-put per farm resident
1930	888.0	378.3	662.3	745.81
1940	905.4	457.0	923.3	1,029.68
1950	739.8	960.6	1,143.1	1,545.16
1960	740.0	1,454.6	1,396.4	1,887.04

Source: U.S. Census of Population, Census years indicated and the *Statistical Abstract of the United States*, 1931, 1941, 1951, 1961 and 1967.

TABLE 4 — EMPLOYMENT IN MINNESOTA, 1955 AND 1967

Economic Sector	1955 Employment (in thousands)	1955 Employment percent of U.S. total	1967 Employment (in thousands)	1967 Employment percent of U.S. total	Percent Change in Employment 1955-1967
Agriculture*	213	4.5	156	4.6	−26.8
Mining	17	2.2	14	2.3	−17.6
Construction	55	2.2	62	1.9	+13.0
Manufacturing	209	1.3	304	1.6	+45.6
Transportation and Utilities	87	2.1	85	2.0	−2.3
Wholesale, Retail	218	2.0	284	2.1	+30.2
Finance, Insurance Real Estate	41	1.9	57	1.8	+39.1
Service and Miscellaneous	106	1.9	184	1.8	+73.5
Government (incl. Education)	131	1.9	211	1.8	+61.2
TOTAL	1,080	1.99	1,357	1.95	+25.5

* Note: Agricultural employment estimated by multiplying the number of commercial farms by the average farm employment per farm household in the West North Central States Census region.

Source: *Statistical Abstract of the United States*, 1956 and 1967.

The advancing tide of early white settlement was fed by streams of European immigrants who came from many sources at different times. These ethnic groups tended to cluster in different frontier areas that were opening when they arrived (p. 38). Before 1860, mainly German and Scandinavian settlers pushed the agricultural frontier up the Mississippi tributaries in southeastern Minnesota. German settlers dominated the push into the prairies and Big Woods in the next decade. Still later, Norwegian immigrants dominated the settlement of the Red River Valley and western Park Region. Many other nationalities occupied smaller areas which do not appear on these maps. At the beginning of the present decade, these ethnic clusters were still strongly reflected in the pattern of religious denominations and intensity of church membership (p. 39).

These clusters have retained a high degree of ethnic purity in the rural areas. They have been well-springs of out-migrants, but they have attracted few in-migrants to alter the original stock. The growing urban areas, in contrast, have drawn from many different ethnic regions; they have been the major zones of culture contact and cultural variety.

Income

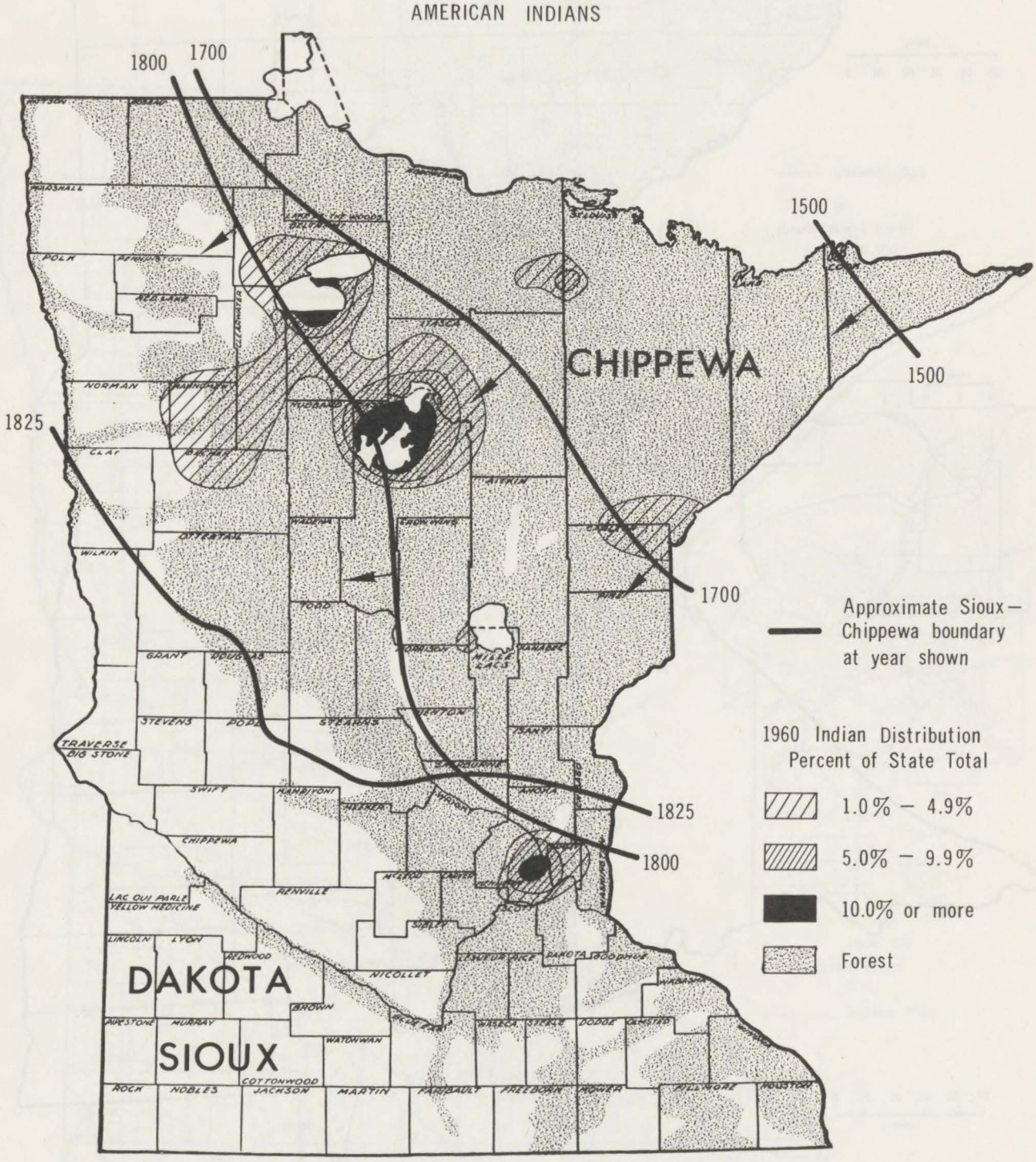
In 1950 county median family incomes exceeded the state median level in five major areas – the Twin Cities commuter zone; the Rochester-Austin-Albert Lea urban complex; Worthington and the Sioux Falls commuter zones; the Fargo-Moorhead area; and the iron mining, processing, and shipping centers and paper milling communities of the northeast (p. 40). The 1960 income pattern was similar (p. 40). Absolute gains from 1950 to 1960 were greatest in existing high-income areas (p. 41). Highest percentage gains were in the fast-growing and most urbanized parts of the Southeast, plus the areas of greatest percentage decline in population and lowest income levels, in north central Minnesota (p. 41).

TABLE 5 — FARM AND NON-FARM PERSONAL INCOME, 1965

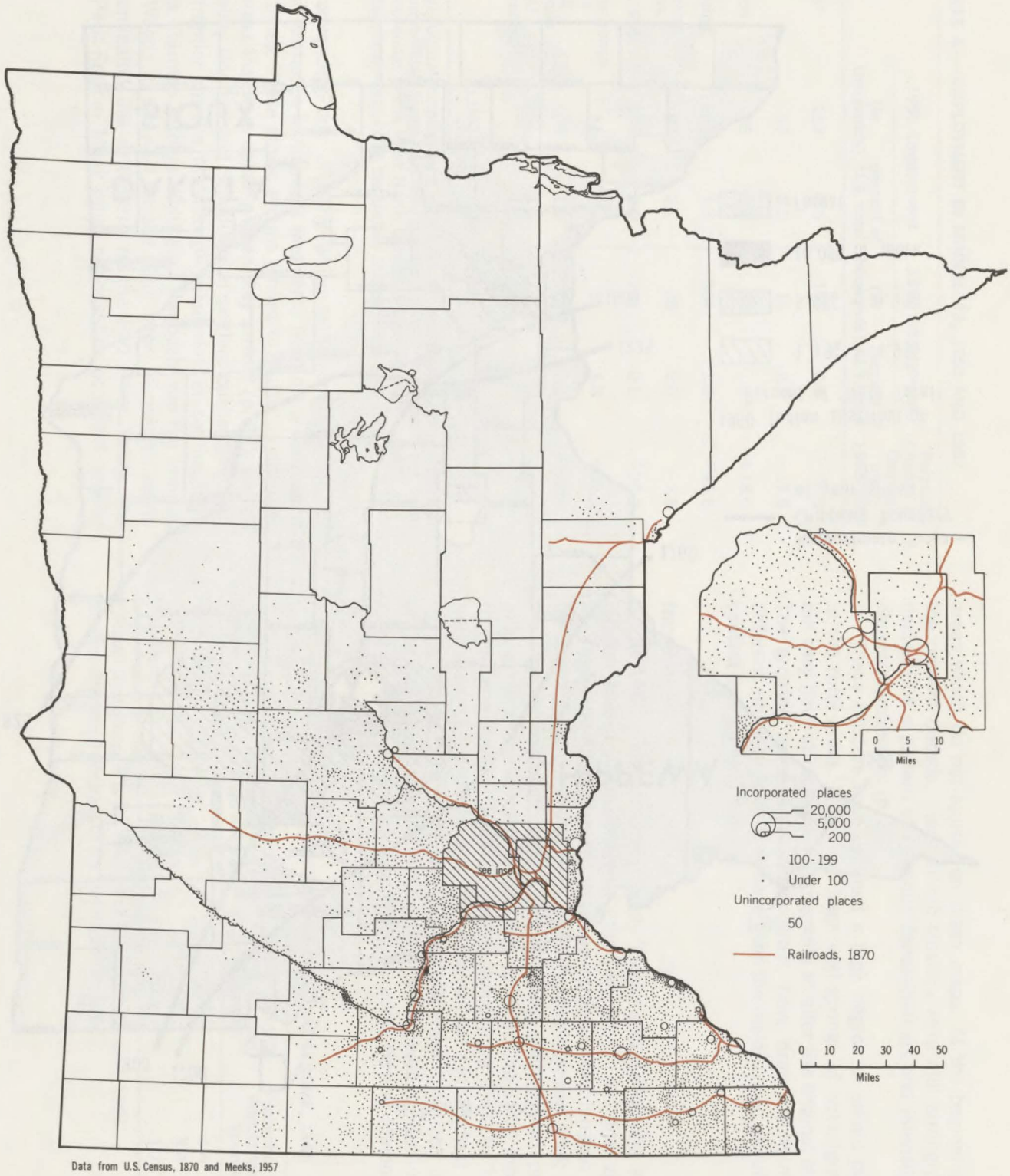
Source of Income	Total Minnesota Personal Income (in millions)	Percent of U.S. Total Income by Source	Percent of U.S. Population by Source
Farm (Net)	636	3.6	4.4
Farm (Gross)*	1,376	4.0	4.4
Non-Farm	8,850	1.8	1.7

* Note: Gross income is the value of all farm products sold, 1964.

Source: *Statistical Abstract of the United States*, 1967.

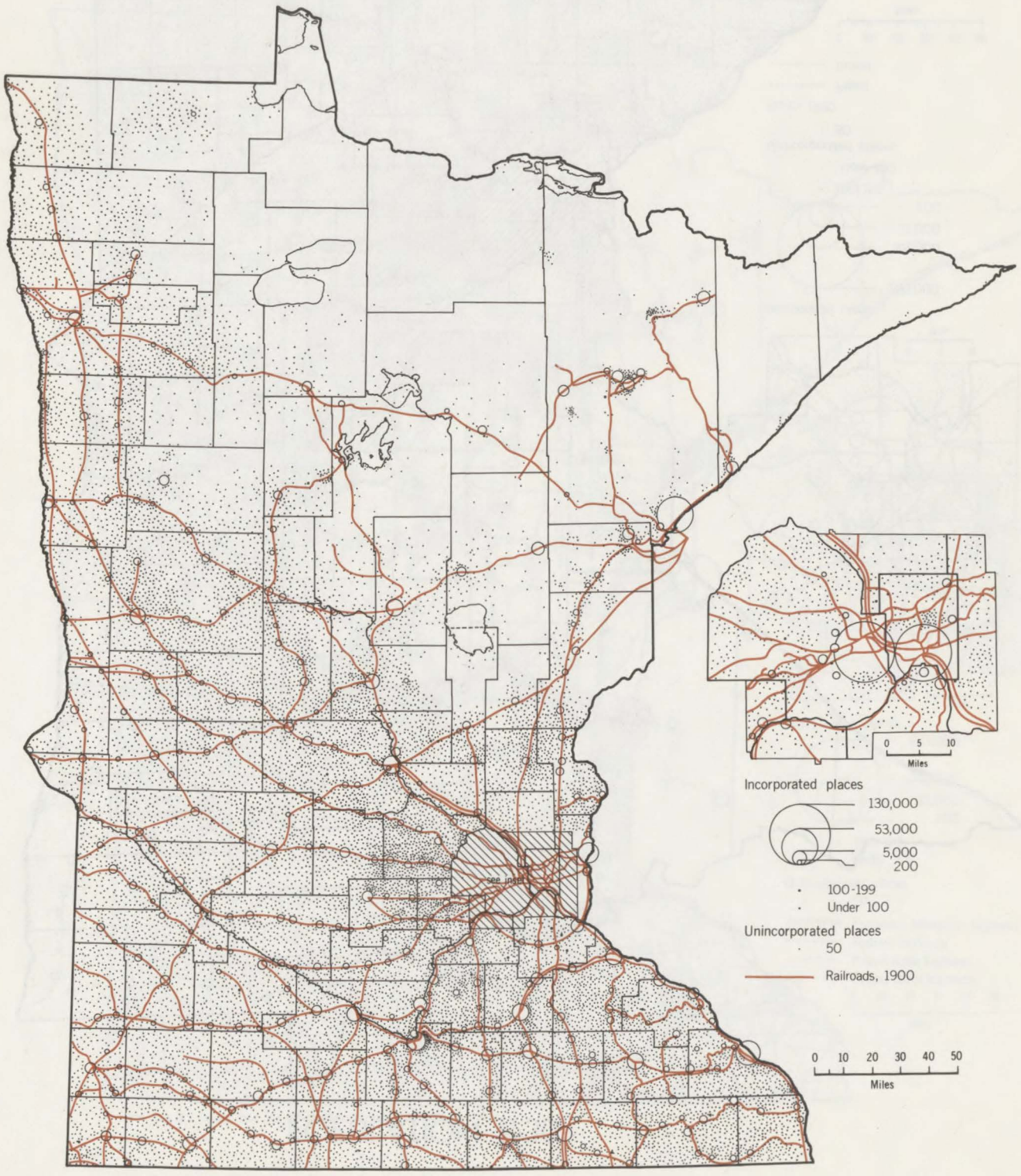

AMERICAN INDIANS
1800
1700
1500
1500
1825
1700
1825
1800
CHIPPEWA
DAKOTA
SIOUX
Approximate Sioux–Chippewa boundary at year shown
1960 Indian Distribution
Percent of State Total
1.0% – 4.9%
5.0% – 9.9%
10.0% or more
Forest

POPULATION, 1870



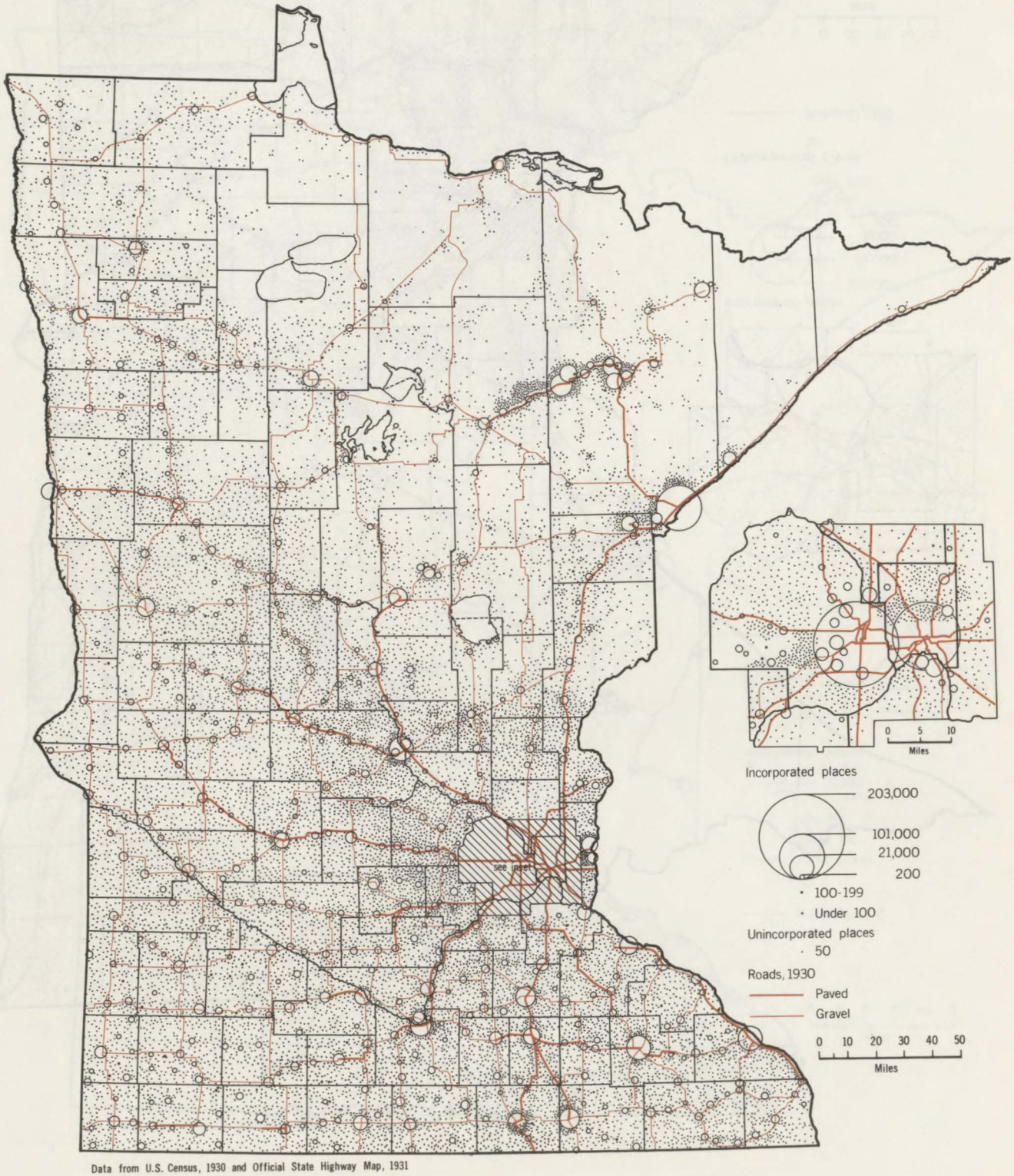
Data from U.S. Census, 1870 and Meeks, 1957

POPULATION, 1900



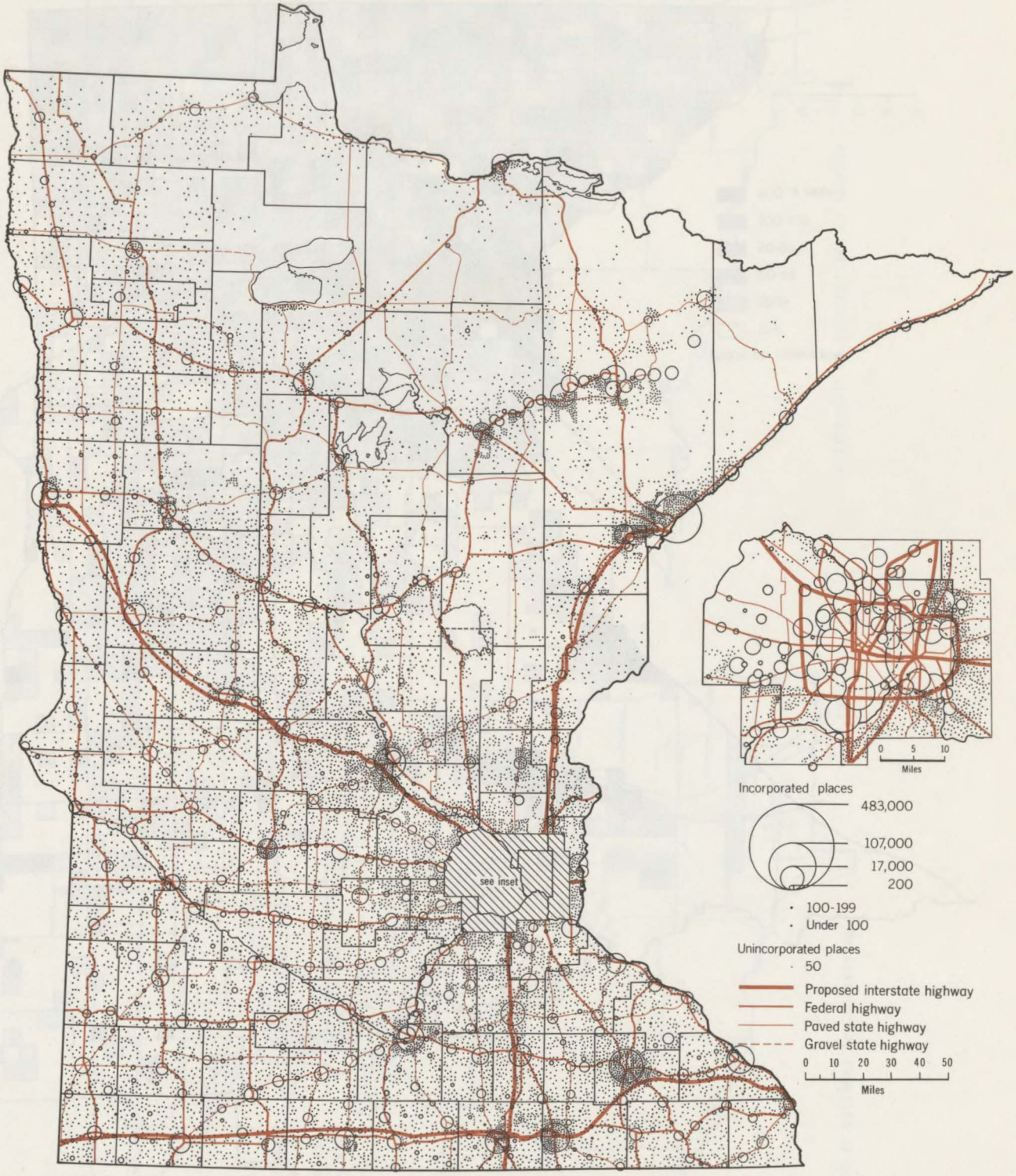
Data from U.S. Census, 1900 and Meeks, 1957

POPULATION, 1930



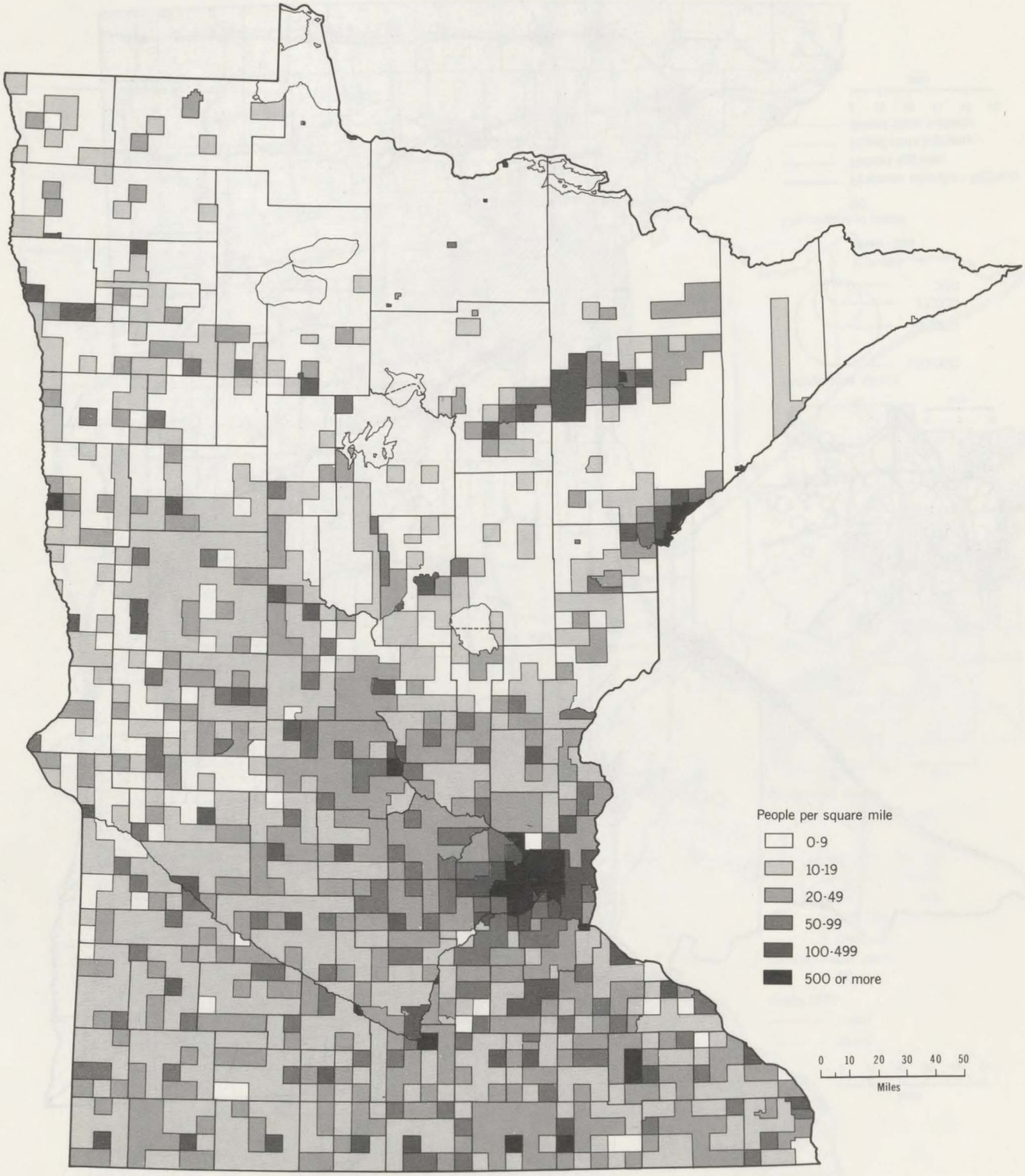
Data from U.S. Census, 1930 and Official State Highway Map, 1931

POPULATION, 1960

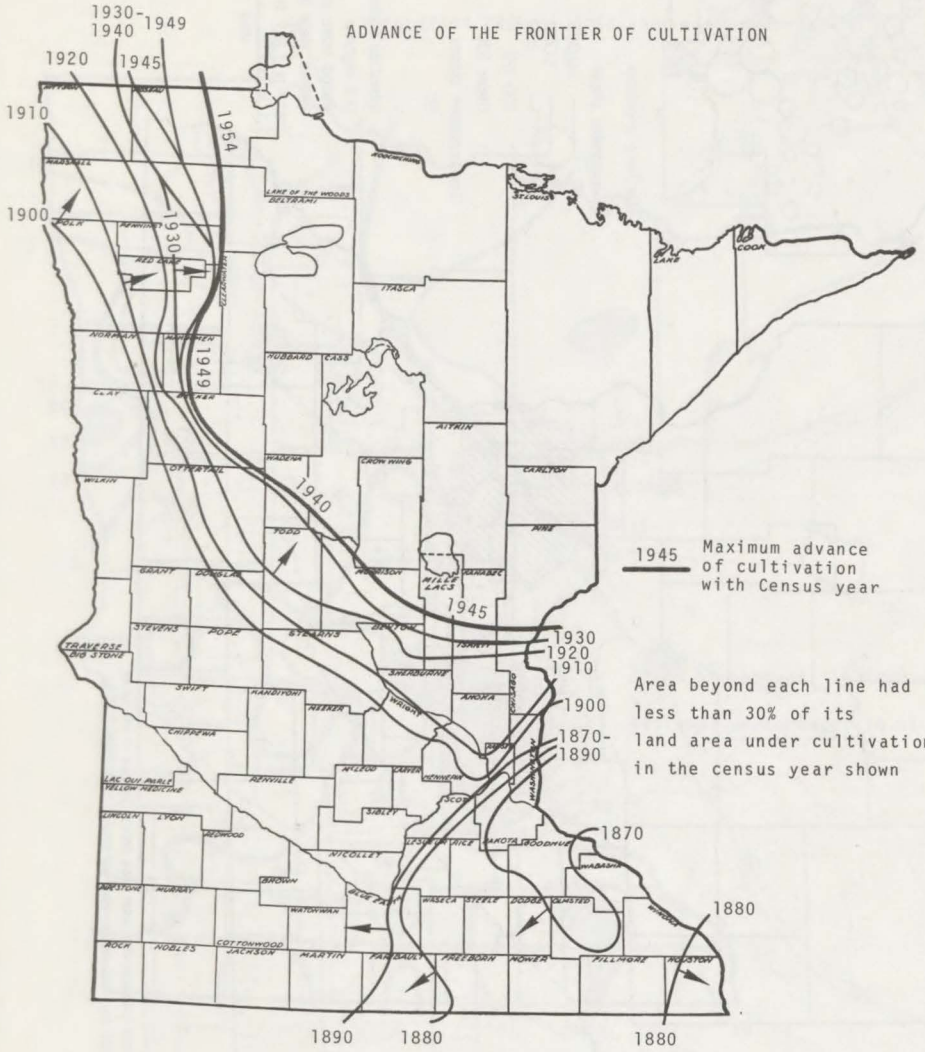


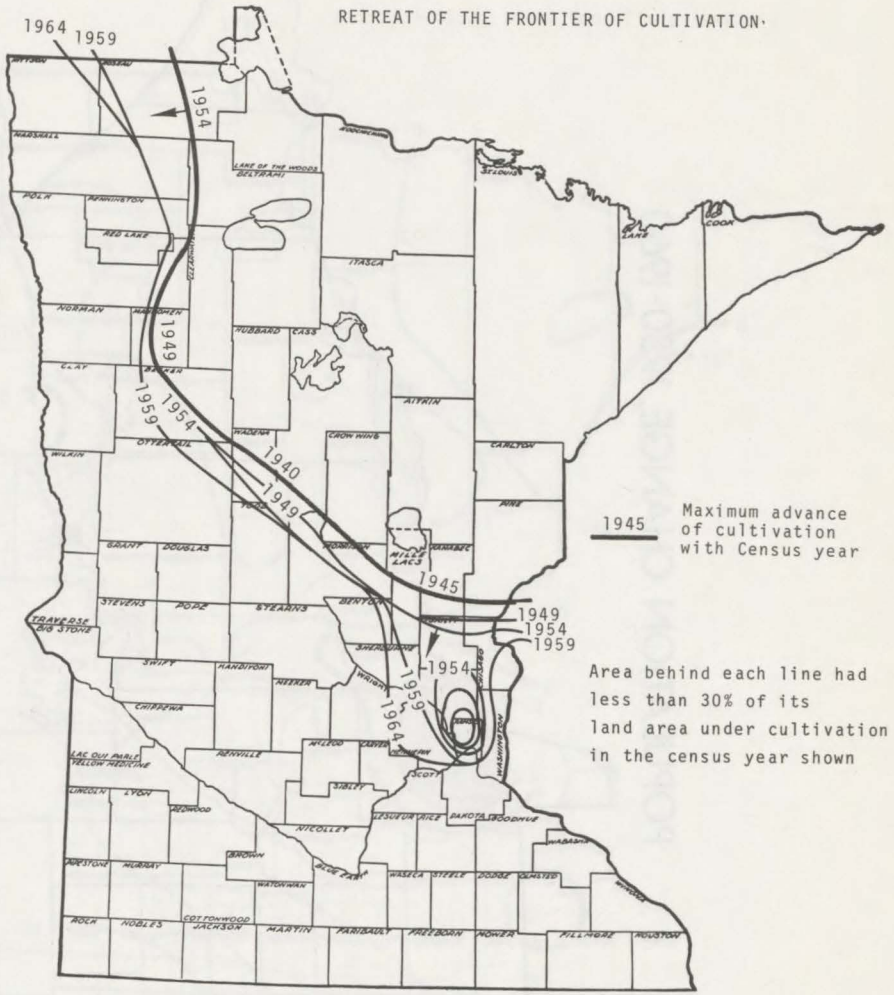
Data from U.S. Census, 1960 and Official State Highway Map, 1960

POPULATION DENSITY, 1960

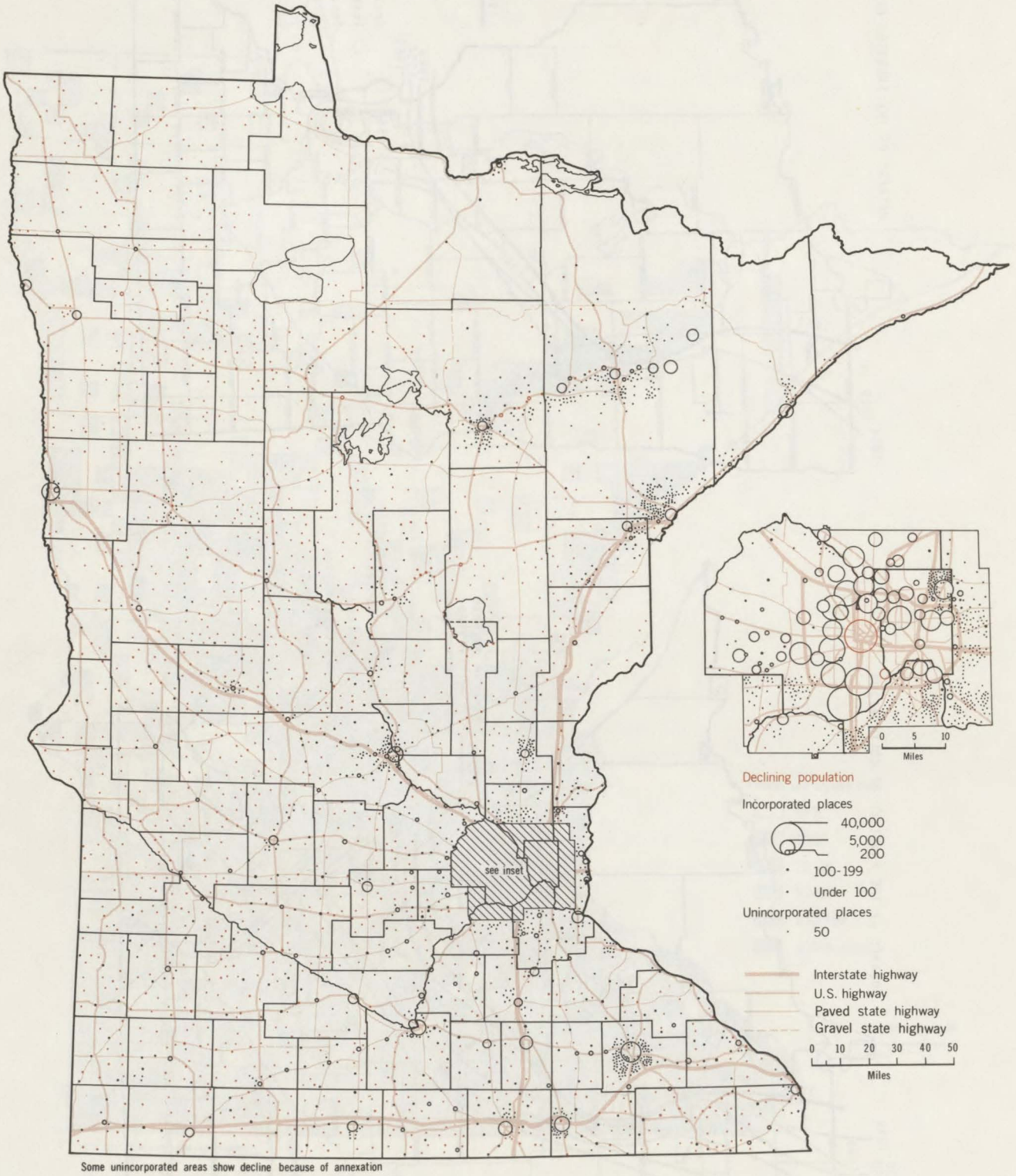


Data from State Highway Department


ADVANCE OF THE FRONTIER OF CULTIVATION
1930-1940
1949
1920
1945
1910
1954
1900
1930
1949
1940
1945
1930
1920
1910
1900
1870-1890
1870
1880
1890
1880
1880
1945 Maximum advance of cultivation with Census year
Area beyond each line had less than 30% of its land area under cultivation in the census year shown


RETREAT OF THE FRONTIER OF CULTIVATION
1964
1959
1954
1949
1940
1945
1949
1954
1959
1954
1959
1964
1945 Maximum advance of cultivation with Census year
Area behind each line had less than 30% of its land area under cultivation in the census year shown

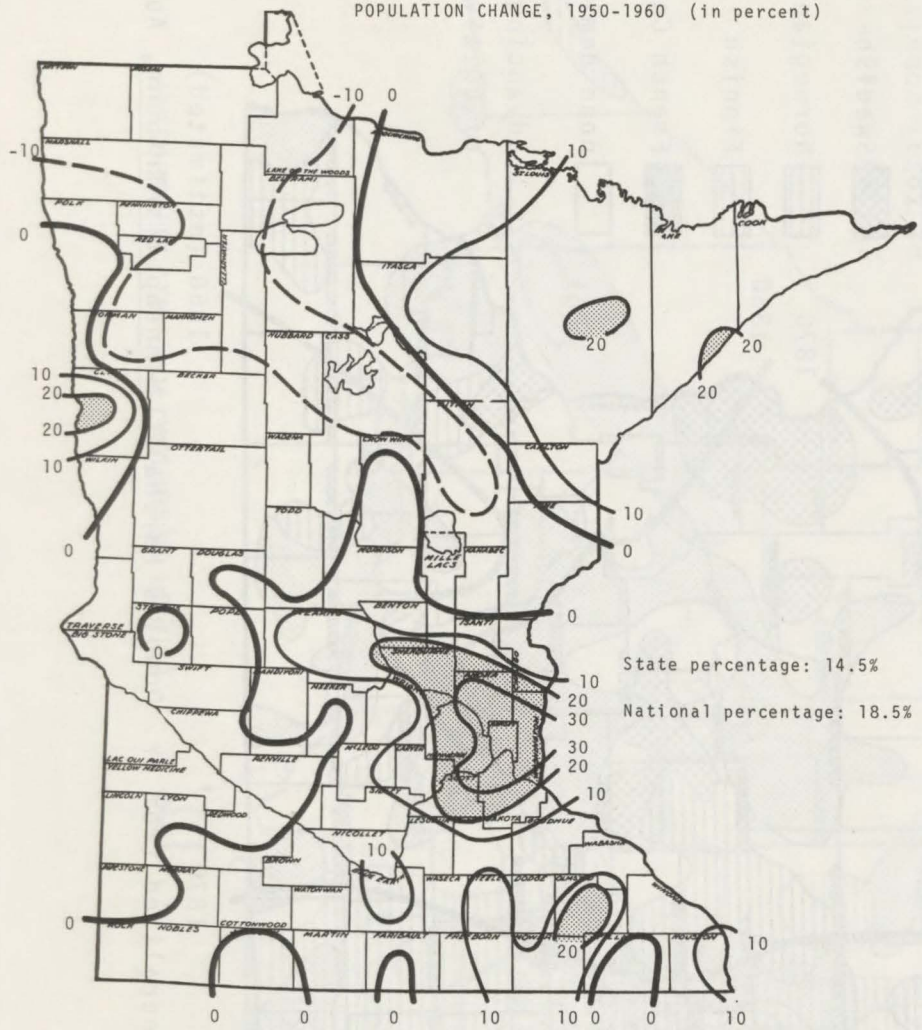
POPULATION CHANGE, 1950-1960



Some unincorporated areas show decline because of annexation

Data from U.S. Census, 1960 and Official State Highway Map, 1967

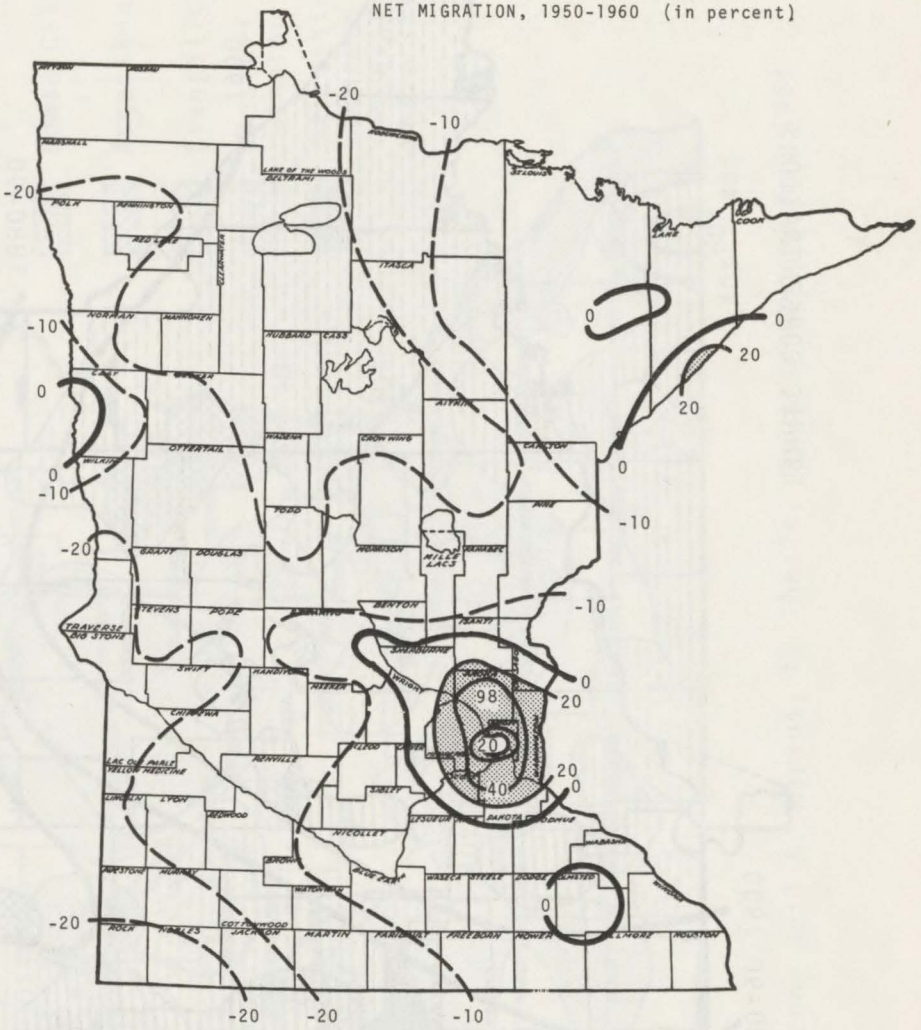
POPULATION CHANGE, 1950-1960 (in percent)

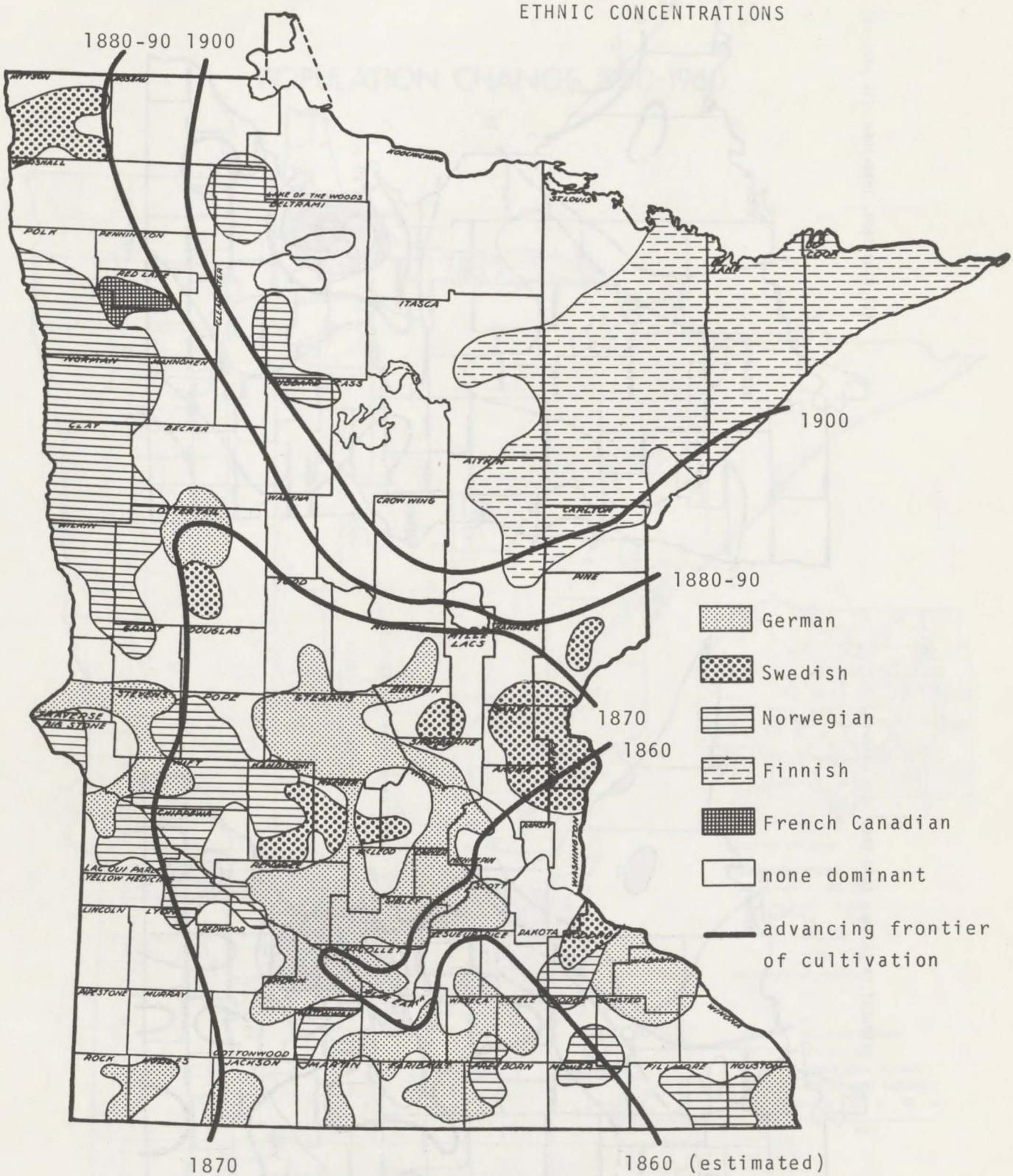


State percentage: 14.5%

National percentage: 18.5%

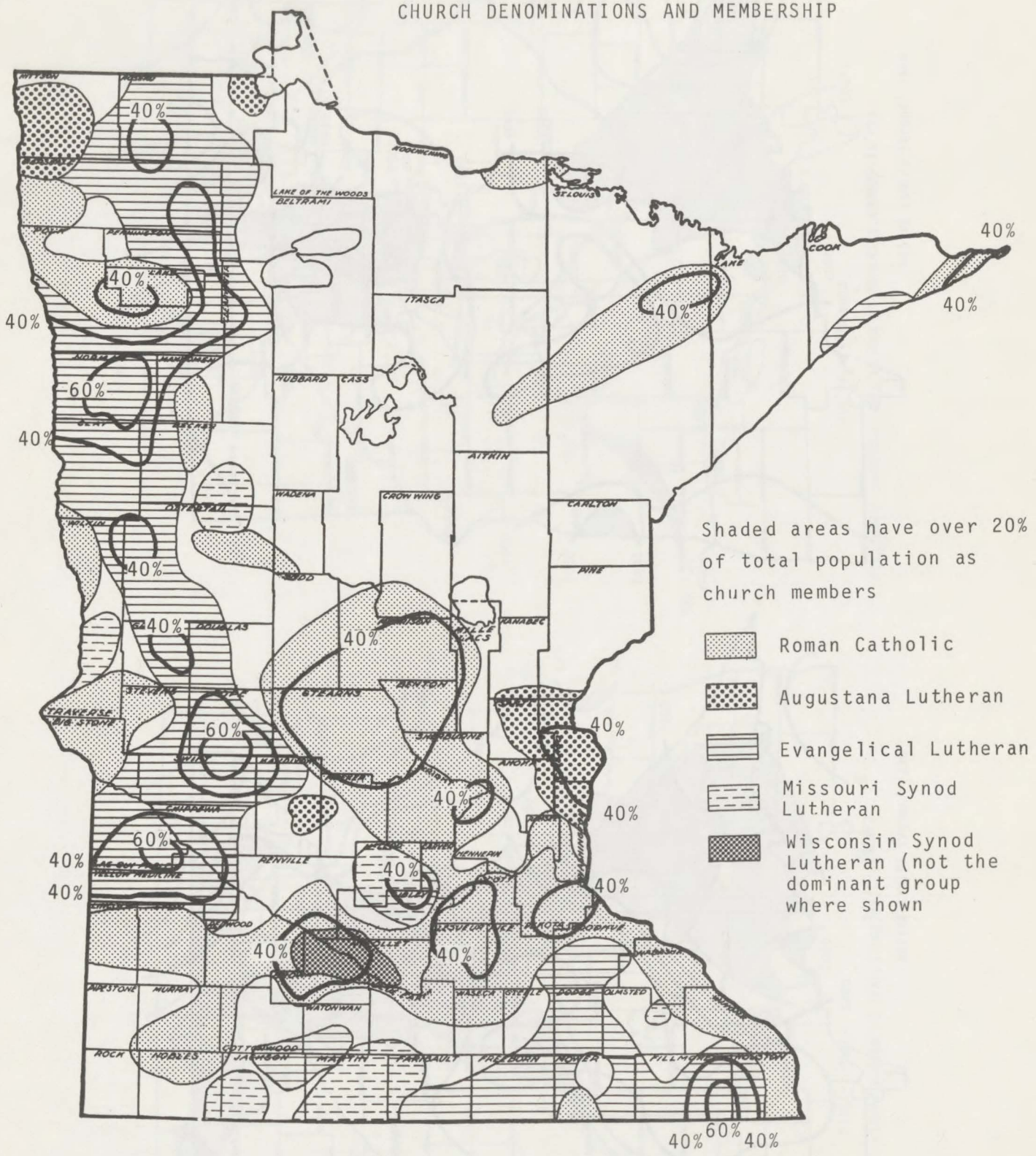
NET MIGRATION, 1950-1960 (in percent)





generalized from Dr. Douglas Marshall, Minneapolis Tribune, August 28, 1949

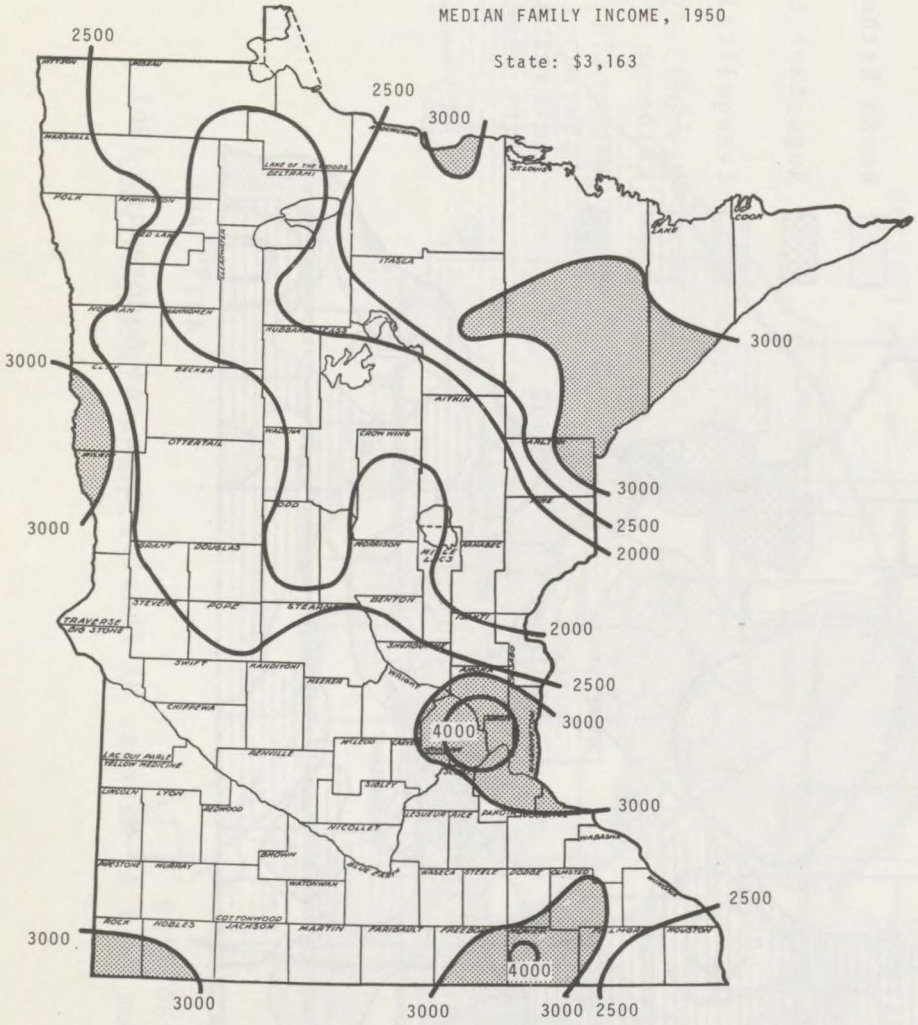
CHURCH DENOMINATIONS AND MEMBERSHIP

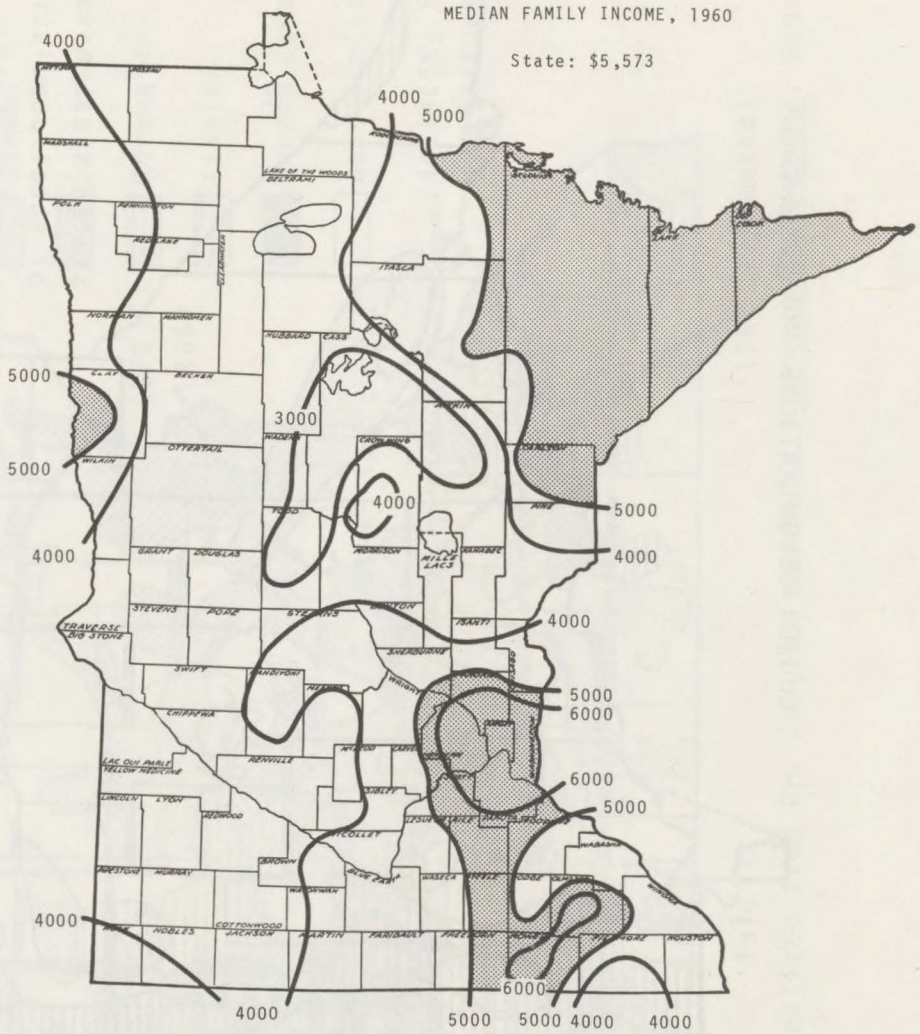


Shaded areas have over 20% of total population as church members

- Roman Catholic
- Augustana Lutheran
- Evangelical Lutheran
- Missouri Synod Lutheran
- Wisconsin Synod Lutheran (not the dominant group where shown

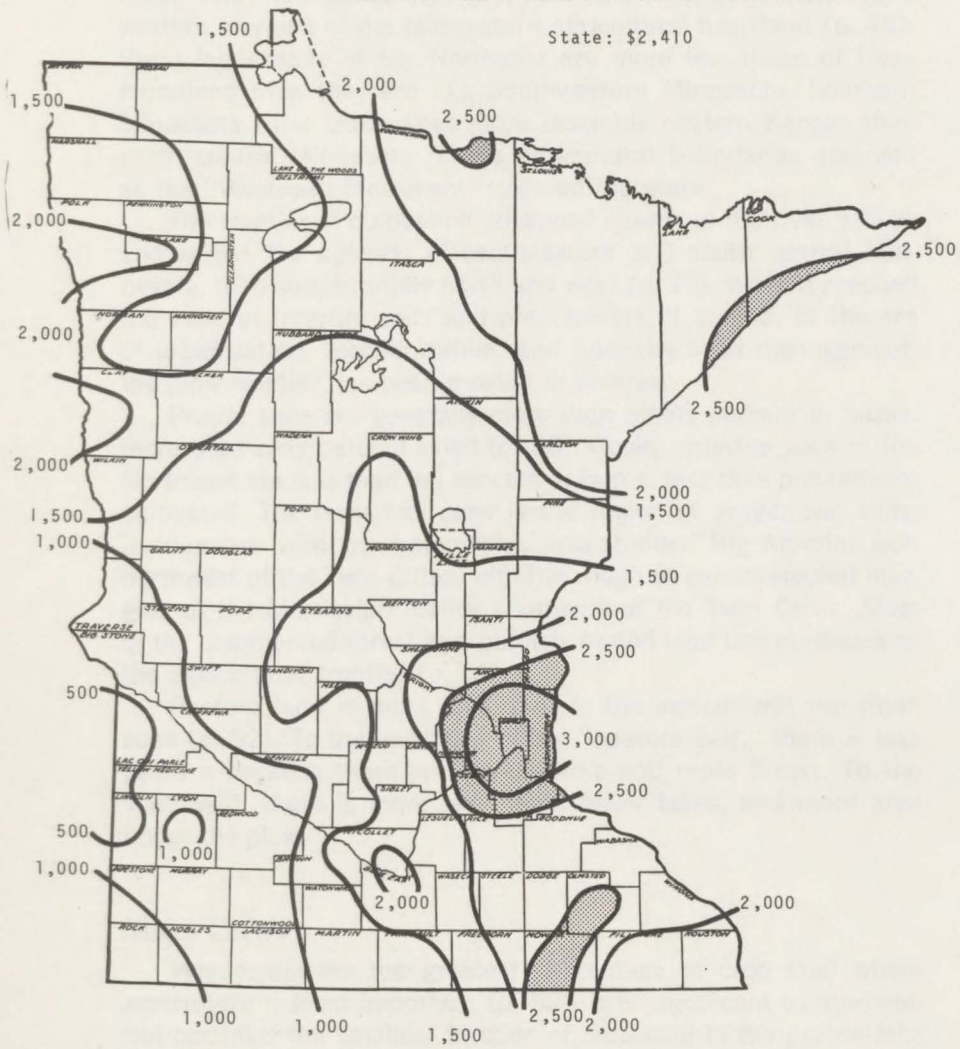
from Neil A. Markus, MA Thesis, Dept. of Geography, 1961


MEDIAN FAMILY INCOME, 1950
State: $3,163
2500
2500
3000
3000
3000
3000
2500
2000
3000
2000
2500
3000
4000
3000
2500
3000
3000
3000
3000
2500
4000


MEDIAN FAMILY INCOME, 1960
State: $5,573
4000
4000
5000
5000
5000
3000
4000
5000
4000
4000
5000
6000
6000
5000
4000
6000
5000
5000
4000
4000

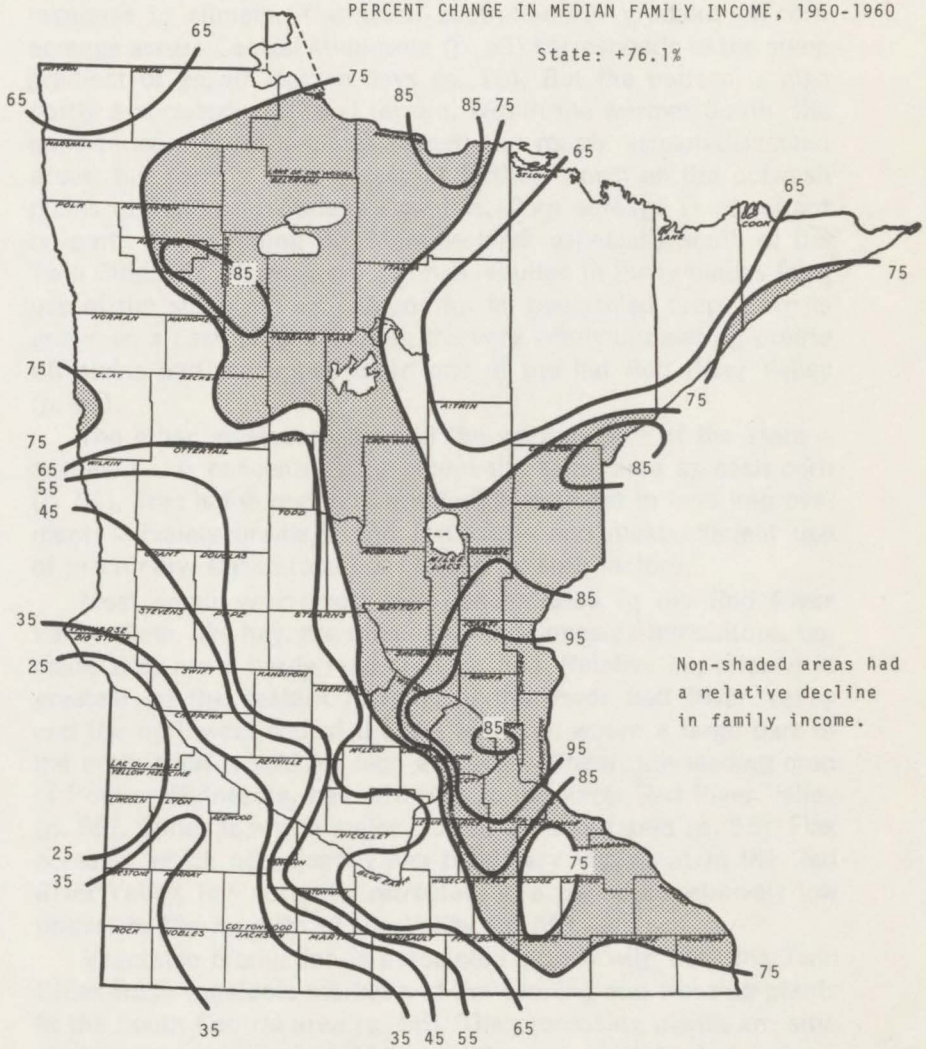
ABSOLUTE CHANGE IN MEDIAN FAMILY INCOME, 1950-1960

State: $2,410



PERCENT CHANGE IN MEDIAN FAMILY INCOME, 1950-1960

State: +76.1%



Non-shaded areas had a relative decline in family income.

Chapter 6

AGRICULTURE

As Minnesota straddles major climatic transition zones between cold, humid and dry, so it also embraces the northern and western margins of the Midwestern agricultural heartland (p. 49). Rural landscapes of the Northeast are more like those of Newfoundland than they are like Southwestern Minnesota. Southern Minnesota rural landscapes more resemble eastern Kansas than north central Minnesota. These agricultural boundaries emerged as the "Westward Movement" crossed the state.

The frontier of cultivation advanced slowly up the river valleys and across the uplands of southeastern and south central Minnesota, then swept rapidly north and west (p. 35). When it reached the zone of infertile soils and pine forests, it stalled. In the era of urbanization, mechanization, and intensive land management, the plow frontier has been moving in reverse.

Prairie soils are generally more than ninety percent in farms, more than sixty percent tilled (p. 50). Rocky, infertile soils of the Northeast are less than ten percent in farms, less than one percent cultivated. The transition zone is the region of gray-brown soils; it coincides with the hummocky, lake-studded Big Moraine belt northwest of the Twin Cities, with the rough stream-dissected margins of the Mississippi Valley southeast of the Twin Cities. Most of the commercial forest and publicly owned land lies northeast of the agricultural frontier (p. 51).

Pasture land is most important in the agricultural transition zone (p. 52). To the northeast of the "pasture belt," there is less pasture because there are fewer farms and more forest. To the southwest, there is more level land, fewer lakes, and more area under the plow.

Major Crops

Hay comprises the greatest percentage of crop land where agriculture is least important (p. 52). It is significant everywhere, but occupies the smallest fraction of crop land in the prairie lake plains and prairie till plains of the Red River Valley, upper Minnesota Valley, and south central counties.

The decision to grow corn varies geographically mainly in response to climate. The steep south-to-north gradient of corn acreage across Central Minnesota (p. 53) corresponds to the steep gradient of growth degree days (p. 16). But the pattern is also partly associated with level terrain. Within the warmer South, the importance of corn declines toward the rough, stream-dissected areas; but corn is most important farthest north on the outwash plains of Todd and Wadena Counties. Corn acreage is important on parts of the rolling Big Moraine land, especially south of the Twin Cities. Accelerated erosion has resulted in many places from use of the steep moraine slopes for an open-tilled crop. Corn is grown as a cash crop mainly in the very gently-undulating prairie till plains and the upper south end of the flat Red River Valley (p. 53).

The other great cash crop of the warmer part of the state — soybeans — is concentrated in about the same area as cash corn (p. 54). This is the region of greatest investment in land improvements — mainly drainage and fertilizer — and most efficient use of machinery. Cash crops are favored by both factors.

Most small grain crops are concentrated in the Red River Valley. Oats, like hay, are ubiquitous in Minnesota agriculture, because they are a hardy feed crop (p. 54). Relative importance is greatest on the eastern margins of the lower Red River Valley and the northwest end of the Big Moraine, where a large part of the production is sold for feed and seed. Wheat, the leading crop of frontier Minnesota, has retreated to the lower Red River Valley (p. 55). Barley is also a major crop in the same area (p. 55). Flax acreage, which occasionally has been very important in the Red River Valley, has currently retreated, in a period of relatively low prices, to the margins of the Valley (p. 56).

Vegetable production is associated closely with both the Twin Cities fresh vegetable market and the canning and freezing plants in the South Central area (p. 56). The processing plants are situated in an area of strong ethnic cohesion — mainly, but not entirely German — and relatively slow rural out-migration. These characteristics have been accompanied by comparatively stable

farm size with a tendency to increase farm productivity and income through intensification, rather than enlargement.

Sugar beet production is most heavily concentrated near sugar factories at Moorhead, Crookston, and East Grand Forks (p. 57). (The impact of the new plant at Drayton, North Dakota, is not reflected by this 1964 census data.) Production also extends to neighboring parts of the Red River Valley and has become significant in the south central till plains.

Commercial potato production is also concentrated in the Red River Valley (p. 57). Appreciable acreages also appear in the farming areas near the Twin Cities and in the distinctive Dutch truck farming settlement at Hollandale in Freeborn County. Scattered potato acreages are relatively significant across the northern counties, where many of the more common crops are grown only in small quantity.

Forest products sold from farm lands are most important in the Northeast; amounting to virtually nothing in the prairie regions (p. 58). Nevertheless, the map indicates that there is some income derived from cutting of remaining wood lots, Christmas tree farms, and riverbottom forests within the main agricultural areas of the state. Christmas trees are grown chiefly on the Anoka sand plain and in the northeastern forest region (p. 58). In both cases, the plantations tend to be on marginal land which was abandoned from pasture or grain production during the Great Depression and World War II.

TABLE 6 — VALUE AND ACREAGE OF MAJOR CROPS, 1949 AND 1964

	Value (in millions of dollars)		Acres (in millions)		Average Value per Acre (in dollars)	
Crops	1949	1964	1949	1964	1949	1964
Corn	284	339	5.8	5.6	49	60
Hay Crops	97	155	3.7	3.5	26	44
Soybeans	27	146	0.8	2.8	36	52
Oats	101	80	4.9	3.0	21	26
Potatoes	17	40	0.09	0.09	191	425
Wheat	36	32	1.2	0.9	29	34
Barley	29	16	1.0	0.6	27	30
Sugar Beets	5	16	0.04	0.1	113	133
Flax	54	12	1.6	0.4	33	27
Vegetables	11	10	0.13	0.15	85	70
Field Seed Crops	6	5	0.23	0.13	25	37
Nursery Products	2	3	0.01—	0.01—	975	1200
Woodlots/ Forest Products	2	2	5.1	3.9	0.42	0.57
Tree Fruits and Berries	2	1	0.01	0.01—	192	294
Pasture and Pastured Woodlots	..	..	5.9	7.6	..	..

Source: U.S. Census of Agriculture, 1949 and 1964.

TABLE 7 — RANK IN VALUE AND ACREAGE OF MAJOR CROPS, 1949 AND 1964

	Rank in Total Value		Rank in Acreage		Rank in Value per Acre	
Crop	1949	1964	1949	1964	1949	1964
Corn	1	1	1	1	6	6
Hay Crops	3	2	4	3	11	8
Soybeans	7	3	8	5	7	7
Oats	2	4	3	4	13	13
Potatoes	9	5	11	12	3	2
Wheat	5	6	6	6	9	10
Barley	6	7	7	7	10	11
Sugar Beets	11	8	12	11	4	4
Flax	4	9	5	8	8	12
Vegetables	8	10	10	10	5	5
Field Seed Crops	10	11	9	9	12	9
Nursery Products	12	12	14	14	1	1
Woodlots/ Forest Products	13	13	2	2	14	14
Tree Fruits and Berries	14	14	13	13	2	3

Note: Pasture and Pastured Woodlots omitted because comparable values were not available.

Source: Table 6.

TABLE 8 — APPROXIMATE PERCENT AND VALUE OF CROPS HARVESTED FOR CASH SALES, 1949 AND 1964

	Percent of Total Bushels Harvested		Value of Cash Sales (in millions of dollars)	
Crop	1949	1964	1949	1964
Soybeans	96	97	26	145
Corn	35	47	84	128
Oats	17	45	19	36
Hay*	7	11	7	34
Wheat	76	97	27	31
Barley	75	91	22	15
Flax	91	96	49	11

* Percent of total tons harvested.
Source: U.S. Census of Agriculture, 1949 and 1964

Commercial Livestock

Dairy cow population density reaches a peak in the Twin Cities milk shed, where fluid milk prices are highest (p. 59). Major ridges of relatively high density extend from that peak northwestward and southward along the Big Moraine, southeastward into the stream-dissected area. Minor ridges run southwestward into the strongly German rural area centering on Brown County, and northeastward along the historic routes to Duluth and the Iron Ranges. Dairying is relatively much less important in the level prairie regions, where pasture gives way to more valuable field crops, and in the Northeast, where forests replace pasture.

Beef cattle population is spread rather evenly across most of the main feed corn growing areas (p. 59). But, it also mingles with dairy cow population in the pasture lands of the Northeast, the Big Moraine, and the dissected Southeast. Beef cattle density is especially high in older till plains of the southwestern prairies. This is an area in which many patches of thin or stony soil are scattered within extensive rich, rolling prairie lands. The result is an unusual regional combination of feed corn and grazing land in that area of the state.

Hog population density is most strongly and simply correlated with grain corn production (p. 60). The gradient drops sharply into cash grains to the Northwest and the dairy-moraine complex to the Northeast.

Sheep and lambs are associated with other grazing livestock populations in the far southwestern prairie and along the crop-to-forest transition zone from the northwest to the southeast corner of the state (p. 60). The only exception is that part of the transition zone in which the dairy cow has her greatest numbers and firmest hold on the economy — from Stearns County to the Twin Cities.

Chicken population, in relation to farm land, is still heavily concentrated in traditional areas of dairying within the southern, corn belt region of the state (p. 61). These areas historically combined cream (for butter) with skim milk production. A skim milk and grain mixture, in turn, was fed to pigs and chickens. The resulting syndrome — of cows, hogs, poultry, grain, and pasture — which the immigrants brought with them from northwest Europe, was well adapted to the moraine and newer till plains, with their mixture of seasonally wet lands and fertile upland prairie. Land drainage, decline of the butter market, modern erosion-reduction techniques, heavier machinery, and new crops have broken the old syndrome. Hybrid corn and soy beans have replaced most of the rough pasture in this region, especially in the prairie till plains. But in 1964, poultry persisted as an important part of the farming picture — particularly in the German ethnic area from McLeod to Brown County and on the rolling moraine land southward from Scott to Freeborn County.

Turkey farming is concentrated in a small number of large producing units (p. 61). These farms cluster near the important processing centers and generally on the margins of the main agricultural region where land prices are moderate.

TABLE 9 — VALUE OF LIVESTOCK AND LIVESTOCK PRODUCTS SOLD, 1949 AND 1964

Animal or Product	Value (in millions of dollars)		Value per Animal Unit (in dollars)	
	1949	1964	1949	1964
Dairy Products	188	311	139	251
Cattle and Calves	170	303	120	137
Hogs and Pigs	189	157	40	27
Turkeys	20	50	6.2	3.6
Eggs	82	46	4.0	2.5
Sheep or Lambs	11	12	19	17
Chickens	15	8	0.9	0.4
Sheep or Lamb Wool	1.7	2.7	3.5	4.1

Source: U.S. Census of Agriculture, 1949 and 1964

Changing Patterns

Wheat was king among Minnesota crops from pioneer times until the turn of the Twentieth Century. No one crop dominates the map today as wheat did in 1879 (p. 62). Higher value crops have replaced wheat, and it has shifted westward to the semi-arid lands where higher value crops either cannot mature or yield very poorly. The wheat retreat westward and northward was well under way by 1920 (p. 62). Only the lower Red River Valley retains important wheat acreage today.

Flax acreage fluctuations illustrate the short run geographic impact of changing price relationships. Flax had been a subordinate but significant crop in western Minnesota before the European outbreak of World War II in 1939 (p. 63). The war shipping crisis required that the nation find domestic substitutes for Soviet and Argentine supplies. To encourage production, a relatively high support price was placed on flax. Farmers converted quickly throughout the main cash crop areas of the state, and soon Minnesota and North Dakota were matching the pre-war flax production rate of the entire Soviet Union (p. 63). The 1949 map reflects some of that expansion over 1939, and suggests the great shrinkage in flax acreage with generally lower prices from that time to 1964.

The northward advance of corn illustrates the impact of seed improvements upon the geographic pattern of crops (p. 64). In the quarter century from 1939 to 1964, the line of thirty percent of cropland in corn moved northward an average distance of one hundred miles; the growing season along the new grain-corn frontier was two weeks shorter and twenty percent cooler than it had been on the frontier 25 years earlier.

Soybeans have made the most spectacular invasion of the state since the wheat invasion of pioneer days (p. 65). The soybean advance illustrates the secondary impact, on crop patterns, of technologic change in industry and changes in world markets. Great new demands arose in American industry; then Japan's Manchurian supplies were cut off after World War II. The result has been a major increase in both domestic and export markets with an accompanying increase in acreage and production. Soybeans were scarcely grown in Minnesota in 1930. Subsequently, they have spread across the newer till plains of the prairie region and changed its agriculture to a predominantly cash crop system in many places.

Changes in the production patterns of most livestock have been characterized by concentration and specialization. Dairy cows, while in general decline, have increased slightly in the prairie-forest transition zone (p. 66). Hog population increases, on the other hand, have been very large. All of this rapid growth has taken place within the grain-corn areas of the southwestern prairie till plains and adjacent margins of the Big Moraine (p. 66). Chicken production, declining over-all, has two marked contrasts: rapid decline in the dairy-moraine transition zone and moderate increase in the traditional southern regions (p. 67). Booming turkey production, in contrast to the other patterns, has established a new pattern unrelated to its early beginnings in the southwestern prairie till plains (p. 67).

Farm Size and Ownership

The "industrial plants" which produce the state's agricultural output are the farms. These have decreased in number and increased in both size and complexity in the present century, especially since the advent of the tractor and automobile.

At the beginning of this century, farms were smallest in the areas of earliest settlement and greatest urbanization (p. 68). Throughout the prairie and forest transition zone, the average farm size tends to become larger toward the more recently plowed areas. Although "bonanza" farms in the Red River Valley had passed their peak, average holdings remained distinctly larger there than elsewhere in the state.

Between 1900 and 1920, farm size remained almost unchanged in the southern half of the state (p. 68). Corn and hogs replaced wheat as the dominant farm products, and intensity of land use increased in that area. Meanwhile, the number of farms was already diminishing, and farm size was increasing in the Red River Valley and the less fertile, poorly-drained eastern extension of the lake plain from Pennington and Roseau to Koochiching County.

These trends persisted through World War II and up to the early 1950's (p. 69). But, during this period farm-size actually decreased slightly in the southern part of the Big Moraine region,

south of the Twin Cities. This was an area of increasing off-farm work and persistence of traditional small dairy farming.

Since 1950, average farm size has jumped sharply in all parts of the state (p. 69). But the traditional regional patterns have generally remained. Areas of most rapid growth of average unit have been in the Red River Valley and the Southeast. In the latter region, the shift to bigger farms has been accompanied by a shift from traditional dairy farming to beef cattle grazing and feeding.

Absolute farm size has increased everywhere in the state in the tractor-auto era since 1920 (p. 70). But it has been slowest to respond in central southern Minnesota. These are the same counties in which feed grain-livestock production has become most intensive and has been further supplemented by cash soybeans, vegetables, and persistence of poultry production.

Percentage changes in farm size have been largest where farm land is least productive and farms are already comparatively large (p. 70). The areas of slowest growth in farm size in the prairie till plains are the same areas in which poultry growing has persisted. In the 1954-64 decade, slowest change in farm size has occurred where dairy farming has persisted and concentrated (p. 71).

Increasing farm size necessarily means decreasing numbers of farms. Although nearly one farm operating unit in every three has quit business since the beginning of the Great Depression, the ratio is only about one in five in the main farming region and about two of three in the Northeast (p. 72). Despite this great decline, total gross farm income has increased (Table 3, p. 27).

Most of these farmers own the places they operate. In Minnesota, as virtually everywhere in the world, tenant renters are most likely on farm land with the highest value (p. 72). Percentage of tenancy throughout the main agricultural region dropped sharply in the years of relatively high farm prices after World War II.

Investment, Income, and Value

Tractors provide one index of the intensity of investment in the farm "plant." The greater density of tractors in the areas of smallest farms reflects the use of smaller machines and, possibly, less efficiency (p. 73).

Land drainage is another indicator of investment in the farm "physical plant". Most of this activity has been on the richest, most nearly flat land of glacial origin (p. 74). In parts of the newer prairie till plains (centered on Renville County), the margins of the Red River Valley (Pennington and Marshall Counties), the Anoka Sand Plain, and Aitkin County, virtually all of the cultivated area is included in drainage districts (p. 74). But the heaviest investment in drainage has been in the newer till plains in the prairie, where ditching is accompanied by laying of tile systems under the fields (p. 75). Return on investment could be highest there because heat and moisture resources are greatest and a grain-corn-hog-soybean economy could be supported.

Gross farm income from products sold reflects very closely the over-all pattern of natural soil fertility (p. 75). In general, incomes in the Southwest are about five times as high as in the Northeast, about twenty times as high as in the rocky tip of the Arrowhead. The details behind this relationship are complex. For example, larger farm size offsets the effect of shorter growing season in the Red River Valley. Many different combinations of crops and livestock underlie similar total sales figures in different areas. Investment in fertilizer and land improvements has been greatest where initial returns from the virgin lands most justified further expenditure. Hence, the original rich lands have maintained or even increased their superiority despite a century of cropping.

Gross sales per acre generally reflect over-all natural productivity (p. 76). They peak in the warmest part of the prairie till plains, decline eastward to rougher areas, and northward in response to shorter growing season. The exception is the peak in the Twin Cities suburban truck farming area.

The state's farms have consistently derived about 65 percent of their total revenue from livestock and animal produce since 1929 (pp. 76-77). But regional specialization has sharpened considerably during the same period. The areas of flat land, high natural fertility, and greatest investment in drainage have shifted toward crop specialization.

This trend toward specialization is also reflected in the changing pattern of farm types (p. 78). The great increase in "miscellaneous and unclassified" farms shows specialization which is difficult to fit into the rigidly defined Census farm types. "General"

farming no longer dominates in any county. In the prairie-forest transition zone, this decline is the conversion from "general" farms to "cash-grain" or "dairy" farms. This conversion resulted from the northern expansion of corn and soybean acreages in recent decades and the failure of small "general" farms (pp. 79-80).

A major direct source of farm income has been the various support programs of the U. S. Department of Agriculture. These have had varying geographical impacts. The early crop price support programs, illustrated on the 1954 map, had their main impact throughout the cash crop regions (p. 80). They were relatively most important in the margins of the lower Red River Valley, where these subsidies encouraged a substantial increase in marginal crop land.

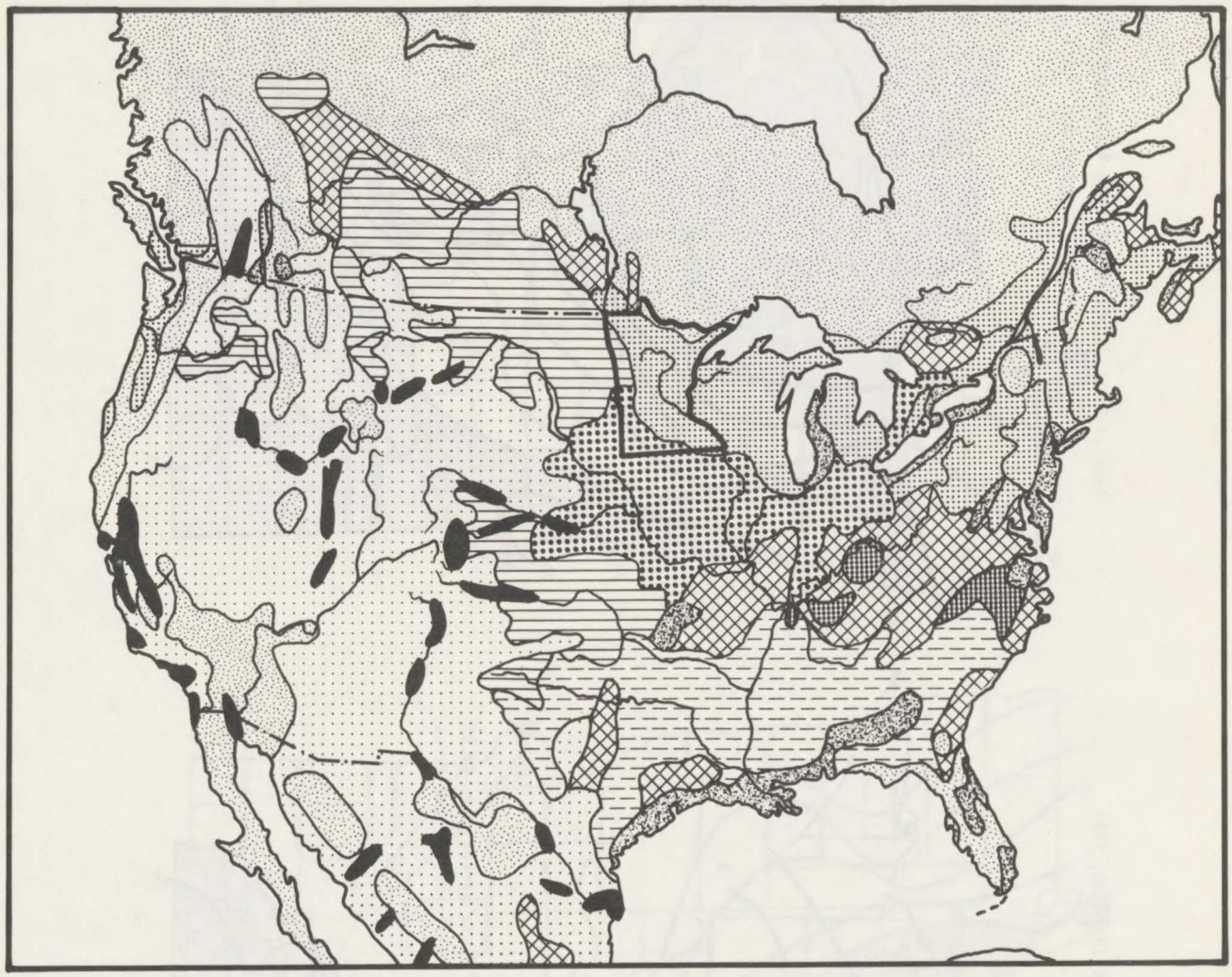
The Soil Bank program had its major impact in marginal areas, where it encouraged accelerated abandonment of crop land (p. 81). The forest fringe zone between the lower Red River Valley and Lake of the Woods was an area of maximum participation in the Soil Bank program. This was the last area of significant advance of the agricultural frontier and also an area of maximum impact of price support programs upon farm income.

Participation in the combined feed grains and soil bank programs in 1964 was more evenly distributed across the state, although intensity remained especially high on the northern extremity of the Lake Agassiz Plain and the Anoka Sand Plain (p. 81).

"Class I" farms and Part-time farms occupy opposite ends of the farm product sales spectrum. Class I farms, which account for only 2.6 percent of all farms in the state, but produce 20 percent of gross sales, are almost entirely within the prairie counties (p. 82). In the transition region of below-average farm income, and also in areas of high urban job opportunities, one-fifth to one-half of the farmers have non-farm work at least three months of the year (p. 82). In the Northeast, most farmers are part-time. Part-time farmers account for nearly one-tenth of the total even in the southwestern prairie counties.

Value of land and buildings per farm reflects the value of products sold and the inherent value of the land (p. 83). It suggests the accuracy with which the land market reflects productivity. The pattern reflects soil fertility differences more accurately in 1964 than it did at the turn of the century because there has been more time for investment in farm improvements in the newer, western counties and more time for farm enlargement in the Red River Valley. Farm values also reflect expansion pressures around the fringes of the Twin Cities much more in the auto era than they did in the street car era. Value of farm land and buildings per acre also reflects value of sales per acre and inherent agricultural productivity of the soil and climate together with the growing impact of the Twin Cities suburban land market (p. 84).

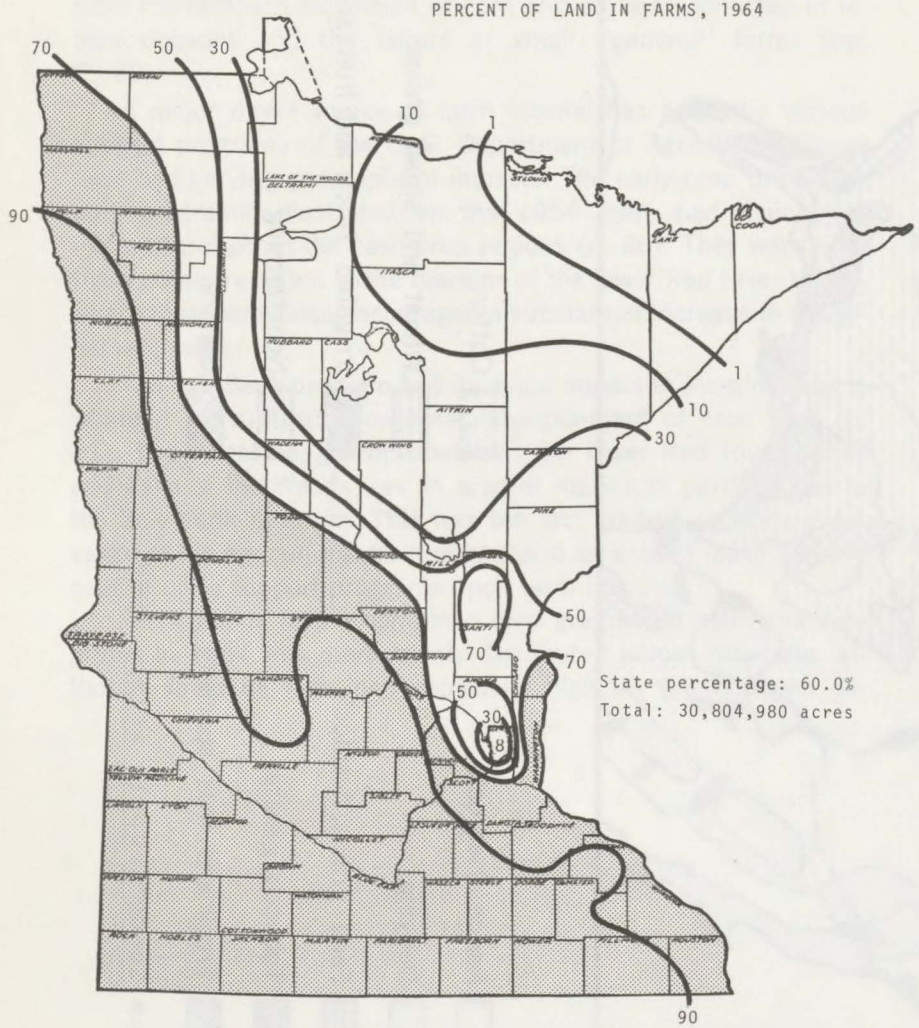
TYPES OF FARMING



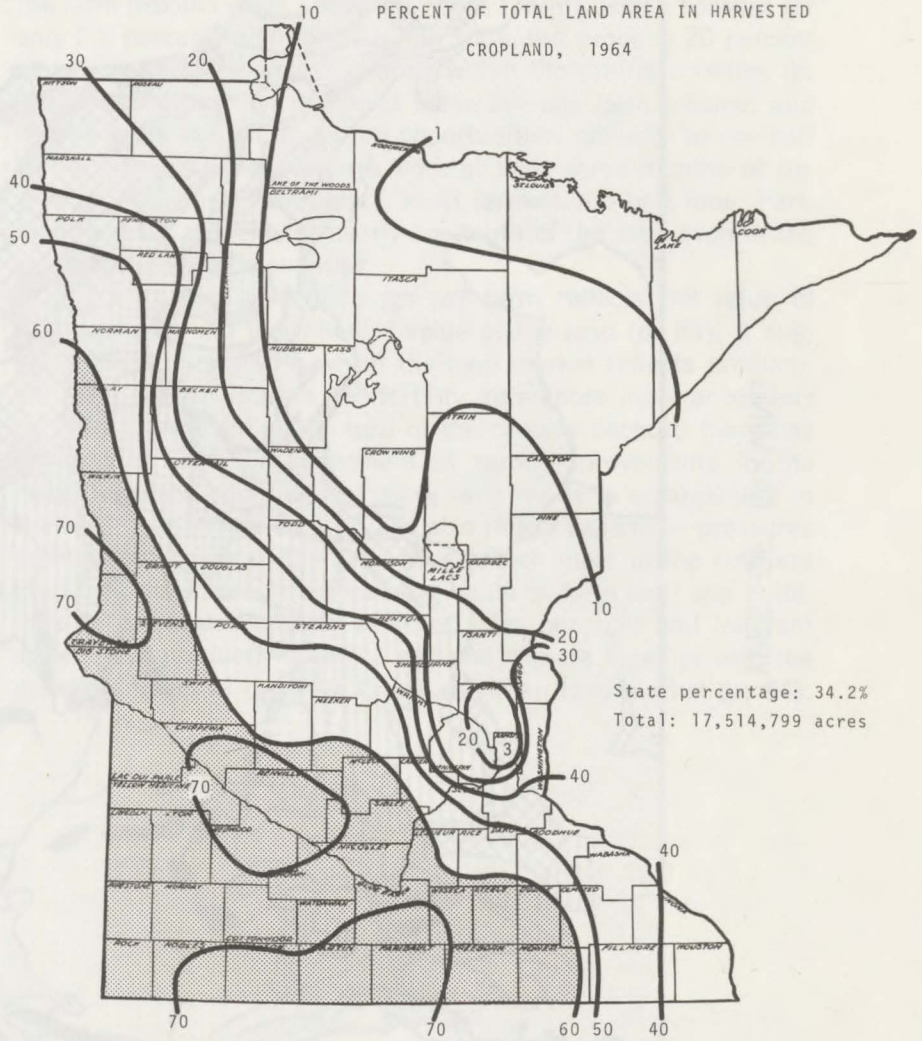
- Range livestock
- Dairying
- Feed grains/livestock
- Tobacco/general
- Truck and fruit specialty
- Cotton
- Wheat and small grains
- Irrigated truck and fruit specialty
- Non-farming
- General

from Goode's World Atlas, 1964

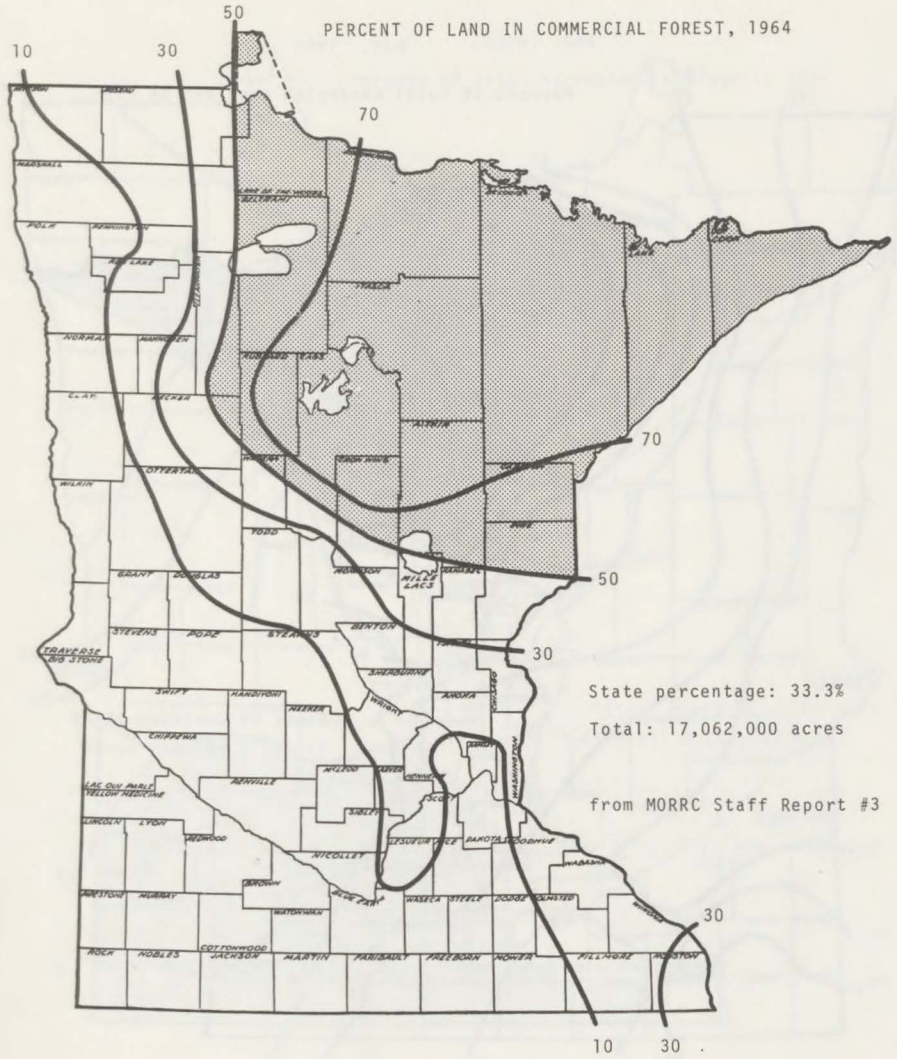
PERCENT OF LAND IN FARMS, 1964



PERCENT OF TOTAL LAND AREA IN HARVESTED CROPLAND, 1964



PERCENT OF LAND IN COMMERCIAL FOREST, 1964



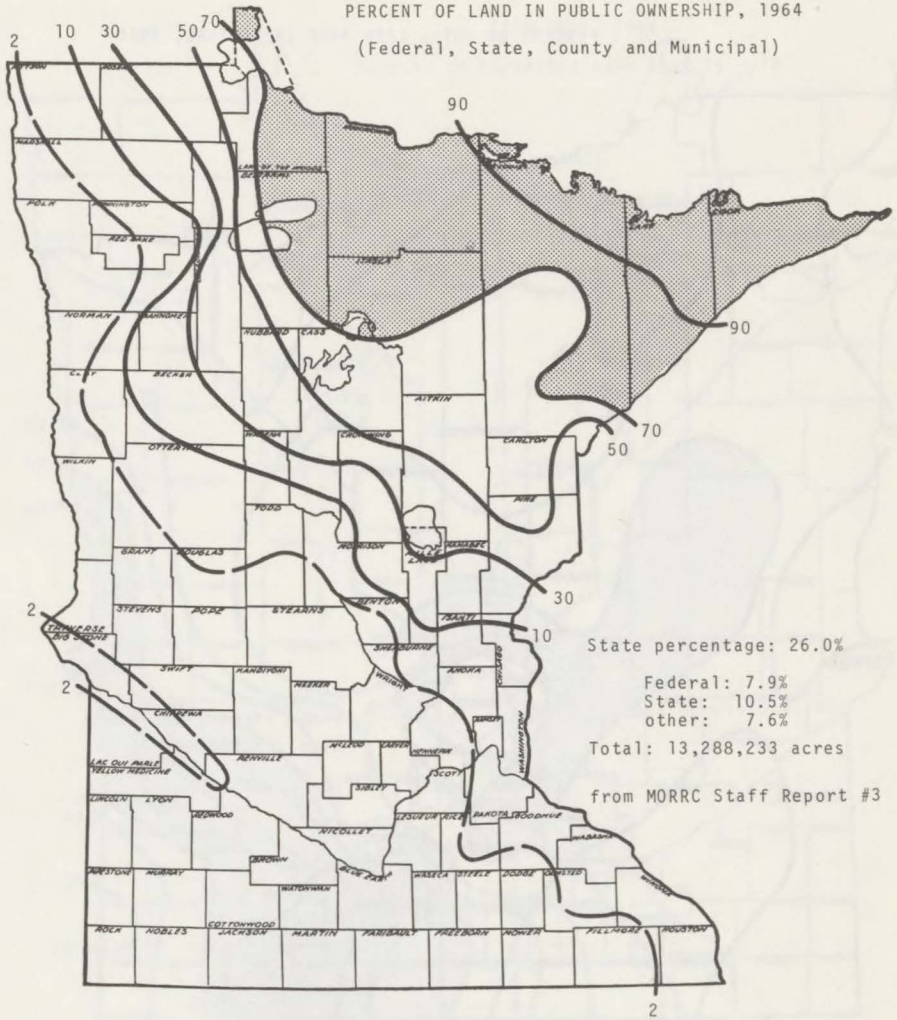
State percentage: 33.3%

Total: 17,062,000 acres

from MORRC Staff Report #3

PERCENT OF LAND IN PUBLIC OWNERSHIP, 1964

(Federal, State, County and Municipal)



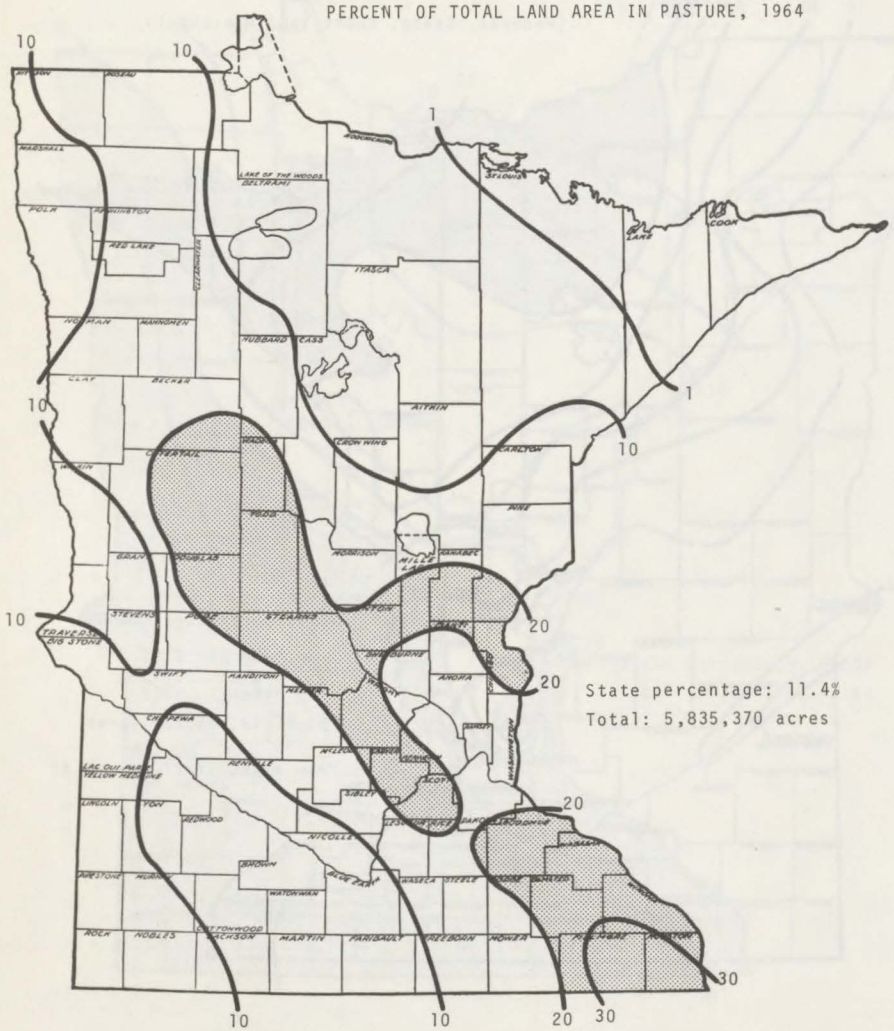
State percentage: 26.0%

Federal: 7.9%
State: 10.5%
other: 7.6%

Total: 13,288,233 acres

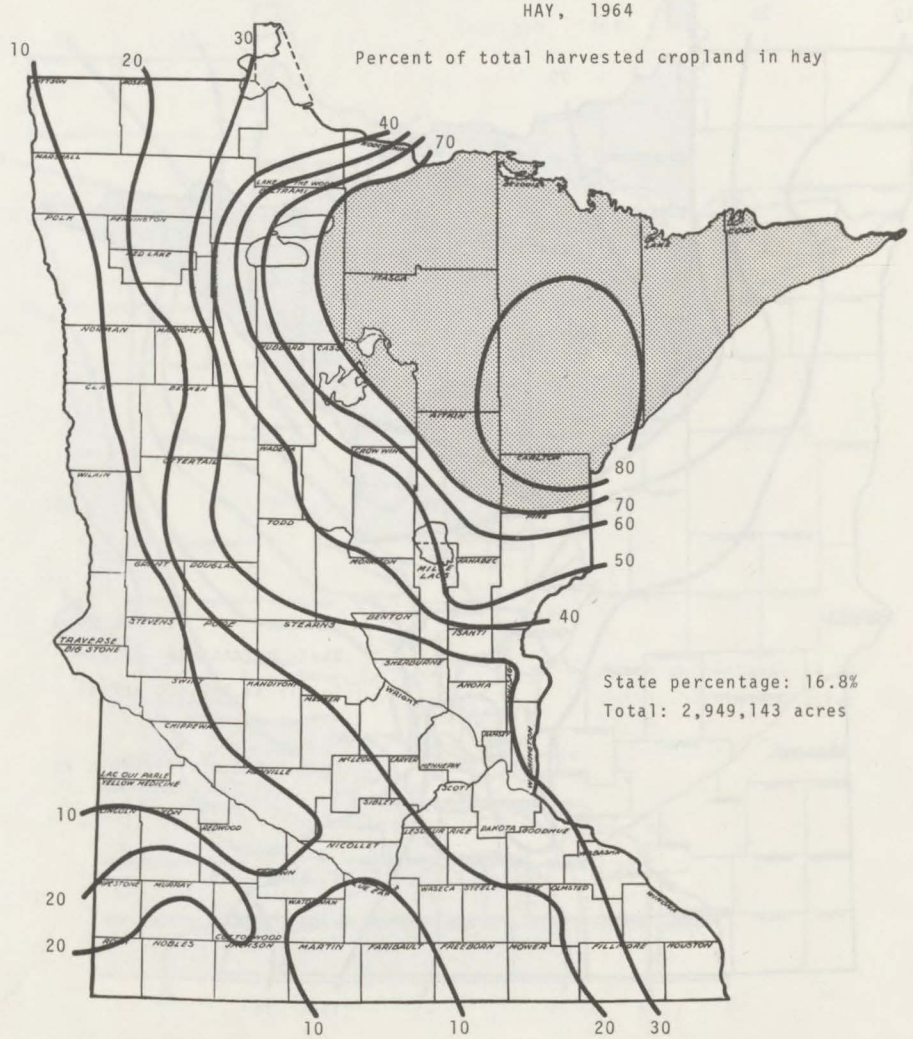
from MORRC Staff Report #3

PERCENT OF TOTAL LAND AREA IN PASTURE, 1964



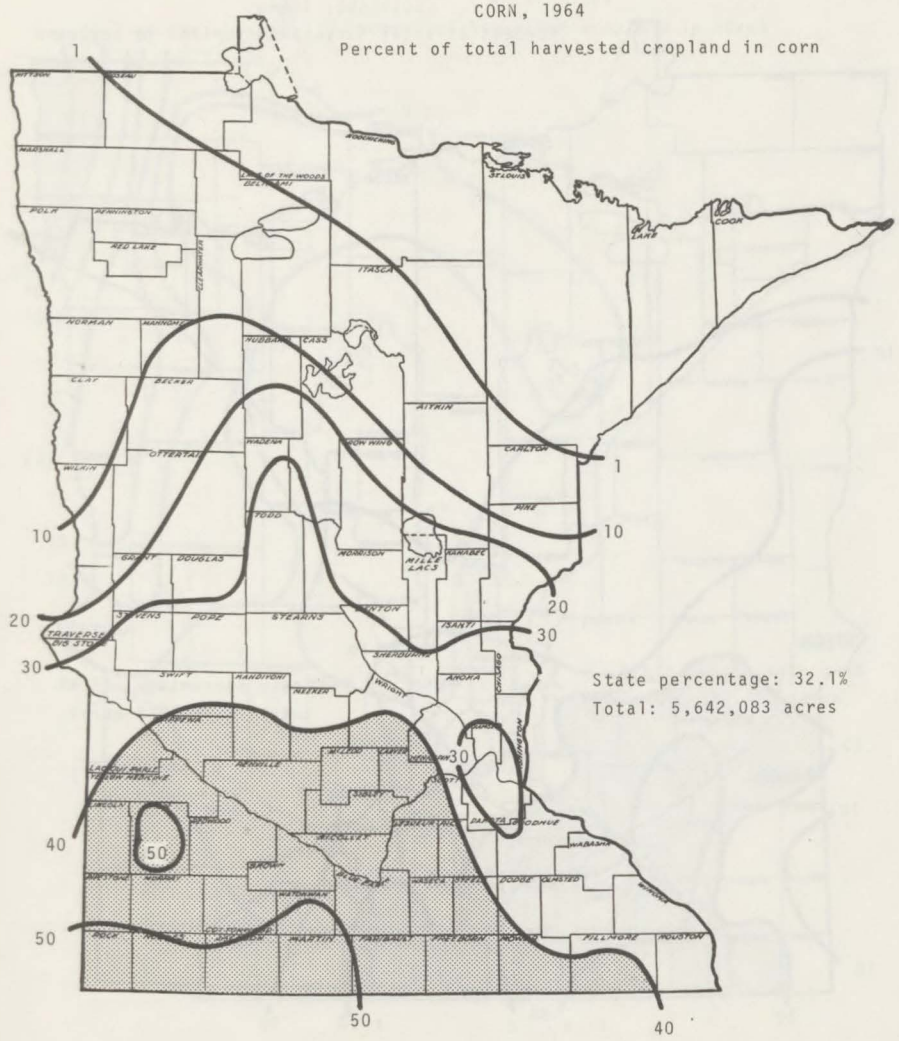
HAY, 1964

Percent of total harvested cropland in hay



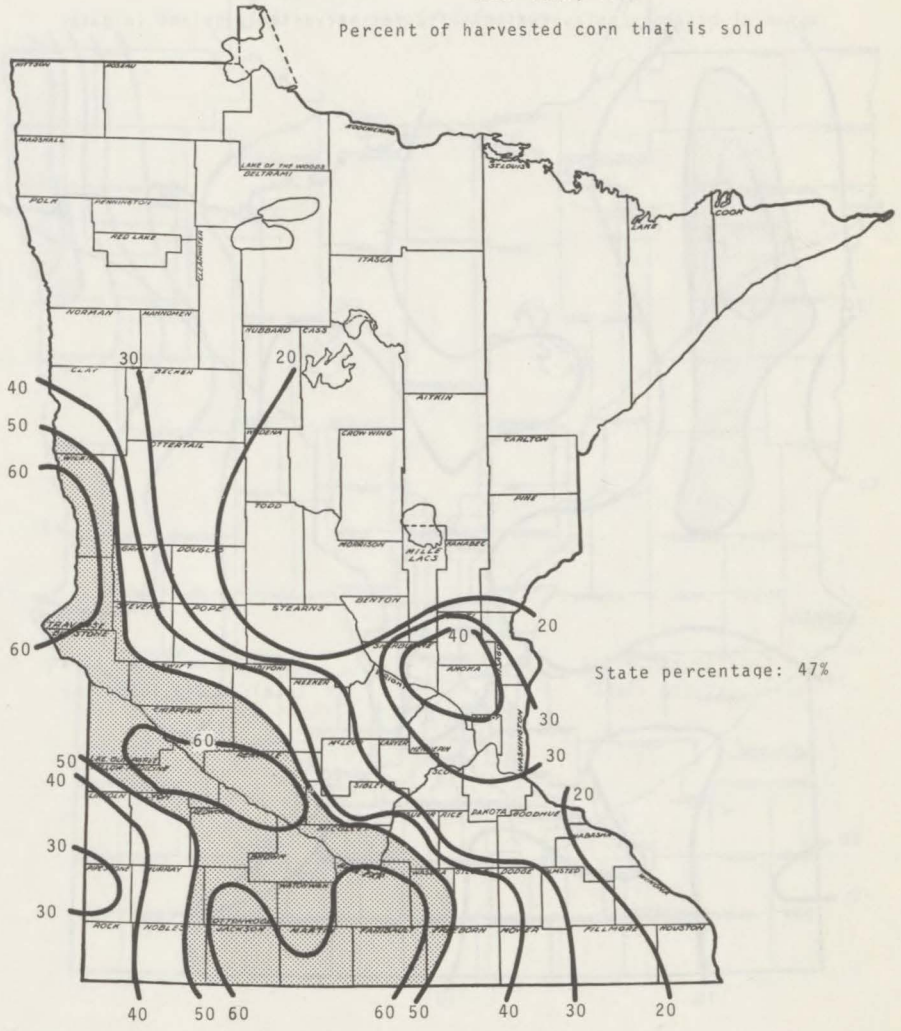
CORN, 1964

Percent of total harvested cropland in corn



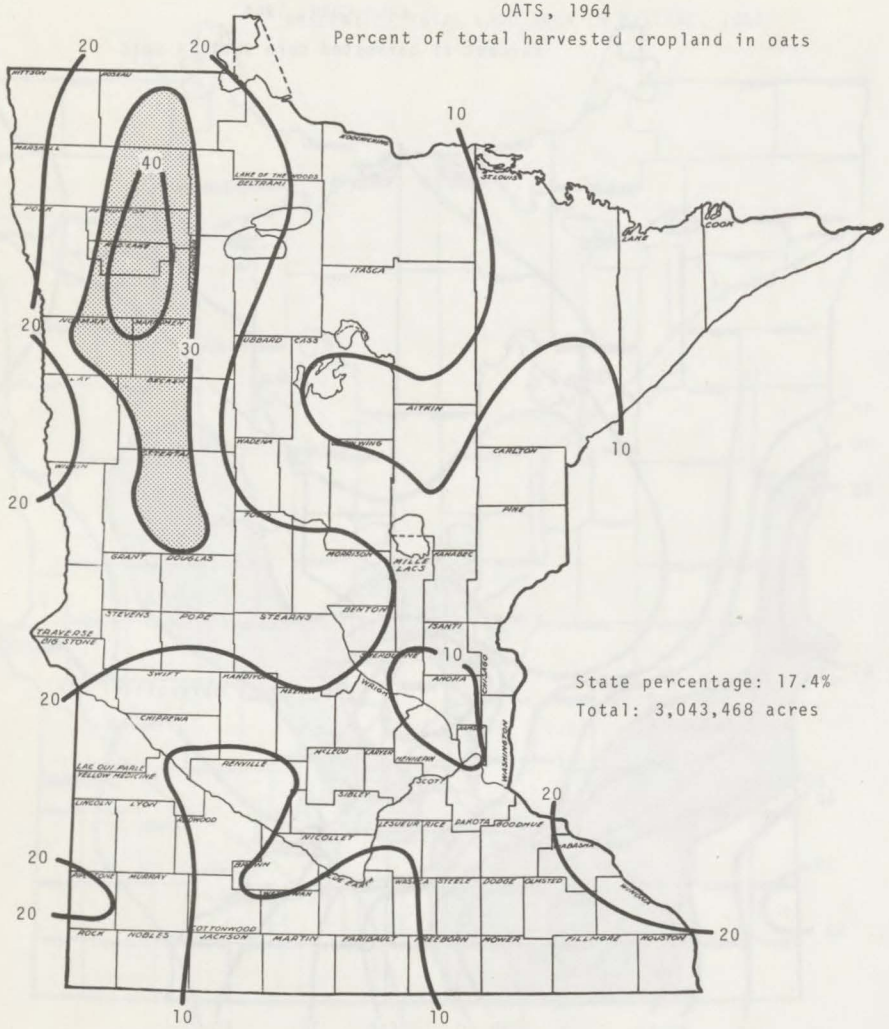
CASH CORN, 1964

Percent of harvested corn that is sold



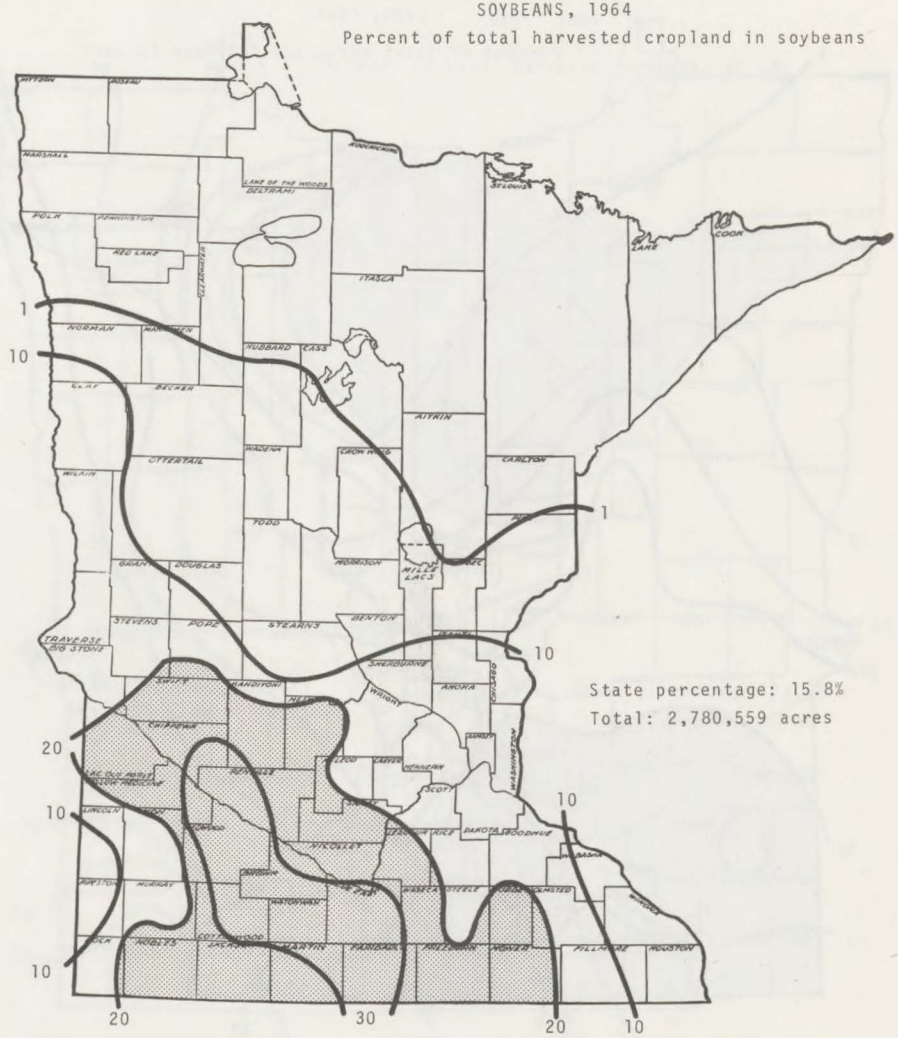
OATS, 1964

Percent of total harvested cropland in oats



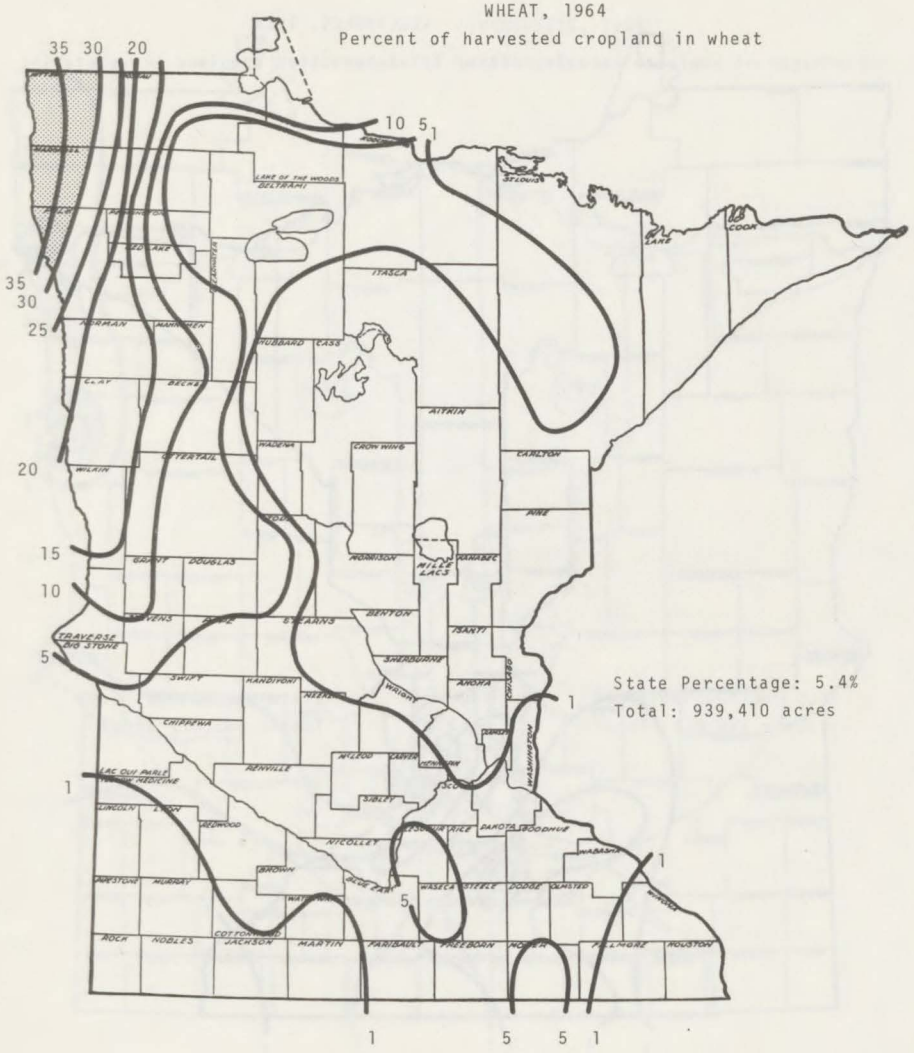
SOYBEANS, 1964

Percent of total harvested cropland in soybeans



WHEAT, 1964

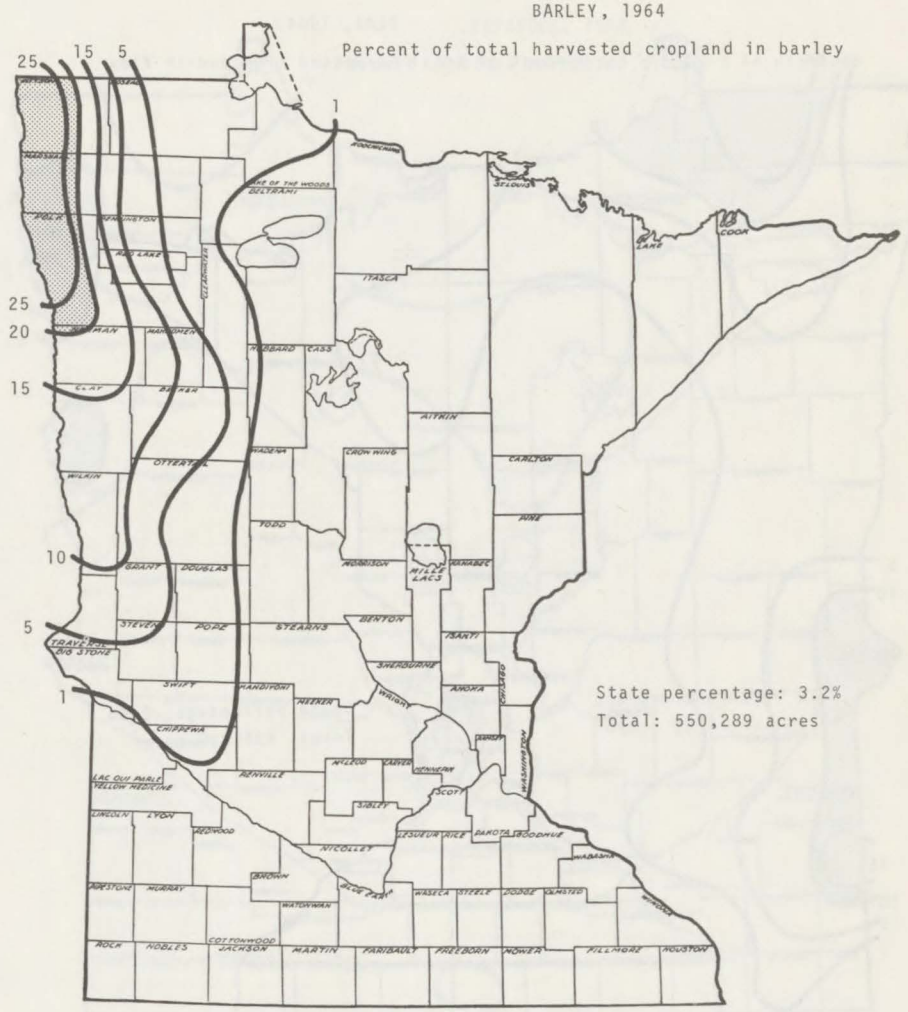
Percent of harvested cropland in wheat



State Percentage: 5.4%
Total: 939,410 acres

BARLEY, 1964

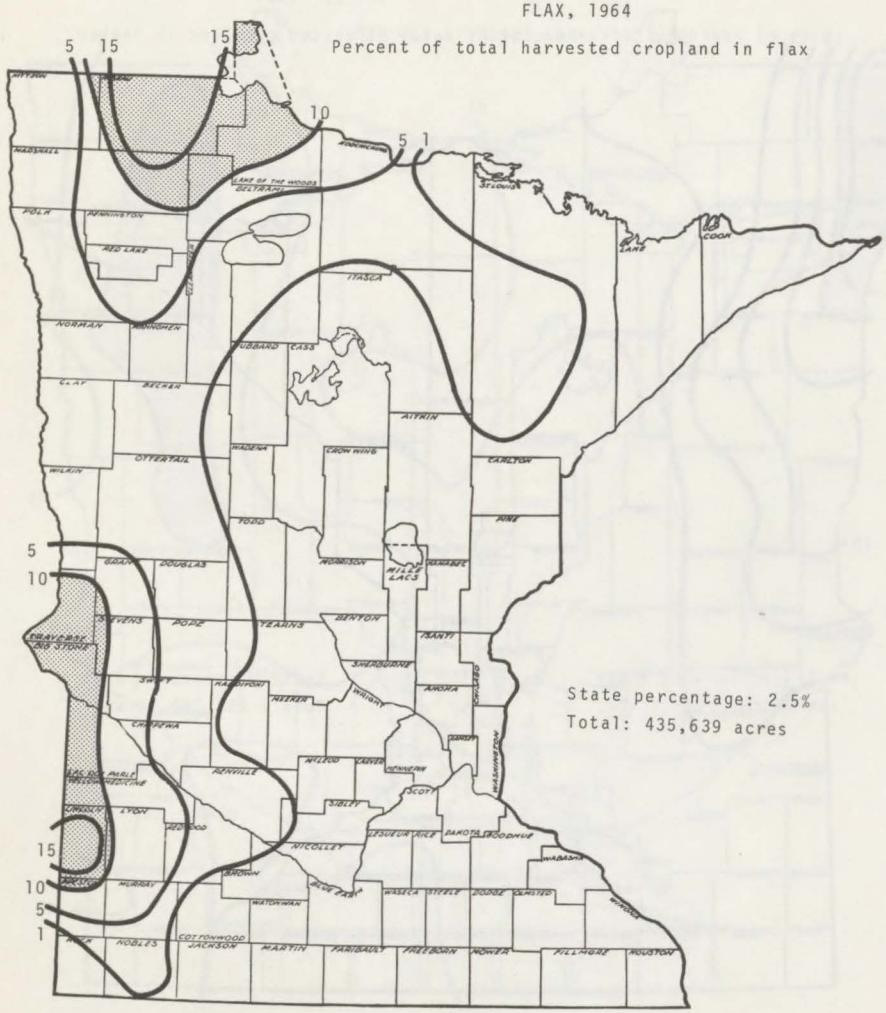
Percent of total harvested cropland in barley



State percentage: 3.2%
Total: 550,289 acres

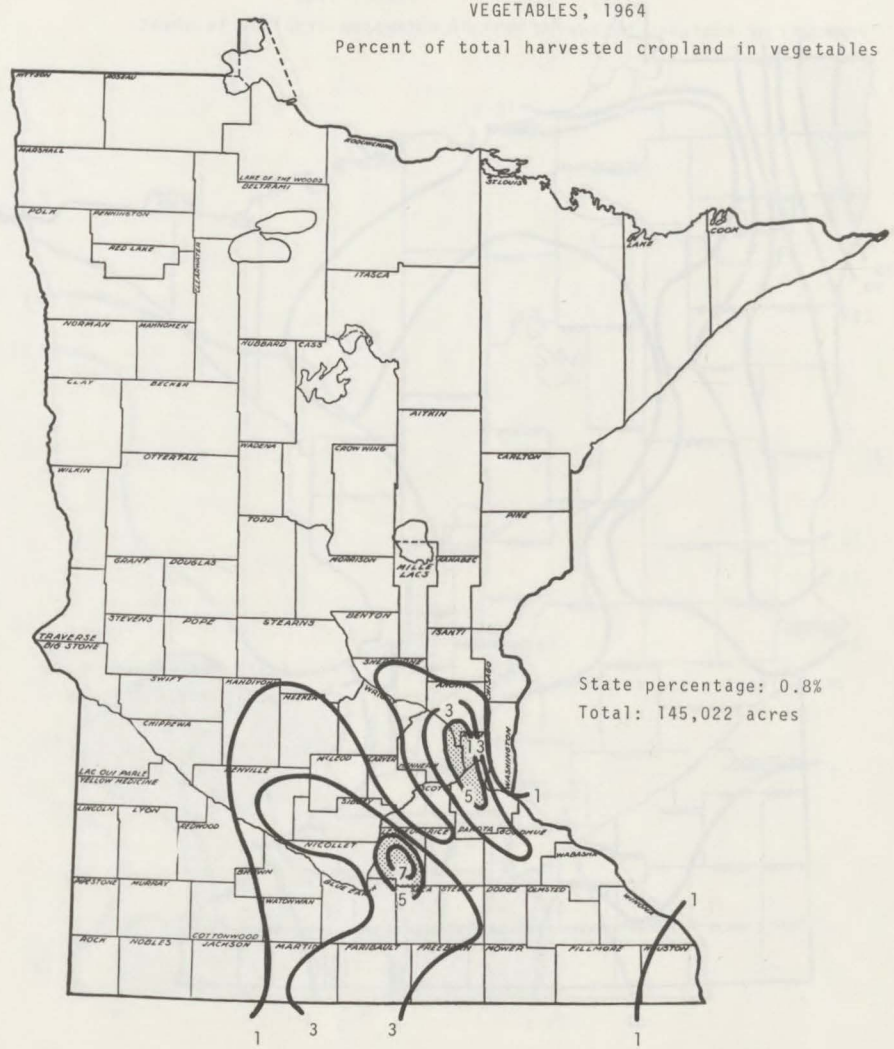
FLAX, 1964

Percent of total harvested cropland in flax



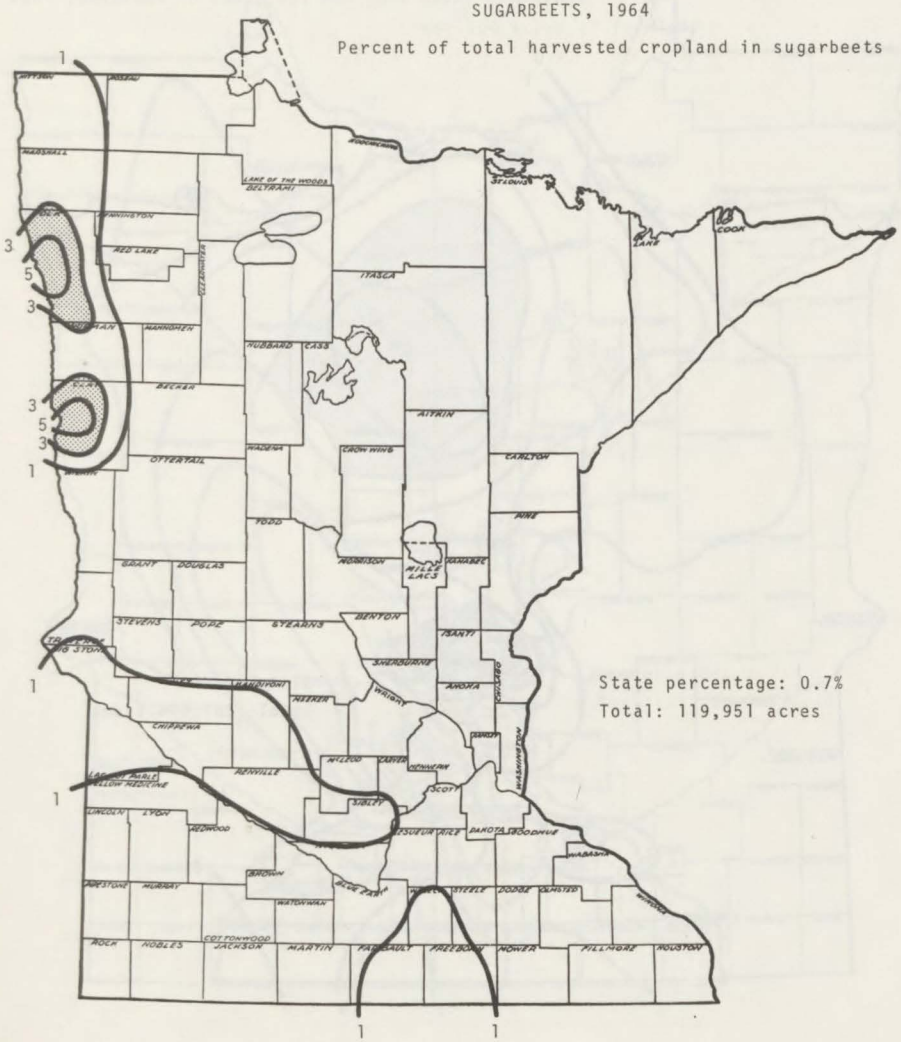
VEGETABLES, 1964

Percent of total harvested cropland in vegetables



SUGARBEETS, 1964

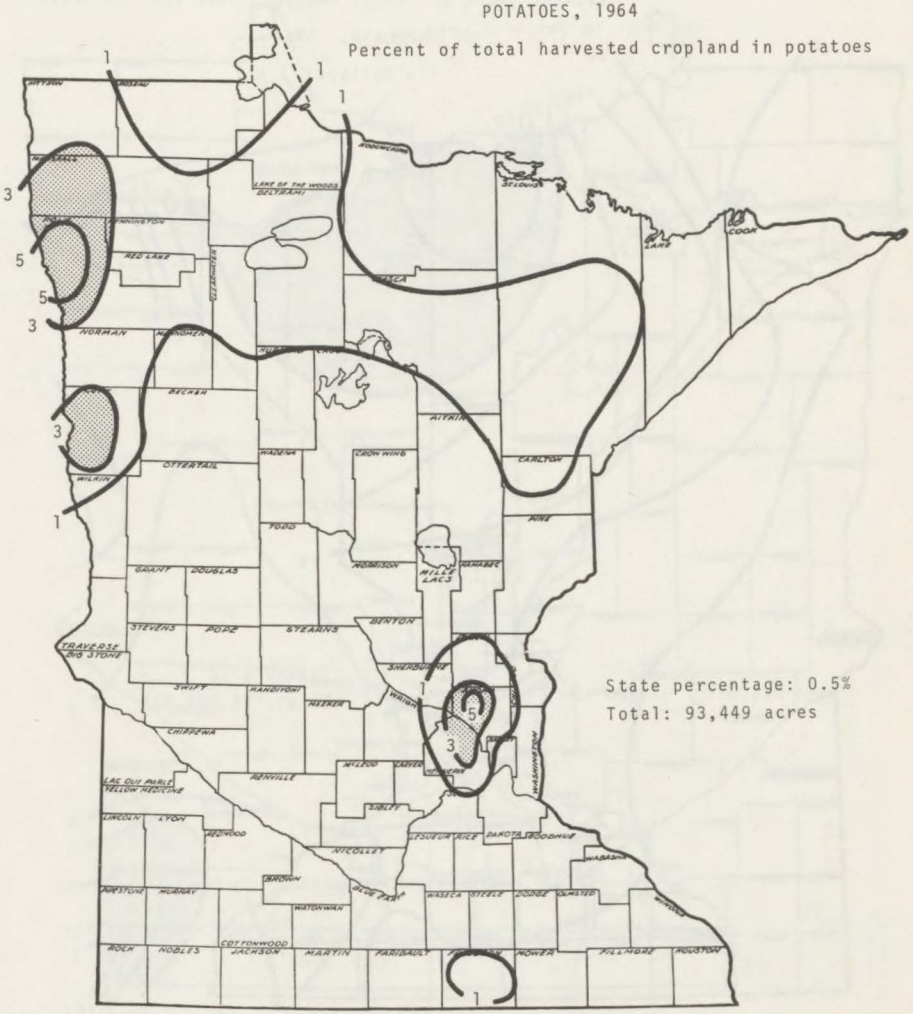
Percent of total harvested cropland in sugarbeets



State percentage: 0.7%
Total: 119,951 acres

POTATOES, 1964

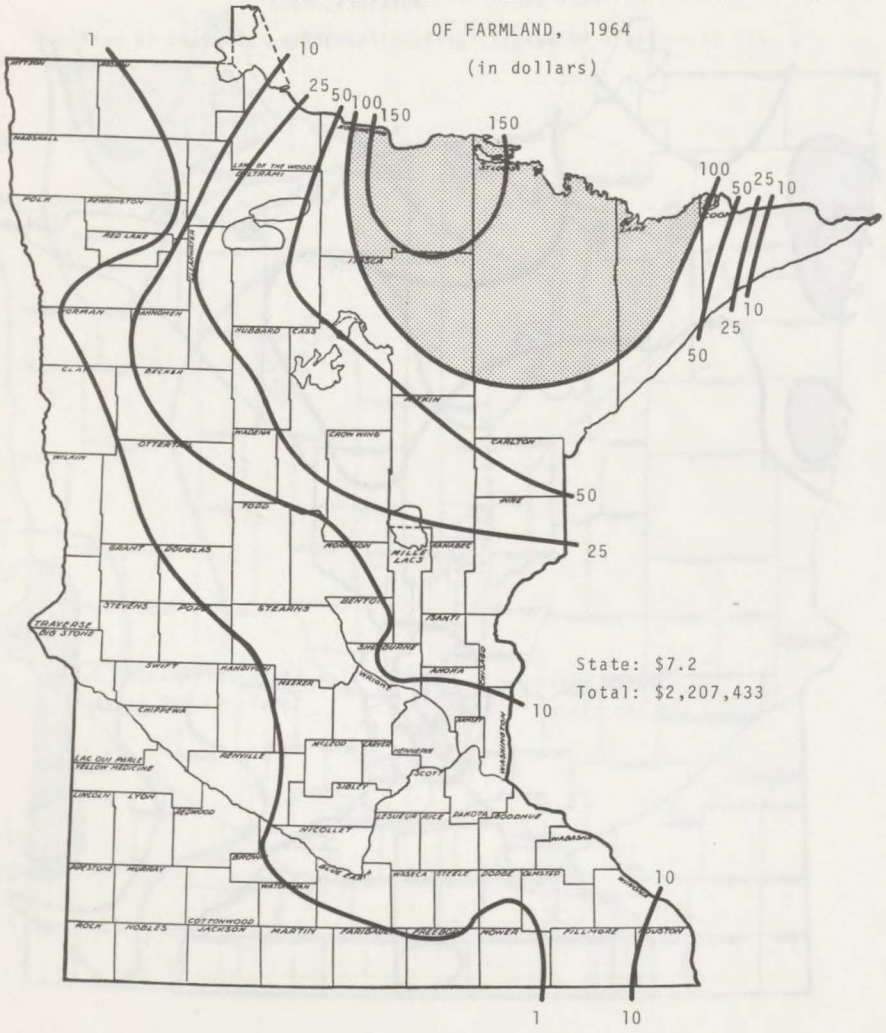
Percent of total harvested cropland in potatoes



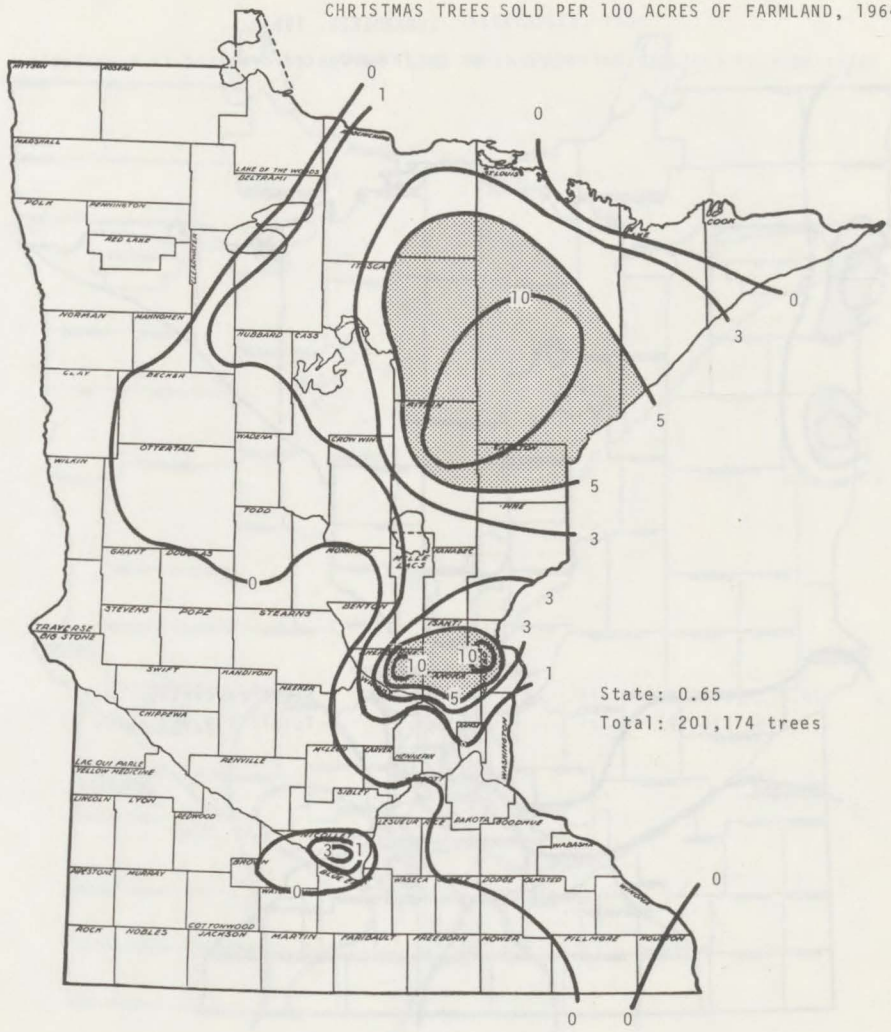
State percentage: 0.5%
Total: 93,449 acres

AVERAGE VALUE OF FOREST PRODUCTS SOLD PER 100 ACRES OF FARMLAND, 1964

(in dollars)

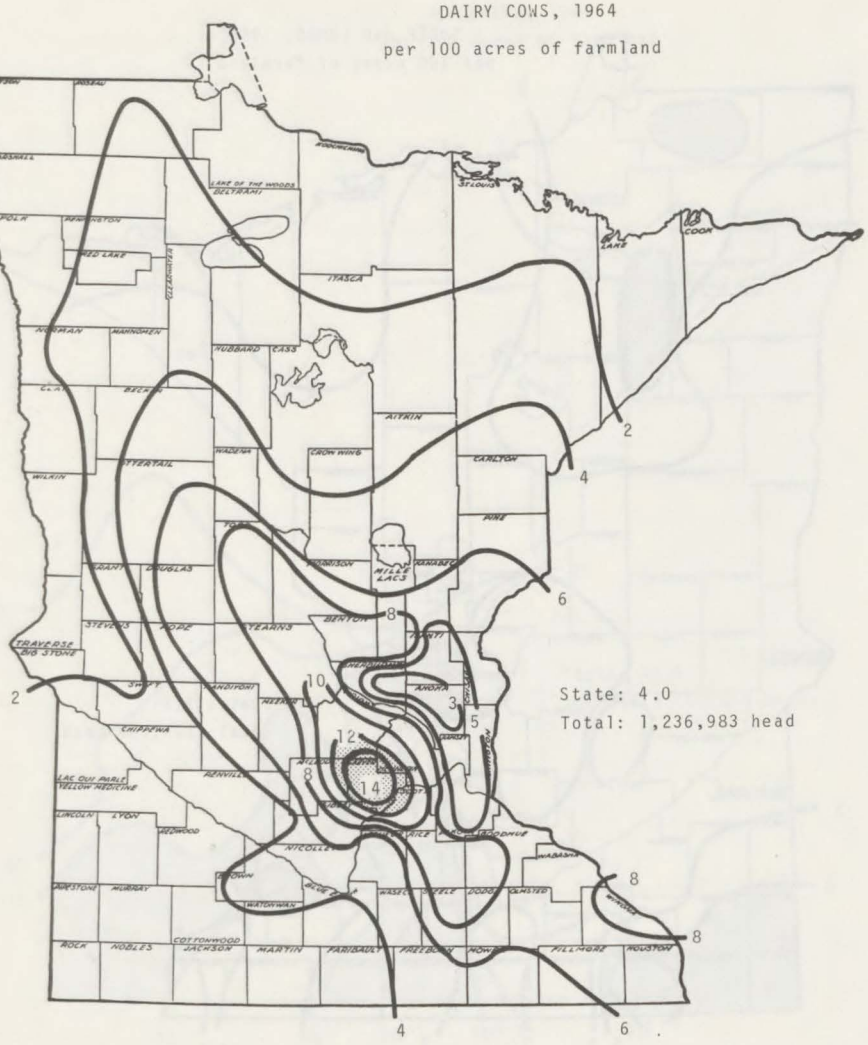


CHRISTMAS TREES SOLD PER 100 ACRES OF FARMLAND, 1964



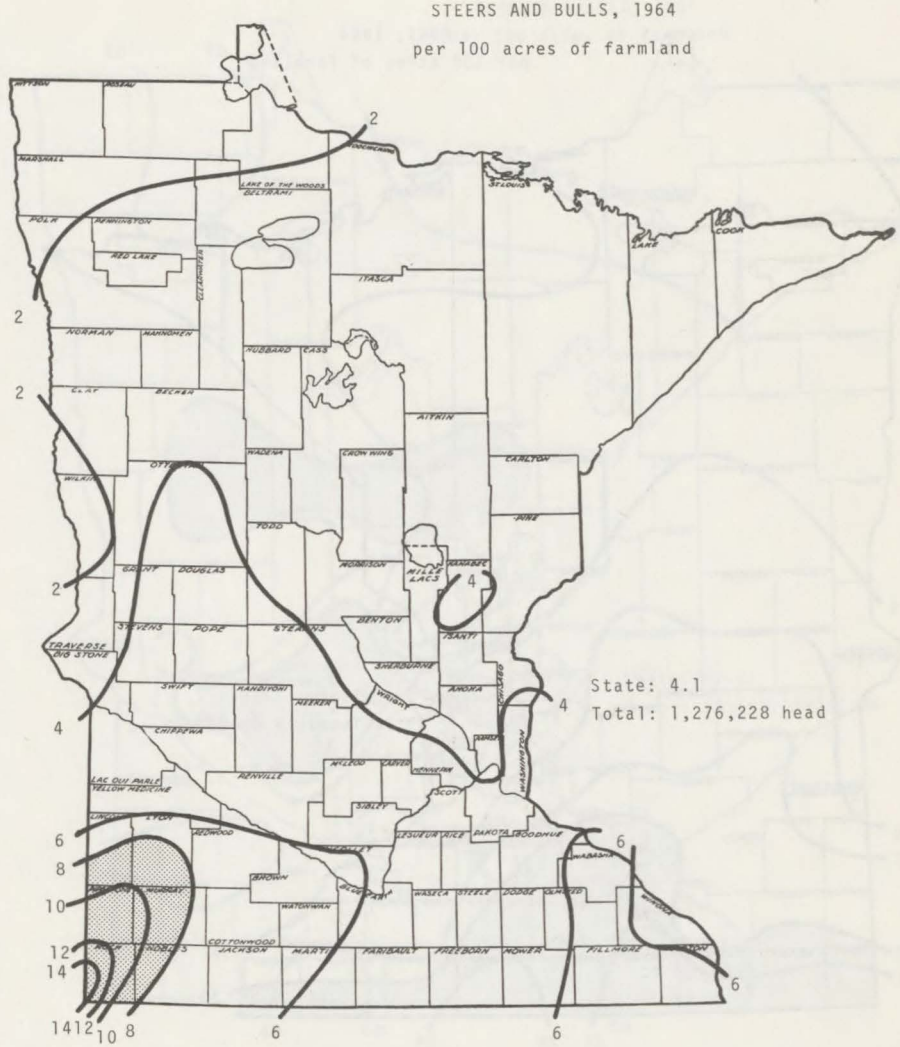
DAIRY COWS, 1964

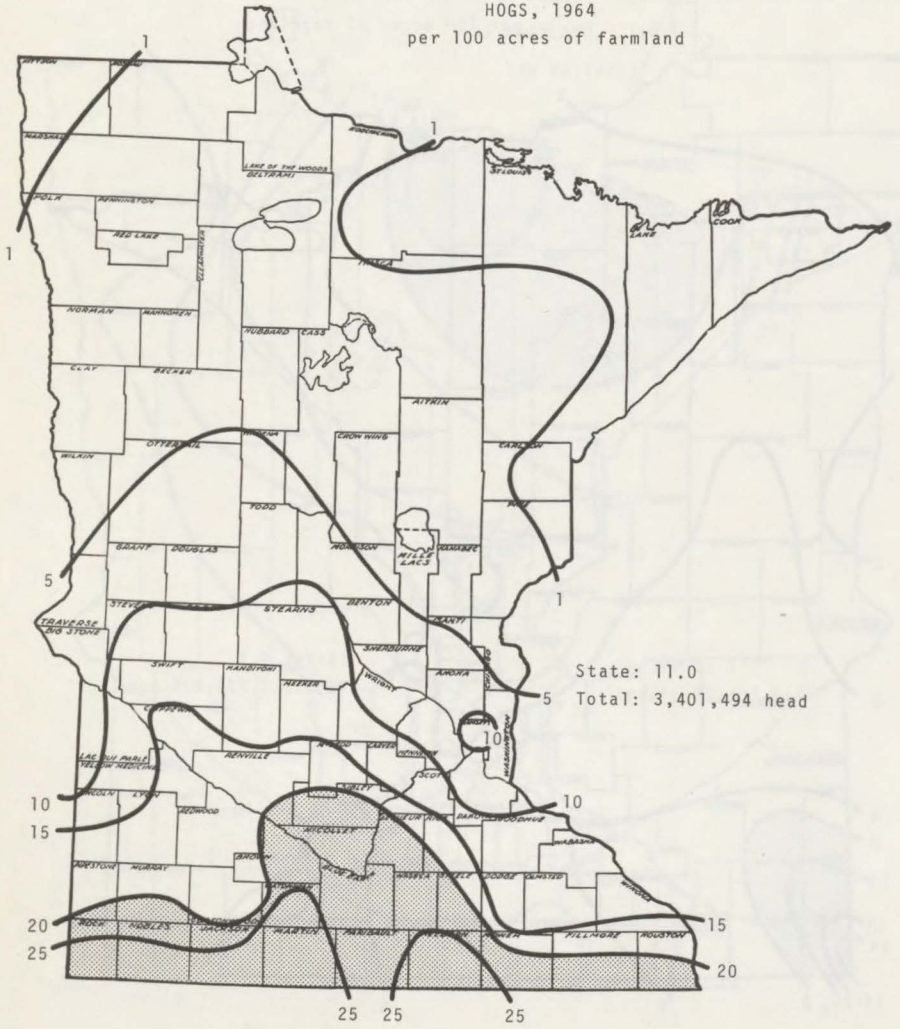
per 100 acres of farmland

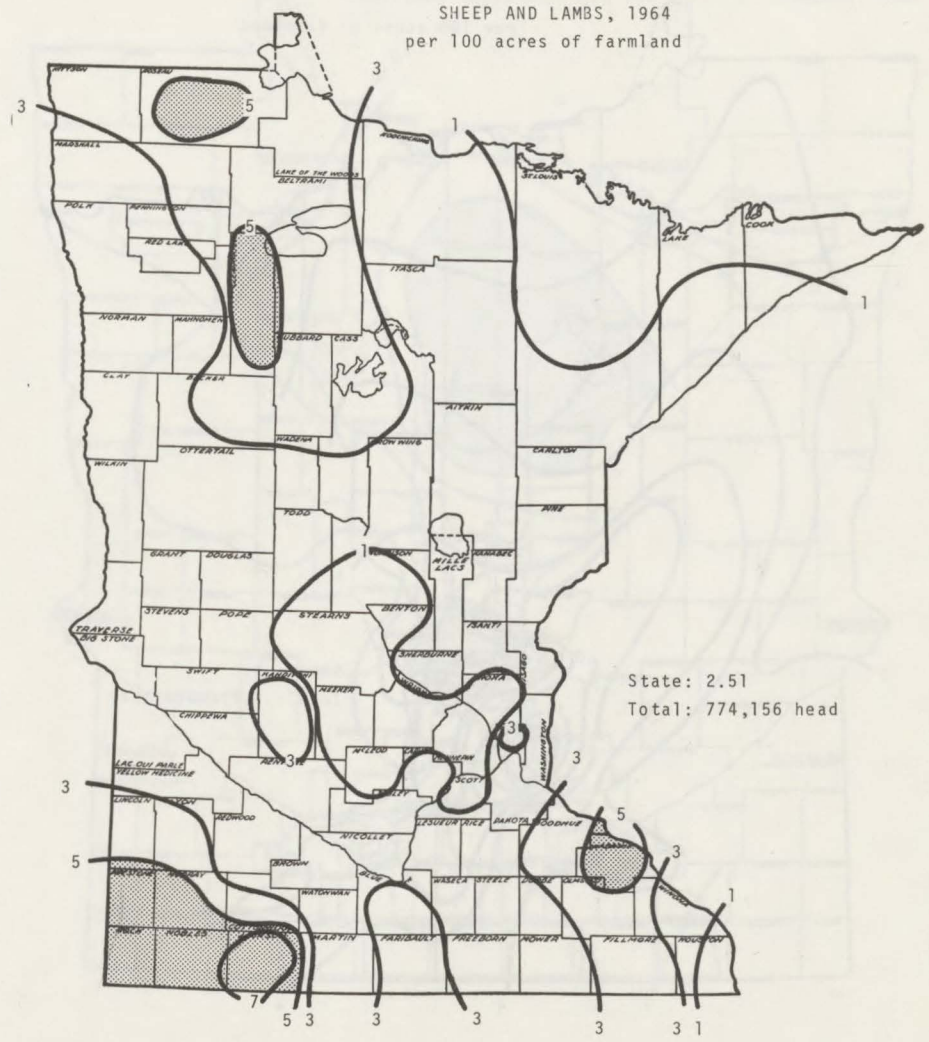


STEERS AND BULLS, 1964

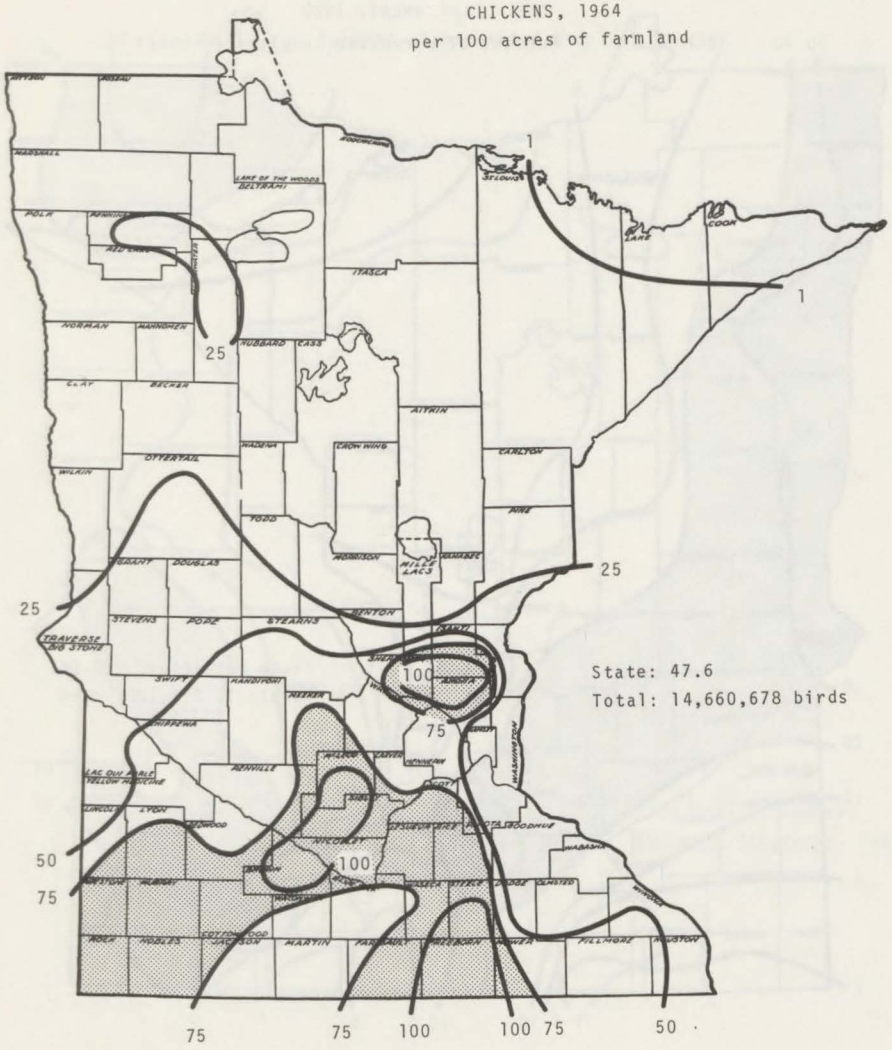
per 100 acres of farmland




HOGS, 1964
per 100 acres of farmland
State: 11.0
Total: 3,401,494 head

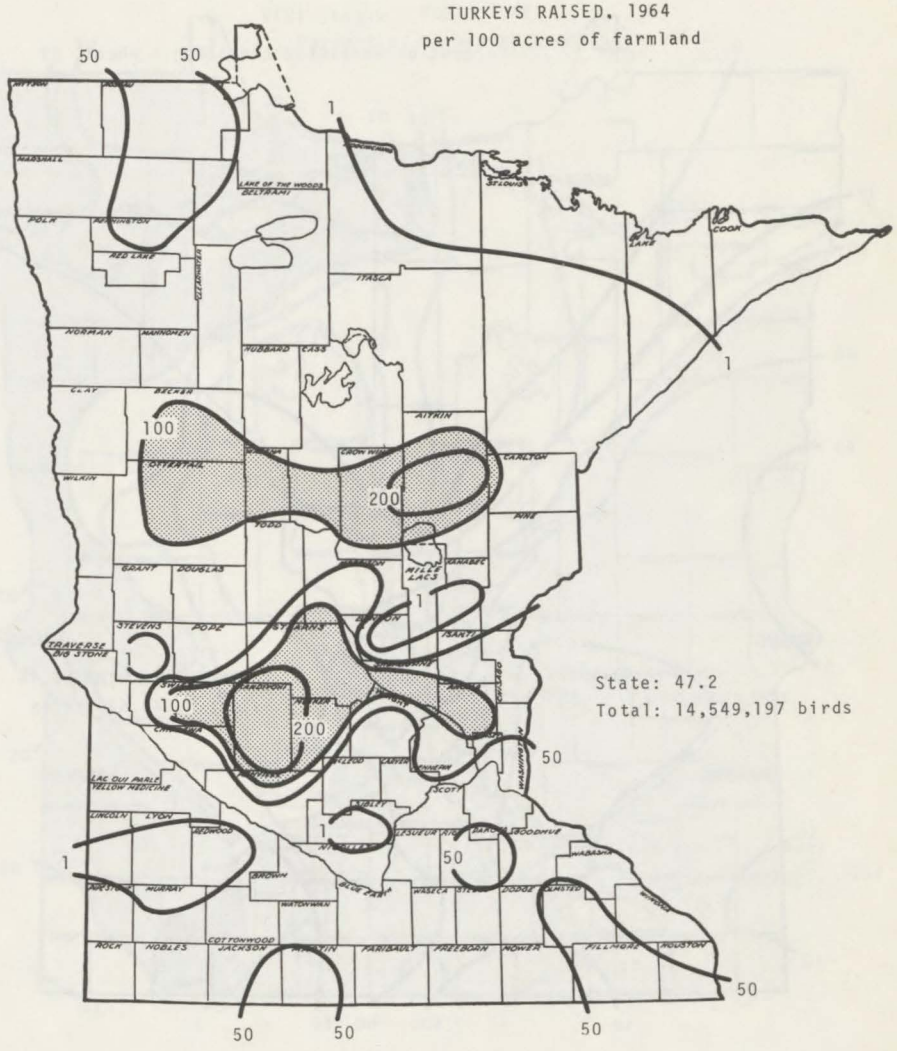

SHEEP AND LAMBS, 1964
per 100 acres of farmland
State: 2.51
Total: 774,156 head

CHICKENS, 1964
per 100 acres of farmland



State: 47.6
Total: 14,660,678 birds

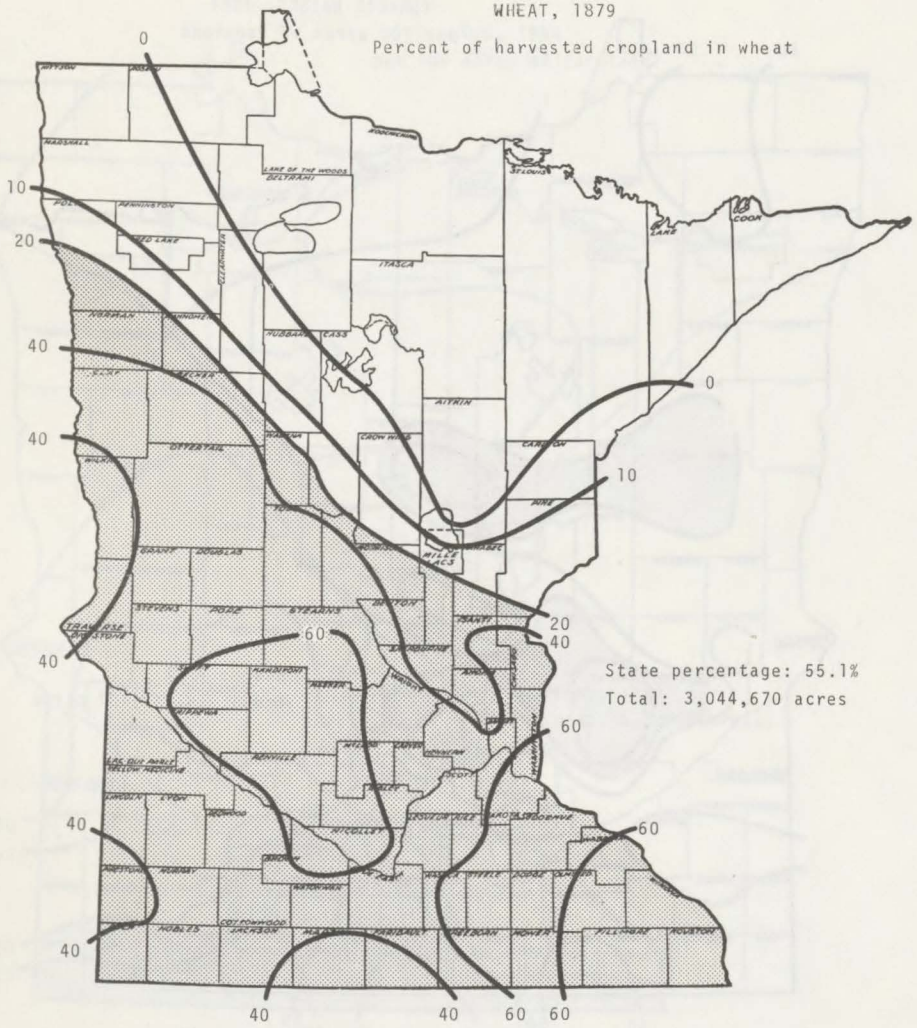
TURKEYS RAISED, 1964
per 100 acres of farmland



State: 47.2
Total: 14,549,197 birds

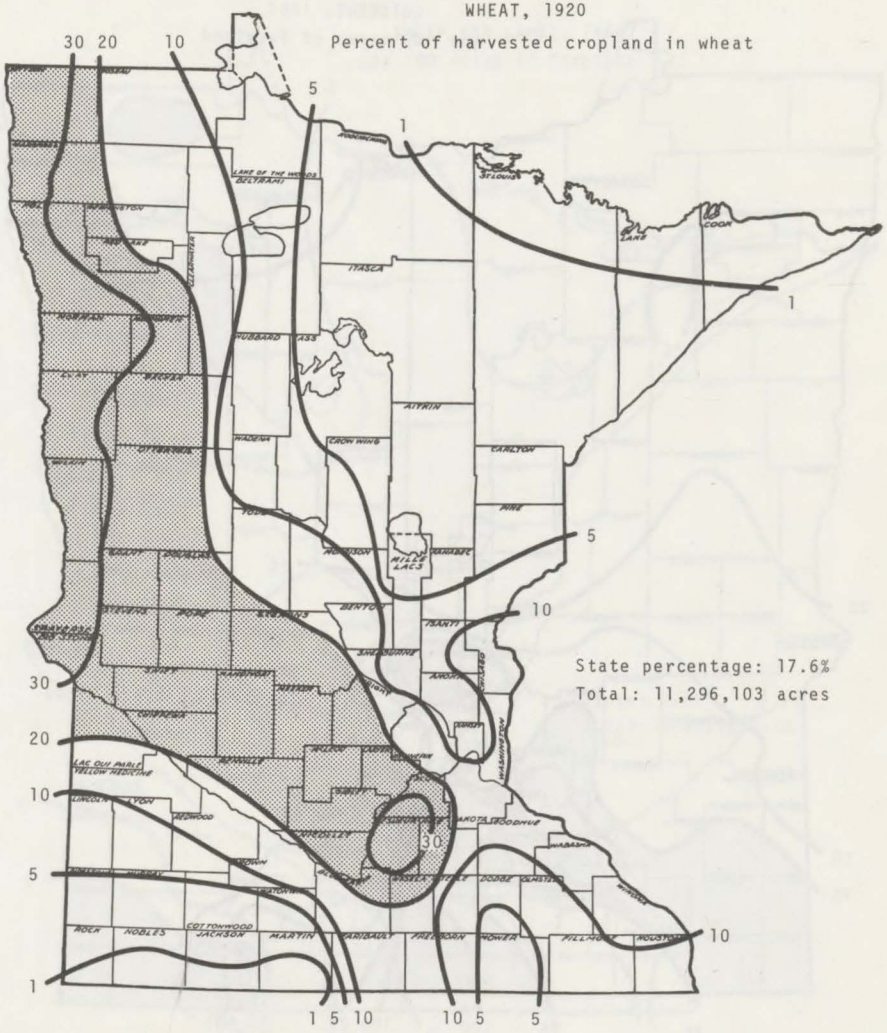
WHEAT, 1879

Percent of harvested cropland in wheat



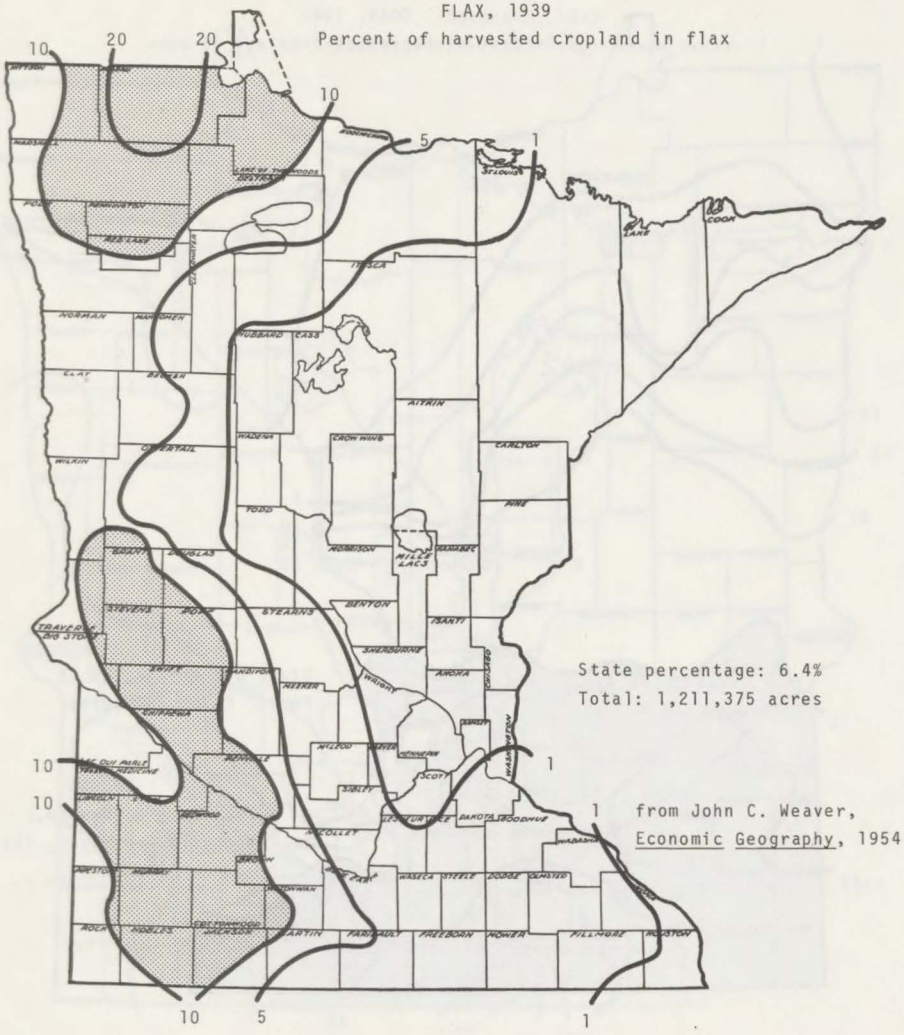
WHEAT, 1920

Percent of harvested cropland in wheat



FLAX, 1939

Percent of harvested cropland in flax

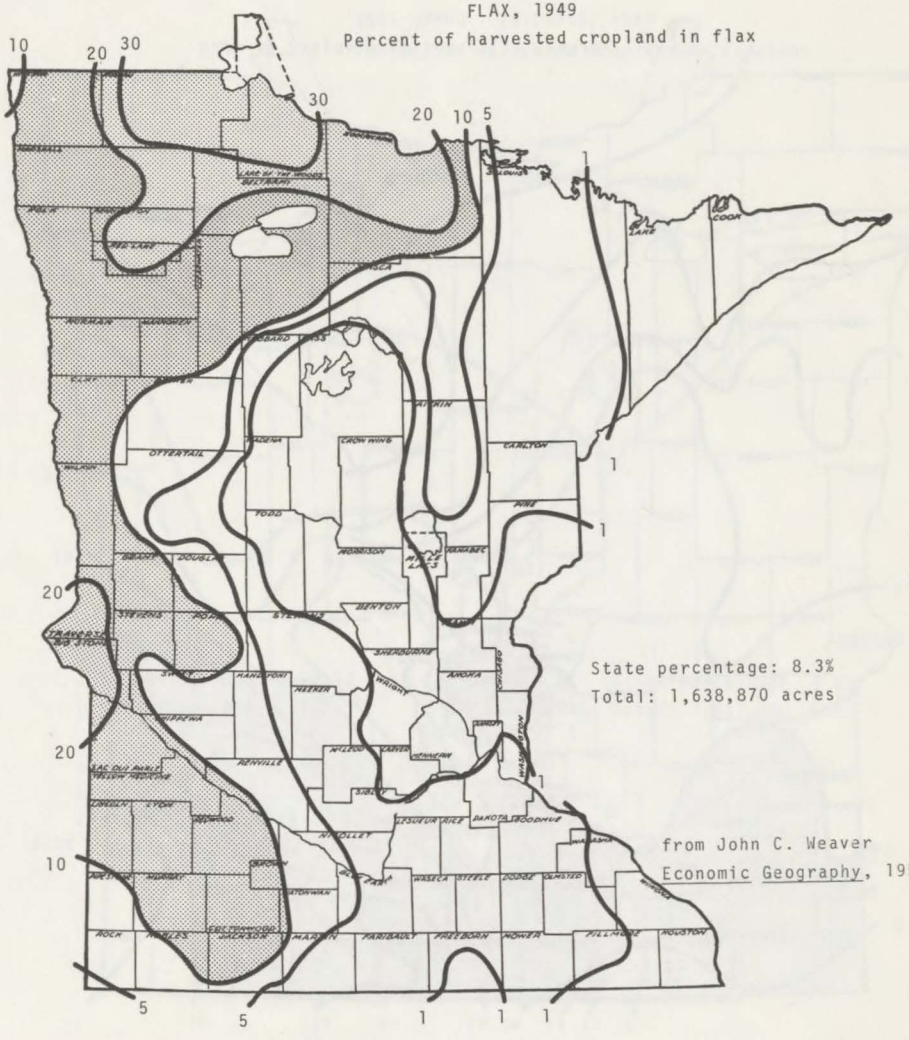


State percentage: 6.4%
Total: 1,211,375 acres

from John C. Weaver,
Economic Geography, 1954

FLAX, 1949

Percent of harvested cropland in flax

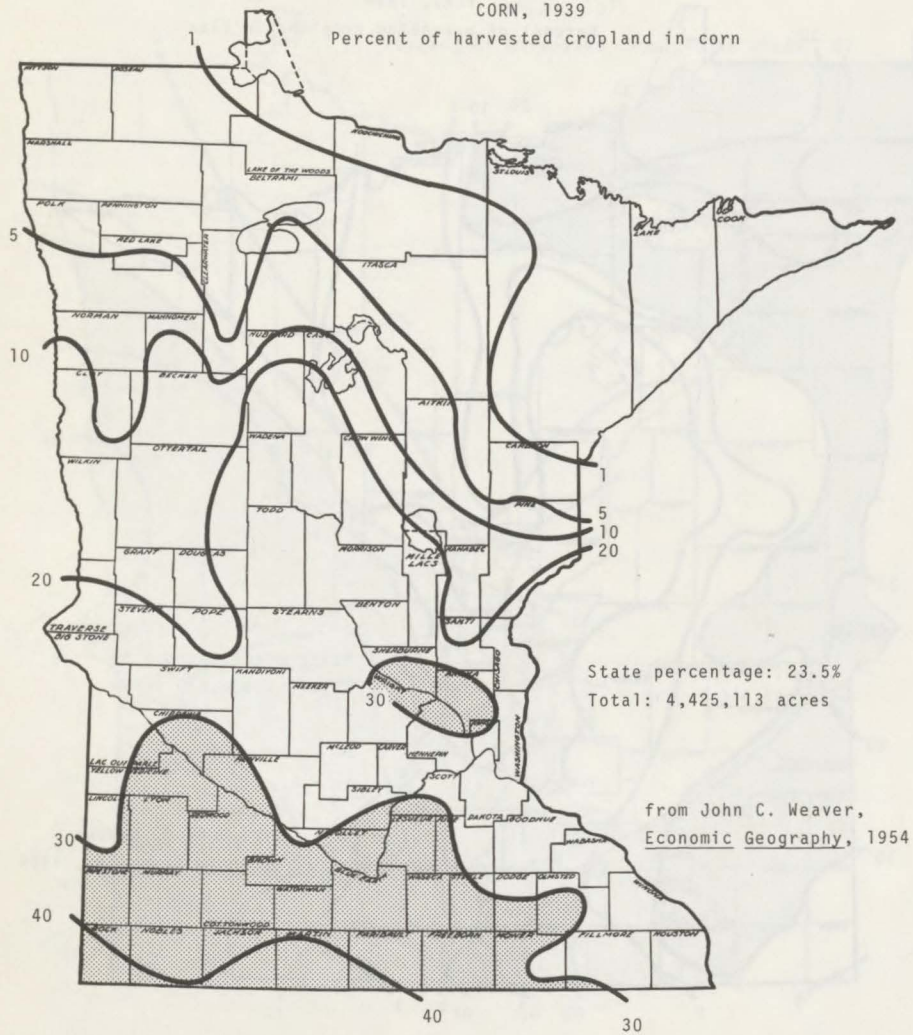


State percentage: 8.3%
Total: 1,638,870 acres

from John C. Weaver
Economic Geography, 1954

CORN, 1939

Percent of harvested cropland in corn



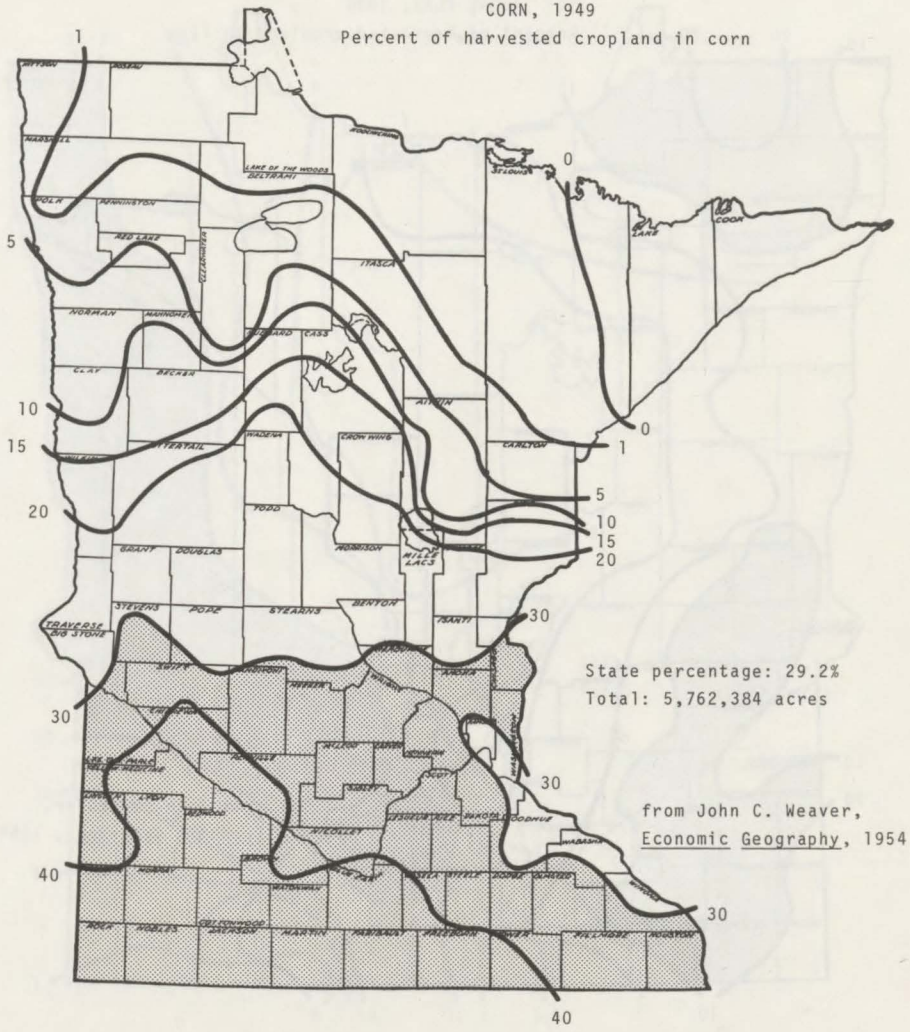
State percentage: 23.5%

Total: 4,425,113 acres

from John C. Weaver, Economic Geography, 1954

CORN, 1949

Percent of harvested cropland in corn



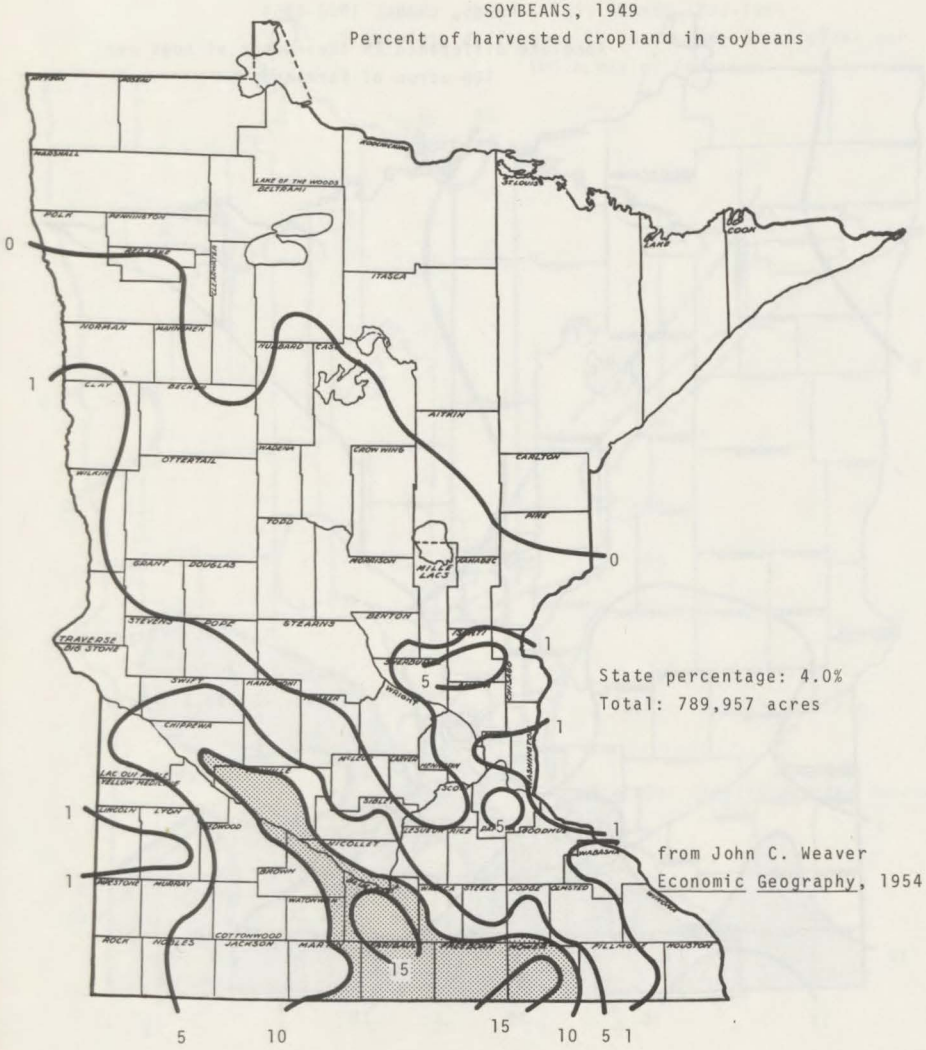
State percentage: 29.2%

Total: 5,762,384 acres

from John C. Weaver, Economic Geography, 1954

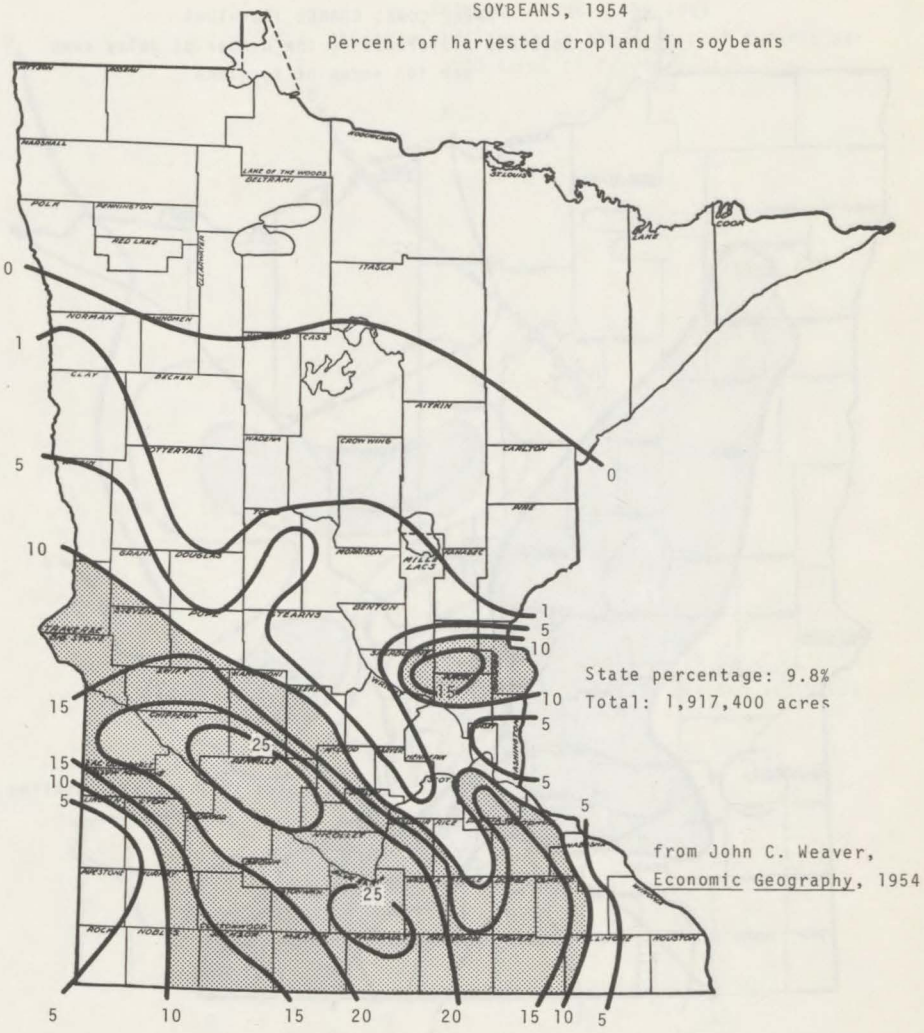
SOYBEANS, 1949

Percent of harvested cropland in soybeans



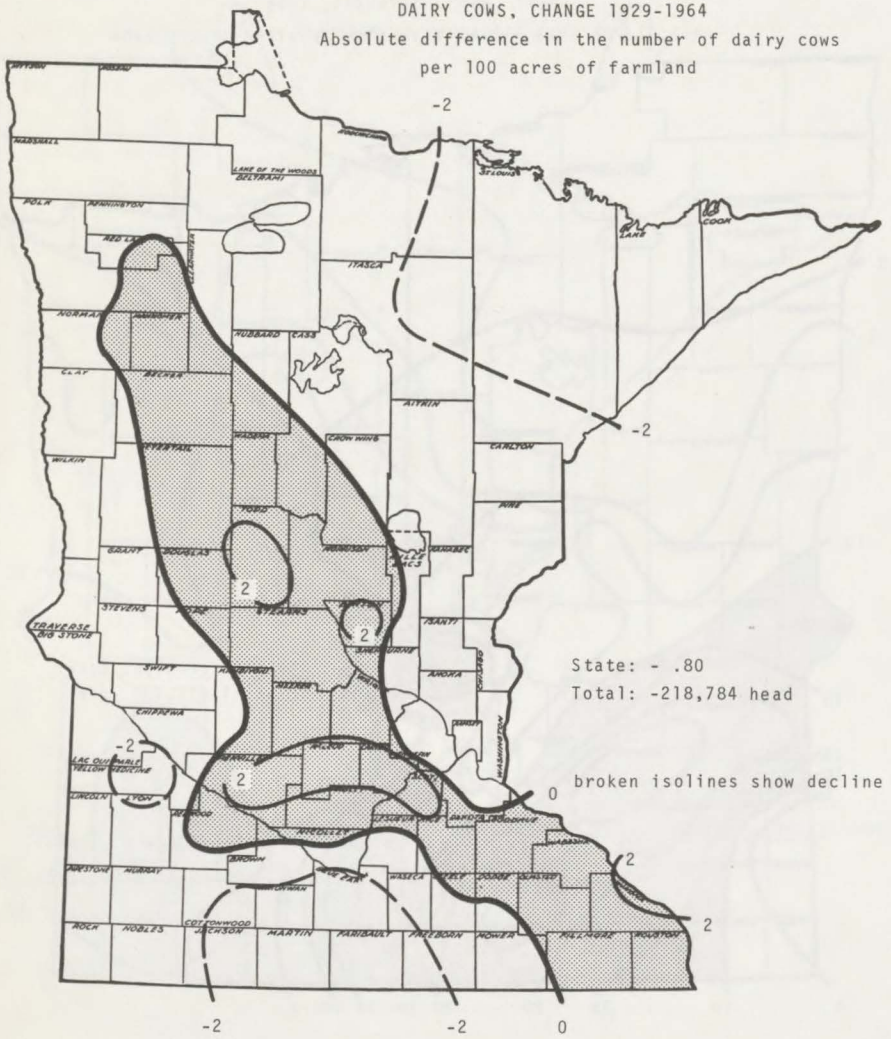
SOYBEANS, 1954

Percent of harvested cropland in soybeans



DAIRY COWS, CHANGE 1929-1964

Absolute difference in the number of dairy cows per 100 acres of farmland



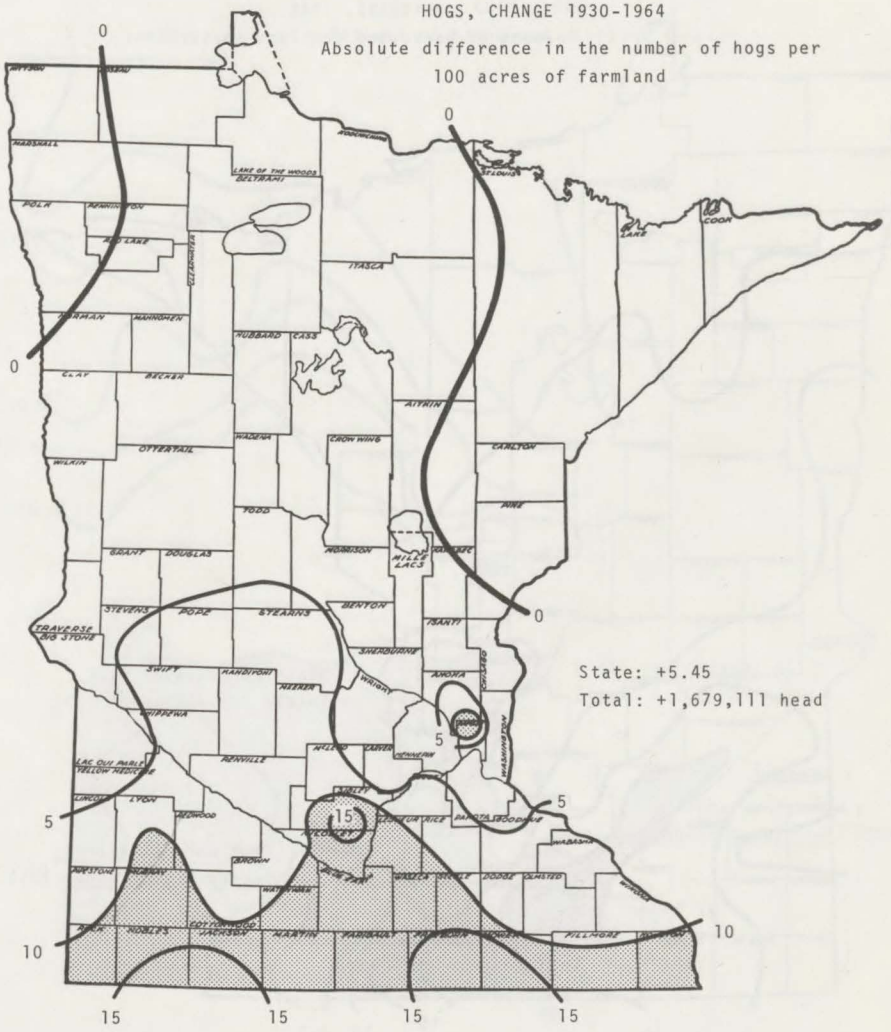
State: - .80

Total: -218,784 head

broken isolines show decline

HOGS, CHANGE 1930-1964

Absolute difference in the number of hogs per 100 acres of farmland

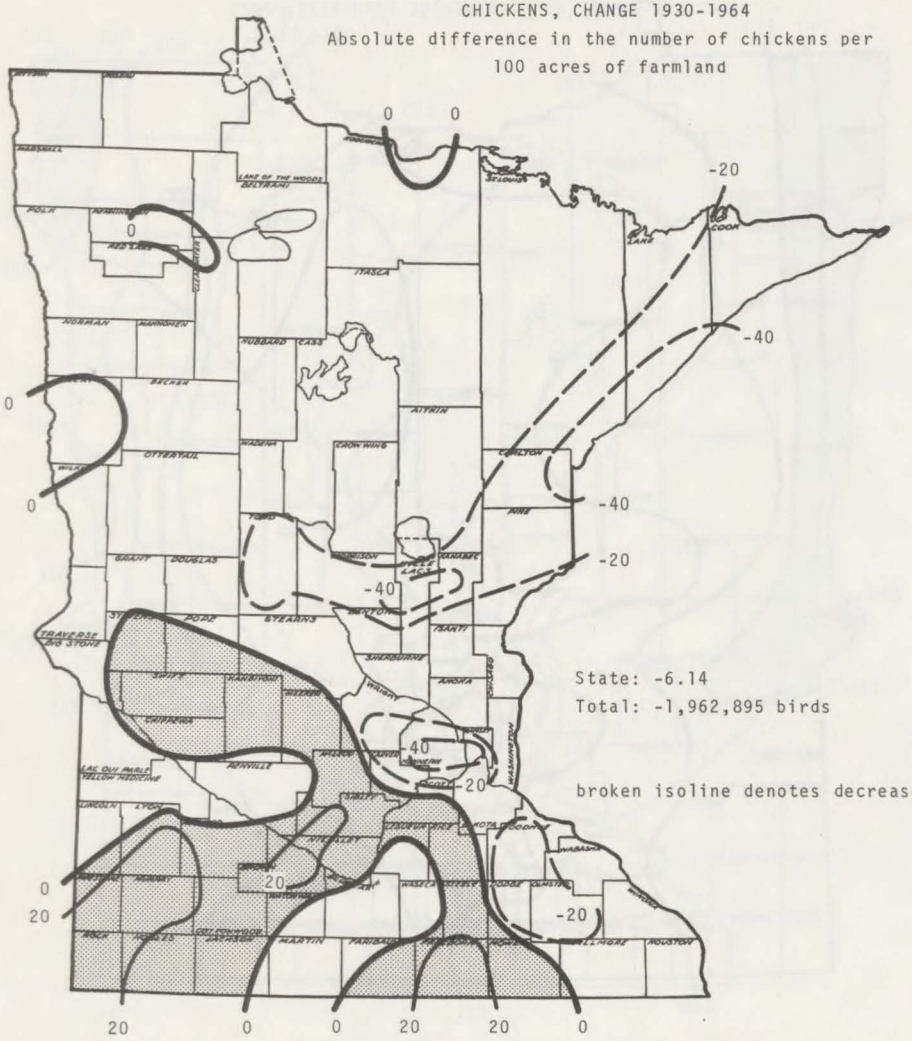


State: +5.45

Total: +1,679,111 head

CHICKENS, CHANGE 1930-1964

Absolute difference in the number of chickens per 100 acres of farmland



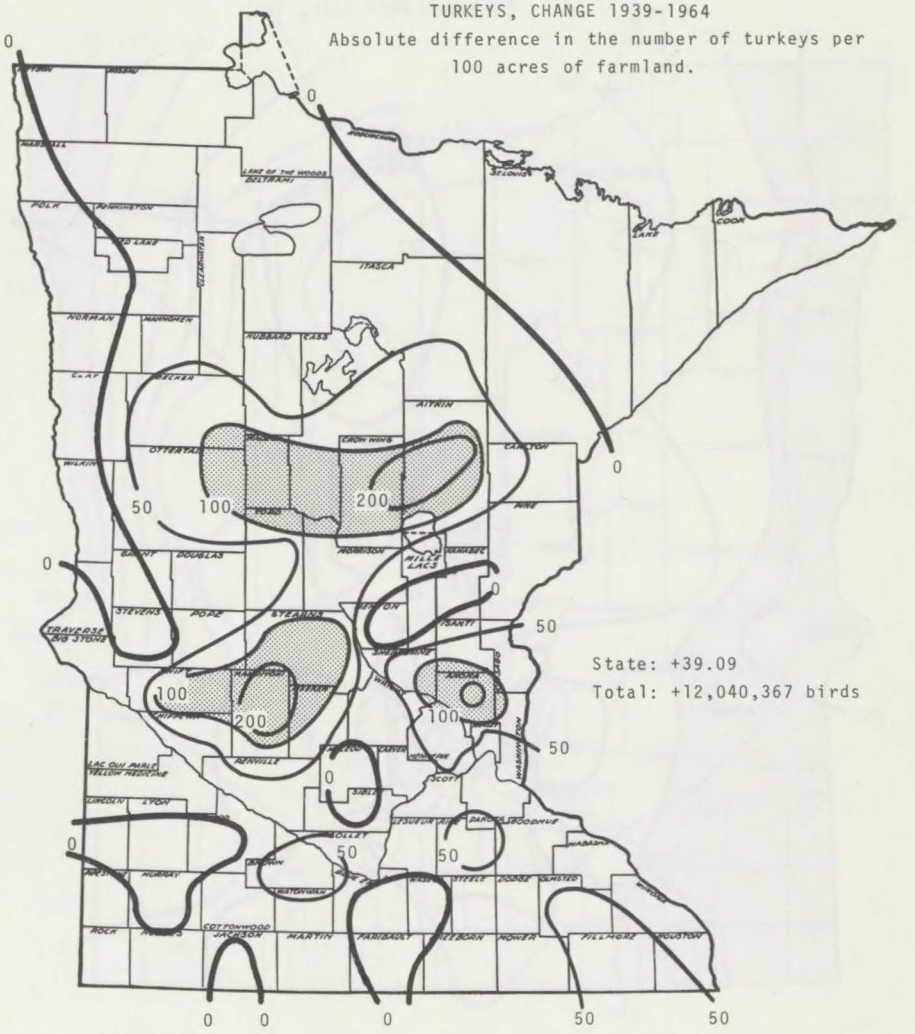
State: -6.14

Total: -1,962,895 birds

broken isoline denotes decrease

TURKEYS, CHANGE 1939-1964

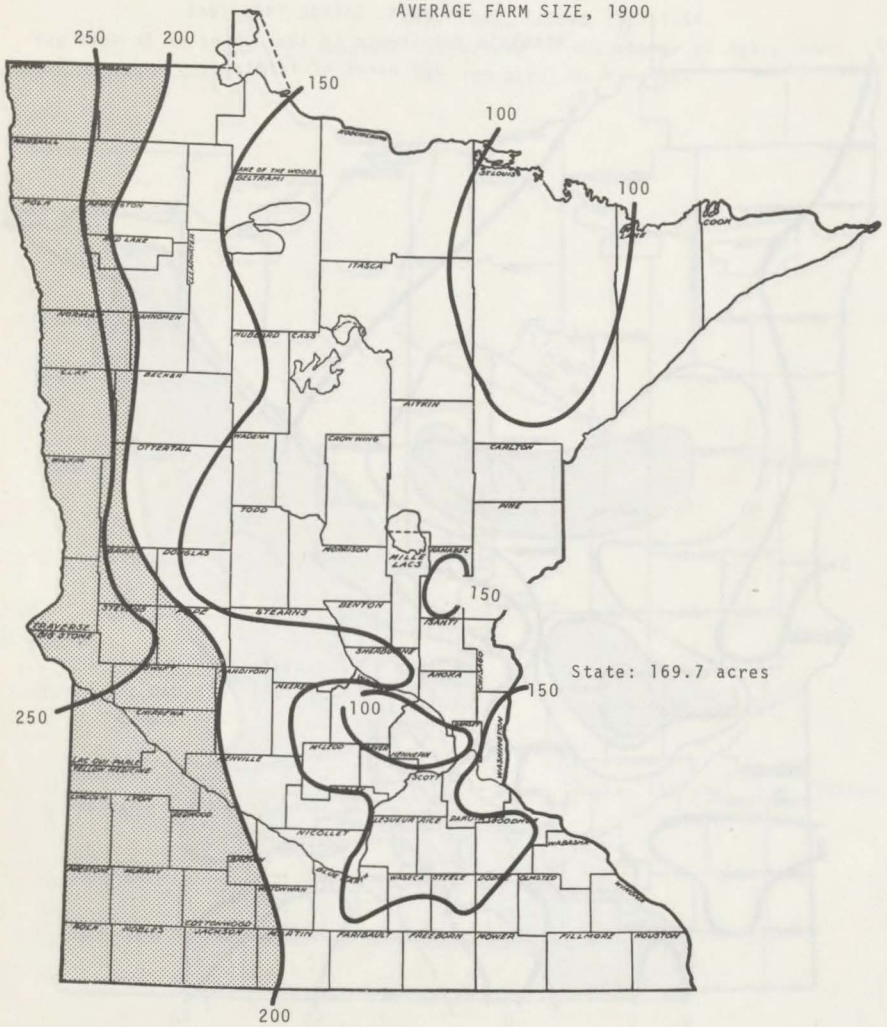
Absolute difference in the number of turkeys per 100 acres of farmland.



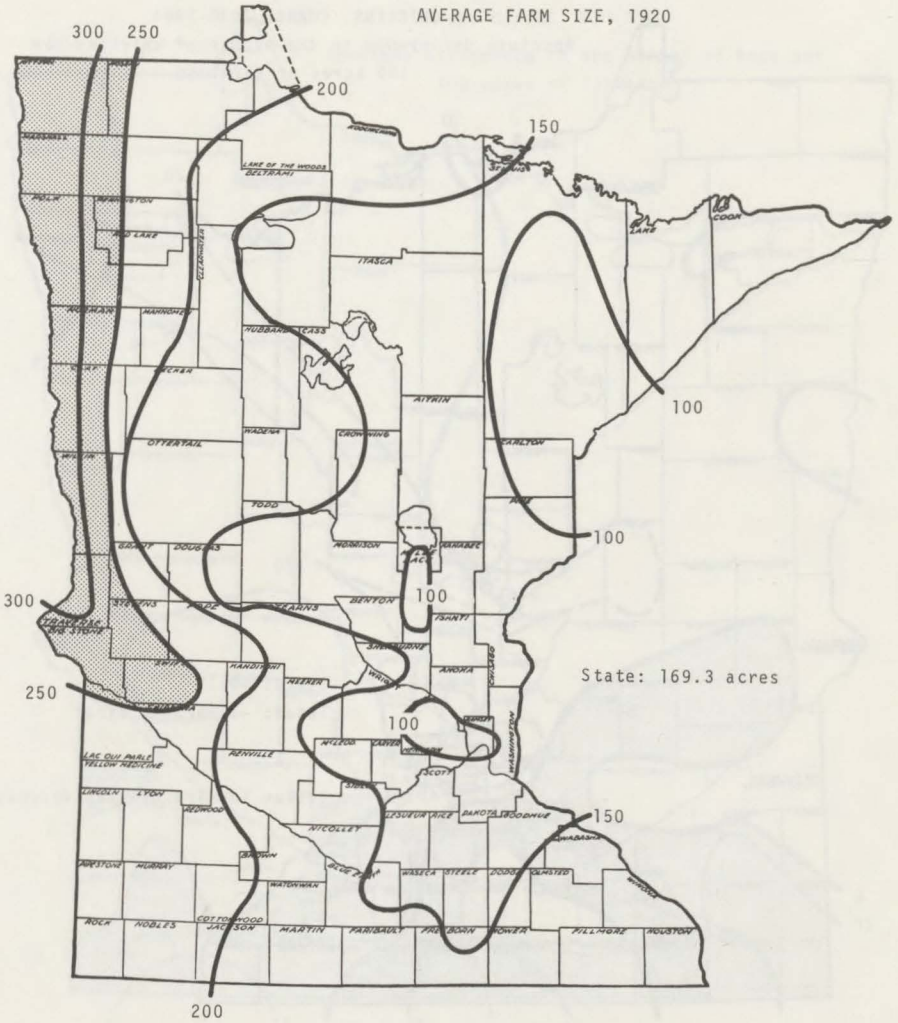
State: +39.09

Total: +12,040,367 birds

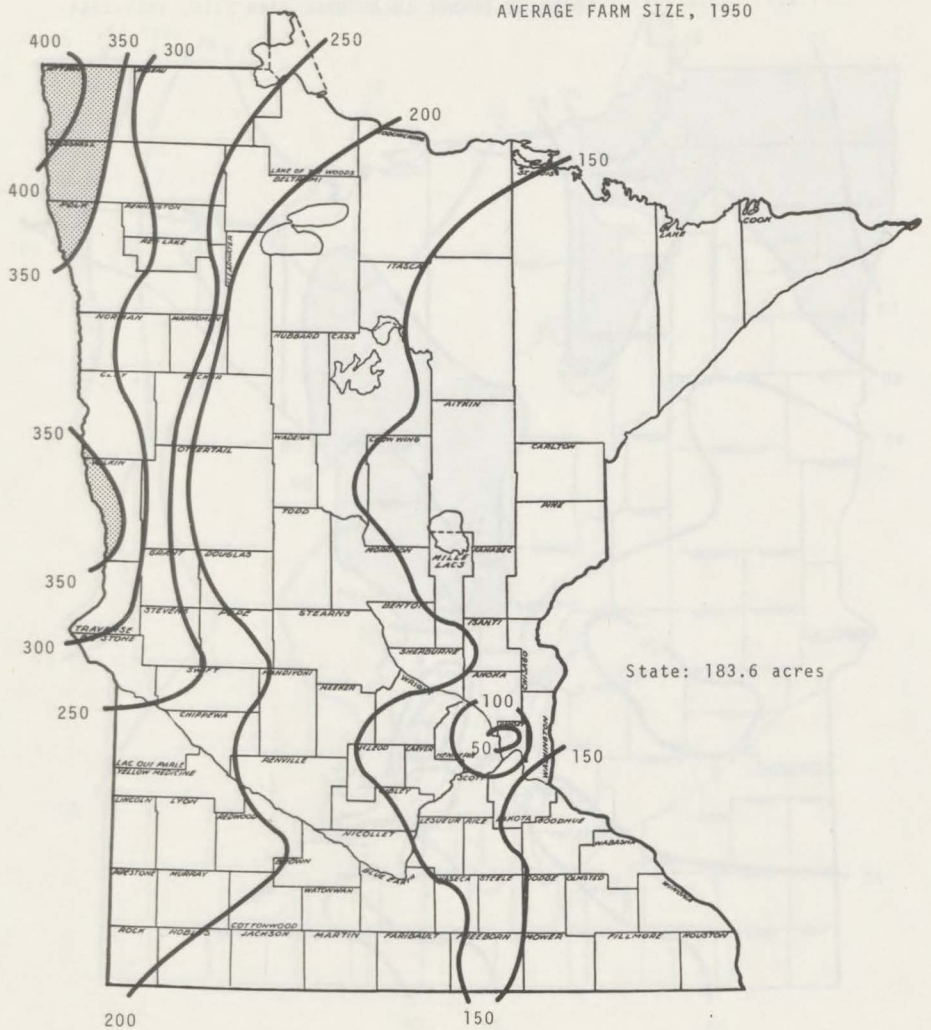
AVERAGE FARM SIZE, 1900



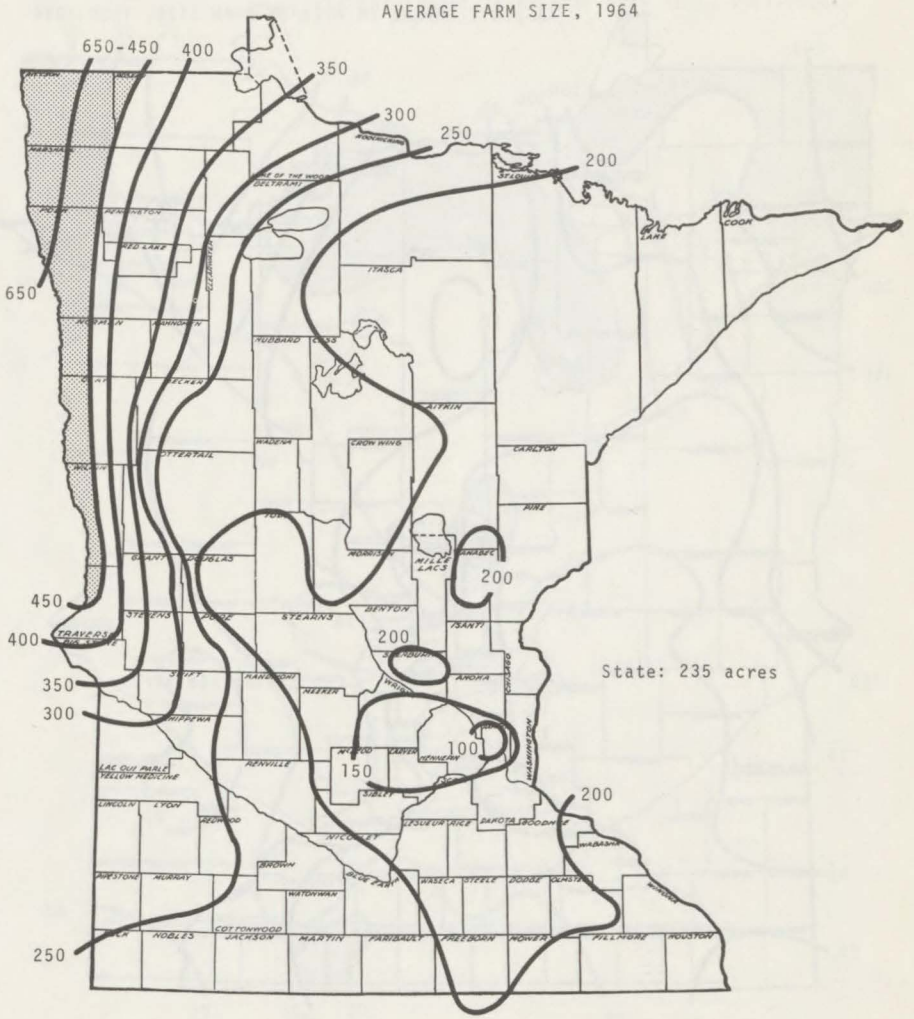
AVERAGE FARM SIZE, 1920



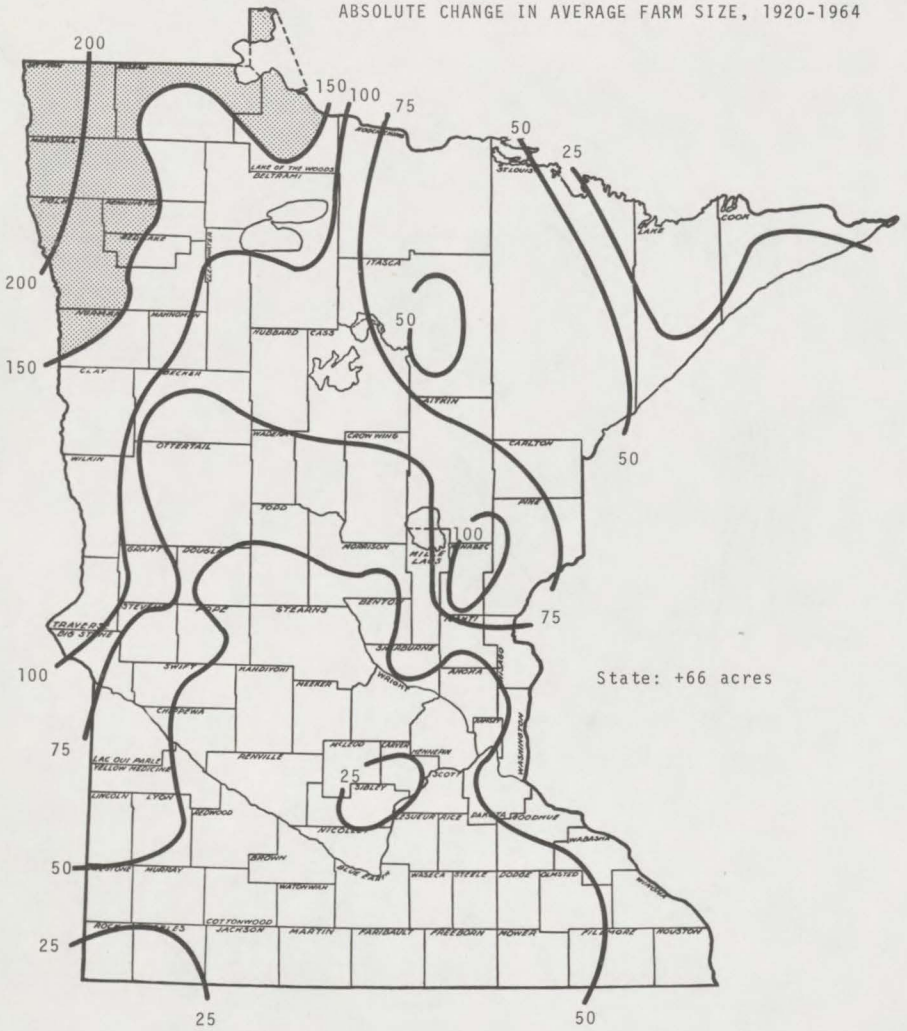
AVERAGE FARM SIZE, 1950



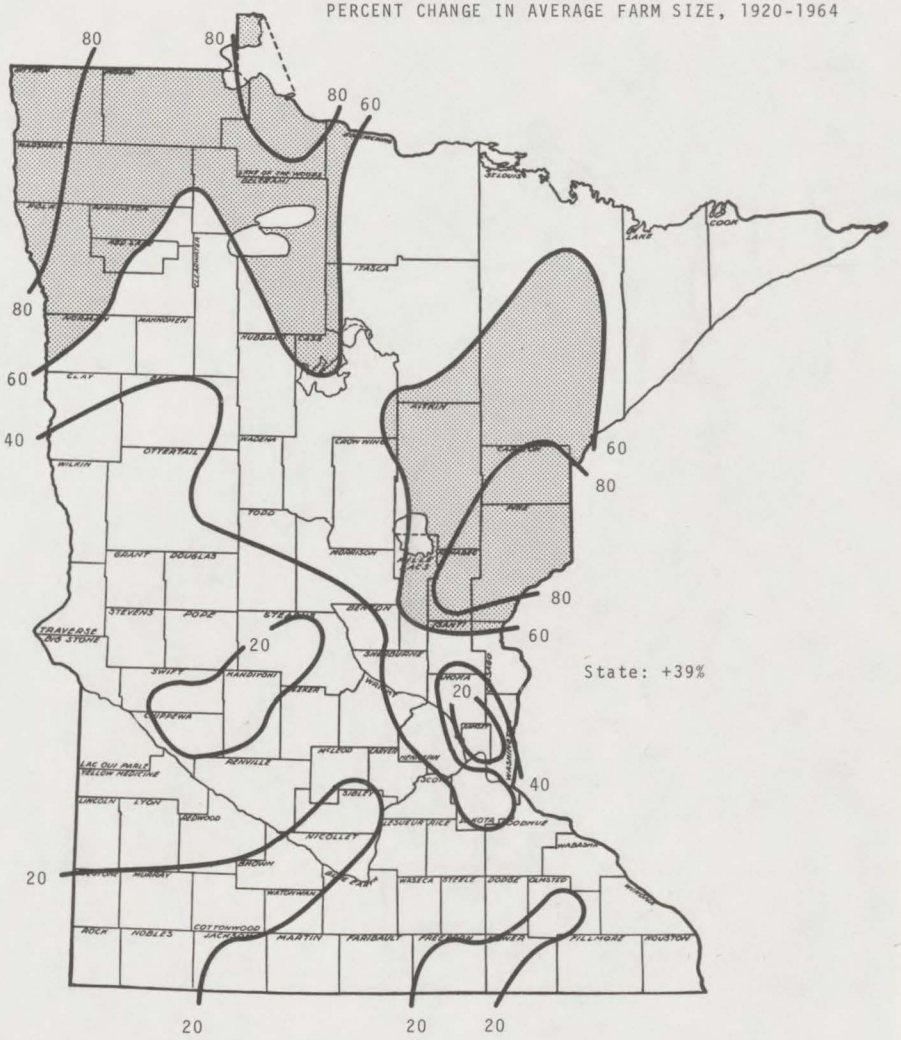
AVERAGE FARM SIZE, 1964



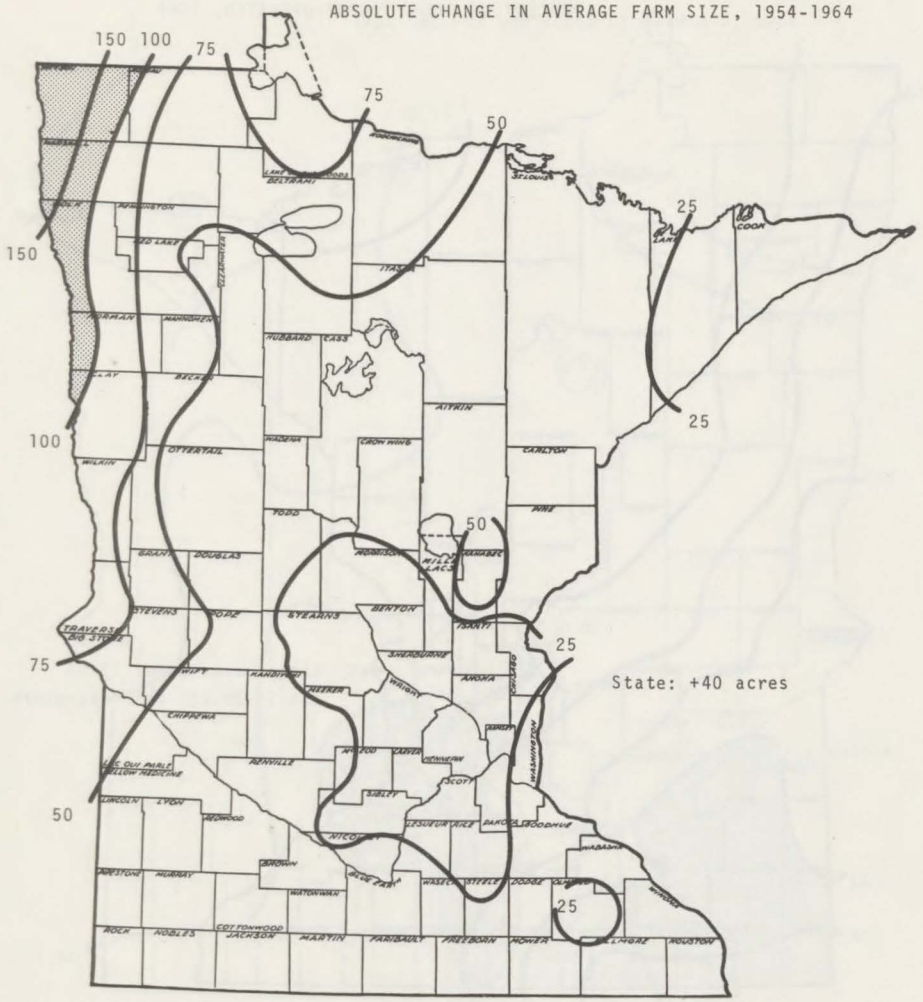
ABSOLUTE CHANGE IN AVERAGE FARM SIZE, 1920-1964



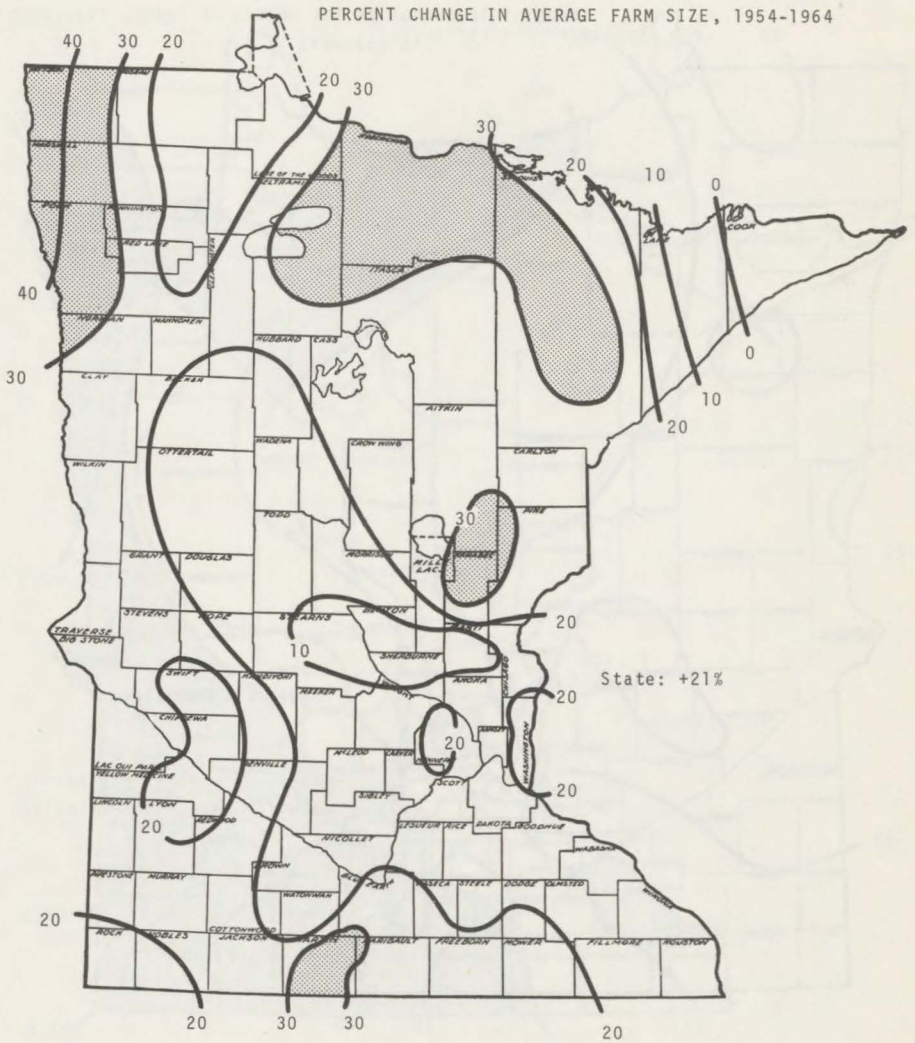
PERCENT CHANGE IN AVERAGE FARM SIZE, 1920-1964



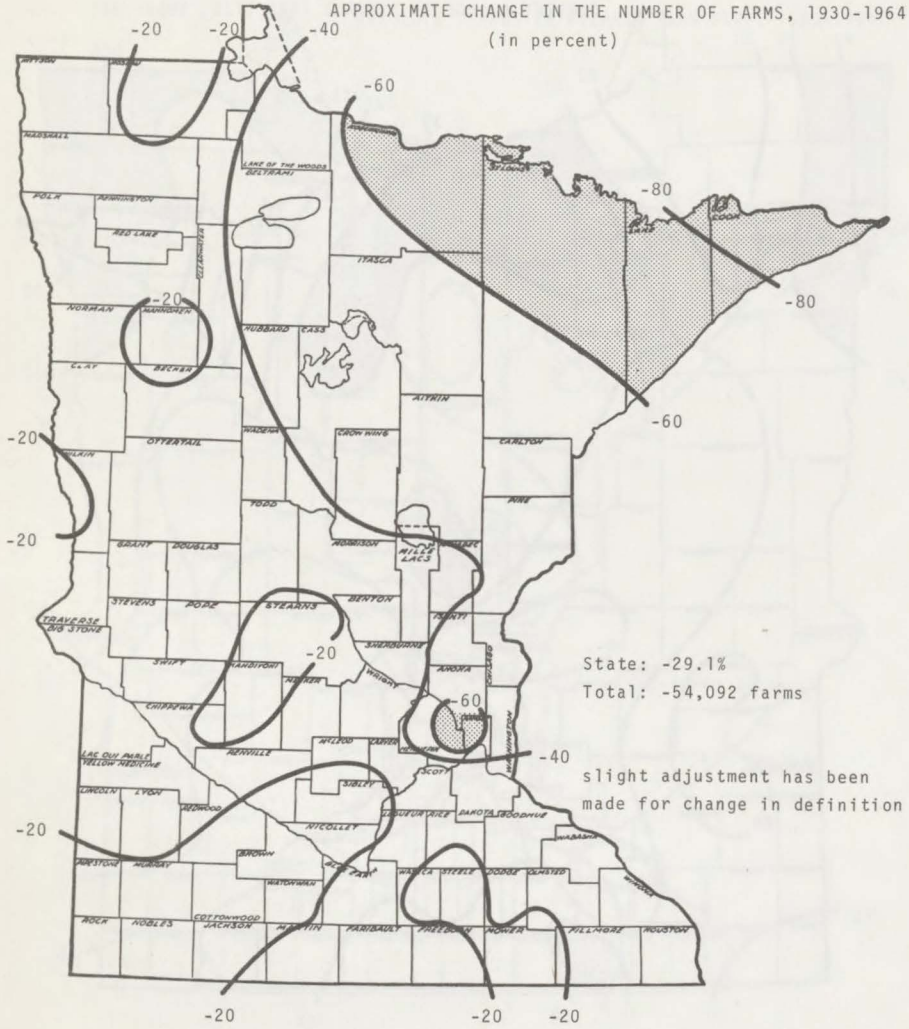
ABSOLUTE CHANGE IN AVERAGE FARM SIZE, 1954-1964



PERCENT CHANGE IN AVERAGE FARM SIZE, 1954-1964



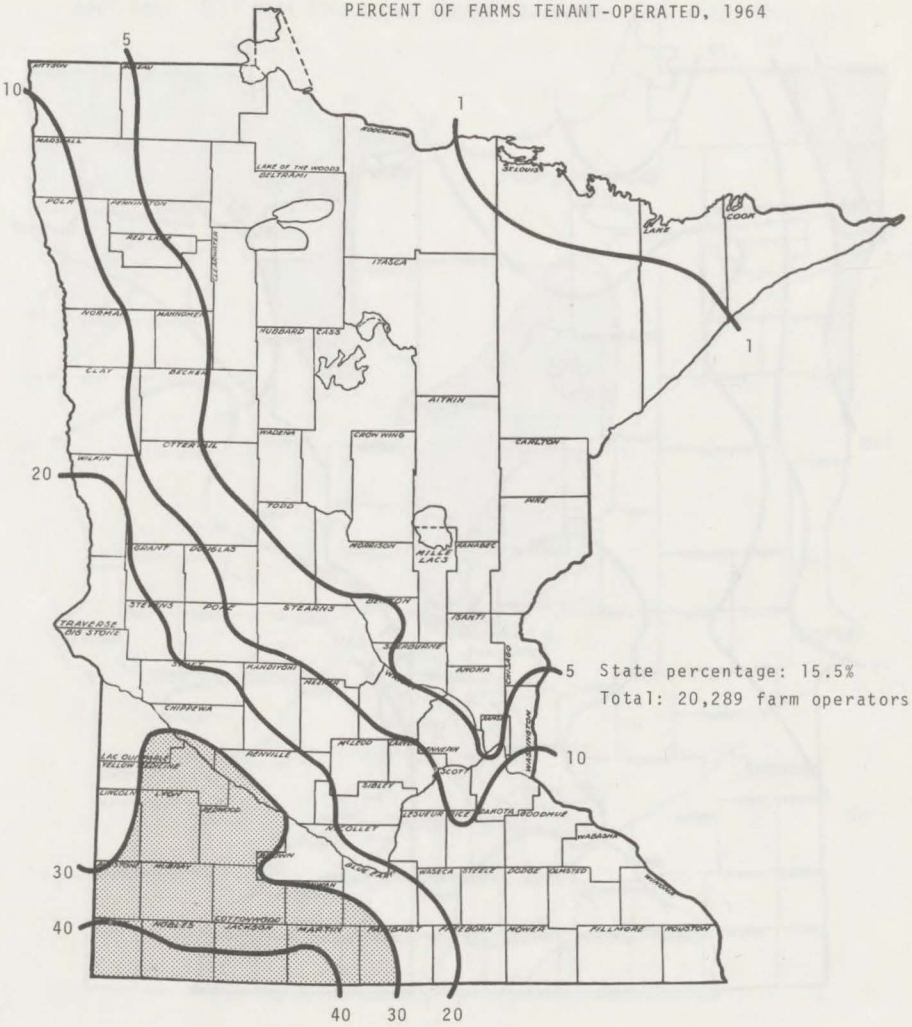
APPROXIMATE CHANGE IN THE NUMBER OF FARMS, 1930-1964
(in percent)



State: -29.1%
Total: -54,092 farms

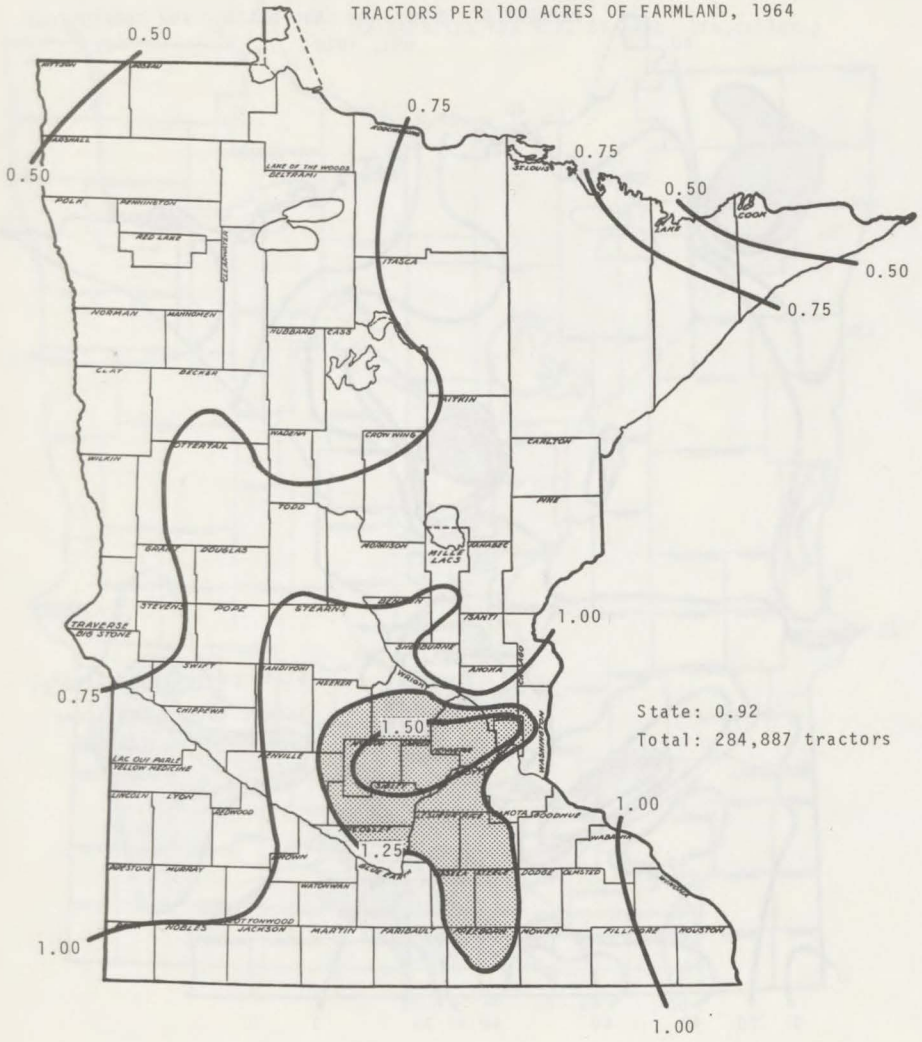
slight adjustment has been made for change in definition

PERCENT OF FARMS TENANT-OPERATED, 1964

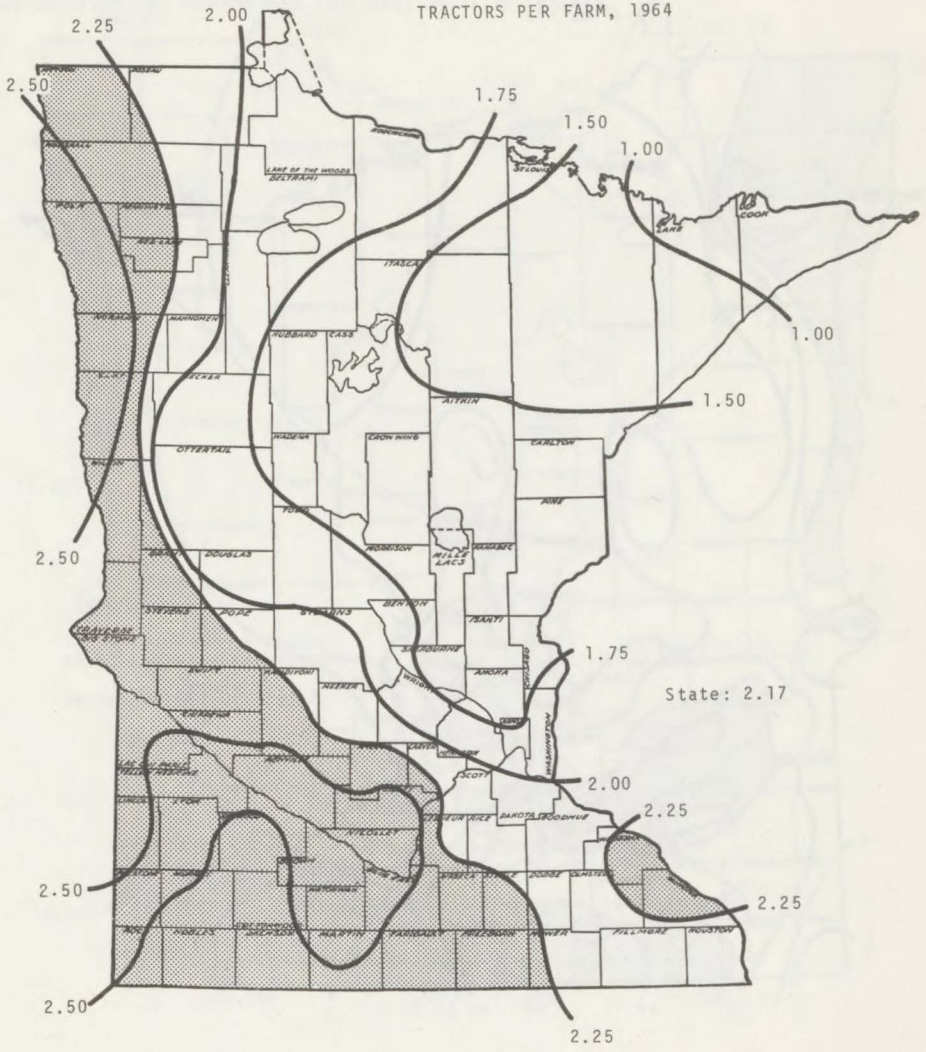


State percentage: 15.5%
Total: 20,289 farm operators

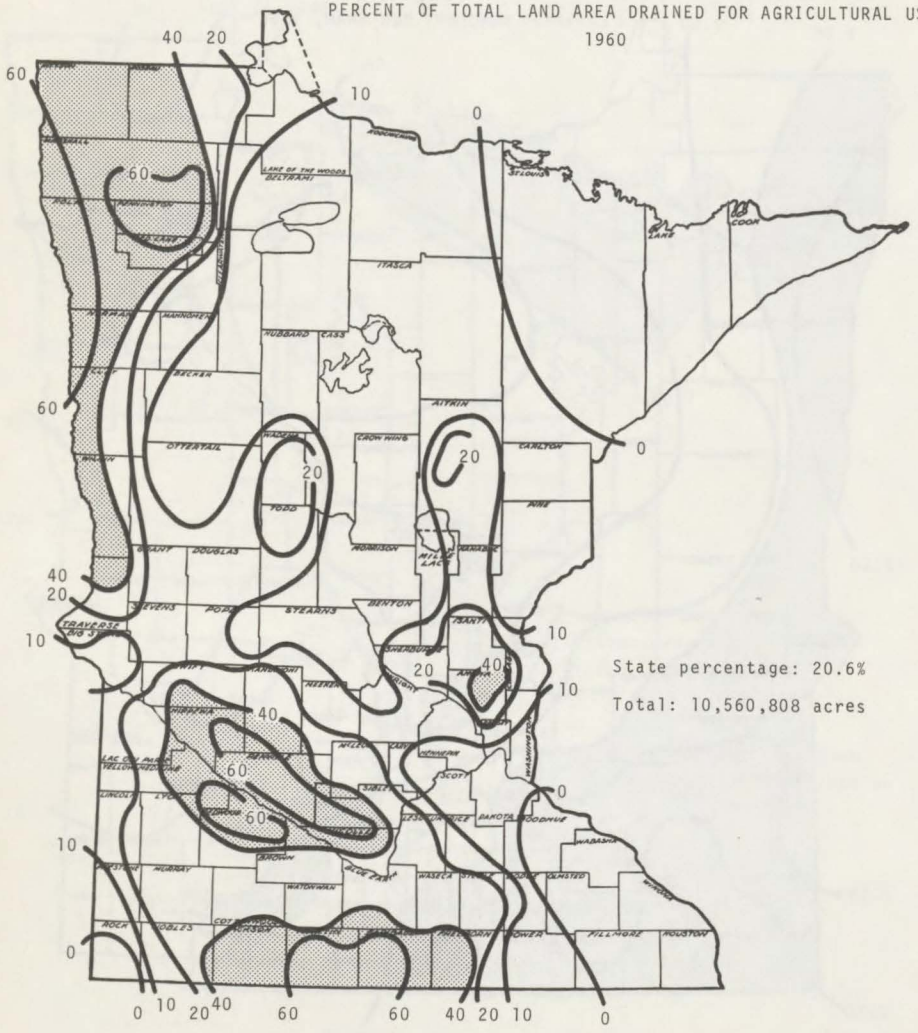
TRACTORS PER 100 ACRES OF FARMLAND, 1964



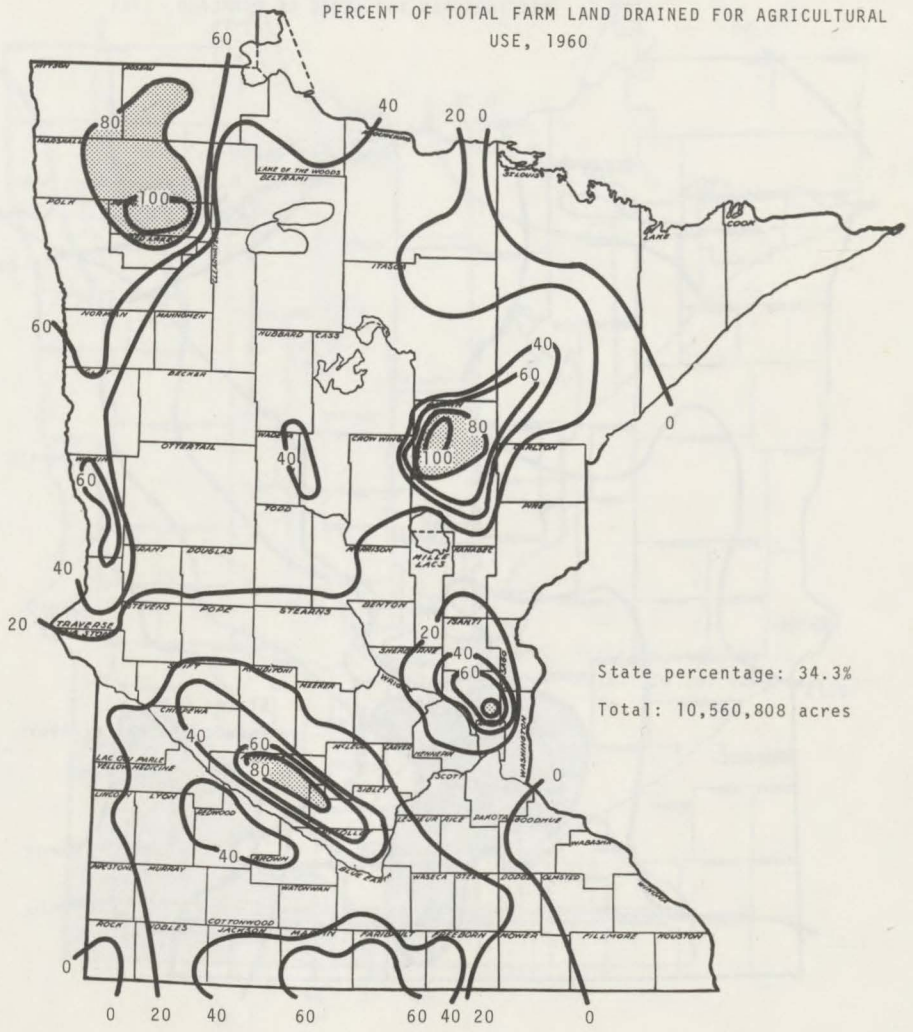
TRACTORS PER FARM, 1964



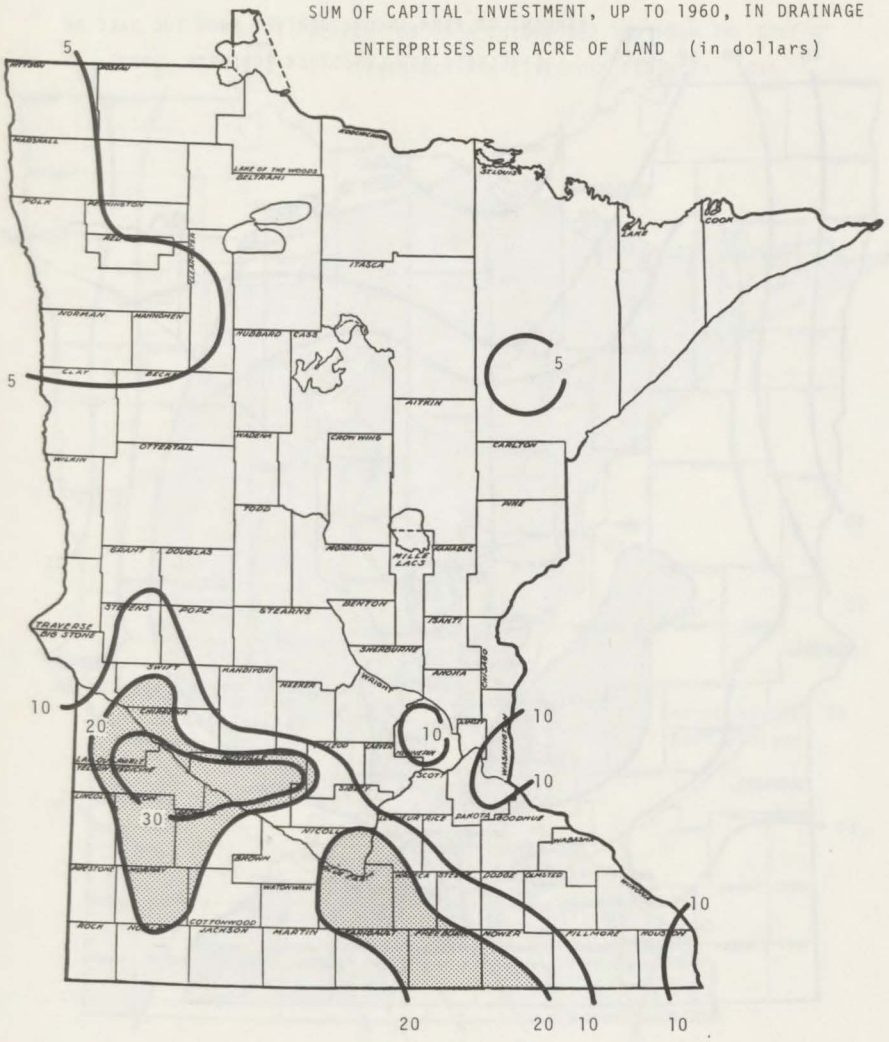
PERCENT OF TOTAL LAND AREA DRAINED FOR AGRICULTURAL USE
1960



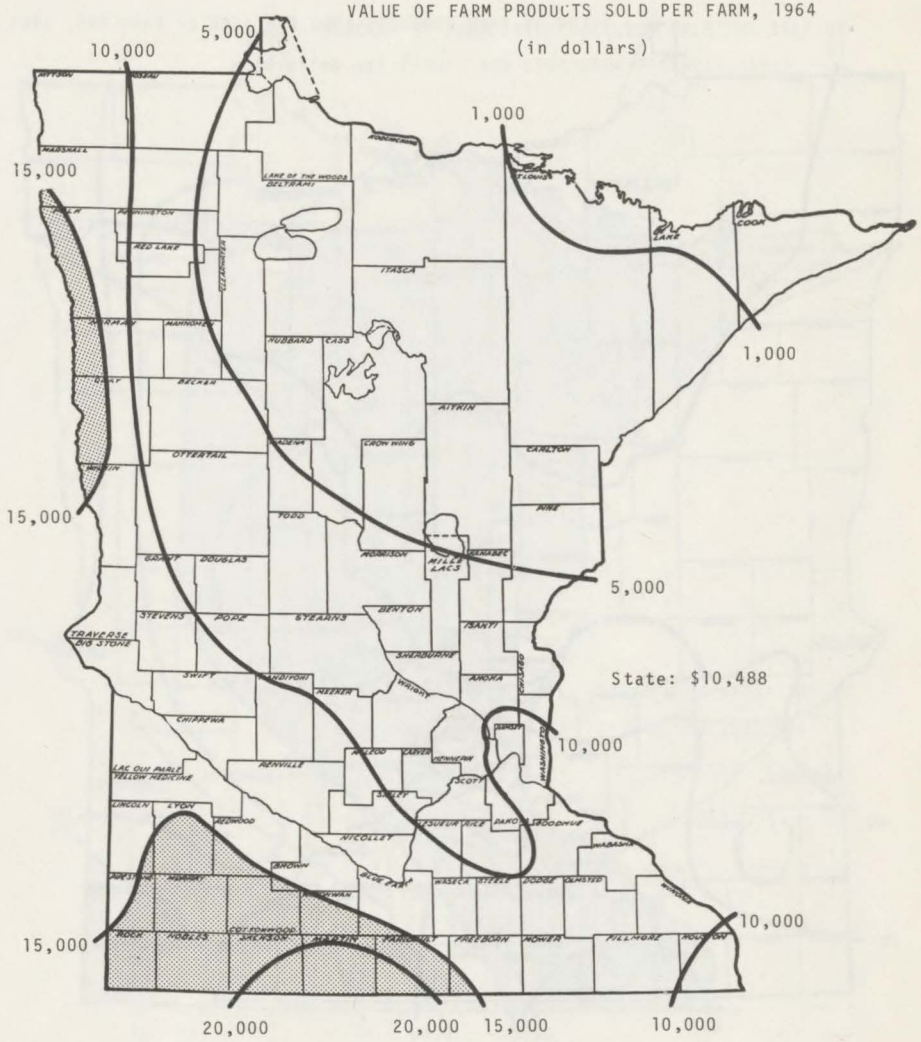
PERCENT OF TOTAL FARM LAND DRAINED FOR AGRICULTURAL USE, 1960



SUM OF CAPITAL INVESTMENT, UP TO 1960, IN DRAINAGE ENTERPRISES PER ACRE OF LAND (in dollars)

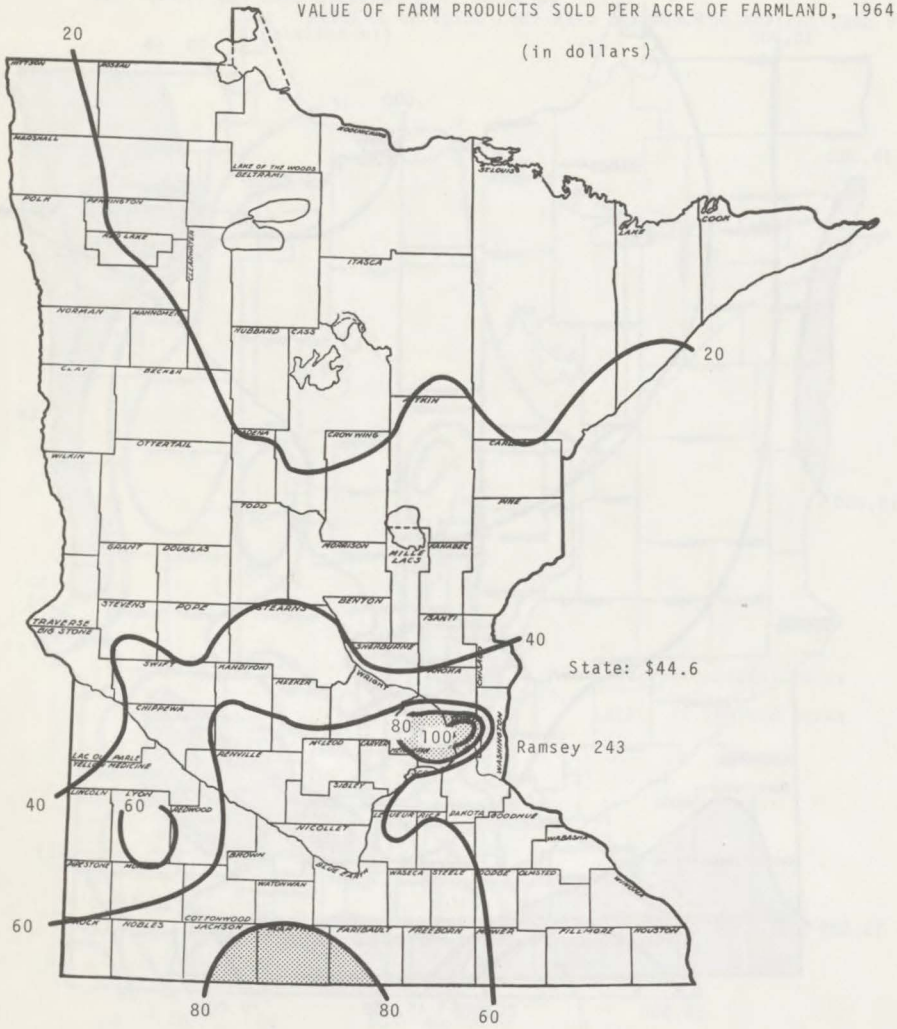


VALUE OF FARM PRODUCTS SOLD PER FARM, 1964 (in dollars)

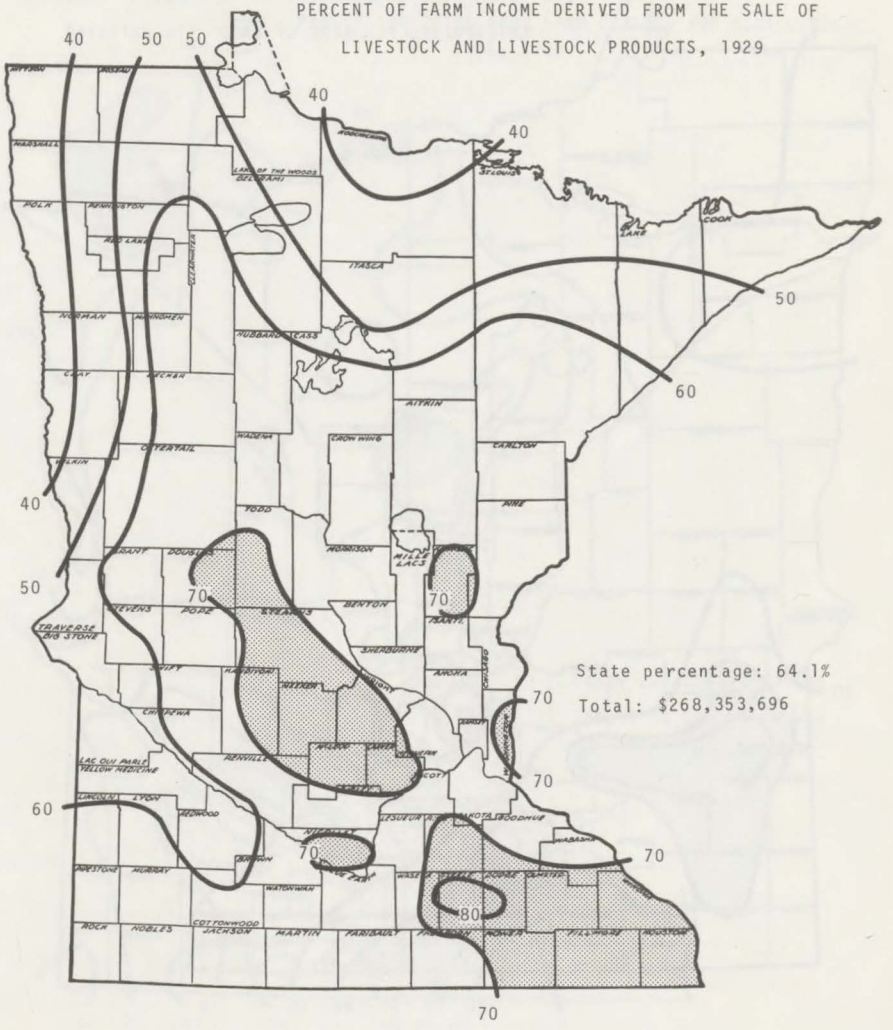


VALUE OF FARM PRODUCTS SOLD PER ACRE OF FARMLAND, 1964

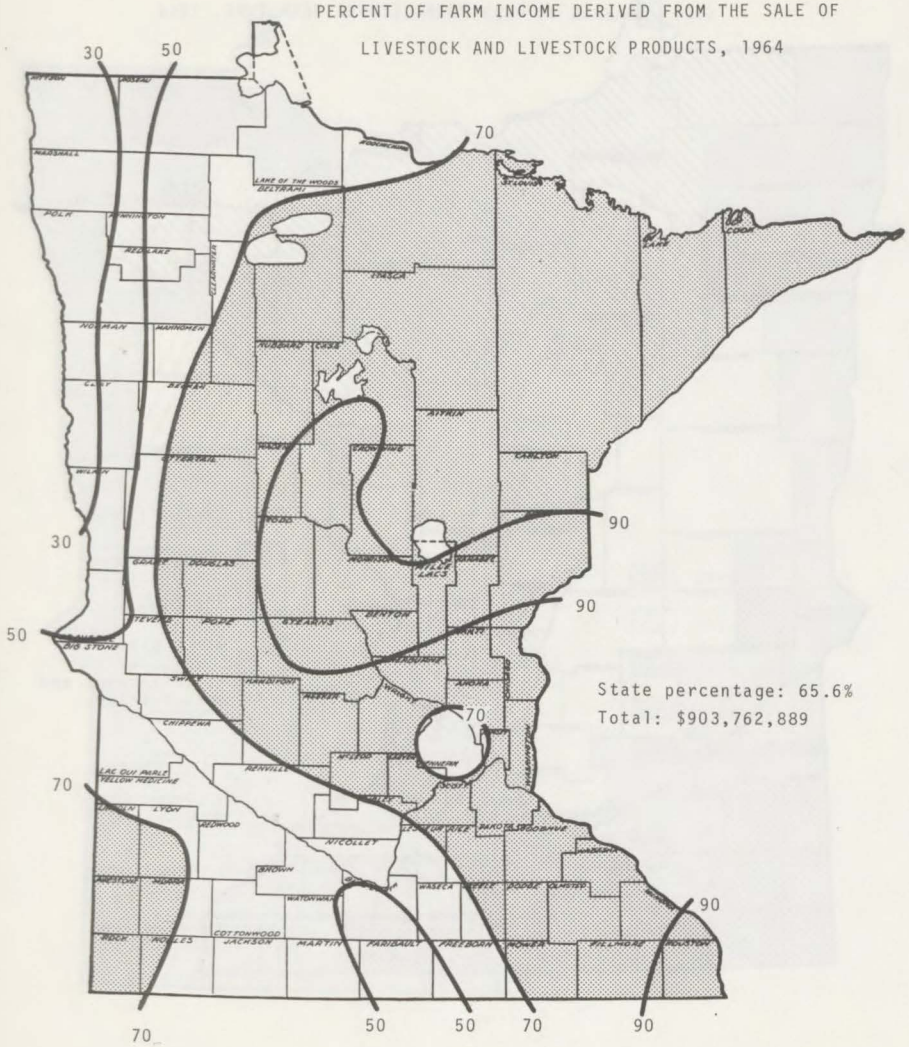
(in dollars)



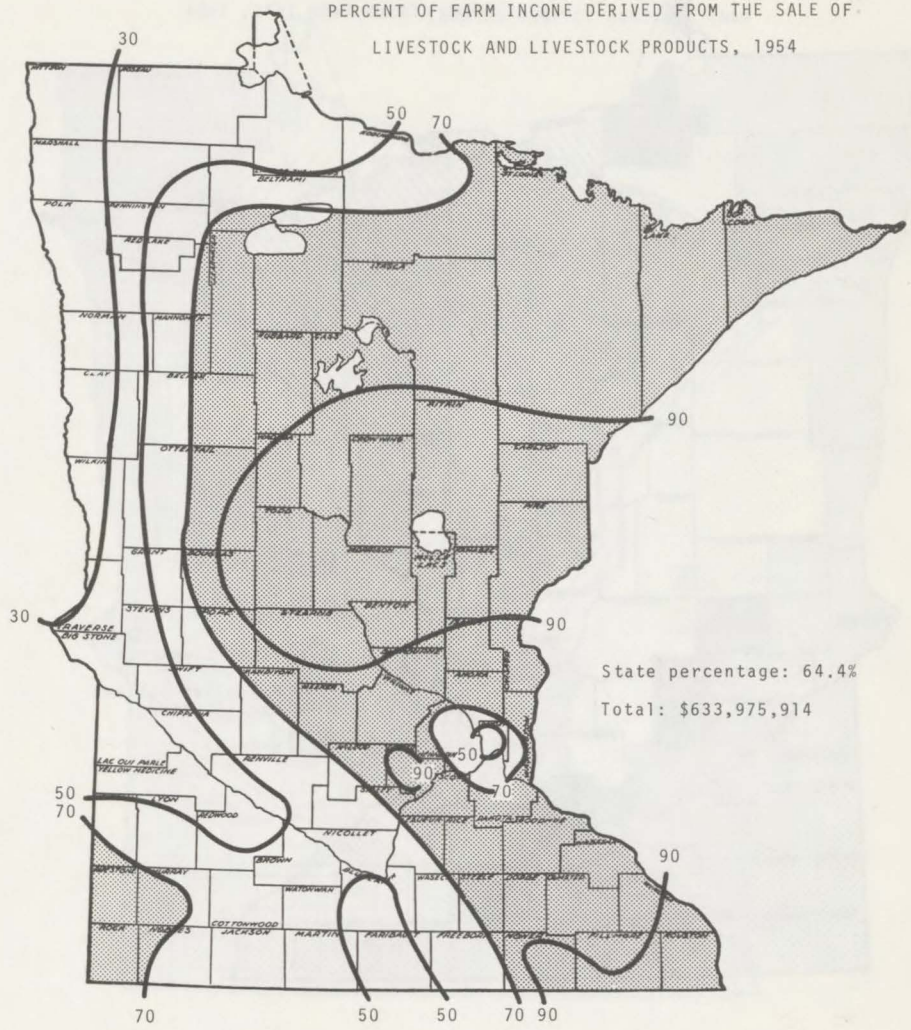
PERCENT OF FARM INCOME DERIVED FROM THE SALE OF LIVESTOCK AND LIVESTOCK PRODUCTS, 1929



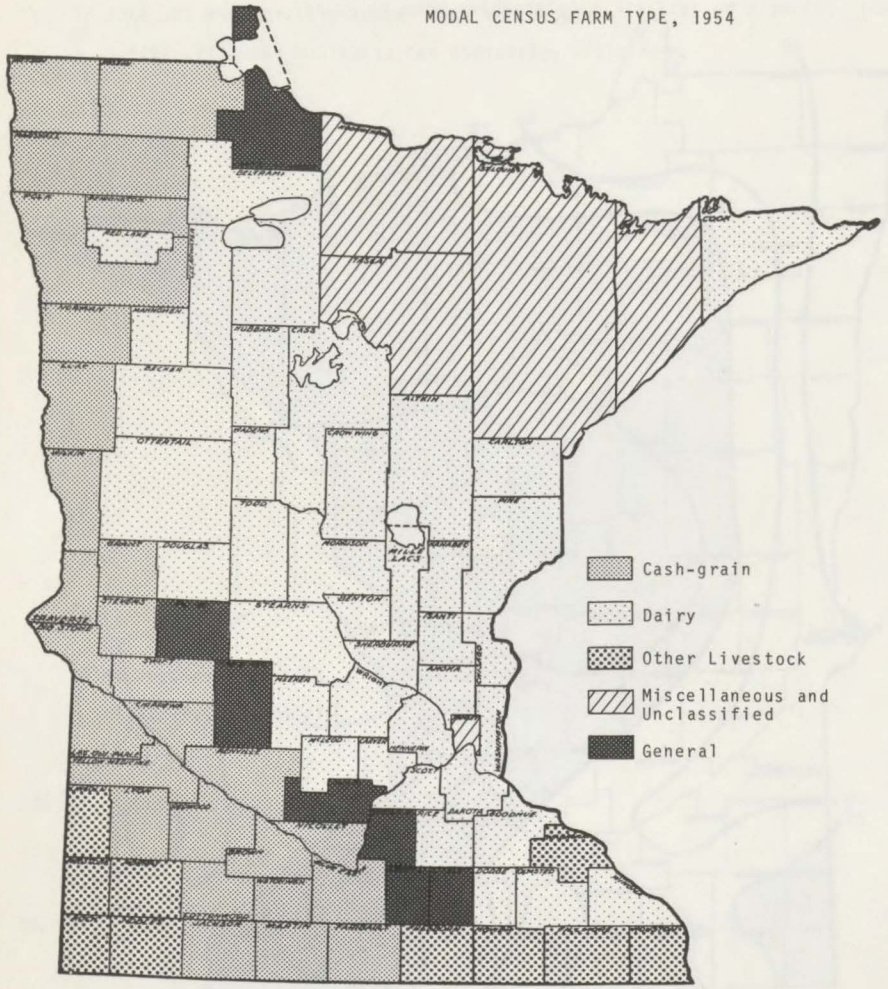
PERCENT OF FARM INCOME DERIVED FROM THE SALE OF LIVESTOCK AND LIVESTOCK PRODUCTS, 1964



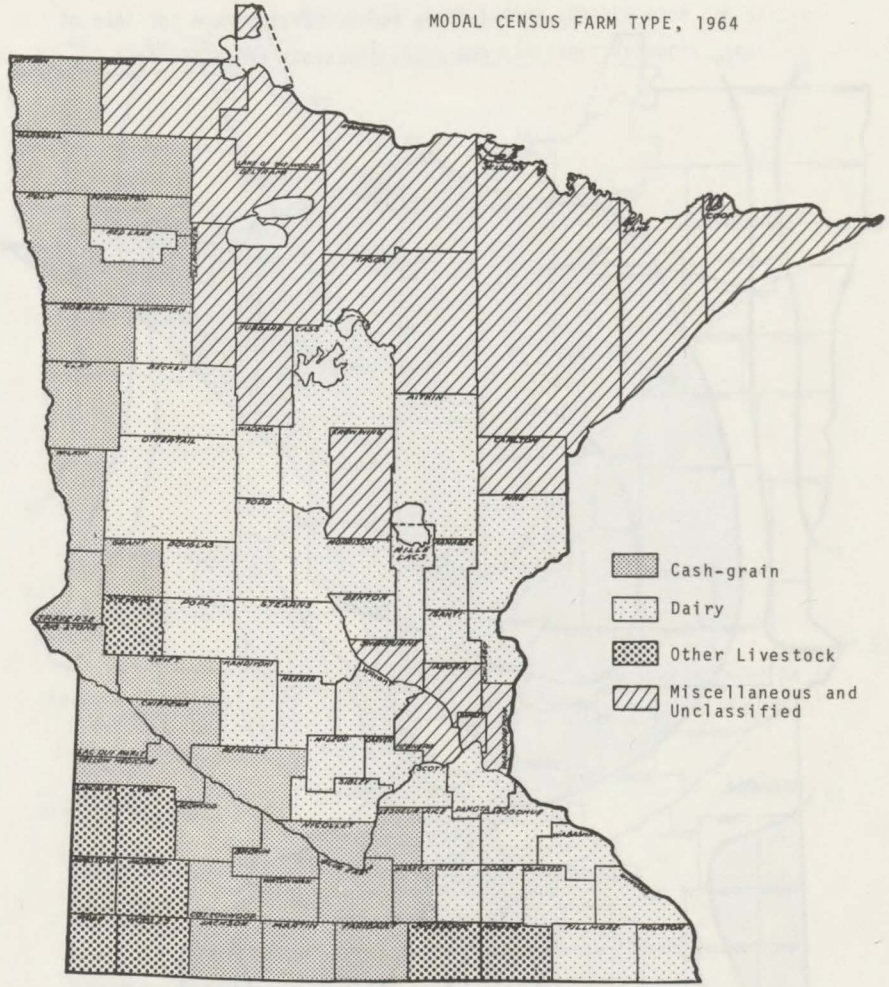
PERCENT OF FARM INCONE DERIVED FROM THE SALE OF LIVESTOCK AND LIVESTOCK PRODUCTS, 1954



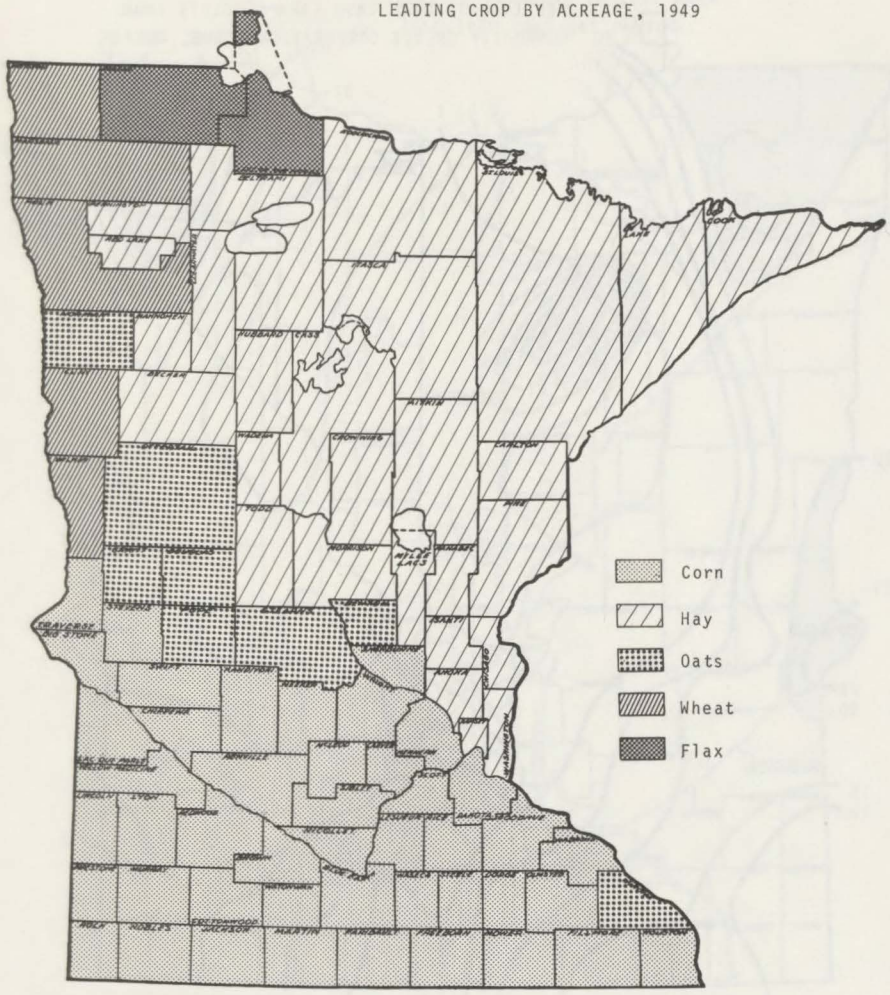
MODAL CENSUS FARM TYPE, 1954



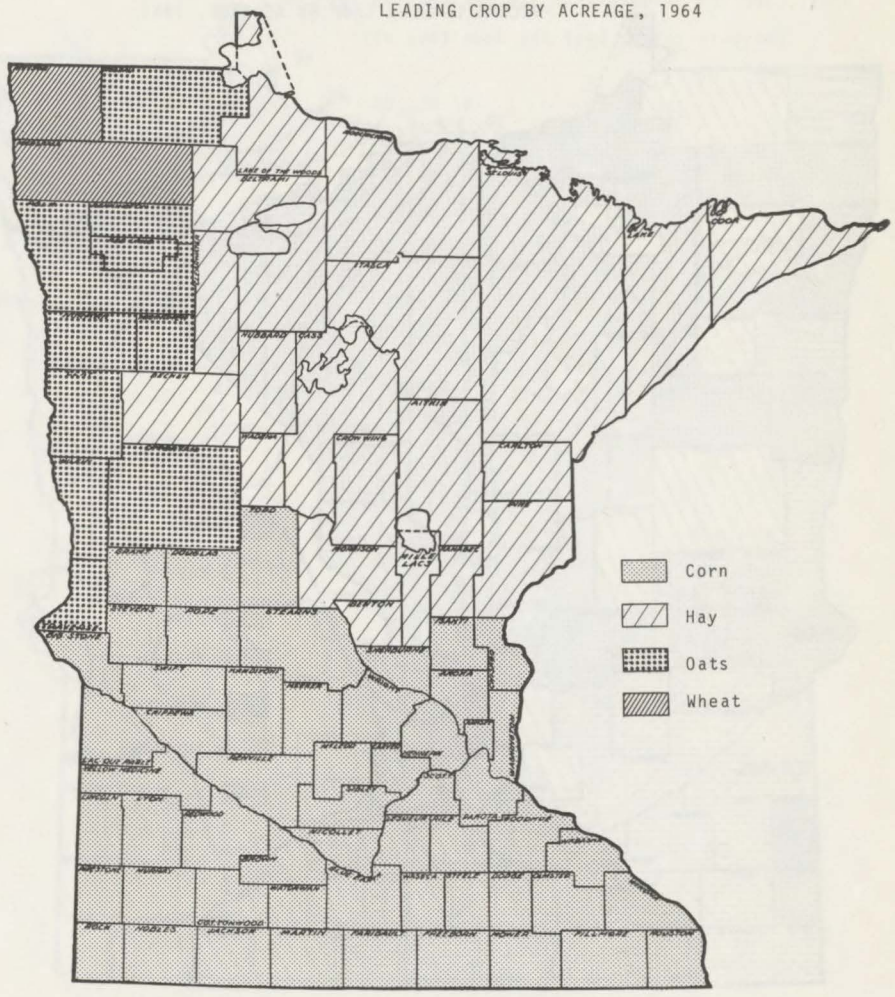
MODAL CENSUS FARM TYPE, 1964



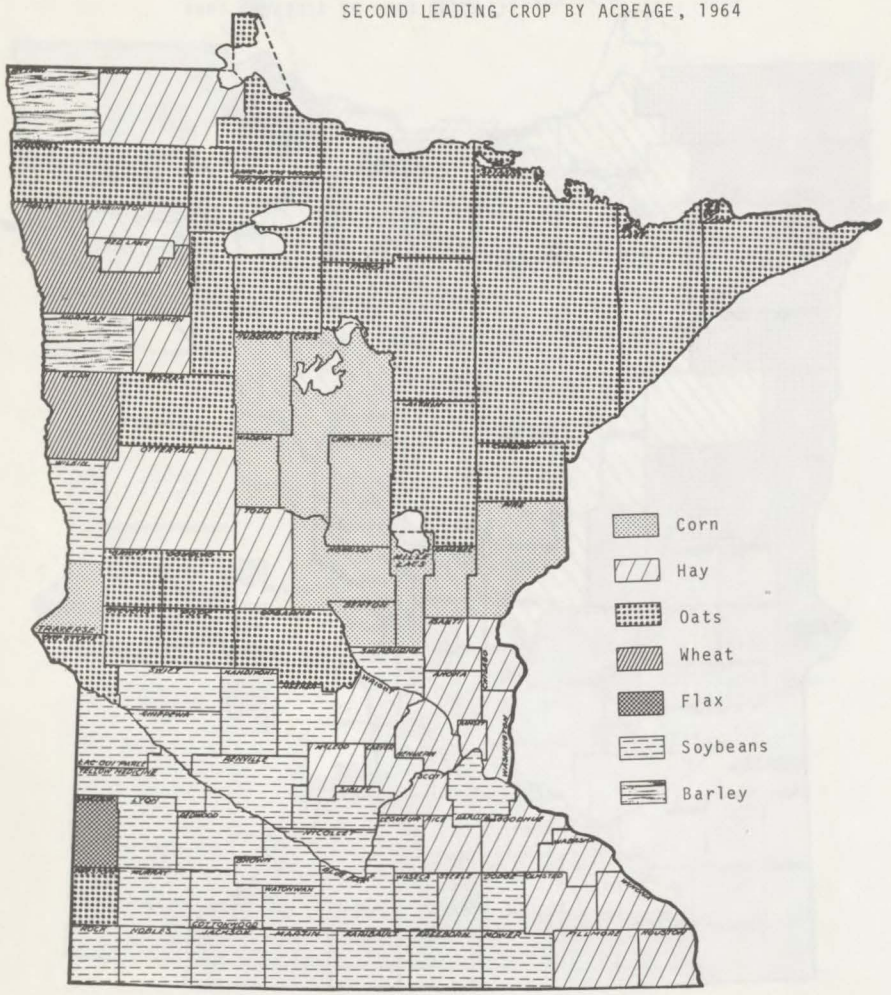
LEADING CROP BY ACREAGE, 1949



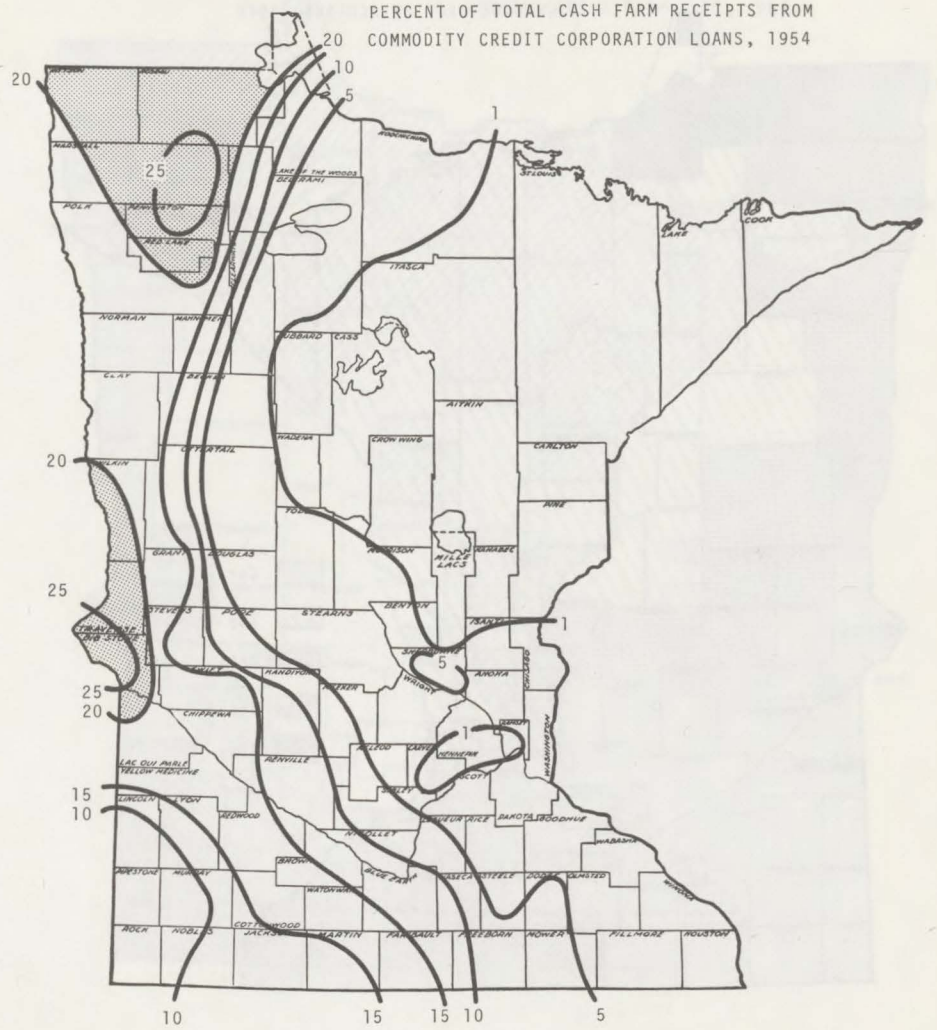
LEADING CROP BY ACREAGE, 1964



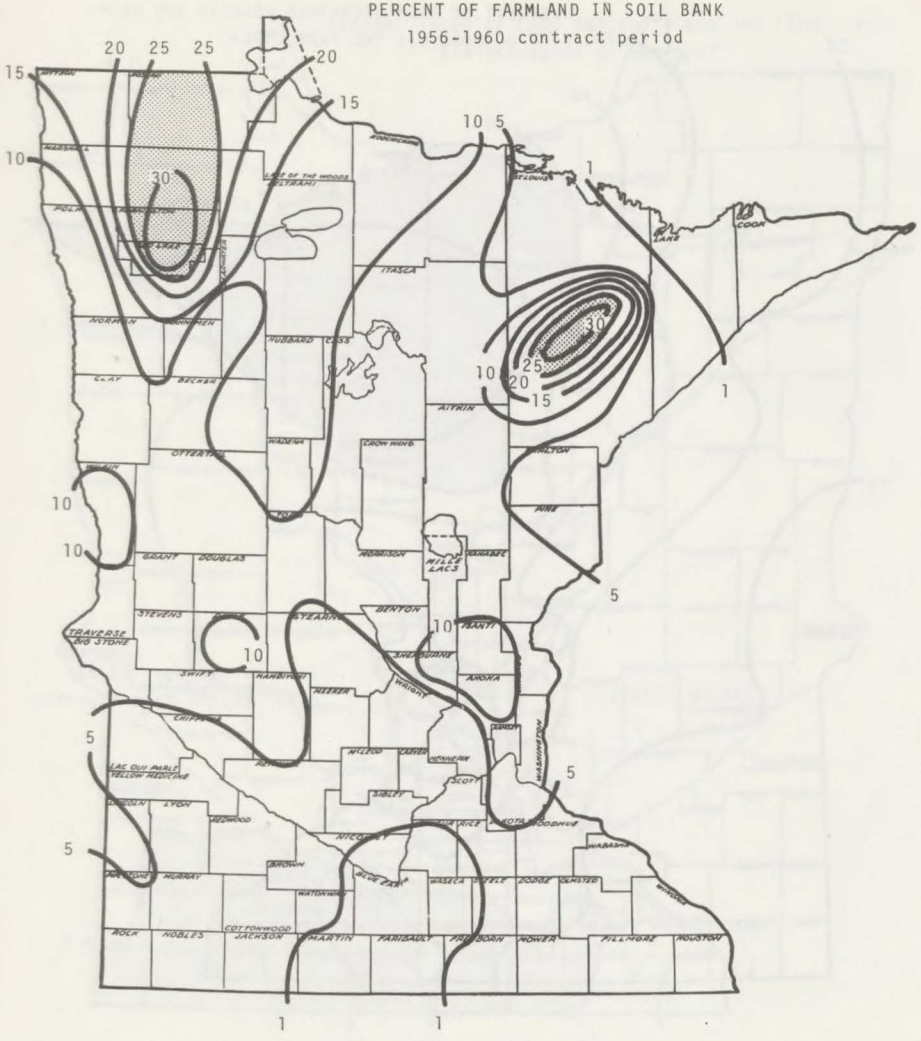
SECOND LEADING CROP BY ACREAGE, 1964



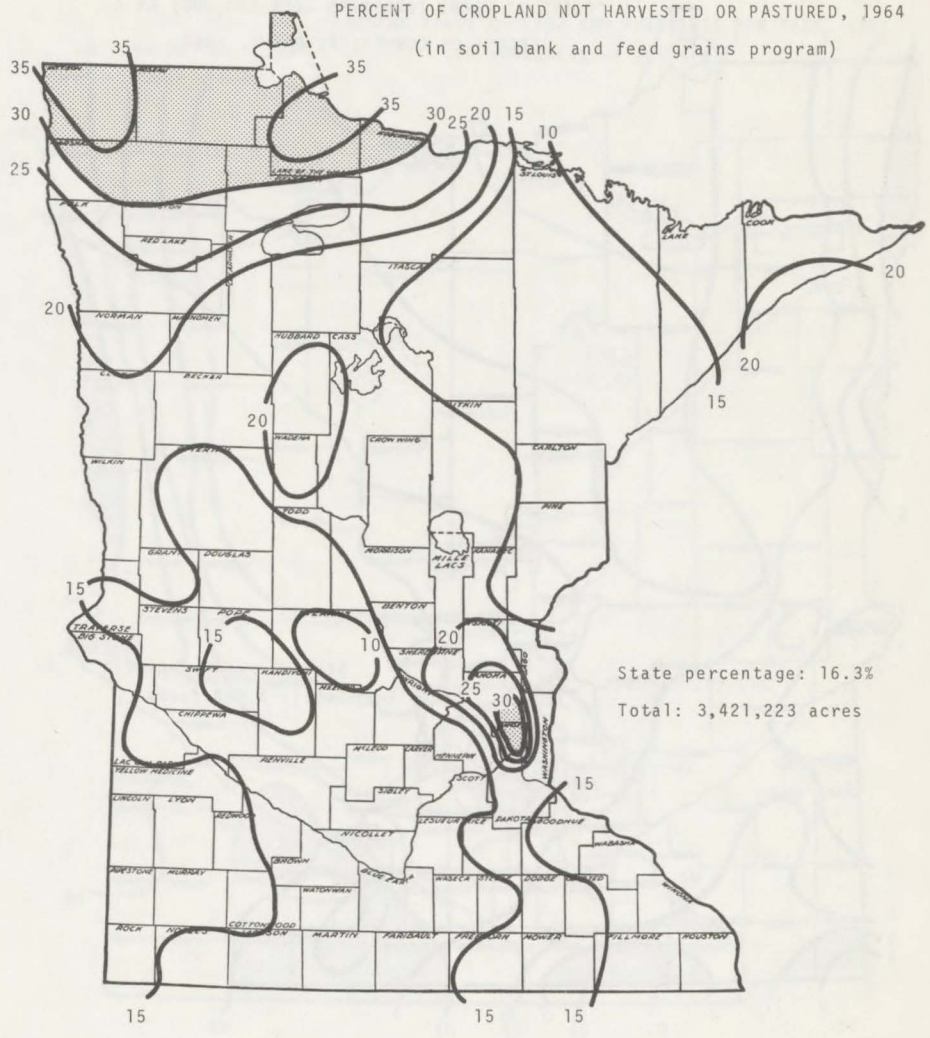
PERCENT OF TOTAL CASH FARM RECEIPTS FROM COMMODITY CREDIT CORPORATION LOANS, 1954



PERCENT OF FARMLAND IN SOIL BANK
1956-1960 contract period



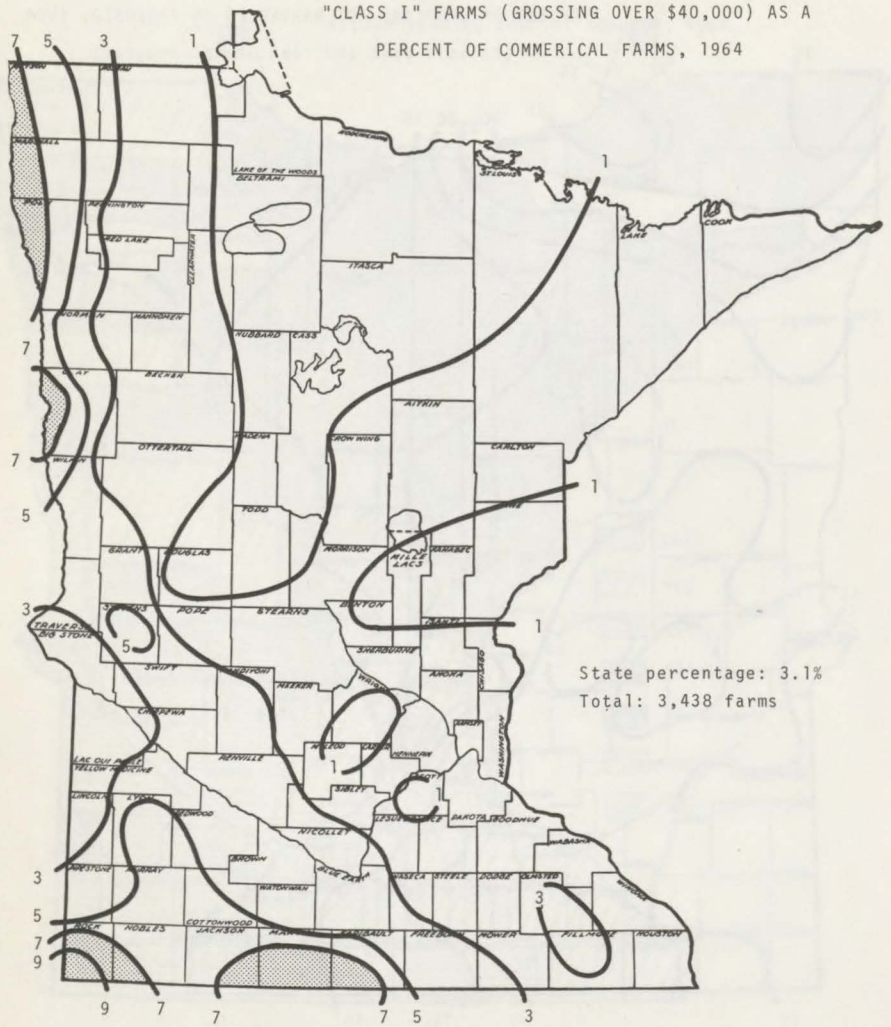
PERCENT OF CROPLAND NOT HARVESTED OR PASTURED, 1964
(in soil bank and feed grains program)



State percentage: 16.3%

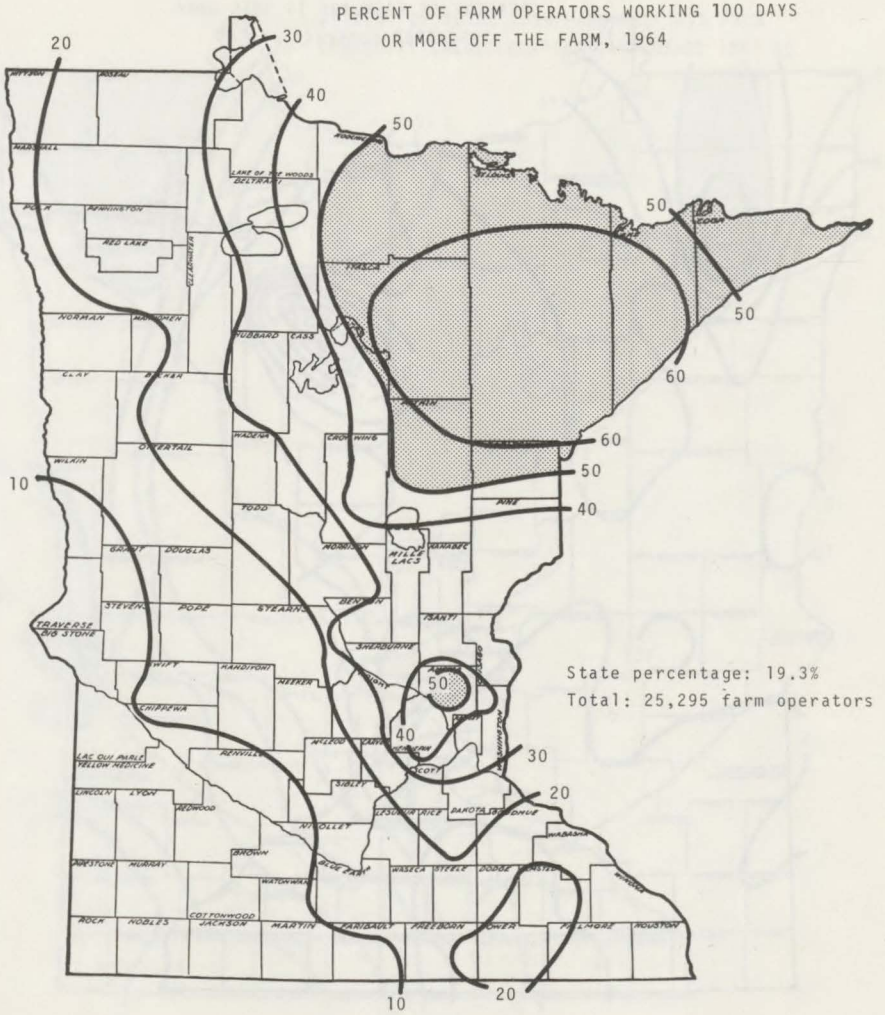
Total: 3,421,223 acres

"CLASS I" FARMS (GROSSING OVER $40,000) AS A PERCENT OF COMMERICAL FARMS, 1964



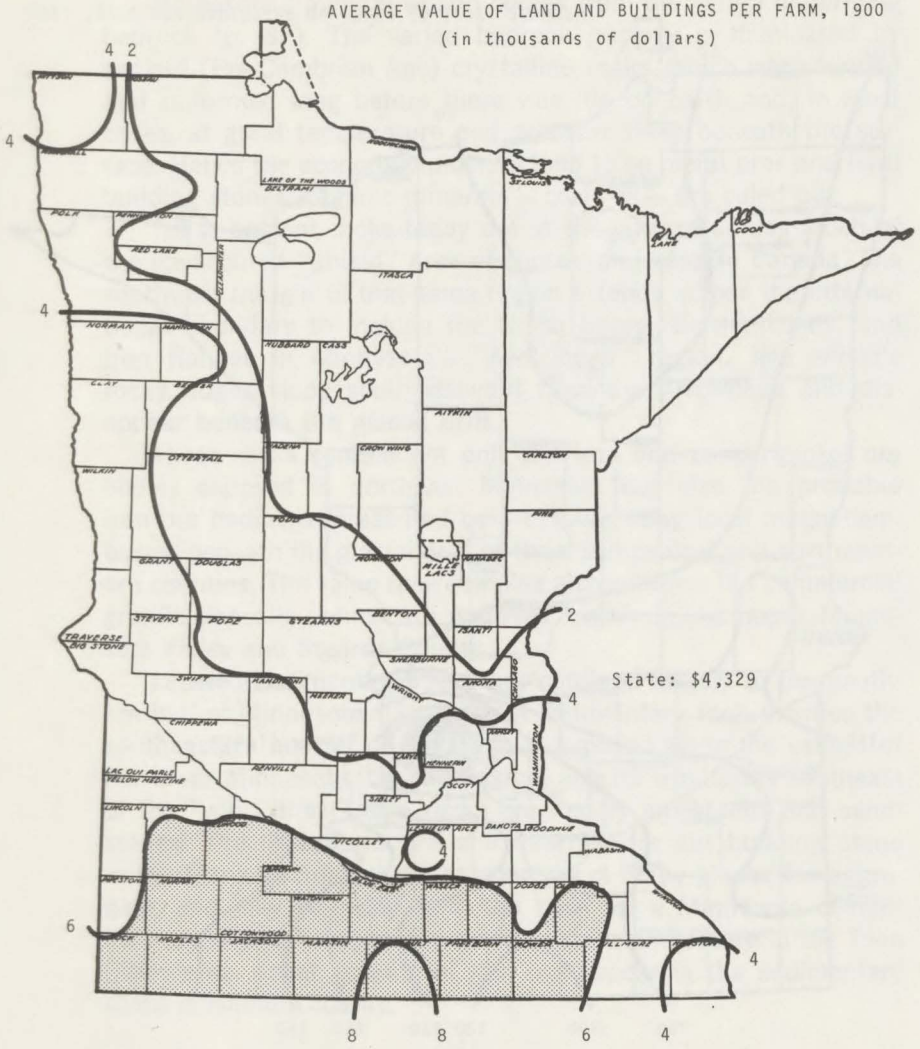
State percentage: 3.1%
Total: 3,438 farms

PERCENT OF FARM OPERATORS WORKING 100 DAYS OR MORE OFF THE FARM, 1964

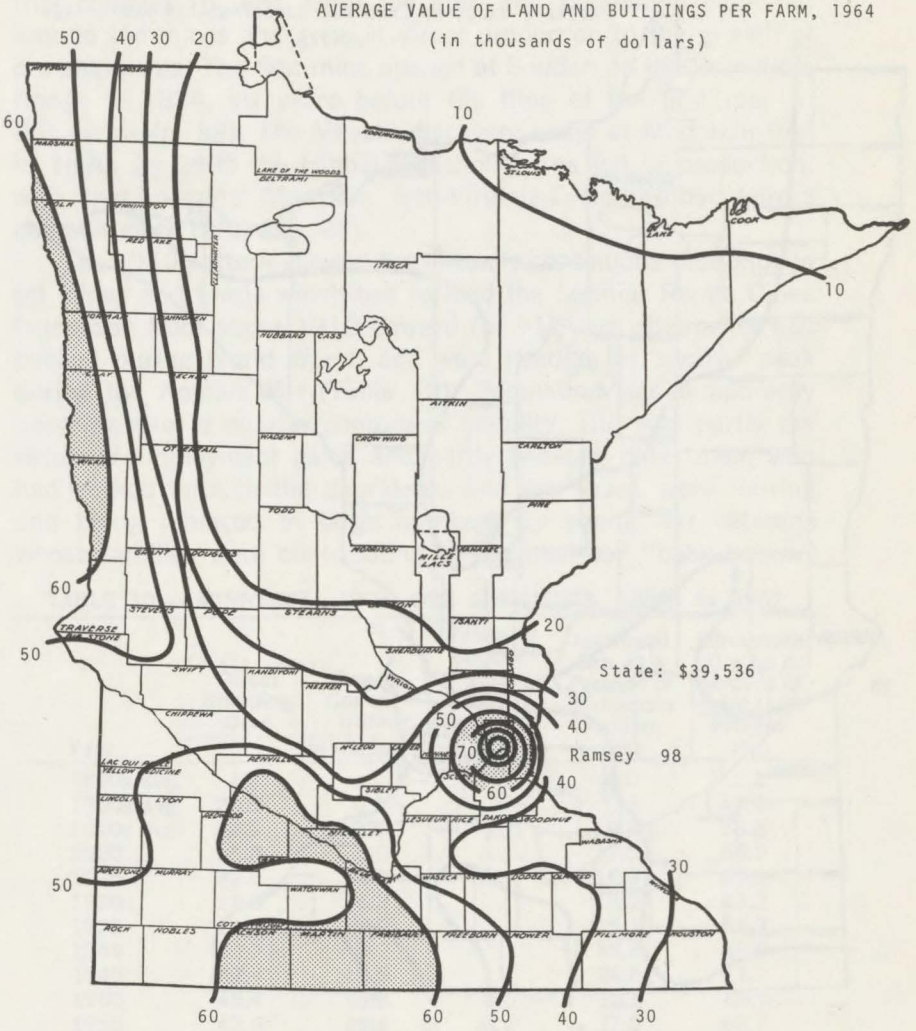


State percentage: 19.3%
Total: 25,295 farm operators

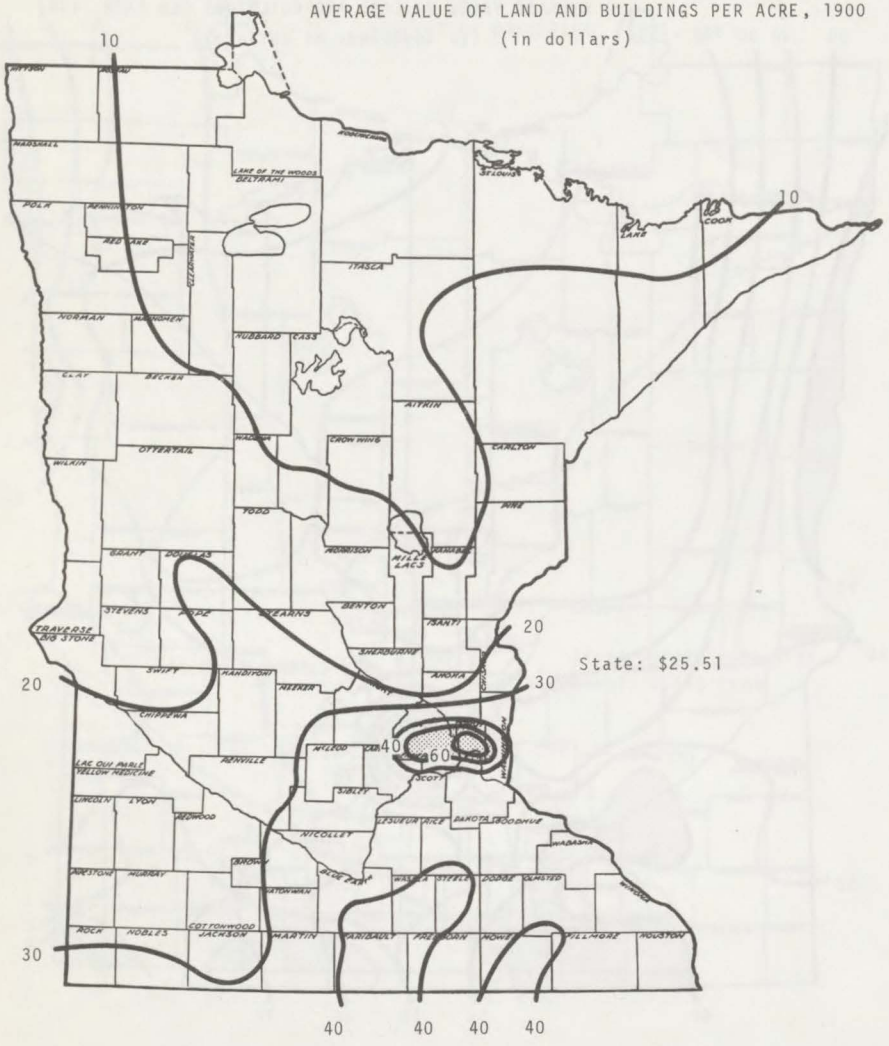
AVERAGE VALUE OF LAND AND BUILDINGS PER FARM, 1900
(in thousands of dollars)



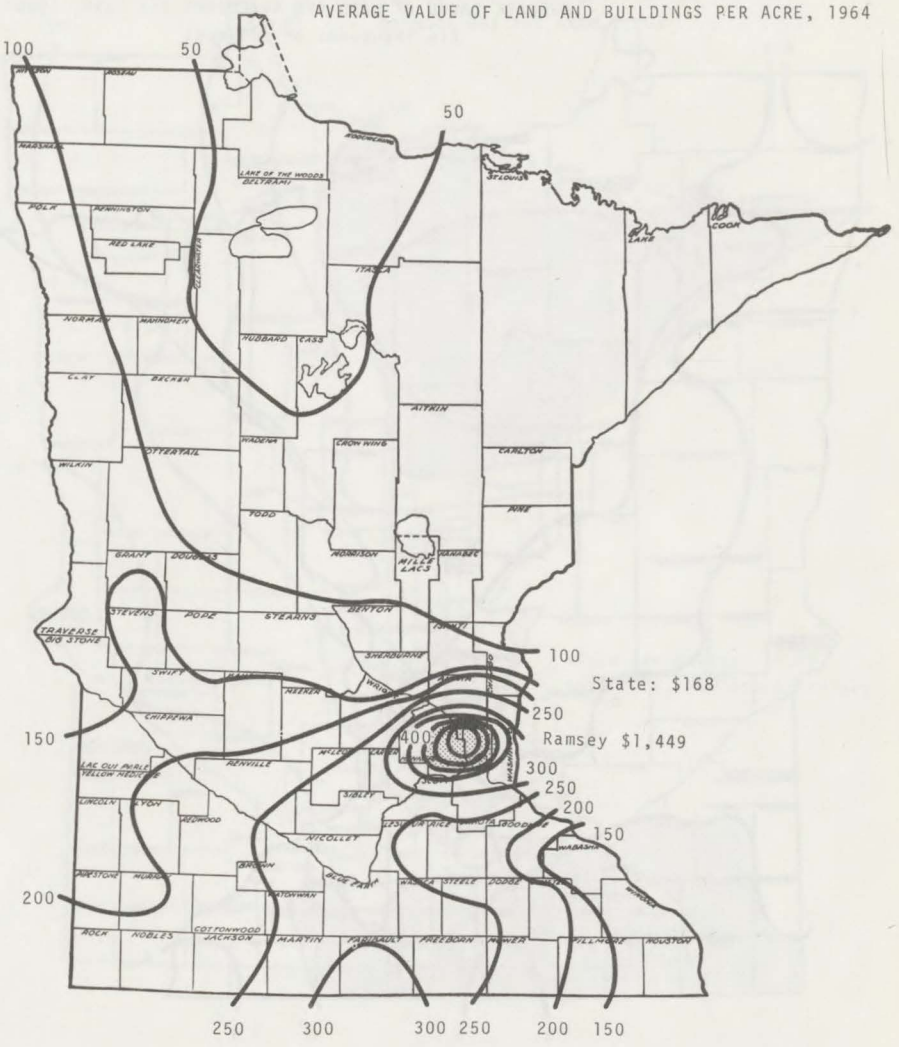
AVERAGE VALUE OF LAND AND BUILDINGS PER FARM, 1964
(in thousands of dollars)



AVERAGE VALUE OF LAND AND BUILDINGS PER ACRE, 1900
(in dollars)



AVERAGE VALUE OF LAND AND BUILDINGS PER ACRE, 1964



Chapter 7

MINERAL PRODUCTION

Minnesota's mineral wealth comes from the varied underlying bedrock (p. 87). The varied bedrock geology is dominated by ancient (Pre-Cambrian Age) crystalline rocks, which were formed and re-formed long before there was life on earth and, in most cases, at great temperature and pressure deep beneath the surface. Hence the economic minerals tend to be metal ores and hard building stones; organic minerals — coal, oil — are ruled out.

These ancient rocks today are at the surface across much of the ice-scoured "shield" area of central and eastern Canada. The southwest margin of that same region extends across the international boundary to include the North Shore, Border Lakes, and Iron Ranges in Minnesota's "Arrowhead" region. The shield's rocky ridges slope southwestward from the Arrowhead and disappear beneath the glacial drift.

These rocks contain not only the iron and copper-nickel ore bodies exposed in northeast Minnesota but also the probable iron ore bodies, represented by areas of strong local magnetism, buried beneath the glacial drift of the north central and northwestern counties. The same rock complex also contains the commercial granite deposits, which are quarried mainly in the upper Minnesota Valley and Stearns County.

Layered sedimentary rocks are confined largely to the southern half of Minnesota. The thickest sedimentary rock mantles the southeastern quarter of the state, is exposed along the valleys of the lower Minnesota, the Mississippi and its tributaries southeast of the Twin Cities. These rocks are mainly limestones and sandstones. The limestones are still quarried for cut building stone in the Mankato area; they are quarried at many places for aggregate, and may someday form the base for a Minnesota cement industry. The sandstone is used for glass manufacture in the Twin Cities area. Local pockets of iron ore appear in the sedimentary rocks in Fillmore county.

The Iron Ranges

The mineral areas of overwhelming importance are the Iron Ranges — a massive component of the Great Lakes heavy industrial complex (p. 88). Until the auto era, population clustered around the mines and grew in direct proportion to the growth of ore shipments. The first mine opened at Soudan on the Vermilion Range in 1884, six years before the time of the first map in this series (p. 89). The Mesabi discovery came at Mountain Iron in 1890. By 1905 the Hibbing-Chisholm area led in production, with the booming Mountain Iron-Virginia-Eveleth-Gilbert-Aurora complex close behind (p. 90).

The 1950 pattern showed the virtually continuous belt of open pit mines and towns which has formed the familiar Range Cities landscape from about 1910 onward (p. 91). Ore shipments had peaked during World War II and were headed for another peak during the Korean War (Table 10). Population was temporarily booming after a quarter century of stability. This was partly the result of employment gains and partly because older men, who had worked through the depression and war years, were retiring and being replaced in large numbers by young war veterans whose families were contributing to the post-war "baby boom."

TABLE 10 — MINNESOTA IRON ORE SHIPMENTS, 1890s to 1967

Year	Direct Shipping Ores	Gravity Concentrates	Taconite Concentrates (mostly pellets)	Improved Ore as a Percent of Minnesota Production	Minnesota Ore as a percent of total U.S. Production
	(in million tons)				
1890s avg.	4.3	. . .	. . .	0.0	2.2
1900s avg.	20.8	0.1—	. . .	0.3	47.4
1910s avg.	32.5	3.6	0.01—	9.8	58.8
1920	35.3	5.0	. . .	12.5	58.2
1925	32.5	6.6	. . .	16.9	60.9
1930	28.5	6.3	. . .	18.2	63.2
1935	15.4	5.2	. . .	25.1	61.3
1940	39.7	9.2	. . .	18.8	65.0
1945	47.4	15.5	. . .	24.6	71.2
1950	45.4	19.9	0.01—	30.5	66.9
1955	43.6	25.4	1.2	37.8	66.2
1960	21.4	22.3	11.4	61.1	65.9
1965	10.7	19.6	18.9	78.3	57.8
1967	10.9	13.1	24.1	77.3	57.7

Source: *University of Minnesota Bulletin, Mining Directory Issue,* 1953 and 1968.

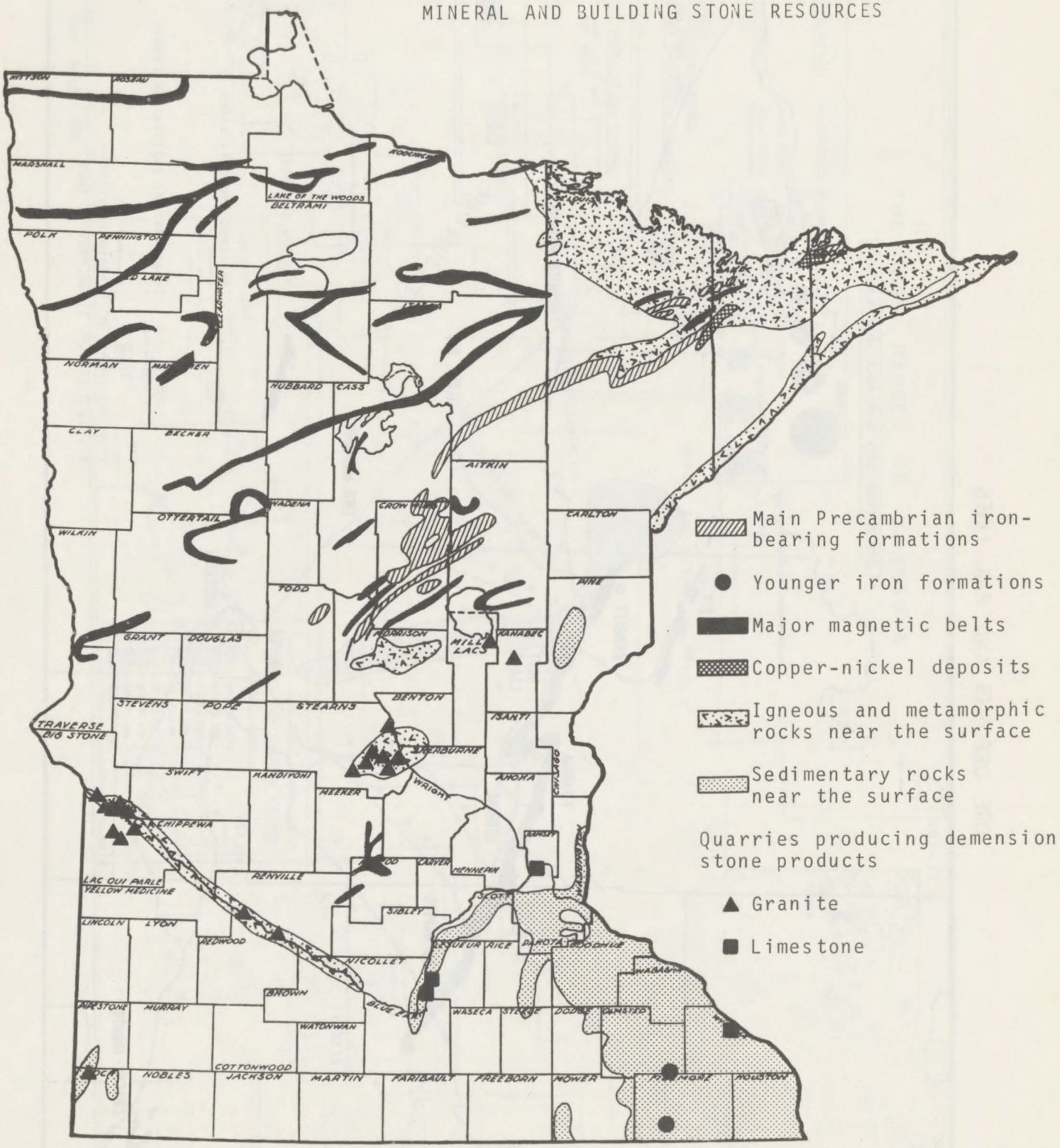
The 1960 map reflects three major changes (p. 92). First, the taconite industry had added new towns and accompanying new production at Hoyt Lakes and Babbitt, at the east end of the Mesabi Range. Second, production of high grade non-magnetic ores in the older parts of the range had declined. Finally, population had dispersed markedly, from the compact towns adjoining the mines to forested lake shores and hillsides within commuting distance. Automobile commuting also has made it easier for mine and taconite mill workers to shift jobs, in response to openings and seniority, without shifting place or residence. Thus, the Range Cities have become a dispersed metropolitan complex of nearly 100,000 people.

Taconite mills continue to grow (p. 93). The earliest large plant, Reserve at Silver Bay, was placed beside Lake Superior's abundant water supply. The second major plant, Erie at Hoyt Lakes, located at the source of ore and developed local water storage facilities. Other new plants have followed the Erie strategy and also have begun to draw taconite processing westward into the historic producing districts.

The unusual landscape of this metropolis in the wilderness is comprised of mines, transportation lines, built-up areas, lakes and forest (p. 94-95). "Locations" such as Mahoning, Leetonia, and Keer were necessary when men had to walk to work, or mass transportation was expensive and slow (p. 96). Other "locations" like Kelly Lake were railroad oriented. Many of the old settlements are abandoned and replaced by new isolated homes and subdivisions or the planned new towns of Silver Bay (p. 97) and Hoyt Lakes.

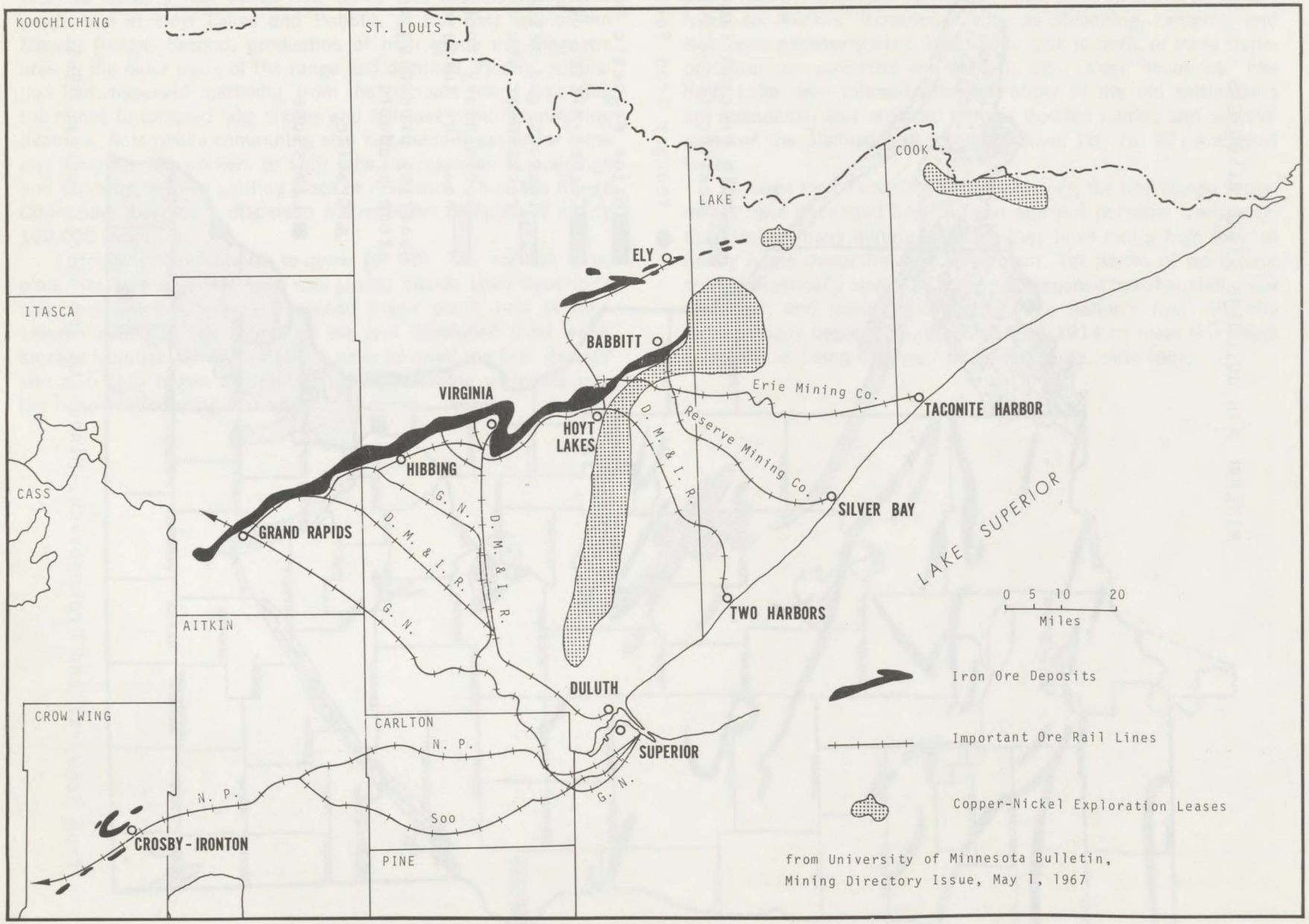
Through their Twentieth Century history, the Iron Range settlements have depended heavily upon efficient personal transportation. Unlike many mining districts, they have had a high level of family home ownership and investment. Yet places of work have shifted drastically along the Range in response to exhaustion, new discovery, and technologic change. The nation's first inter-city bus company began operations there in 1914 to meet this need; a freeway is being extended along the same route today.

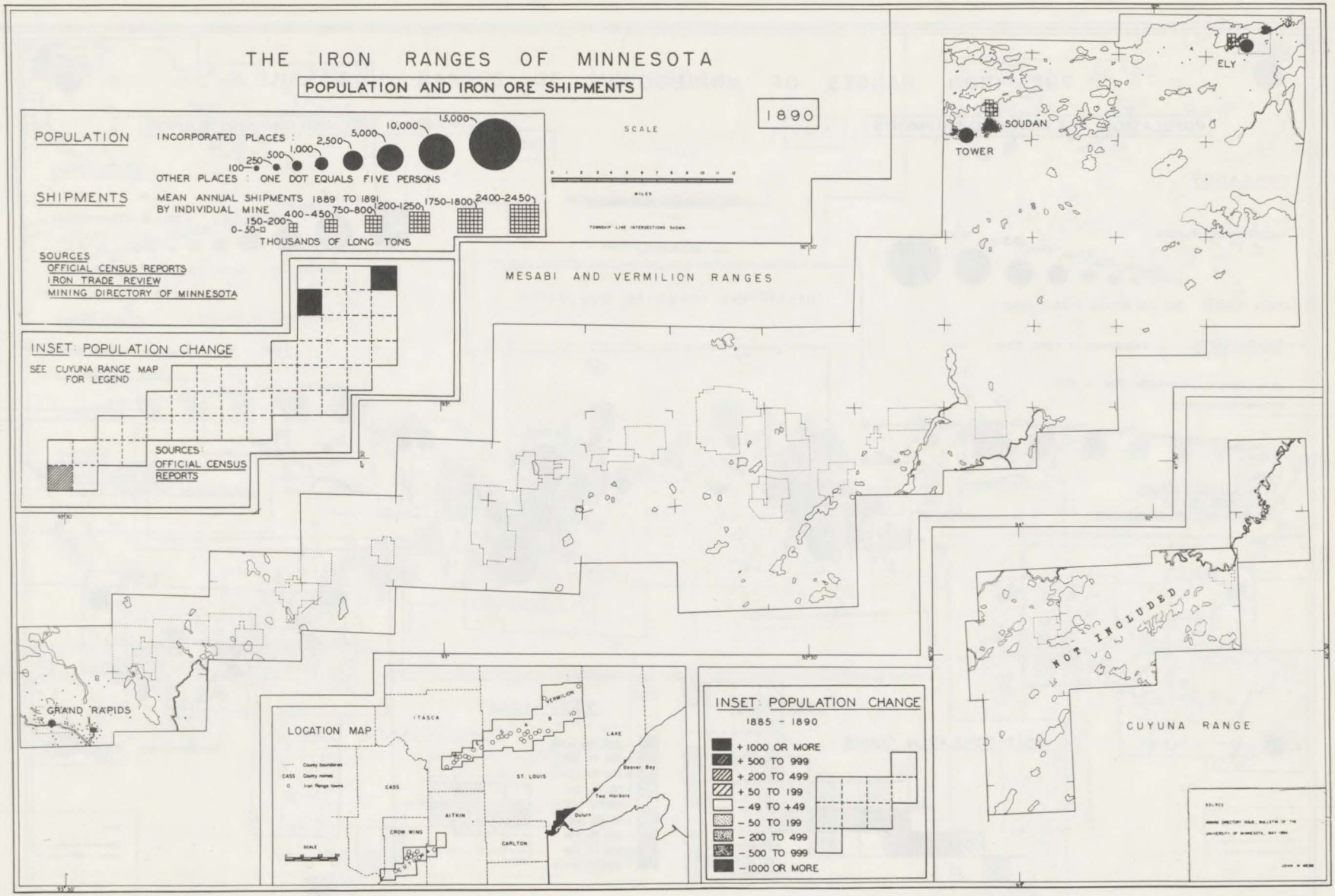
MINERAL AND BUILDING STONE RESOURCES



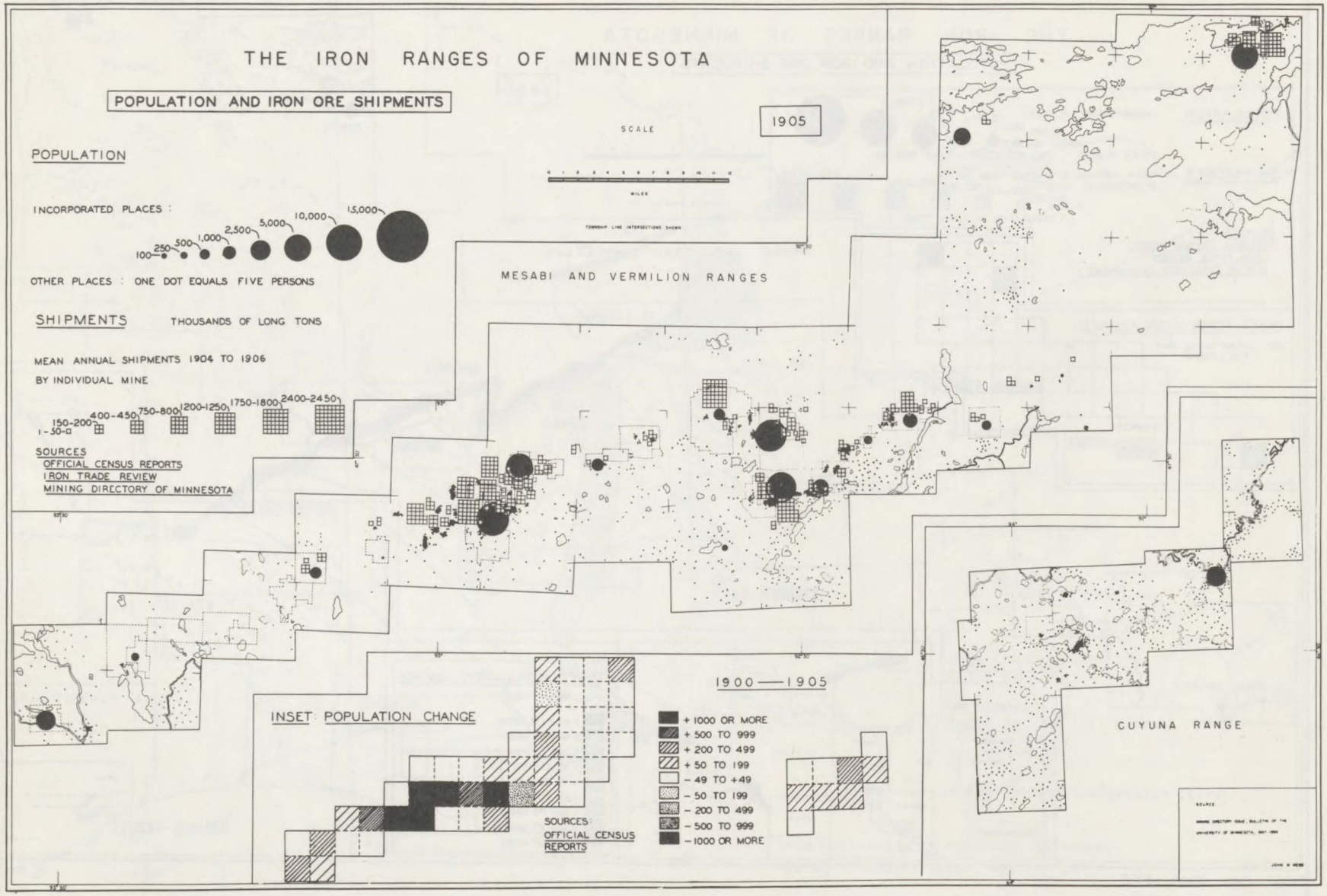
from Schwartz and Prokopovich, Minnesota Geological Survey, 1966.

ORE DEPOSITS AND RAIL LINES

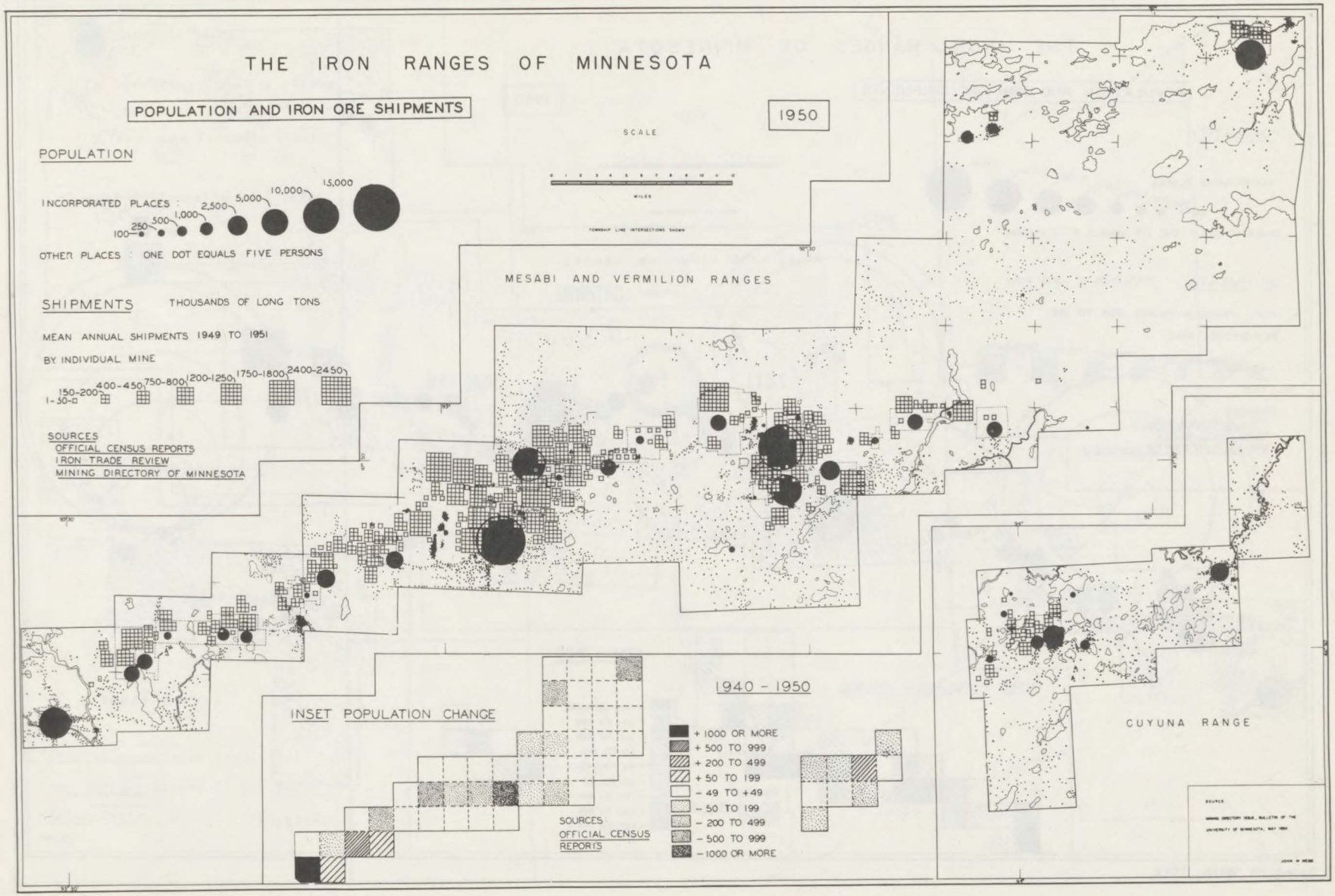




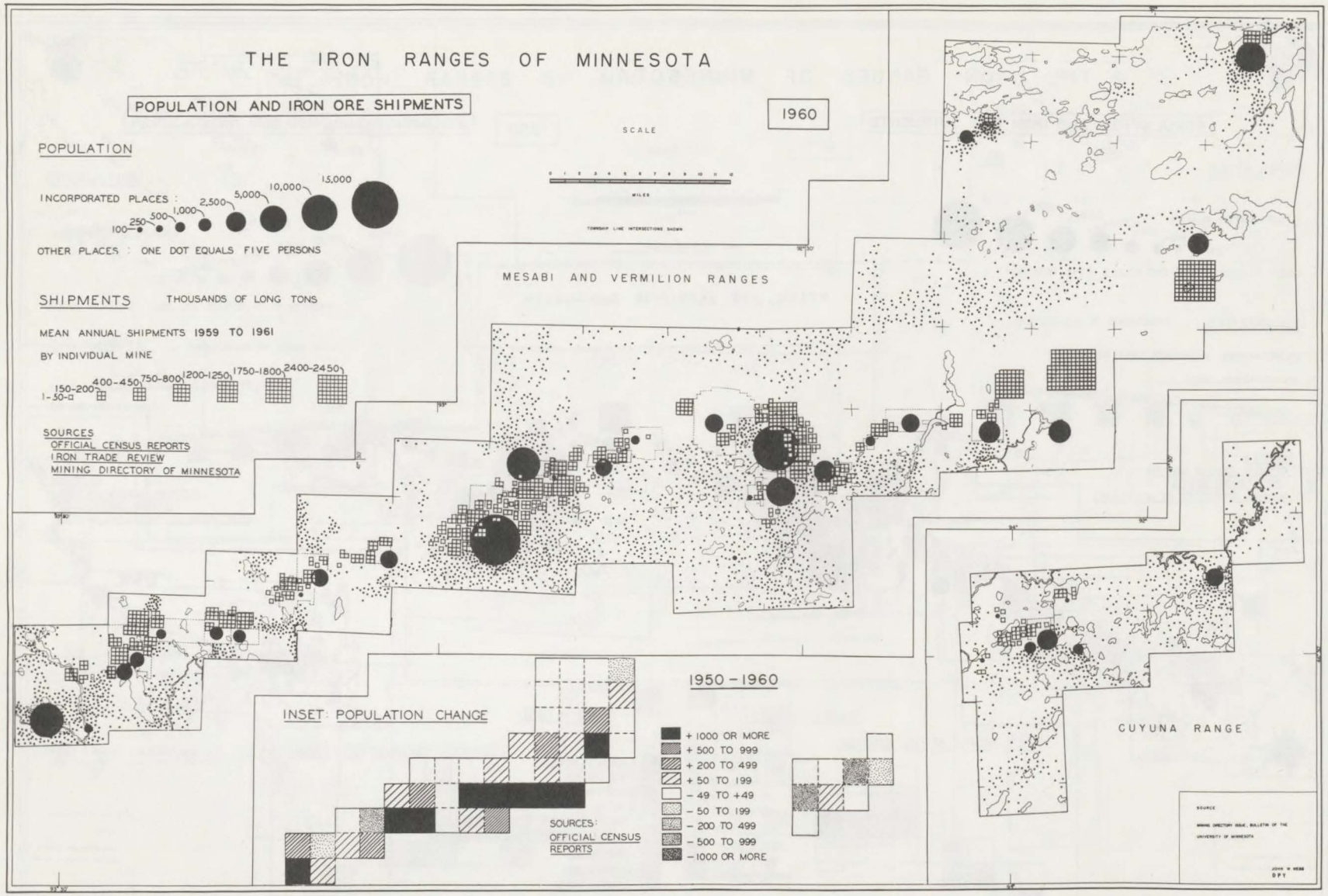
Taken from Webb, 1958



Taken from Webb, 1958

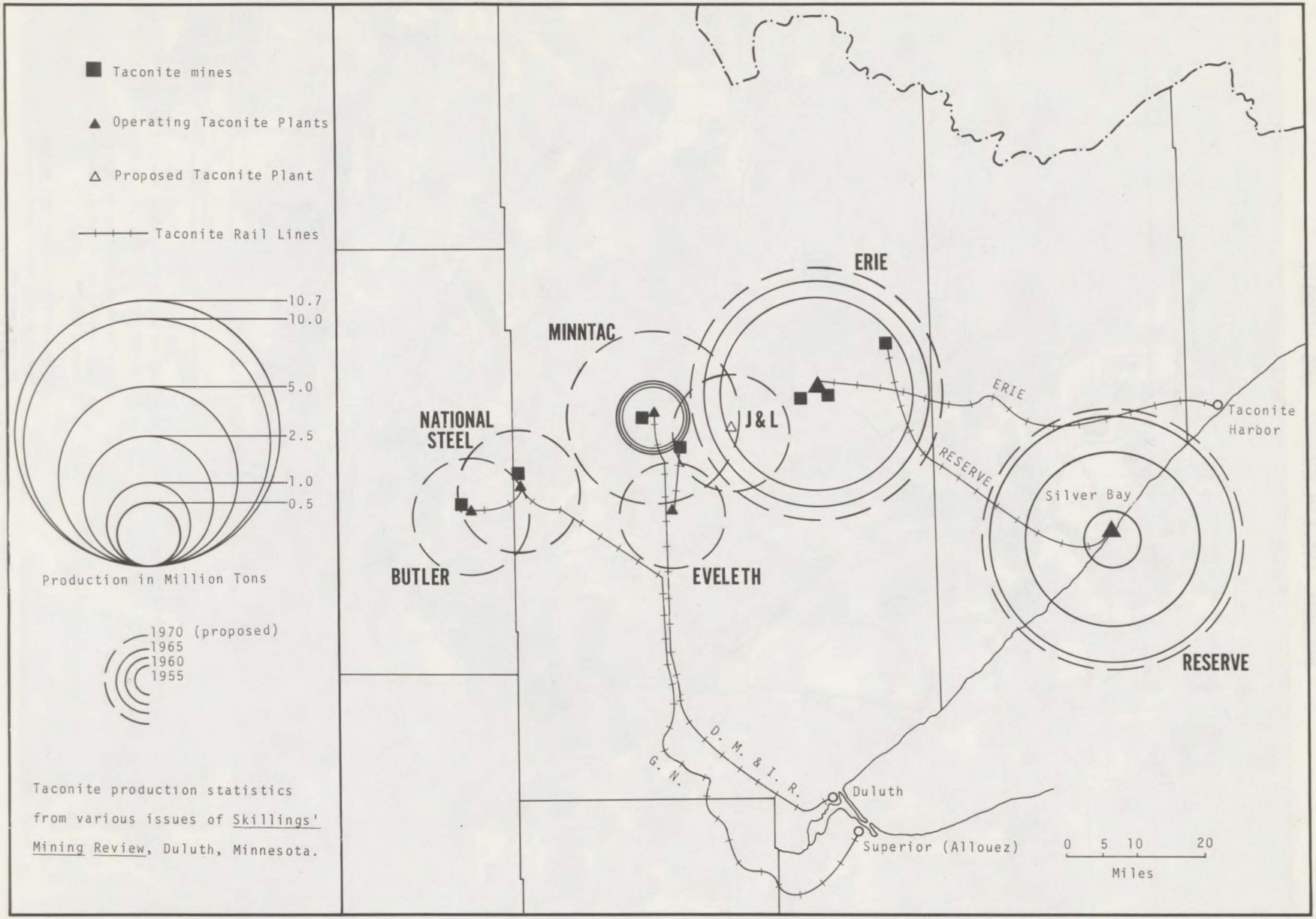


Taken from Webb, 1958



Based on Webb, 1958

TACONITE PRODUCTION



VIRGINIA, EVELETH, GILBERT, AND VICINITY

U. S. or state highway

Railroad

Urban place and non-farm settlement

Forest

Open pit mine

Lean ore, ore material and taconite stockpile

Tailing basin

Stripping dump, dam or dike

0 1 2

Miles

Sources: Base map and forest cover modified from U.S.G.S. topographic maps, 1950-1951.

Mining features and railroads from Mesabi Range Maps prepared by the Great Northern Iron Ore Properties, 1959.

Urbanized areas from Land Use: Survey and Analysis, report of the Range Regional Planning Commission and other agencies, 1961.

HIBBING, CHISHOLM, VICINITY

- U.S. or state highway
- Railroad
- Urban place and non-farm settlement
- Forest
- Open pit mine
- Lean ore, ore material and taconite stockpile
- Tailing basin
- Stripping dump, dam, or dike

0 1 2
Miles

Sources: Base map and forest cover modified from U.S.G.S. topographic maps, 1950-1951.

Mining features and railroads from Mesabi Range Maps prepared by the Great Northern Iron Ore Properties, 1959.

Urbanized areas from Land Use Survey and Analysis, report of the Range Regional Planning Commission and other agencies, 1961.

KELLY LAKE, LEETONIA, AND MAHONING LOCATIONS

- County road
- City street
- Railroad
- Urban place and non-farm settlement
- Forest
- Open pit mine
- Lean ore, ore material and taconite stockpile
- Tailing basin
- Stripping dump, dam, or dike

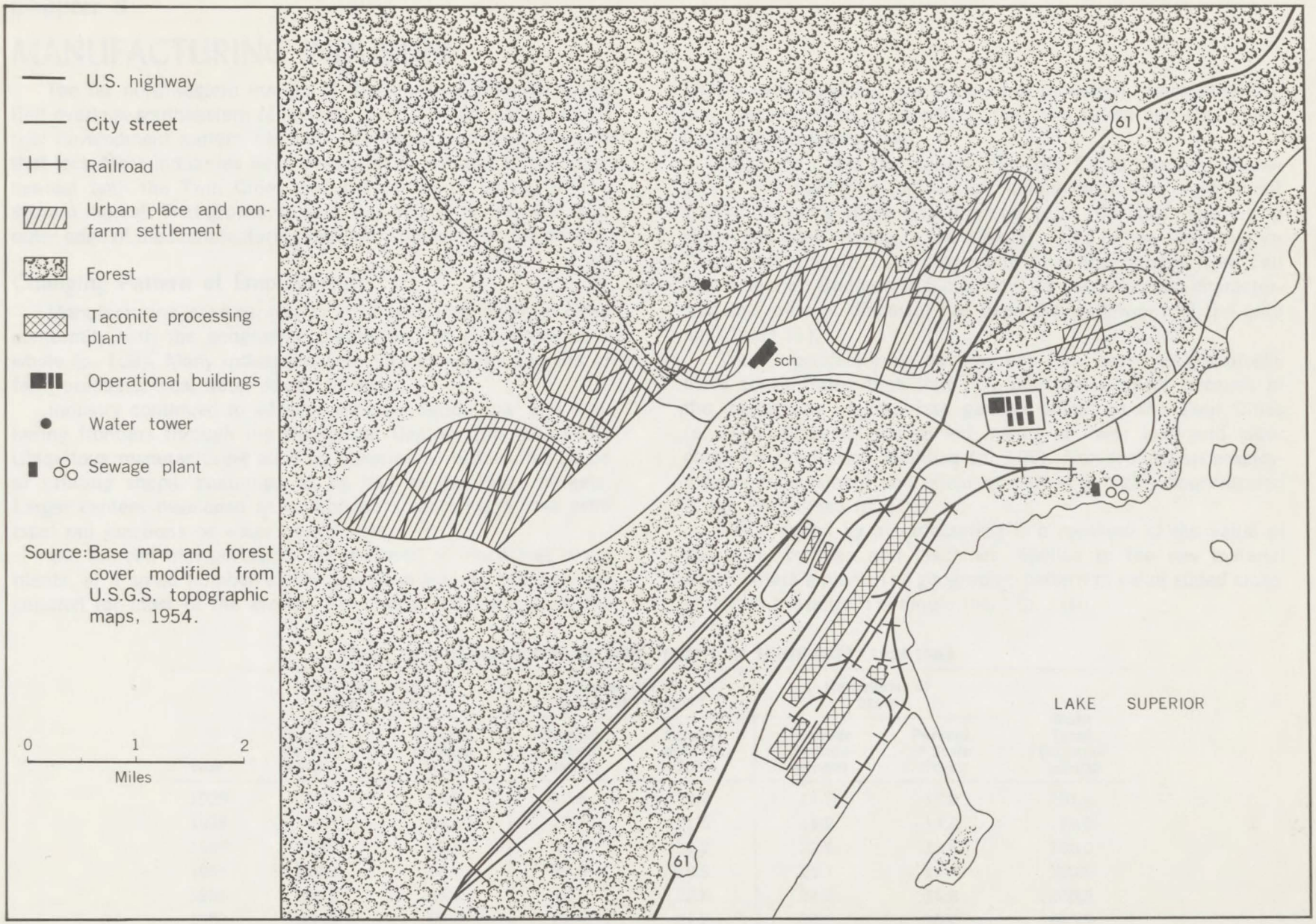
Sources: Base map, mining features and railroads from Mesabi Range Maps prepared by the Great Northern Iron Ore Properties, 1959.

Forest cover modified from U.S.G.S. topographic maps, 1950-1951.

Urbanized areas from Land Use: Survey and Analysis, report of the Range Regional Planning Commission and other agencies, 1961.

0 1 2
Miles

SILVER BAY, 1954



Chapter 8

MANUFACTURING INDUSTRY

The far northwestern margin of the American Manufacturing Belt overlaps southeastern Minnesota (p. 102). The state's industrial development pattern has both reinforced and responded to that fact. Most industries have developed in the part of the state nearest both the Twin Cities and the center of gravity of the eastern market. That growth, in turn, has helped to draw the thin, outer edge of the Manufacturing Belt into southeastern Minnesota.

Changing Pattern of Employment

Manufacturing wage earners in 1870 were distributed in close conformity with the geographic distribution of population as a whole (p. 103). Many industries were tied to nearby sources of farm products, local water power, or ports.

Industry continued to advance with the agricultural and lumbering frontiers through the Nineteenth Century (pp. 103-104). Ubiquitous manufacturing such as bakeries or blacksmith shops or printing shops, continued to be tied to the local markets. Larger centers developed at county seats which were also principal rail junctions or water power sites.

But railroad transportation had improved so much that larger plants, at a small number of key places in the rail network, accounted for most of the growth. The "steel rail" era, from the 1870's to the 1920's, was a period of industrial metropolitanization. Concentration of growth at the Twin Cities and Duluth reflected that trend (p. 104).

Since the Great Depression, the Twin Cities share of Minnesota's manufacturing production employment has held about steady; Duluth's share has dropped (pp. 105-106). The rising share has gone mainly to the smaller cities in the southeastern "industrial triangle," the area south of a line roughly from Eau Claire through Brainerd to Sioux Falls. As centralization characterized the rail era, dispersal has been the watchword of the auto age (Table 11).

Total manufacturing employment has been geographically more concentrated than that of production workers because of the importance of corporate general offices at the Twin Cities (p. 107). Dispersal has aimed mainly at lower land and labor costs for production facilities (p. 108). Non-production employment – management and office workers – is highly concentrated in the Twin Cities (p. 109).

Value added by manufacturing is a measure of the value of the work, by men and machines, applied to the raw material which enters a plant. The geographic pattern of value added closely follows the pattern of employment (p. 110).

TABLE 11 — MANUFACTURING EMPLOYMENT IN MINNESOTA, 1929-1963

Year	Twin Cities 7-County Metro. Area		Remainder of "Industrial Triangle"		Remainder of State		State Total (in thousands)
	Number (in thousands)	Percent of State Total	Number (in thousands)	Percent of State Total	Number (in thousands)	Percent of State Total	
1929	68.2	65.9	20.5	19.8	14.7	14.2	103.4
1939	51.3	64.3	17.2	21.5	11.2	14.1	79.8
1947	122.8	68.2	34.6	19.3	22.5	12.5	180.0
1954	139.3	68.7	38.6	18.9	25.1	12.4	203.0
1958	136.8	65.4	47.7	22.8	24.7	11.8	209.2
1963	166.5	67.8	53.4	21.7	26.0	10.6	245.9

Source: U.S. Census of Manufacturers, Census years indicated.

New capital investment in plant and equipment reflects the existing pattern, together with the trend toward dispersal – especially within the industrial triangle, and the relatively static position of Duluth (p. 110).

Raw Material Processors

One group of Minnesota industries is located near sources of raw materials – either present sources or past. This series of maps shows the farm product, wood, and mineral processors in that group. Their distribution patterns reflect in part the geography of their raw material suppliers; but they also reflect the pull of the metropolitan market and the inertia of historical location. These raw material processors once dominated the state's industry. Their over-all output has increased, although the mix of products has changed greatly; and other, more diversified industries have grown much faster (Table 12).

Most of the farm product processing plants closely follow the pattern of their raw material sources and also reflect the pull of the metropolitan market (pp. 111-112). Vegetable processing plants are most closely identified with their farm suppliers (p. 113). They are concentrated in the south central region, where farm-size increase has been slow and intensification of production greatest in the state.

The major anomaly is the state's remaining flour milling industry (p. 113). It persists in the region where wheat was once king of farm crops, waterfalls turned the mill wheels and turbines, and river packets docked to haul flour and grain to eastern markets. But the mills are remote from their sources of wheat today.

TABLE 12 — MANUFACTURING EMPLOYMENT BY MAJOR INDUSTRY GROUPS, 1947 AND 1963

	Employment (in thousands)			Percent of Total Employment		
Industry Group	1947	1963	Percent Change 1947-1963	1947	1963	Change in Percent of Total 1947-1963
Foods and Beverages	46.6	48.6	+0.4	25.9	19.8	−6.1
Machinery, except Electrical	24.1	37.5	+55.6	13.4	15.3	+1.9
Printing and Publishing	18.1	21.9	+21.1	10.0	0.9	−1.1
Electrical Machinery	15.1	19.0	+25.9	8.4	7.7	−0.7
Paper and Allied Products	8.9	13.5	+51.8	4.9	5.5	+0.6
Fabricated Metal Products	11.2	13.3	+18.8	6.2	5.4	−0.8
Stone, Clay, and Glass Products	3.6	11.0	+205.8	2.0	4.5	+2.5
Instruments and Related Products	1.1	8.3	+655.0	0.6	3.4	+2.8
Transportation Equipment	3.4	8.0	+135.3	1.9	3.3	+1.4
Apparel and Related Products	9.0	7.7	−14.5	5.0	3.1	−1.9
Lumber and Wood Products	6.3	7.0	+11.1	3.5	2.9	−0.6
Chemicals and Allied Products	5.0	5.6	+12.0	2.8	2.3	−0.5
Primary Metal Industries	7.0	5.5	−21.4	3.9	2.2	−1.7
Rubber and Plastic Products	0.6	3.5	+483.0	0.3	1.4	+1.1
Furniture and Fixtures	3.2	2.8	−12.5	1.8	1.1	−0.7
Textile Mill Products	4.7	2.5	−46.8	2.6	1.0	−1.6
Petroleum and Coal Products	1.6	1.5	−6.3	0.9	0.6	−0.3
Leather and Leather Products	1.6	N.D.	....	0.9	N.D.	....
Miscellaneous Manufacturing	8.9	6.0	−32.6	4.9	2.4	−2.5
TOTAL	180.0	245.9	+36.5	100.0	100.0	

N.D. — no data; withheld to avoid disclosure, but included in state total.

Source: U.S Census of Manufactures, 1948 and 1963.

Among the timber processors sawmilling is mostly concentrated in the forest region; but mill work and wood fabricating industries are more likely to be located near the markets; and furniture and fixture plants are almost entirely in the major urban industrial-market region (pp. 114-115). Paper mills and fabricating plants are comparatively large units. The mills stand either near sources of pulpwood in the Northeast or near major sources of scrap and major markets in the Twin Cities. Wallboard production and some fabricating is located at the northern mills, but most fabricating is near the main population and food packing centers – the chief markets for paper cartons.

The Diversified and "Foot-loose" Majority

The majority of Minnesota's industries are not located here because of some nearby raw material source (pp. 116-127). They draw their supplies from distant and widely-scattered places; and they turn out a remarkable diversity of products which flow into regional, national, and export markets (p. 116 and p. 128). Major industrial classes include machinery and instruments; clothing; chemicals; publishing; electrical and optical goods; and metal, plastics and wood products. Throughout this series, map after map reinforces four important generalizations about these diversified industries:

1) The locational consideration of over-riding importance for all of these firms has been a combination of (a) proximity to the regional population center at the Twin Cities metropolis, (b) the historic national concentration of consumer and industrial markets from Chicago to the Middle Atlantic seaboard, and (c) the center of gravity of the national farm supplies and equipment market in the Corn Belt (use clear overlay found in back pocket). As a result, most of the activity has remained south of the Eau Claire-Brainerd-Sioux Falls line.

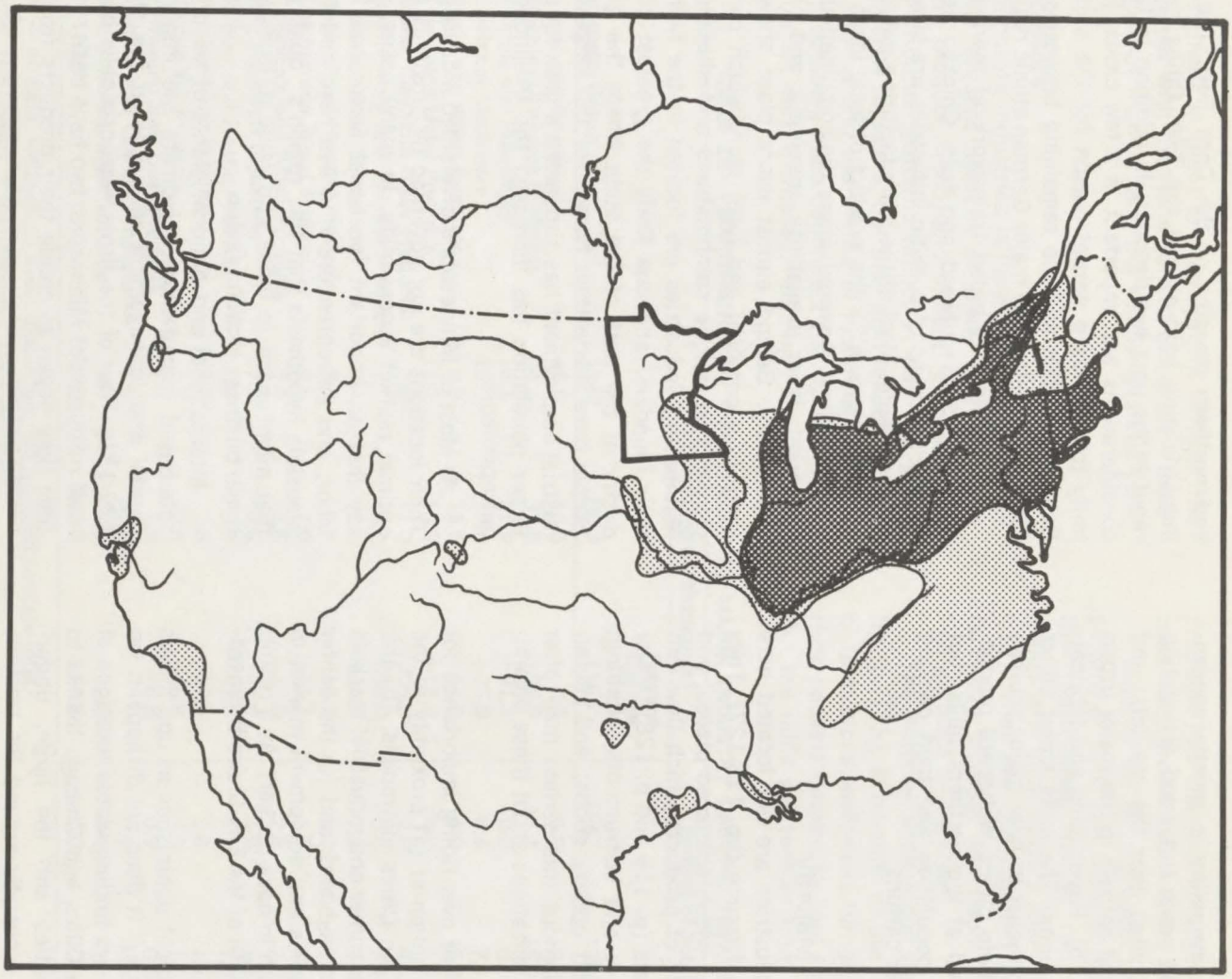
2) Although industrial development diminishes as one moves away from the southeastern "triangle," it does not disappear. On the contrary, many types of plants are finding viable locations at increasing distances from the Twin Cities and Chicago thanks to ever-improving transportation facilities and the large, underutilized labor force in rural areas, especially around the western and northern margins of the Corn Belt. The widening of this industrializing halo around the Twin Cities has been especially rapid in the past two decades. In addition to labor, other special considerations are important in a few cases. For example, proximity to ore was a partial reason for the steel mill location at Duluth (p. 121); and the remaining breweries outside the Twin Cities stand within the major German ethnic regions (p. 117).

3) Within this broad framework of market gradients – from the Twin Cities outward and from Chicago northwestward – the specific locations of specific industries are strongly influenced by chance events. Most of the manufacturing industries of the region are "home-grown" – the product of local ideas and entrepreneurship. They have flowered where the combination of transport costs to market, labor availability, ingenuity, and product quality was satisfactory. Behind almost every plant shown on these maps there is a personal and local story which contains all of these elements in unique combinations and shadings. Thus, many of Minnesota's industries are located in the home communities of their founders; and one finds the greatest concentration of industry in the part of the state where the greatest number of people have made their homes for the longest time. Growing industrial employment has supported a growing population. But the larger population has increased the likelihood of emergence of entrepreneurs.

4) Most of Minnesota's diversified industries are "foot-loose." Their locations are not governed by proximity to raw materials or optimal market accessibility. In many cases, one would have to say that an important locational factor has been management, labor, and entrepreneurs who live here and like it. It is thus a plausible hypothesis that this region's "quality of life," whatever that might mean to those who value it, is its most important national business location factor.

International and national plants of six of the largest Minnesota-based manufacturers indicate the importance of enterpreneurial and management resources in the state's industry (pp. 129-131). Four of the firms were originally based on the agricultural resources of Minnesota; two have been "foot-loose" from the time they began to create their products from the ideas of Minnesota people.

MANUFACTURING REGIONS

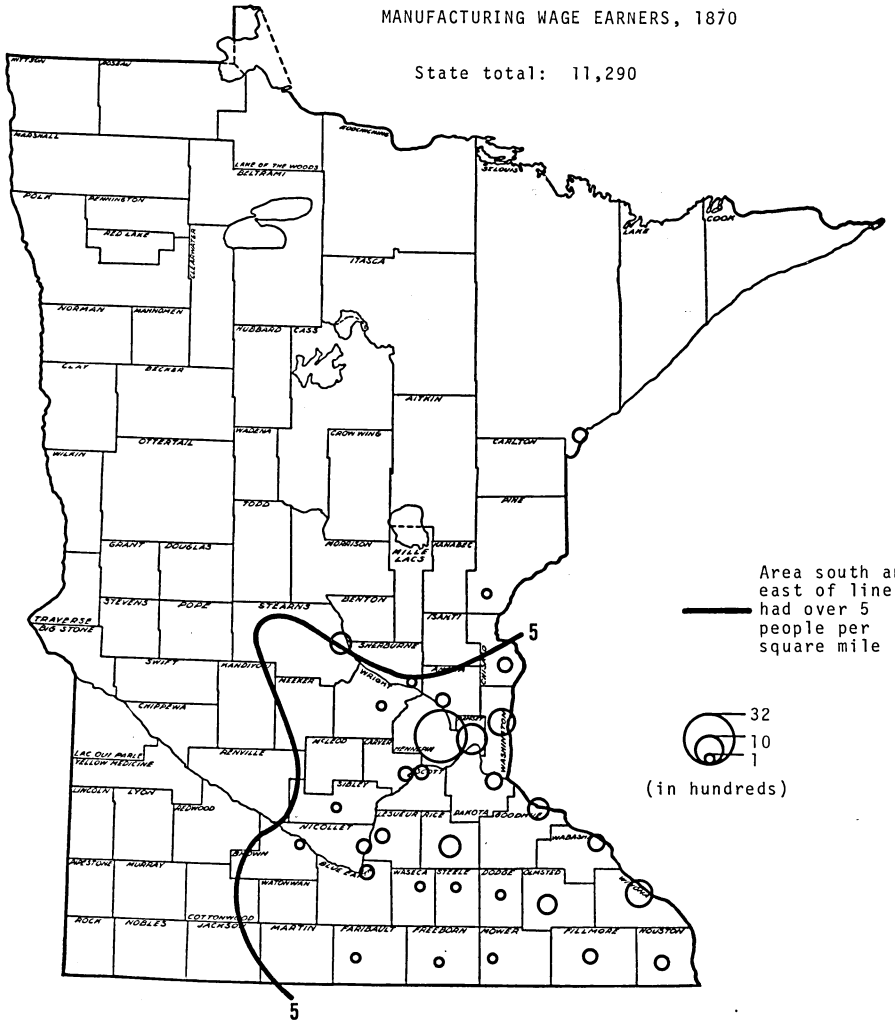


High density — main American manufacturing belt
(from White, Foscue and McKnight, 1964)

Medium density
(from Goode's World Atlas, 1964.)

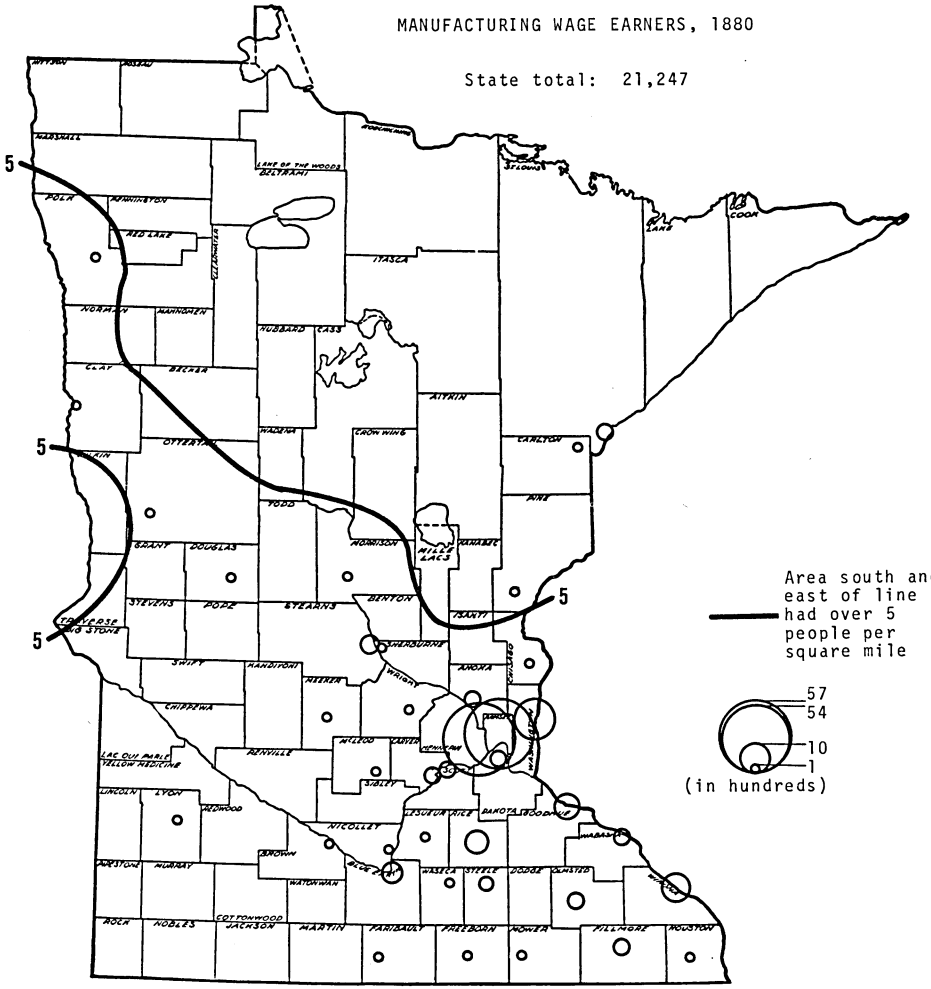
MANUFACTURING WAGE EARNERS, 1870

State total: 11,290



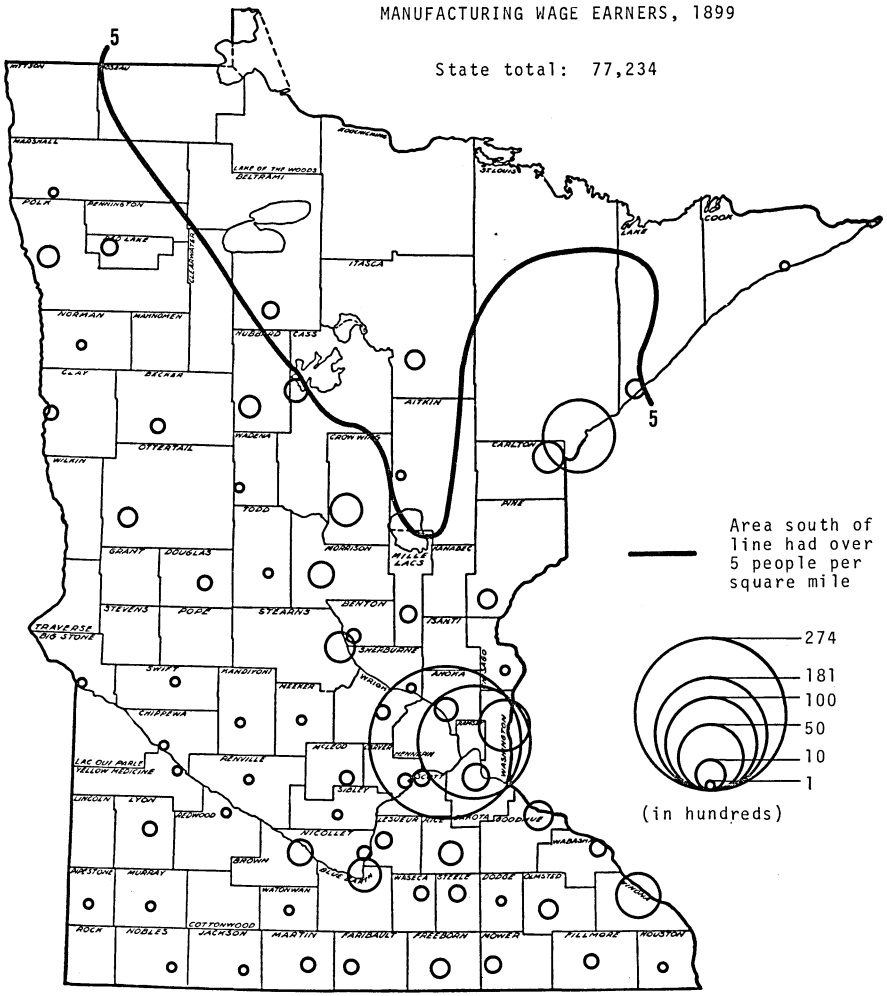
MANUFACTURING WAGE EARNERS, 1880

State total: 21,247



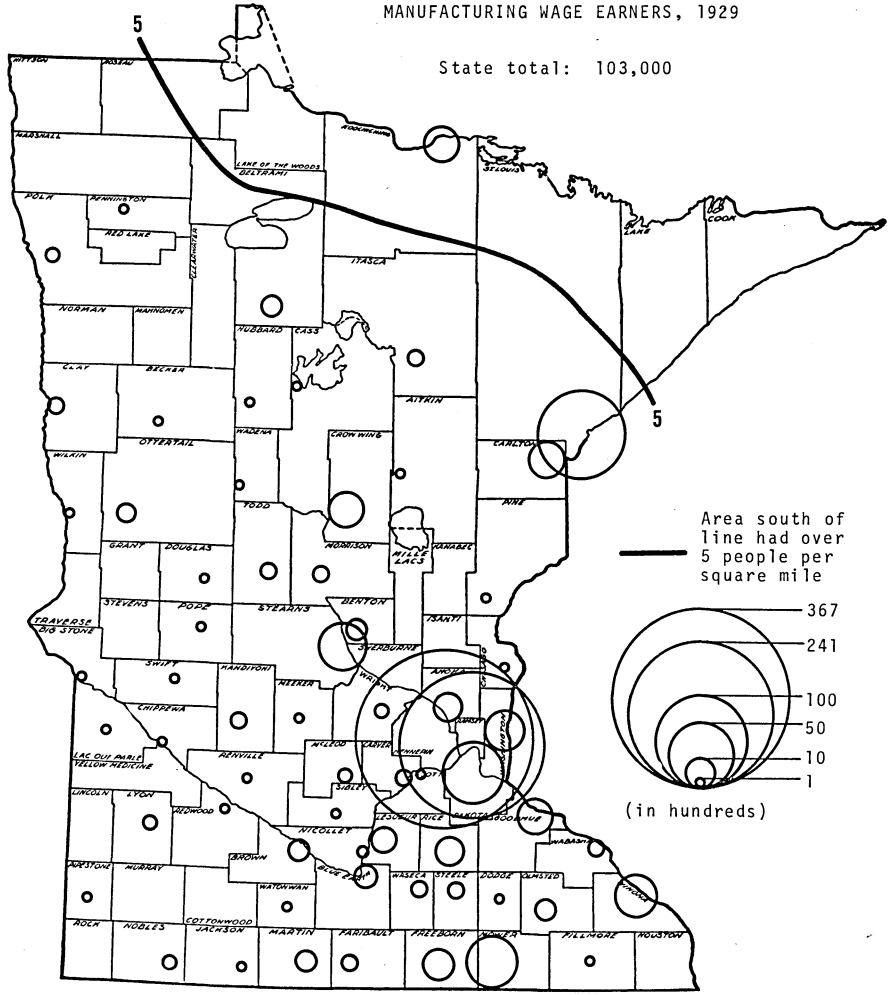
MANUFACTURING WAGE EARNERS, 1899

State total: 77,234



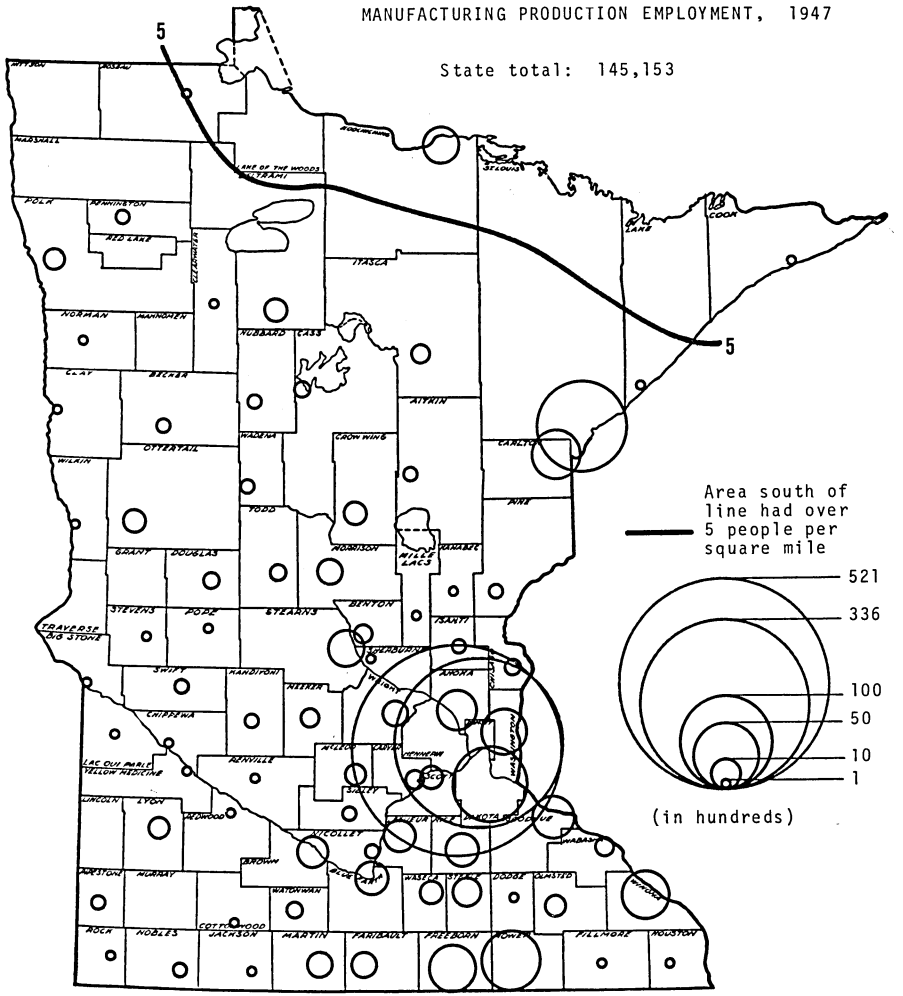
MANUFACTURING WAGE EARNERS, 1929

State total: 103,000



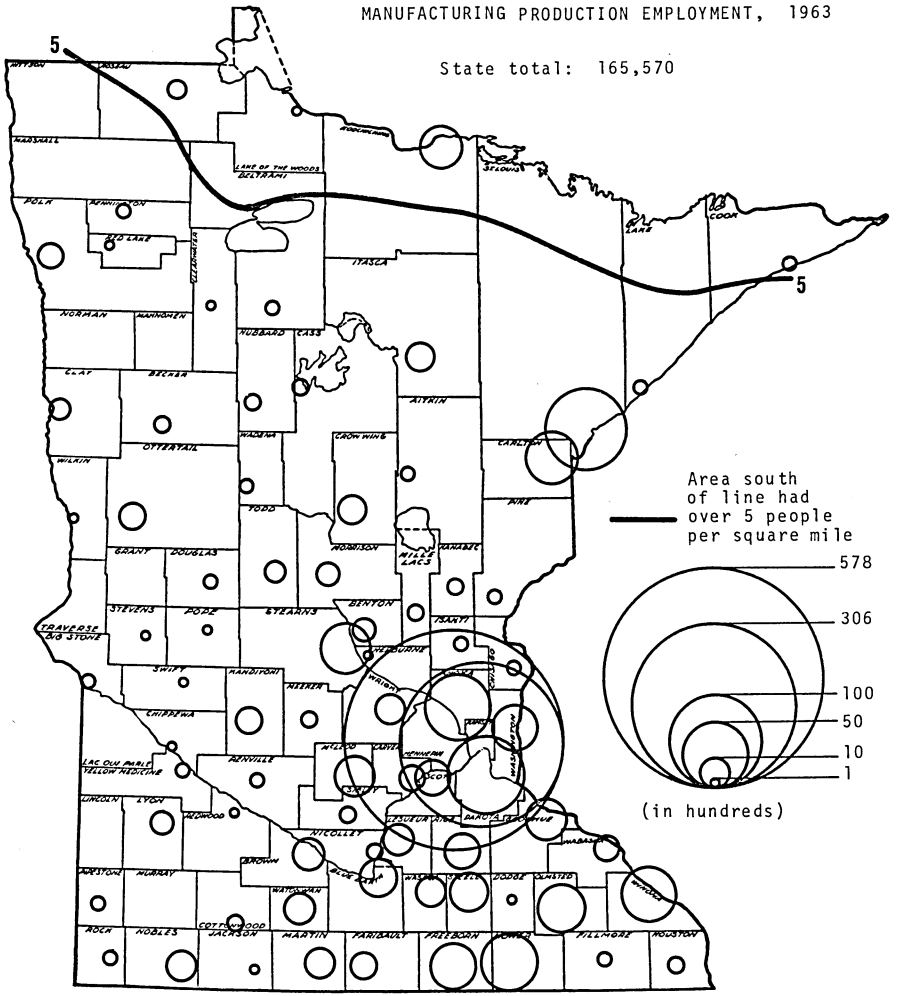
MANUFACTURING PRODUCTION EMPLOYMENT, 1947

State total: 145,153



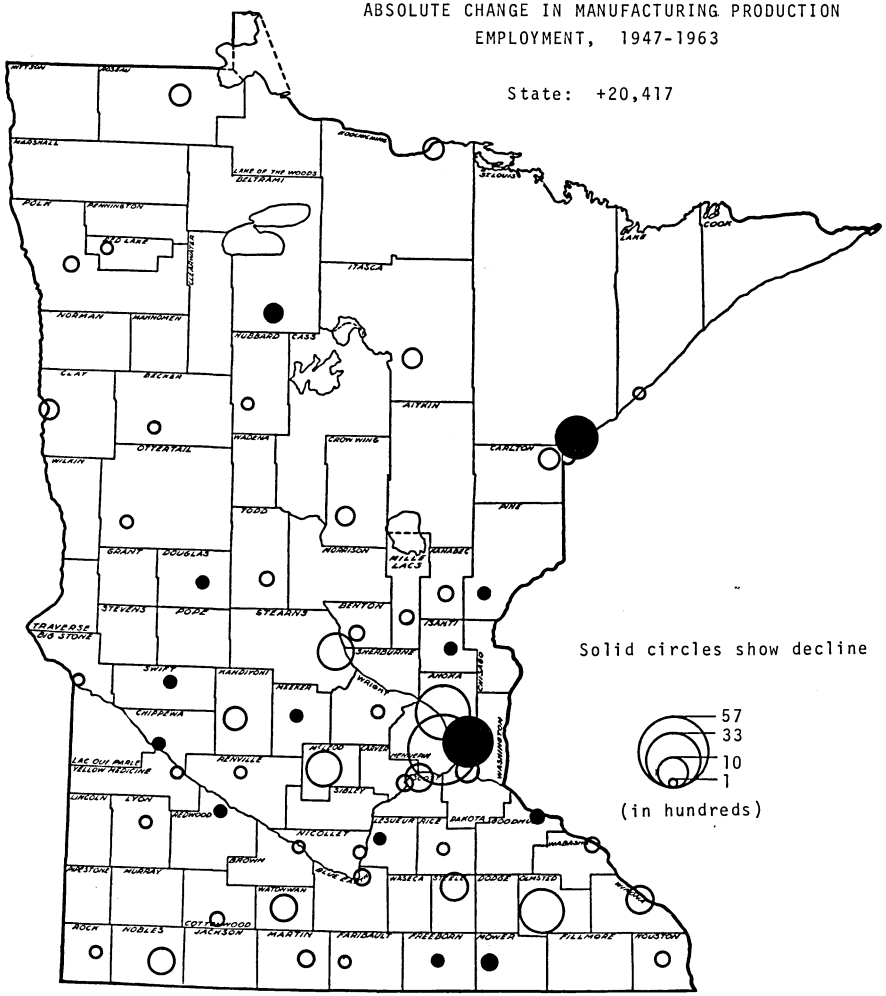
MANUFACTURING PRODUCTION EMPLOYMENT, 1963

State total: 165,570



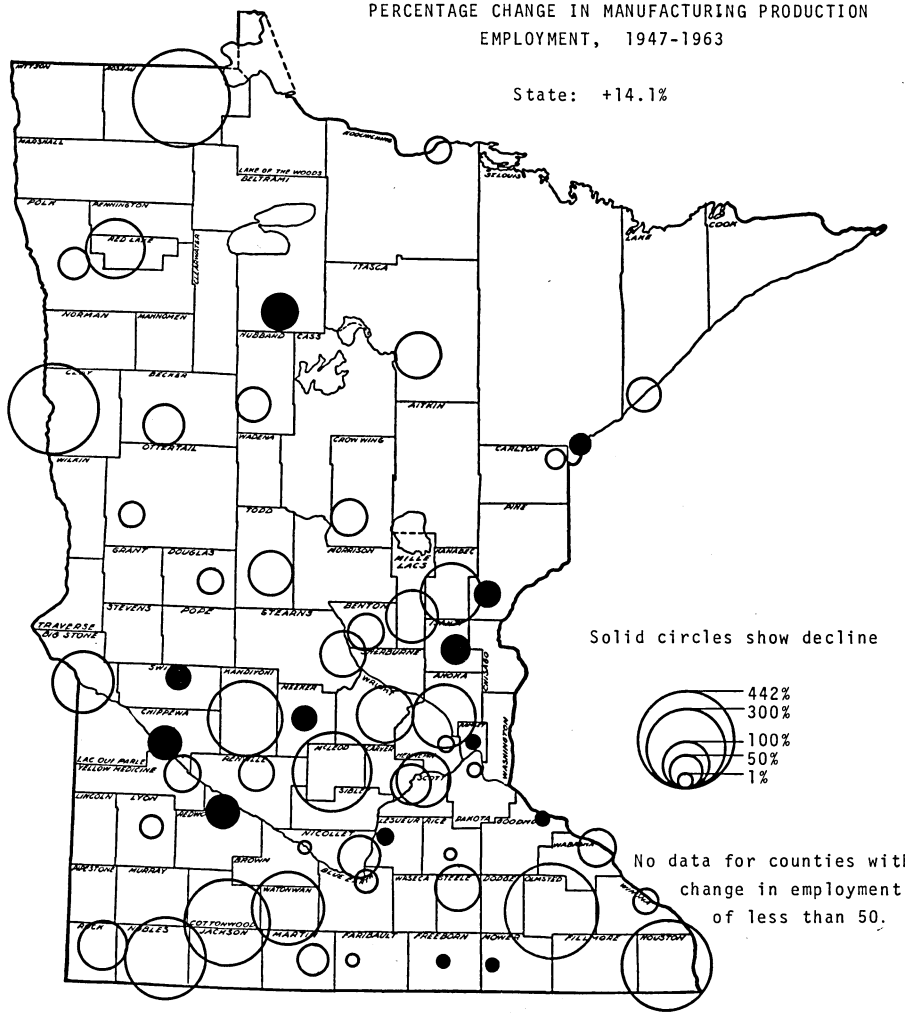
ABSOLUTE CHANGE IN MANUFACTURING PRODUCTION EMPLOYMENT, 1947-1963

State: +20,417



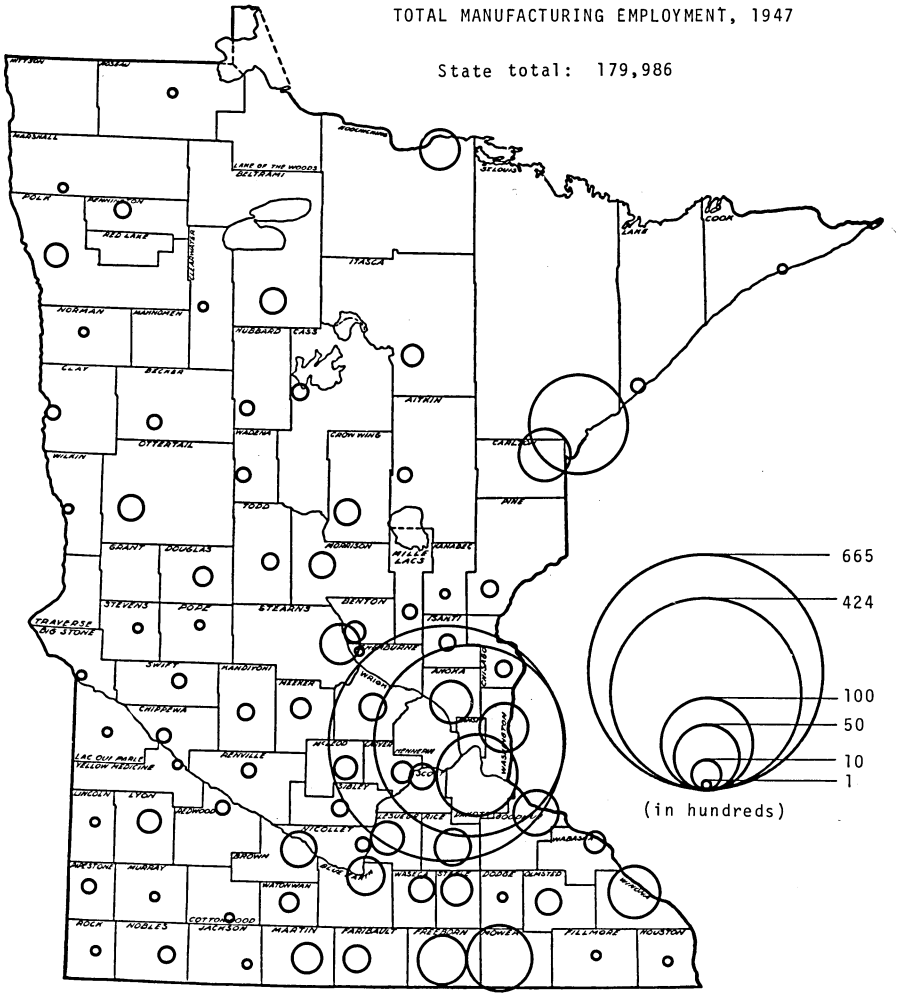
PERCENTAGE CHANGE IN MANUFACTURING PRODUCTION EMPLOYMENT, 1947-1963

State: +14.1%



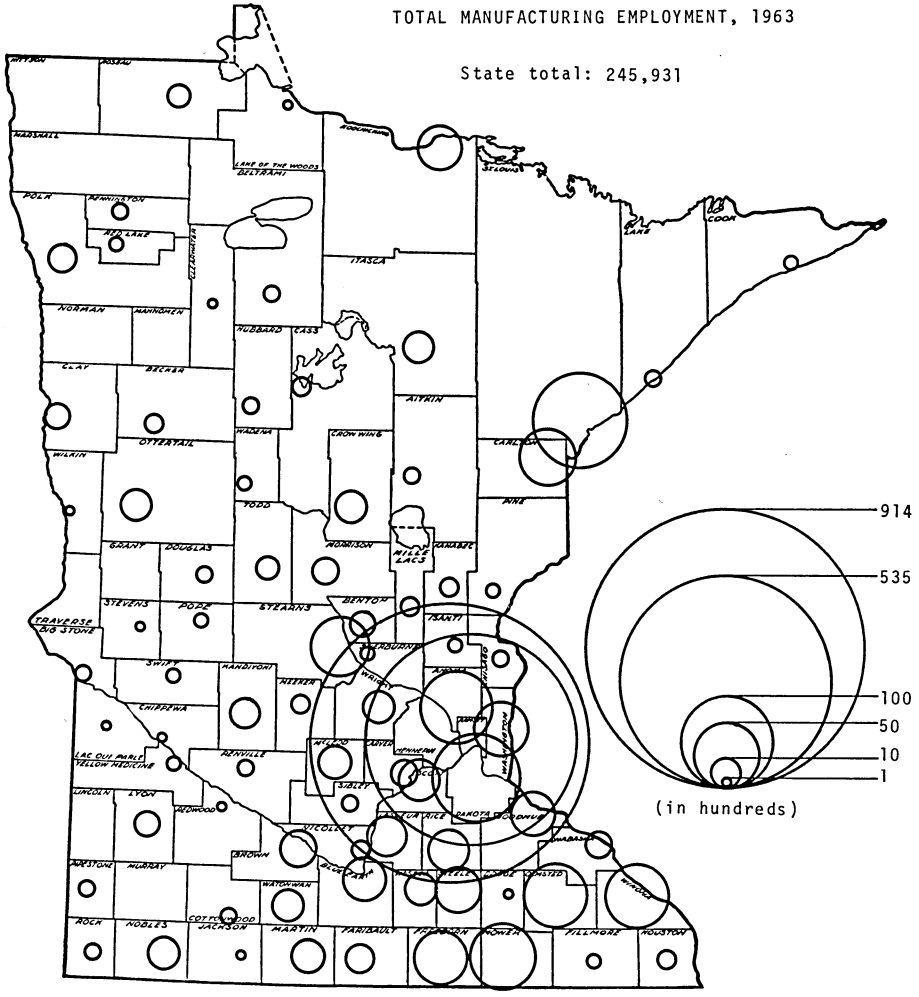
TOTAL MANUFACTURING EMPLOYMENT, 1947

State total: 179,986



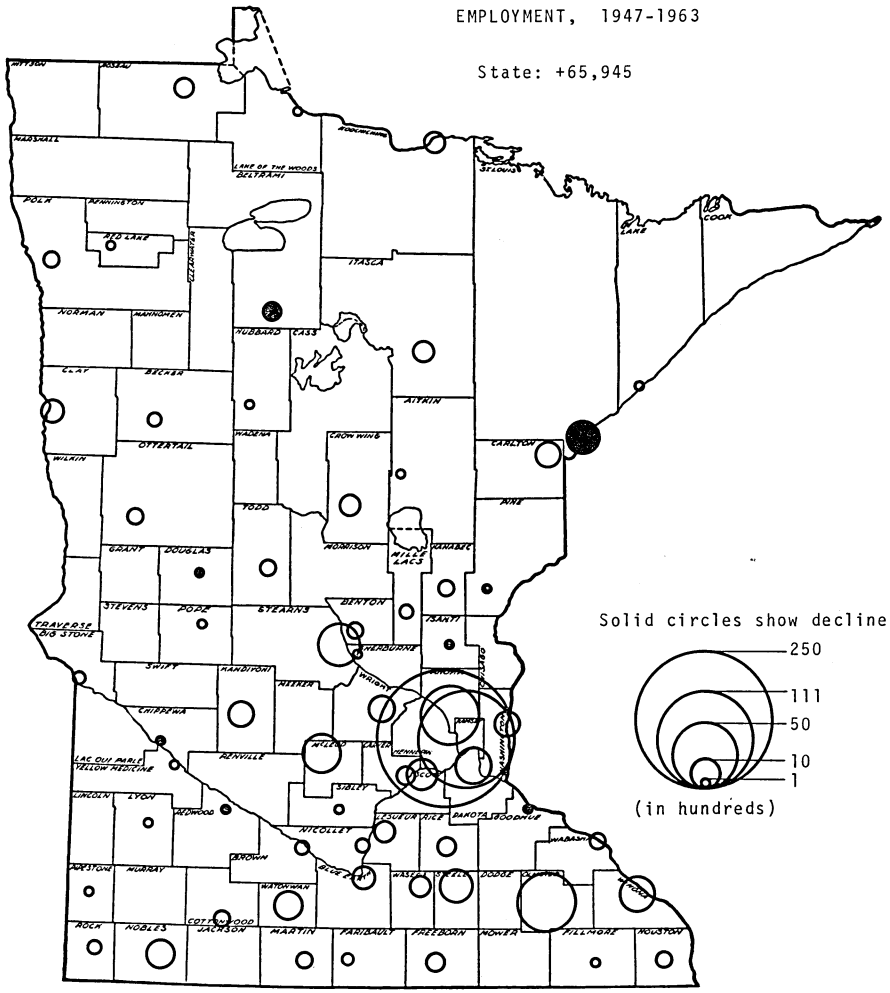
TOTAL MANUFACTURING EMPLOYMENT, 1963

State total: 245,931



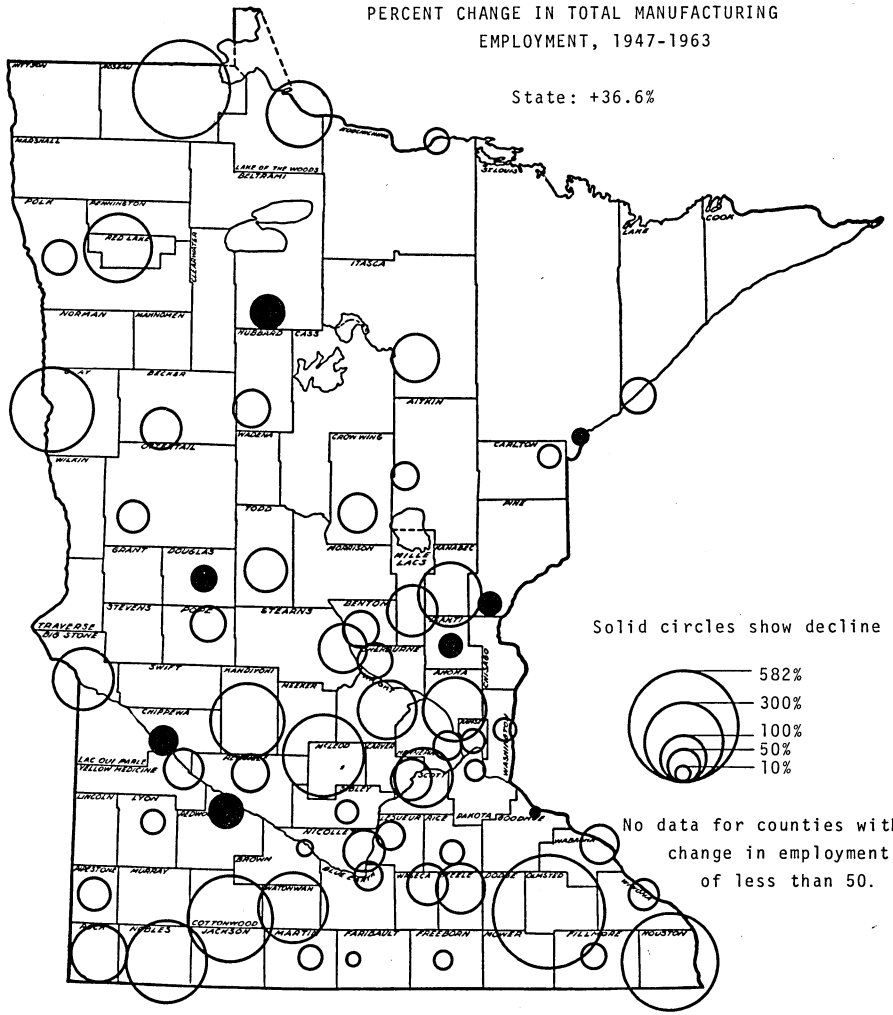
ABSOLUTE CHANGE IN TOTAL MANUFACTURING EMPLOYMENT, 1947-1963

State: +65,945



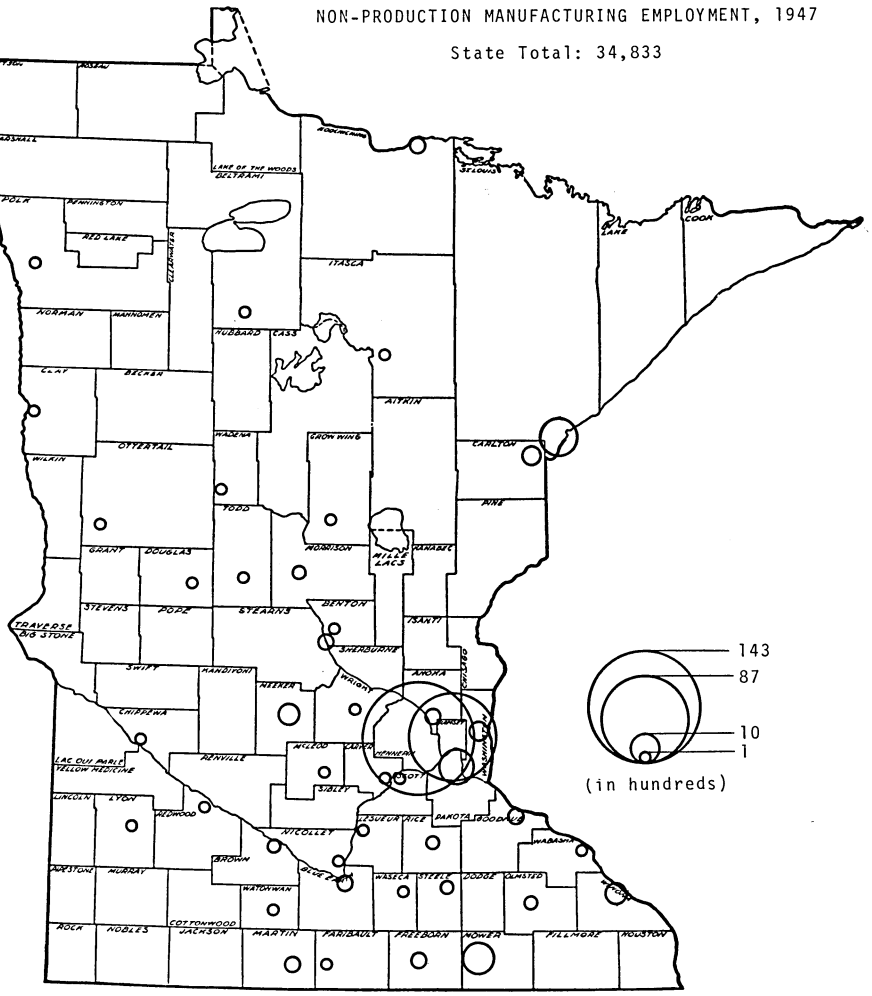
PERCENT CHANGE IN TOTAL MANUFACTURING EMPLOYMENT, 1947-1963

State: +36.6%



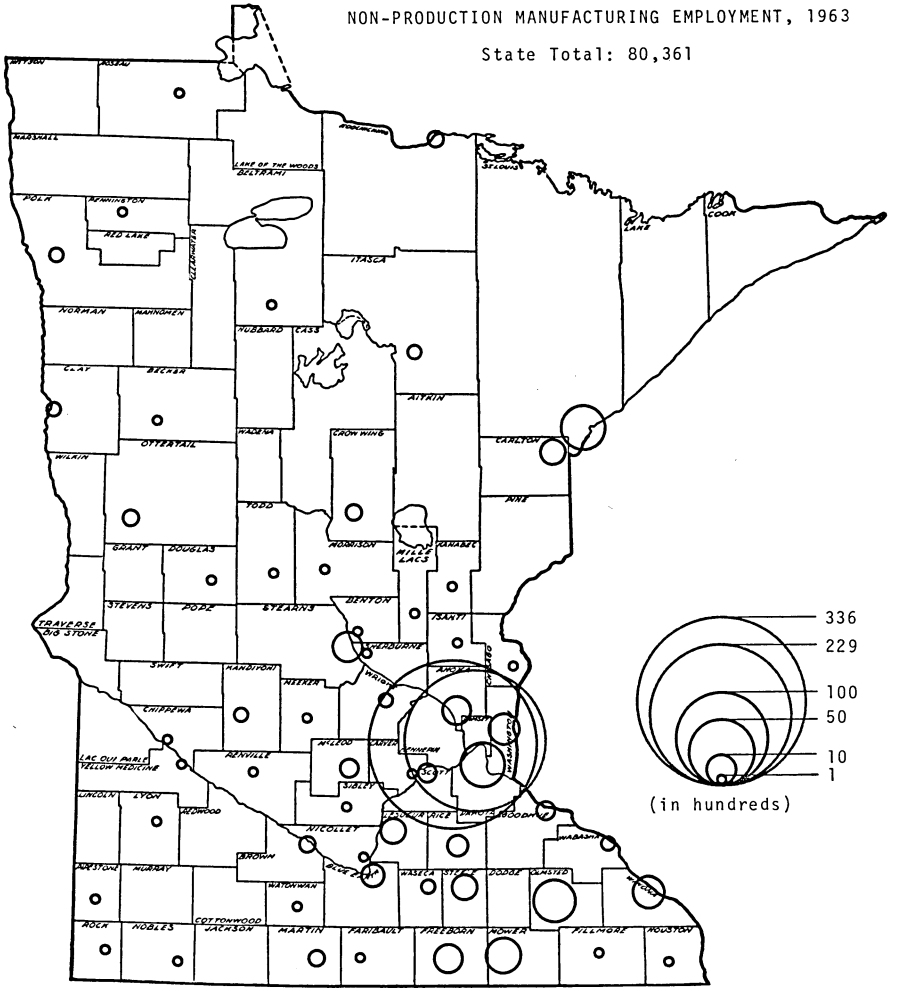
NON-PRODUCTION MANUFACTURING EMPLOYMENT, 1947

State Total: 34,833



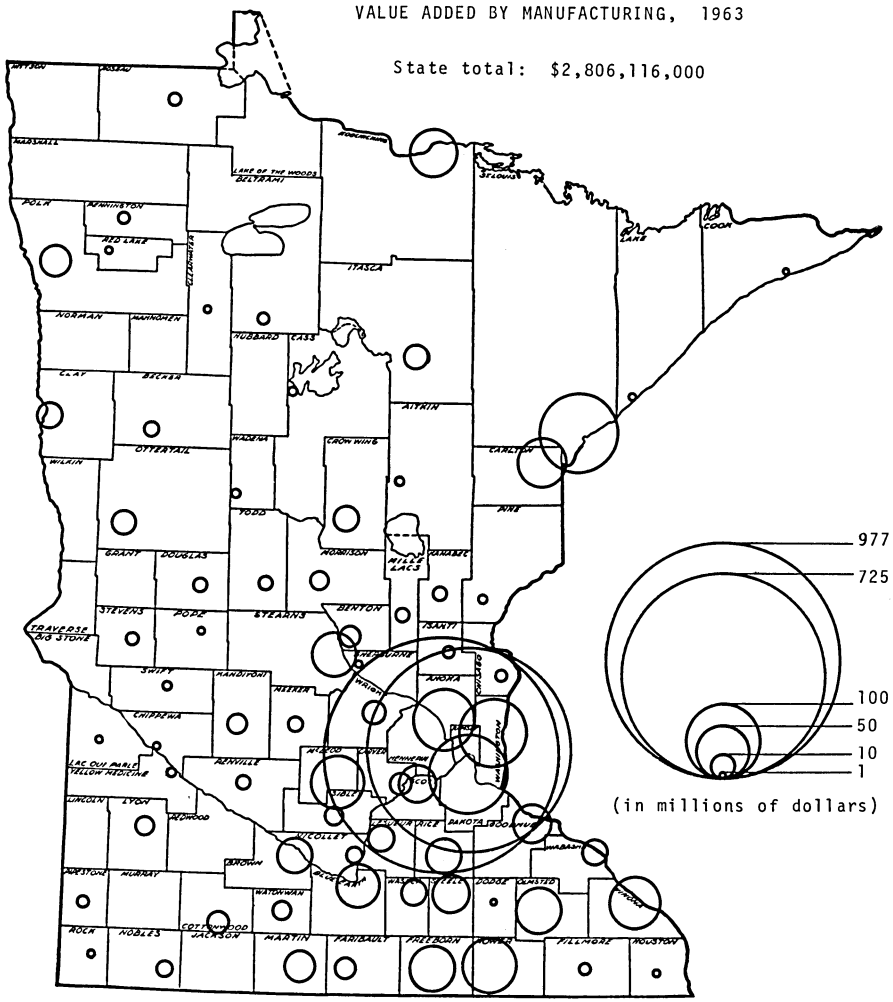
NON-PRODUCTION MANUFACTURING EMPLOYMENT, 1963

State Total: 80,361



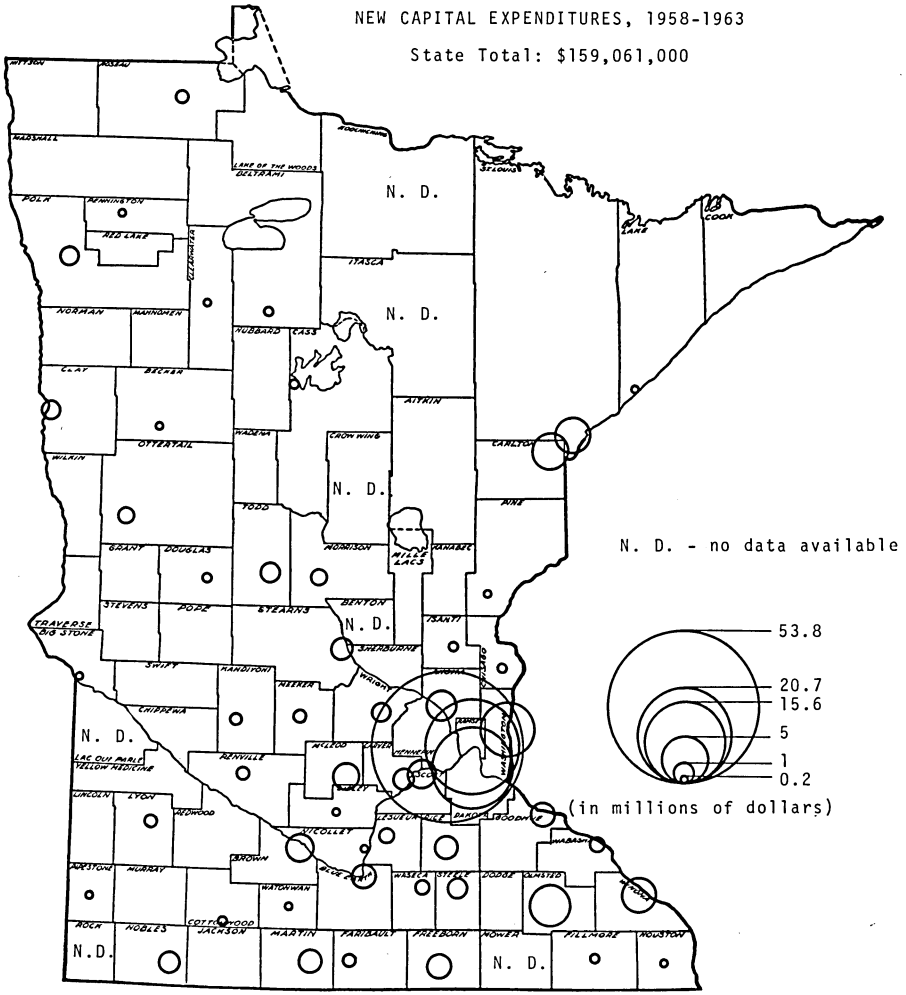
VALUE ADDED BY MANUFACTURING, 1963

State total: $2,806,116,000

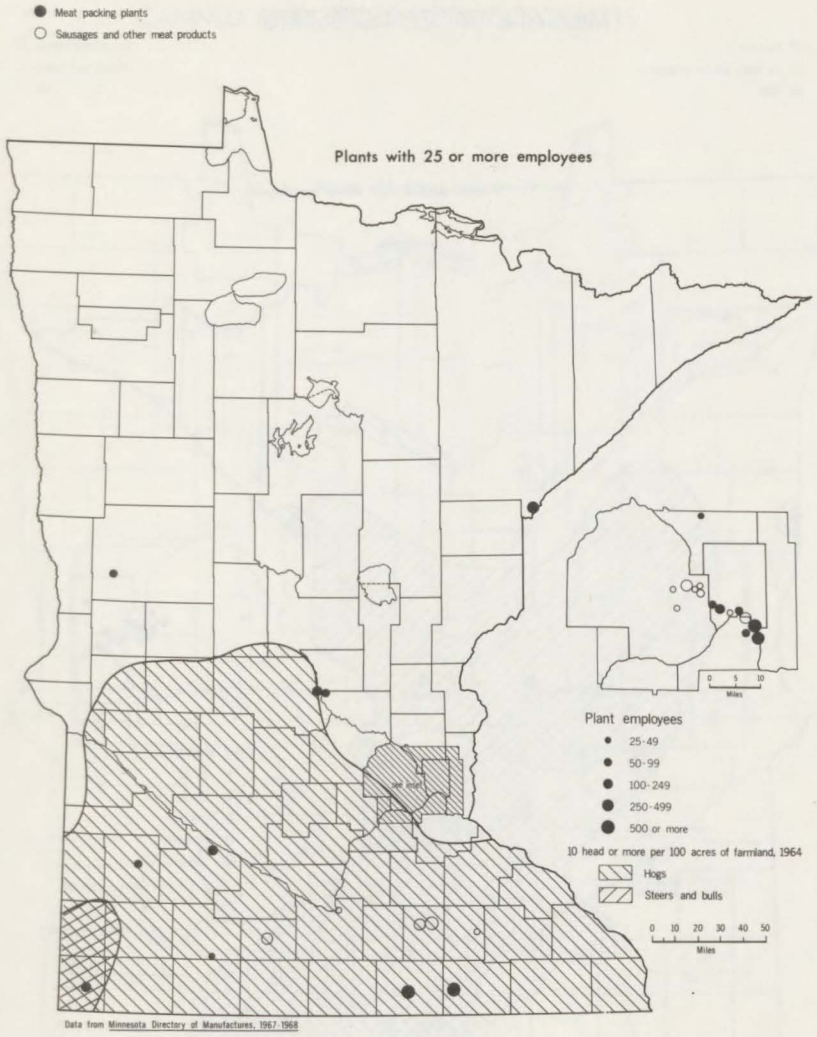


NEW CAPITAL EXPENDITURES, 1958-1963

State Total: $159,061,000

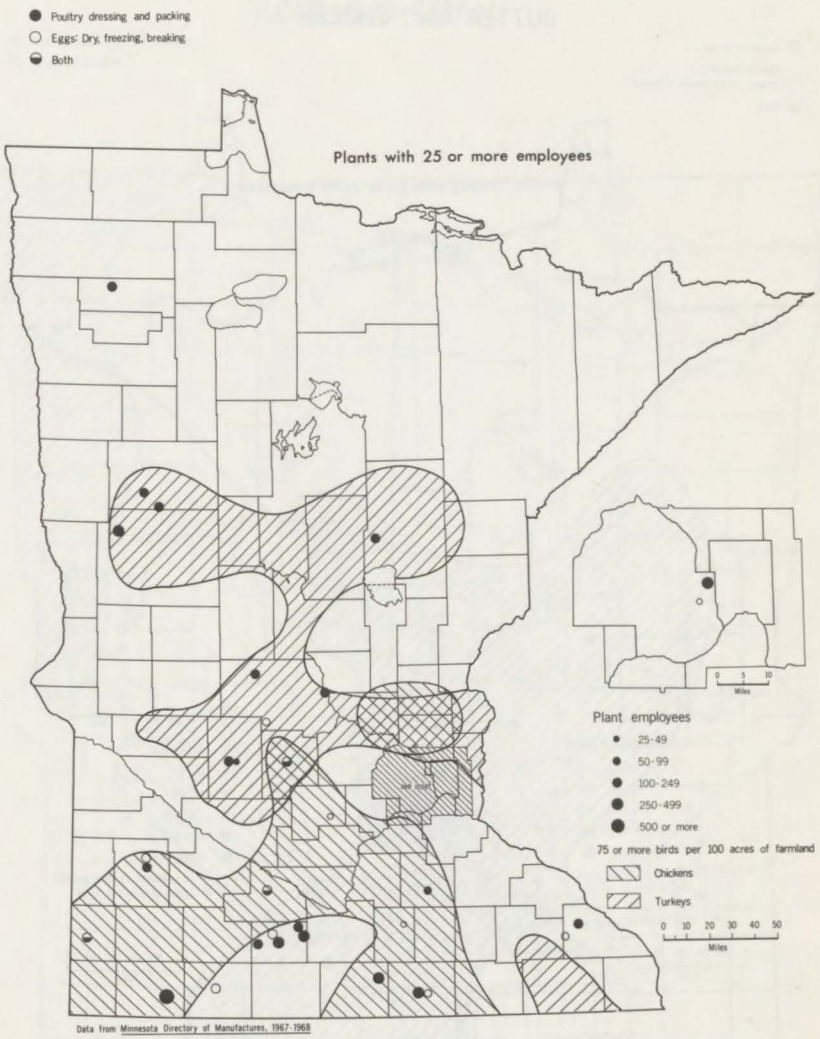


MEAT PRODUCTS



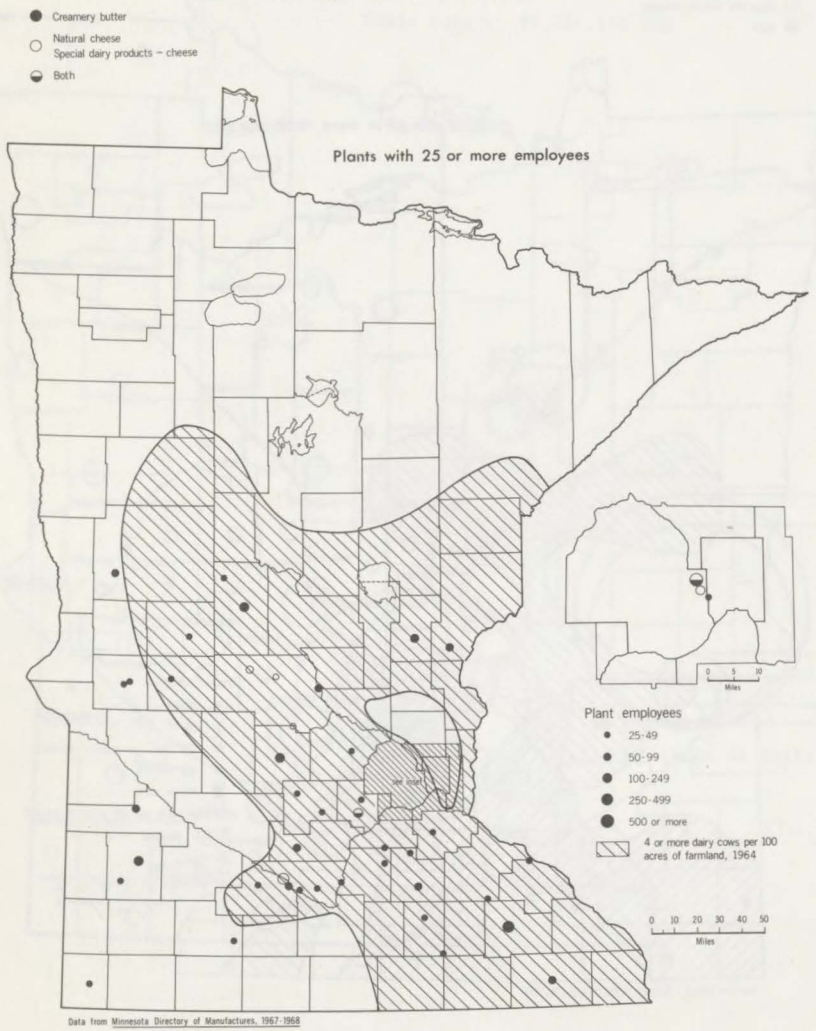
Data from Minnesota Directory of Manufactures, 1967-1968

POULTRY AND EGGS



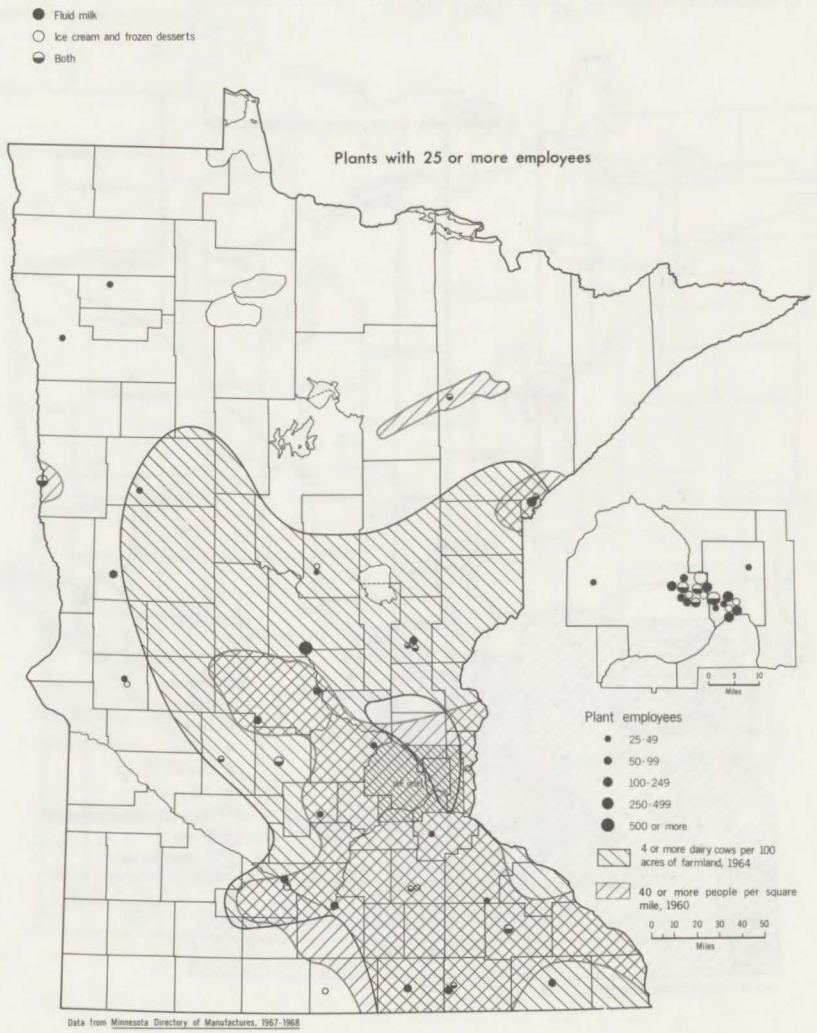
Data from Minnesota Directory of Manufactures, 1967-1968

BUTTER AND CHEESE



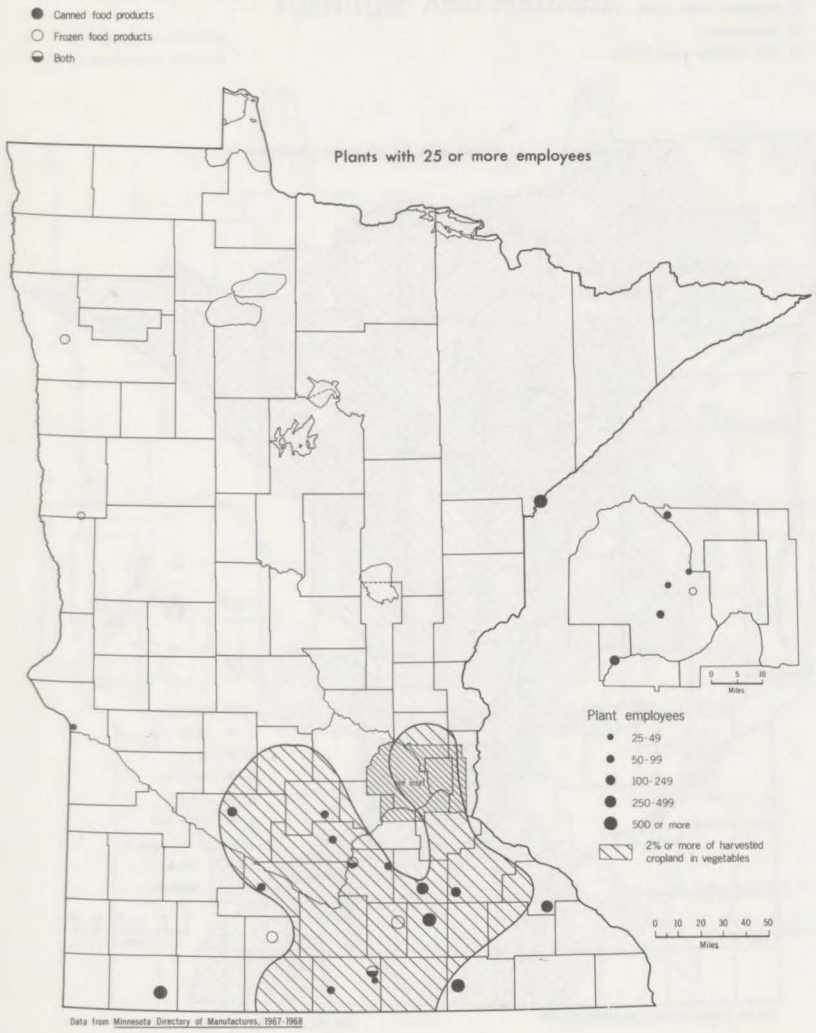
Data from Minnesota Directory of Manufactures, 1967-1968

MILK AND FROZEN DESSERTS



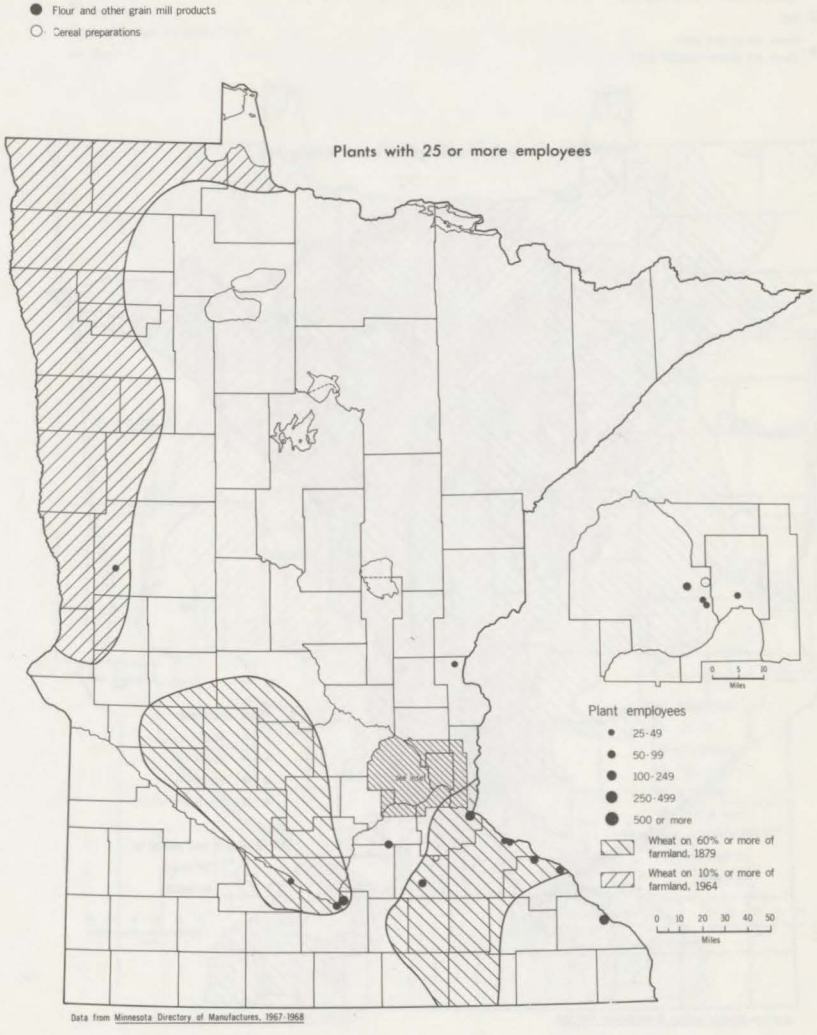
Data from Minnesota Directory of Manufactures, 1967-1968

CANNED AND FROZEN FOOD PRODUCTS



Data from Minnesota Directory of Manufactures, 1967-1968

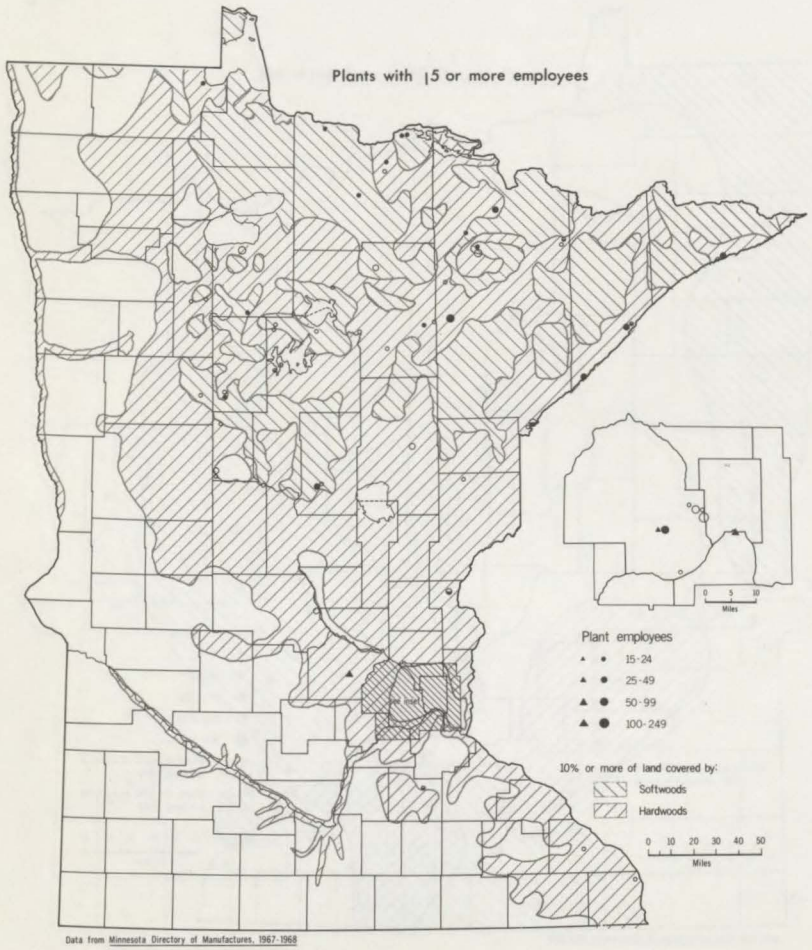
FLOUR AND CEREAL



Data from Minnesota Directory of Manufactures, 1967-1968

WOOD PROCESSING

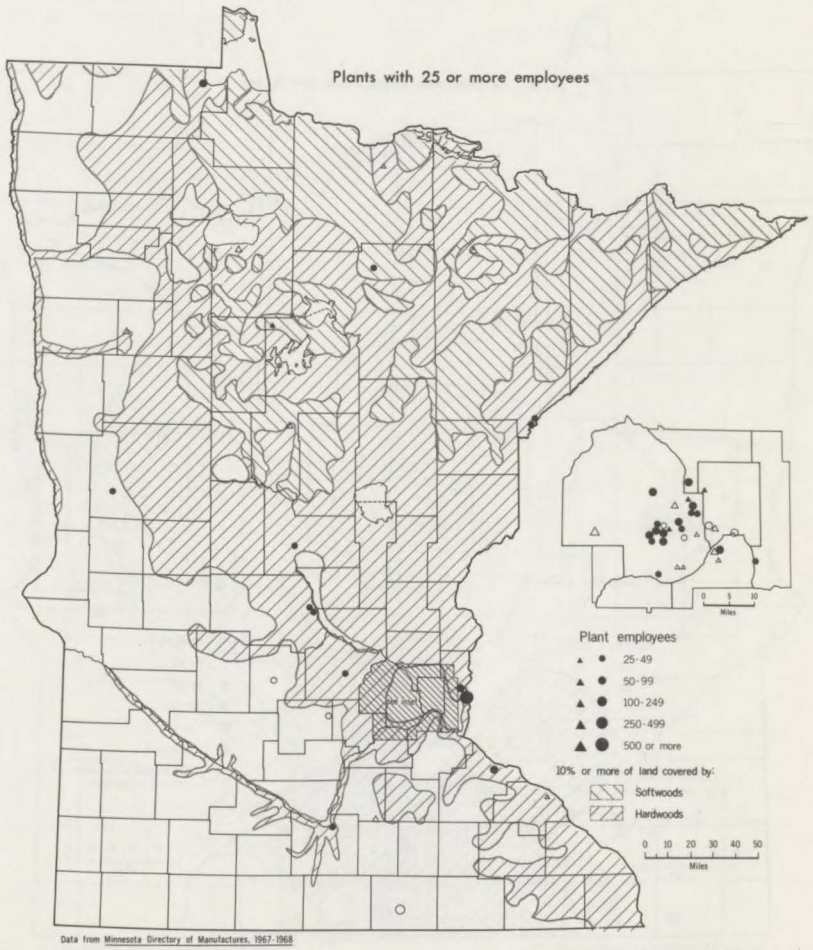
- Logging camps and constractors
- Sawmills and planing mills
  Hardwood dimension and flooring mills
- Both
- Veneer and plywood plants
  Veneer and plywood container plants



Data from Minnesota Directory of Manufactures, 1967-1968

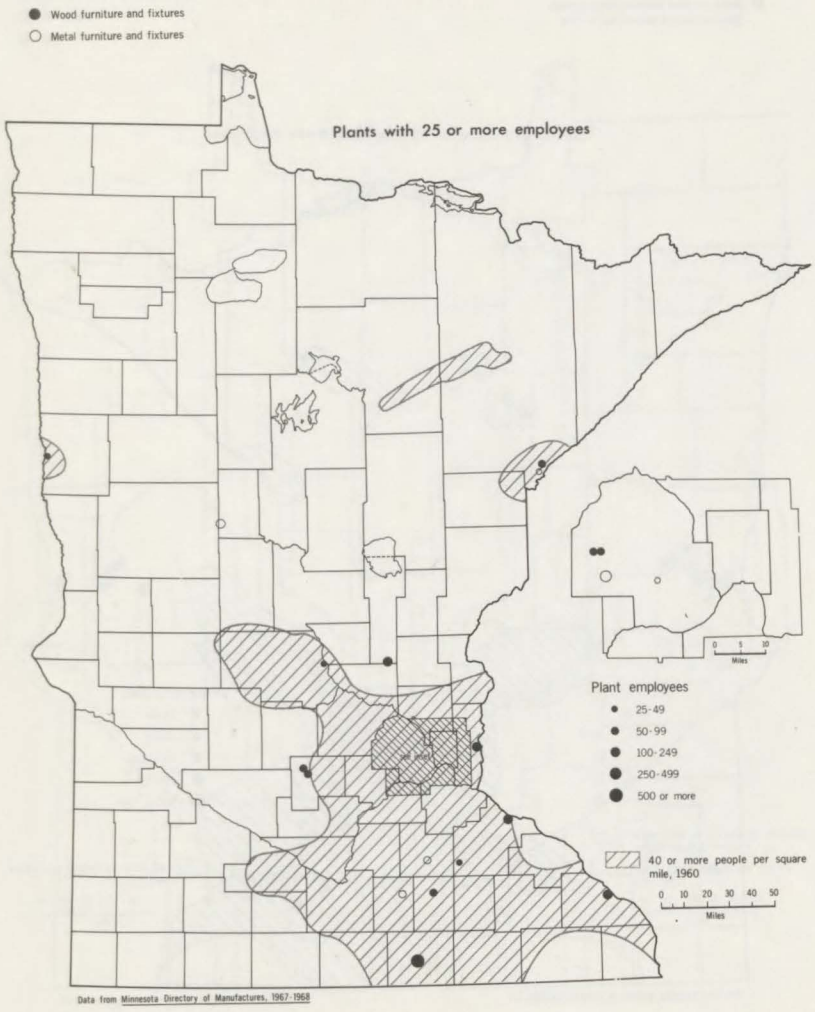
WOOD FINISHING

- Millwork plants
- Prefabricated wooden buildings and structural members
- Wood preserving
- Other miscellaneous wood finishing



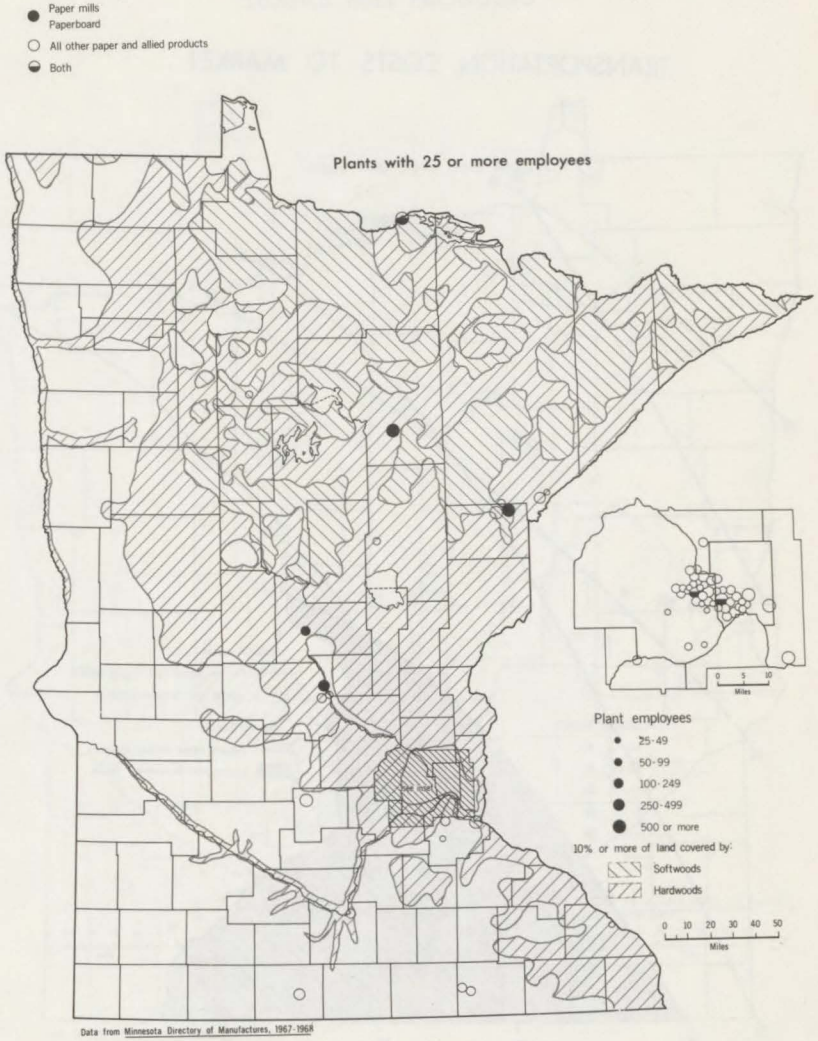
Data from Minnesota Directory of Manufactures, 1967-1968

FURNITURE AND FIXTURES



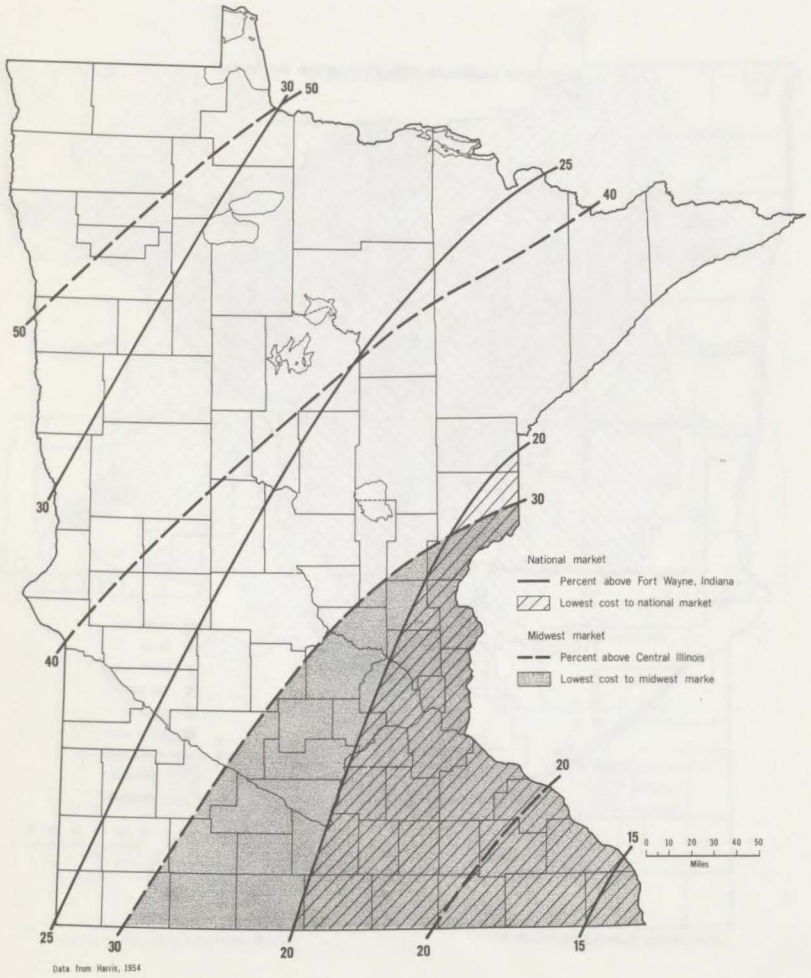
Data from Minnesota Directory of Manufactures, 1967-1968

PAPER AND ALLIED PRODUCTS



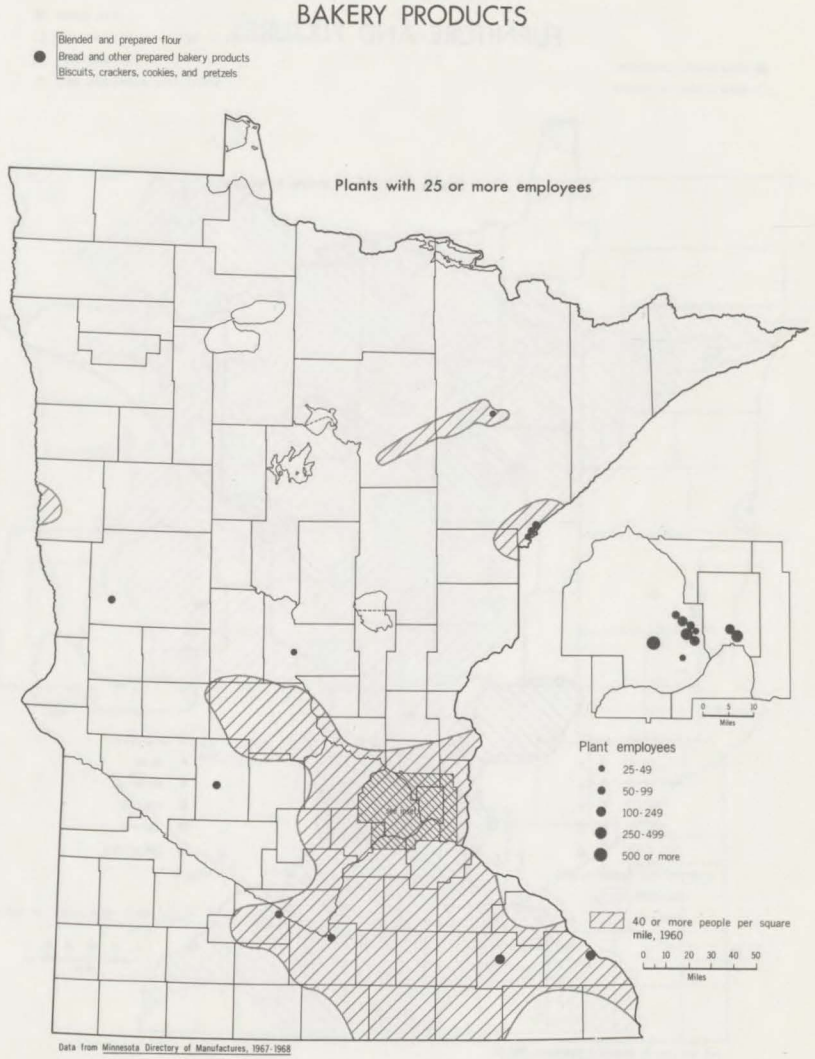
Data from Minnesota Directory of Manufactures, 1967-1968

TRANSPORTATION COSTS TO MARKET



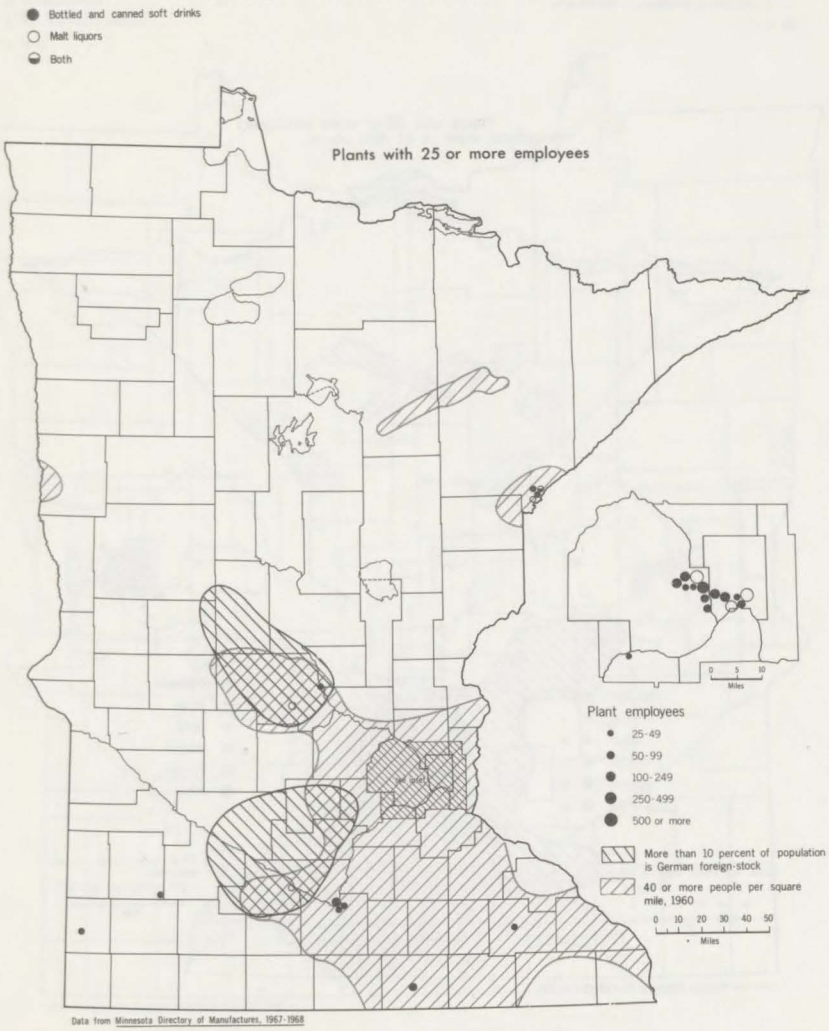
Data from Harris, 1954

BAKERY PRODUCTS



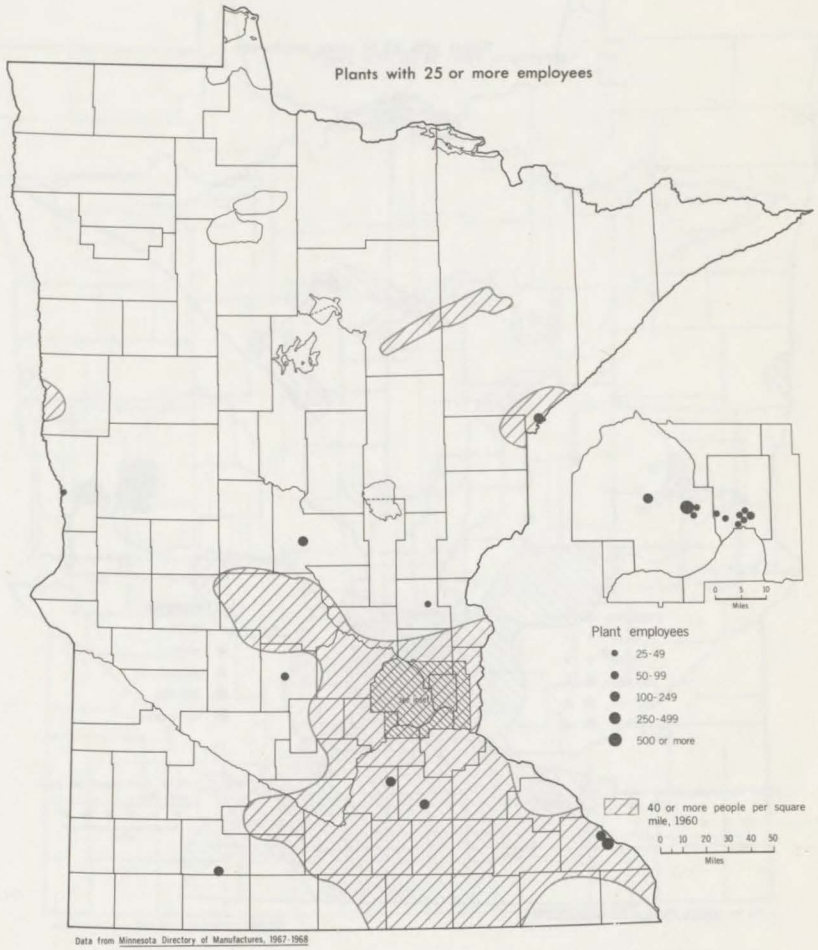
Data from Minnesota Directory of Manufactures, 1967-1968

MALT LIQUORS AND SOFT DRINKS



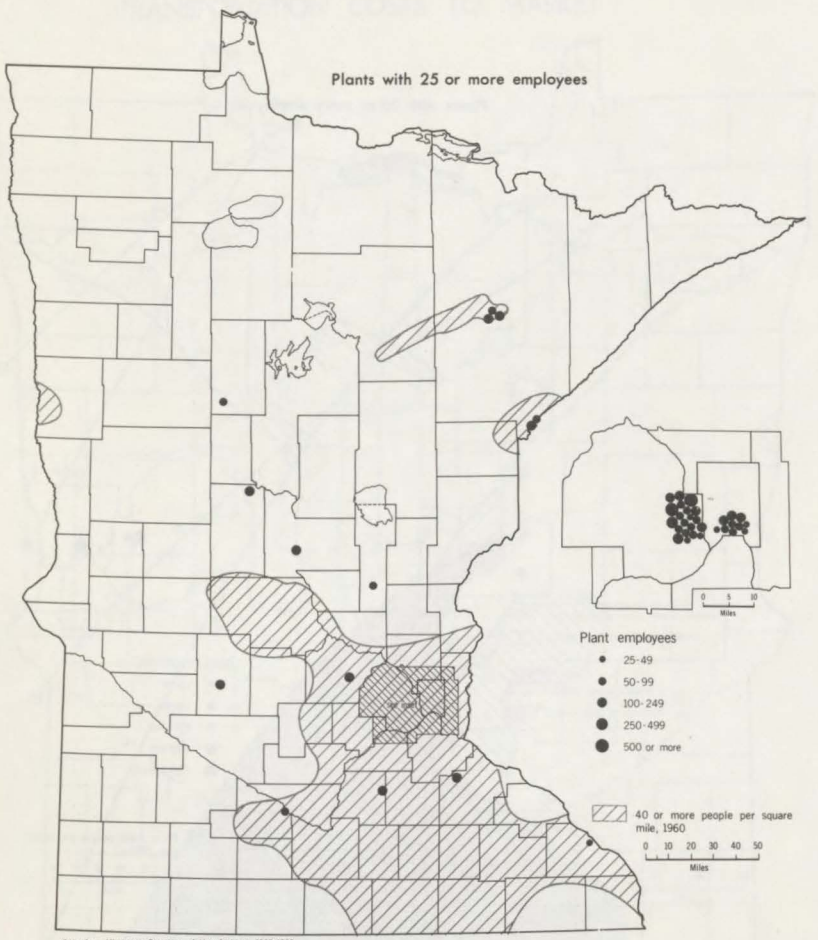
Data from Minnesota Directory of Manufactures, 1967-1968

TEXTILE MILL PRODUCTS



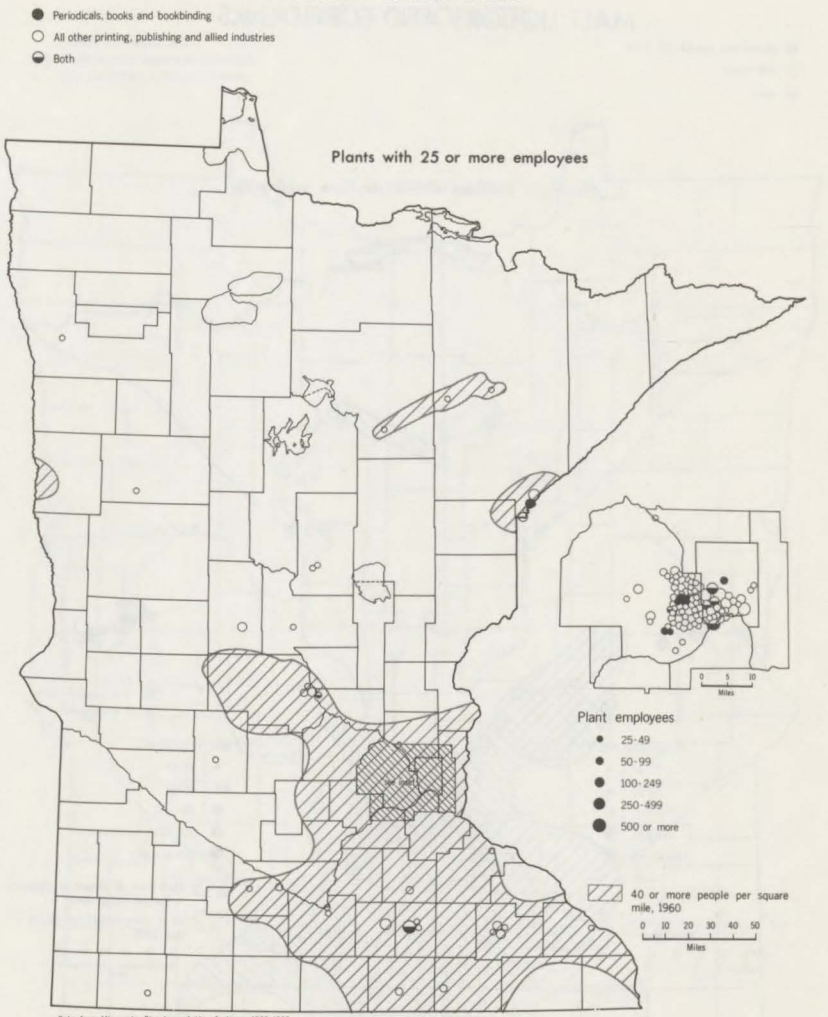
Data from Minnesota Directory of Manufactures, 1967-1968

APPAREL



Data from Minnesota Directory of Manufactures, 1967-1968

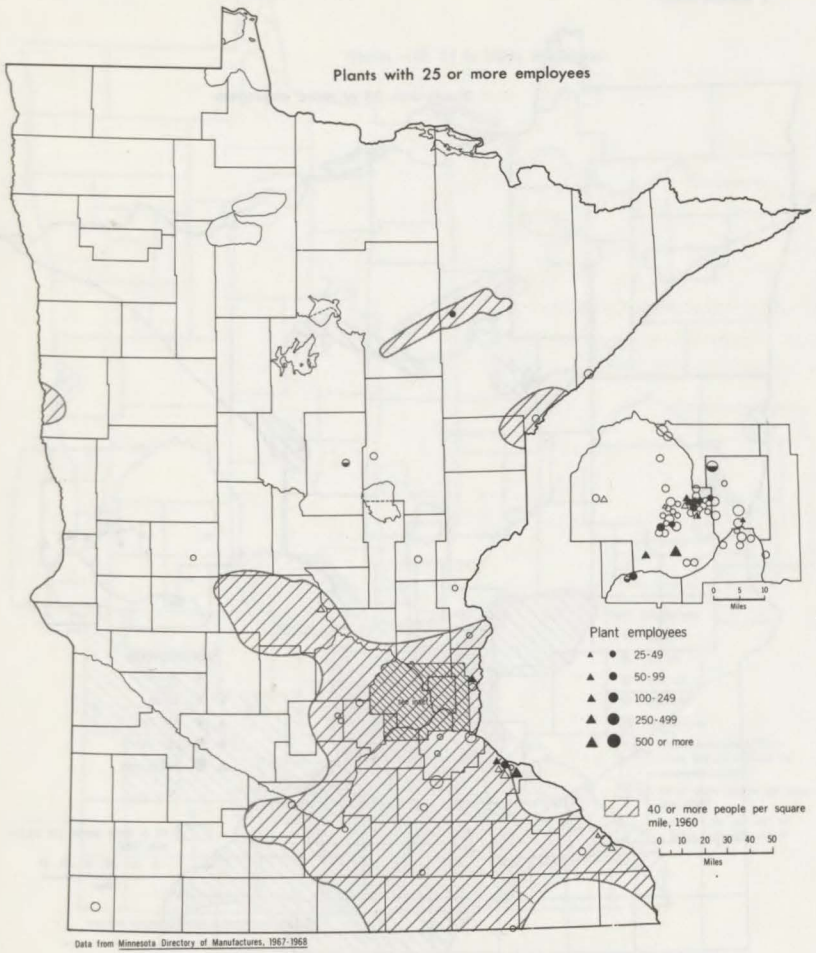
PRINTING, PUBLISHING AND ALLIED INDUSTRIES



Data from Minnesota Directory of Manufactures, 1967-1968

RUBBER, PLASTIC AND LEATHER PRODUCTS

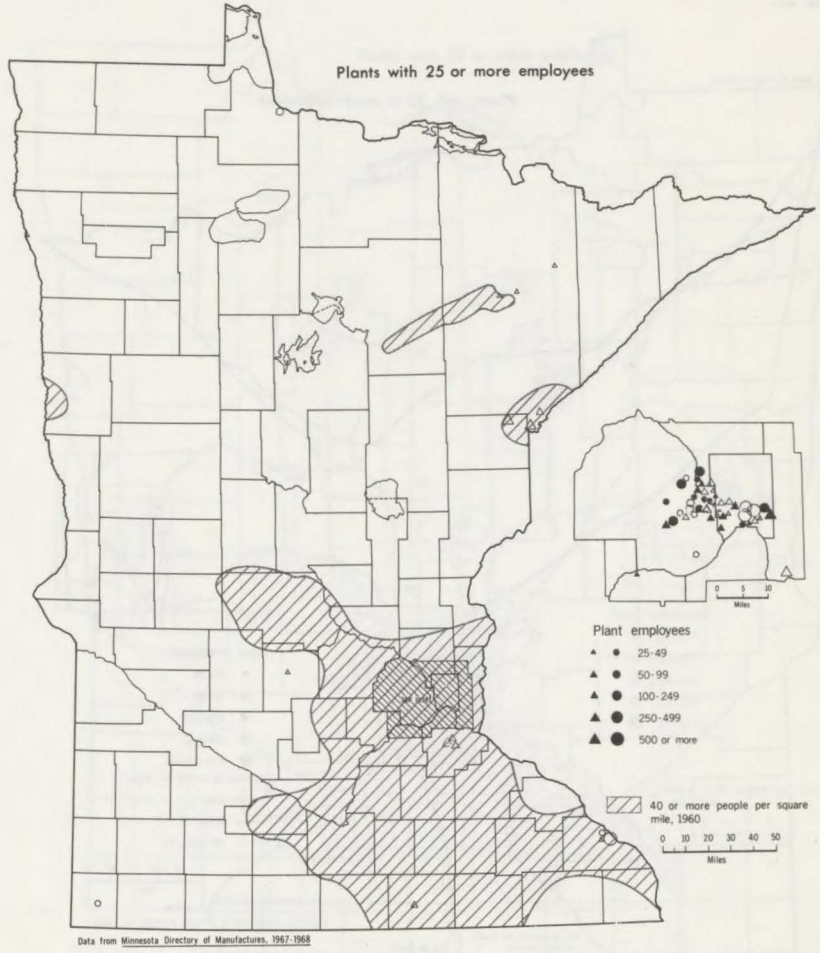
- Rubber products
- Plastic products
- Both
- Shoes and boots
- All other leather products
- Both



Data from Minnesota Directory of Manufactures, 1967-1968

CHEMICALS AND ALLIED PRODUCTS

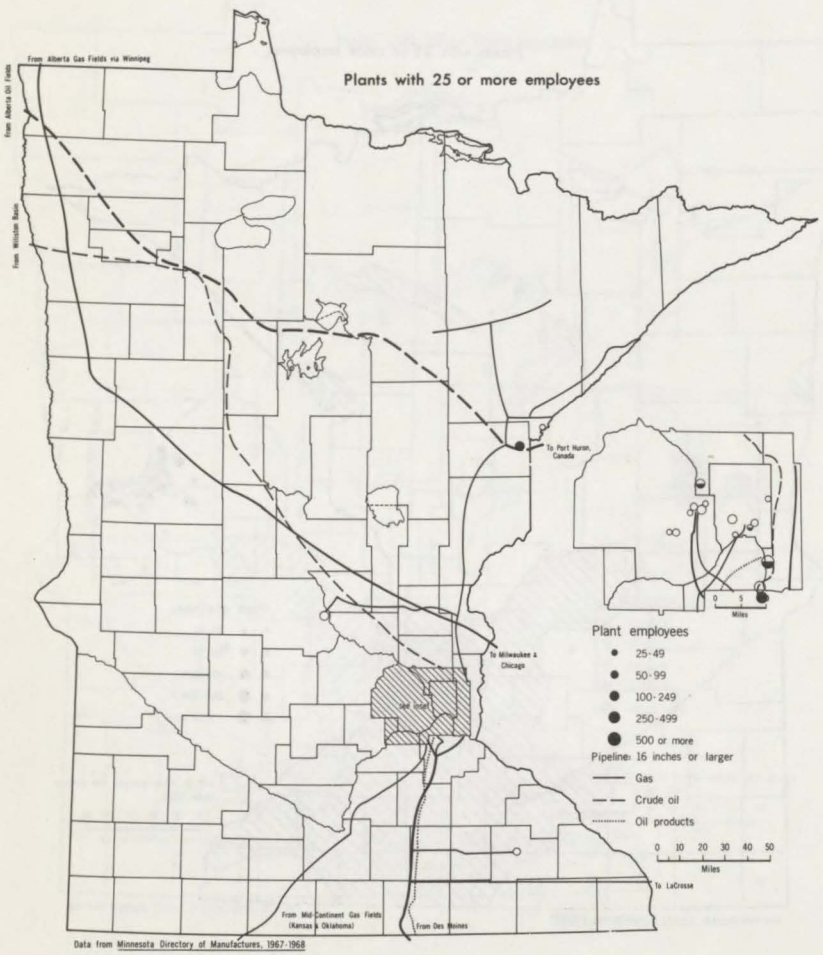
- Paints, varnishes, and paint allied products
- Drugs and cosmetics
- Soaps and specialty cleaners
- All other chemical products



Data from Minnesota Directory of Manufactures, 1967-1968

PETROLEUM REFINING AND RELATED INDUSTRIES

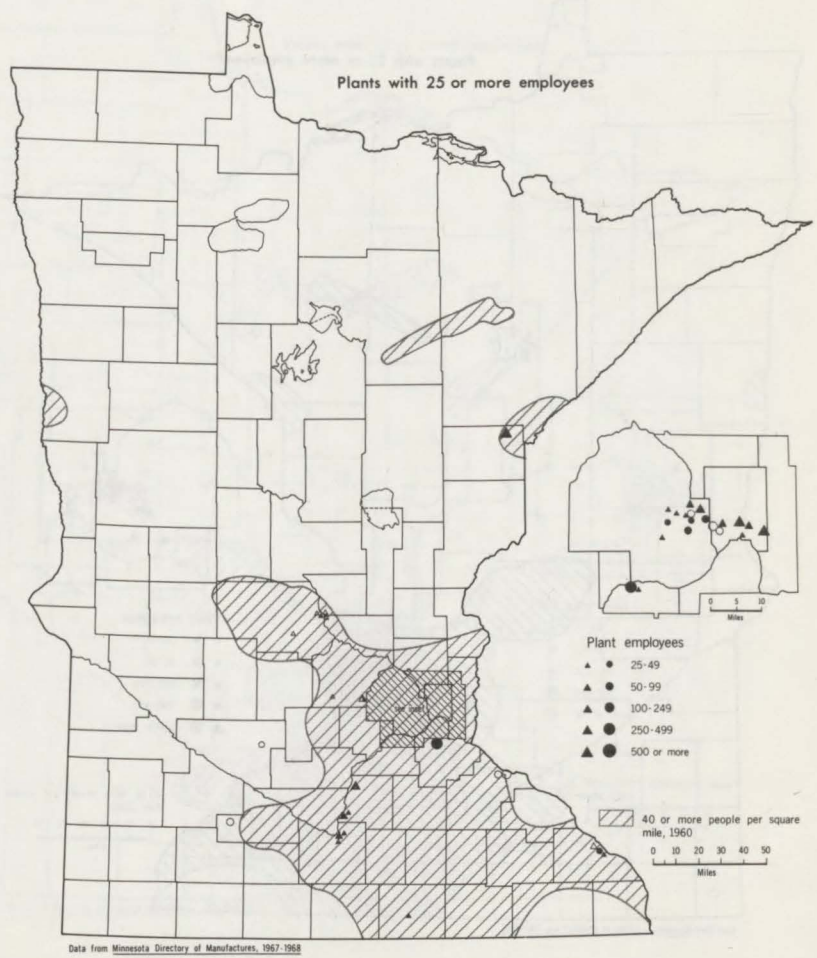
- Petroleum refining
- Petroleum related industries
- Both



Data from Minnesota Directory of Manufactures, 1967-1968

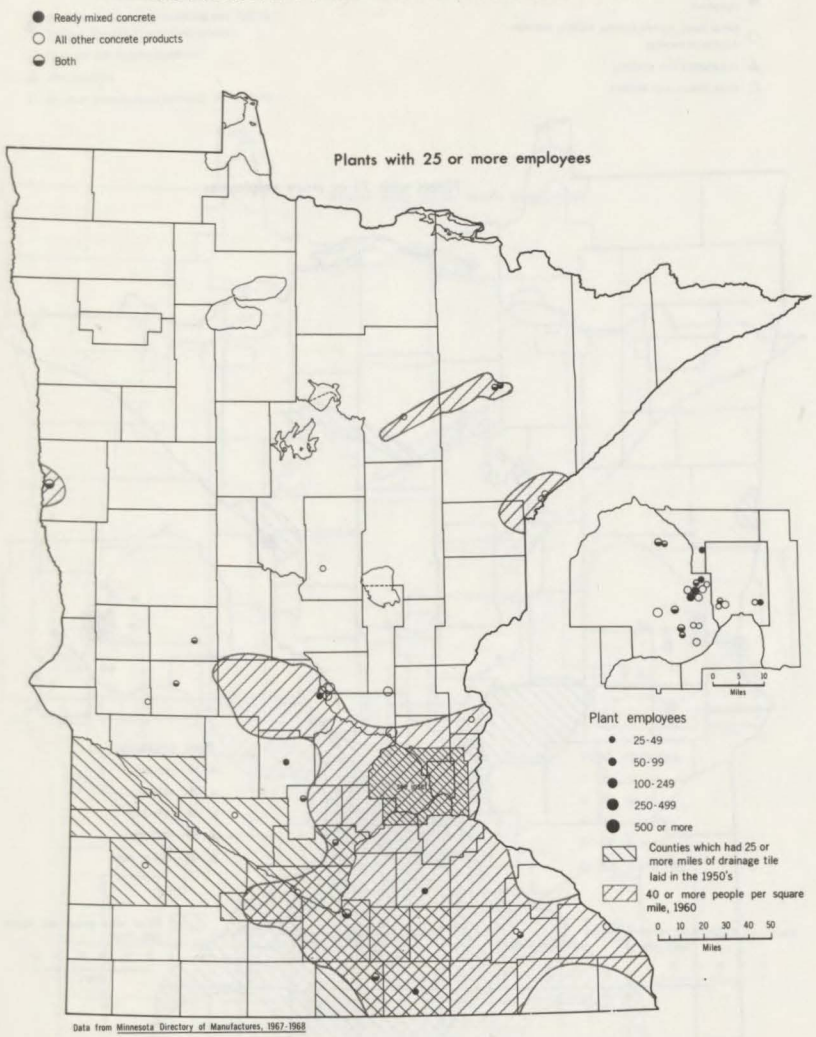
GLASS, CLAY AND STONE PRODUCTS

- Glass and glass products
- Clay products
- Both glass and clay products
- Stone products
- Monuments and markers only
- Both stone products



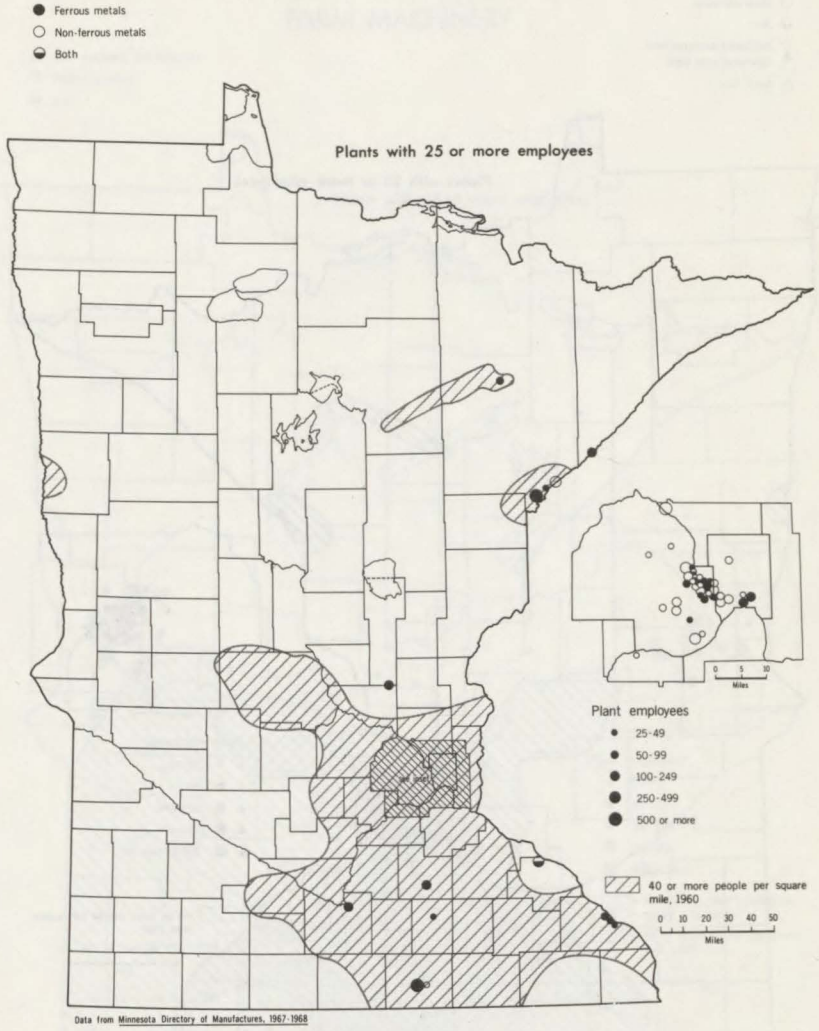
Data from Minnesota Directory of Manufactures, 1967-1968

CONCRETE AND CONCRETE PRODUCTS



Data from Minnesota Directory of Manufactures, 1967-1968

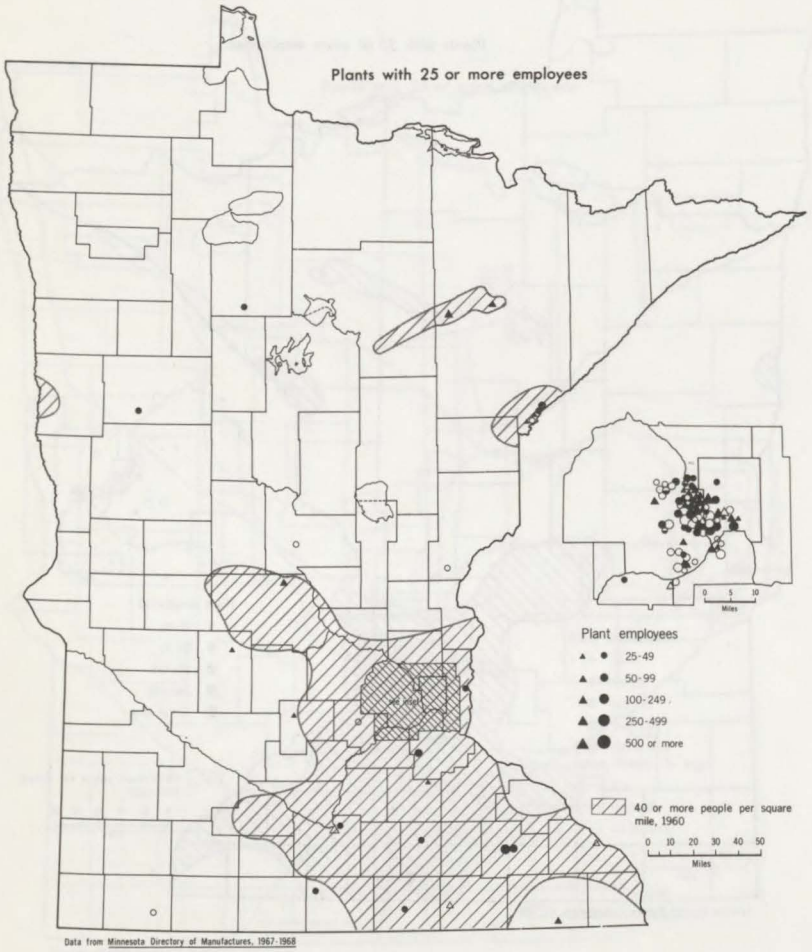
PRIMARY METAL INDUSTRIES



Data from Minnesota Directory of Manufactures, 1967-1968

SHEET METAL FABRICATION AND STAMPING, STRUCTURAL FABRICATION AND METAL CANS

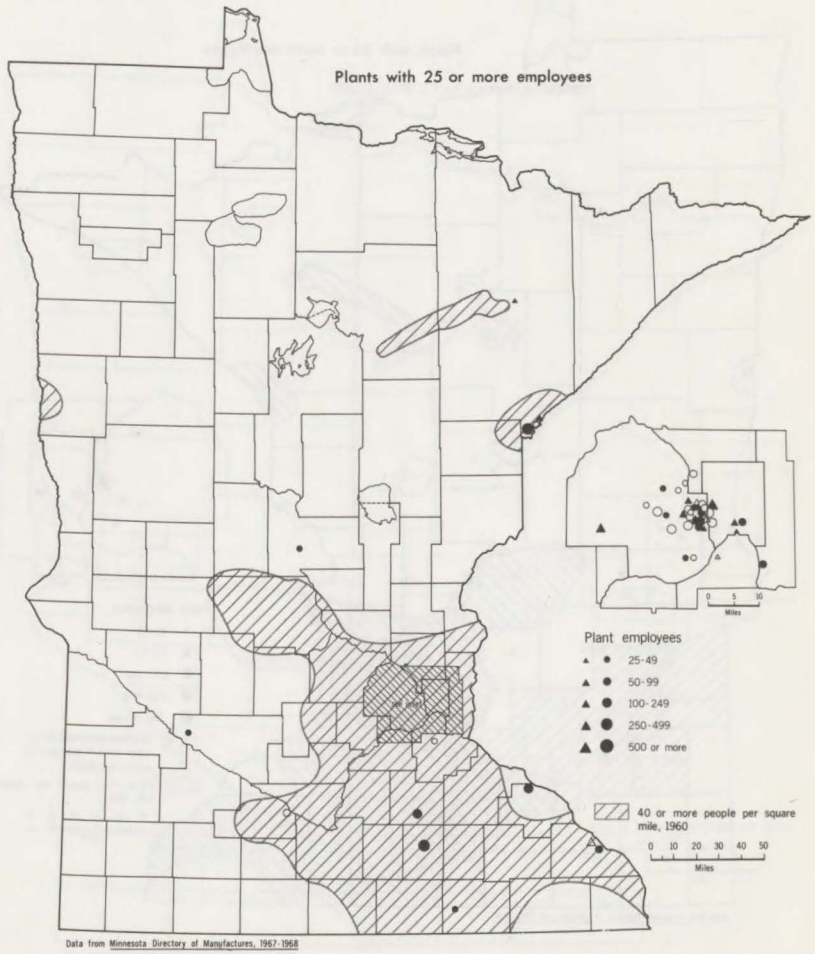
- Sheet metal fabrication
- Metal stampings
- Both
- Fabricated structural steel
  Fabricated plate work
- Metal cans



Data from Minnesota Directory of Manufactures, 1967-1968

HARDWARE AND RELATED FABRICATED METALS

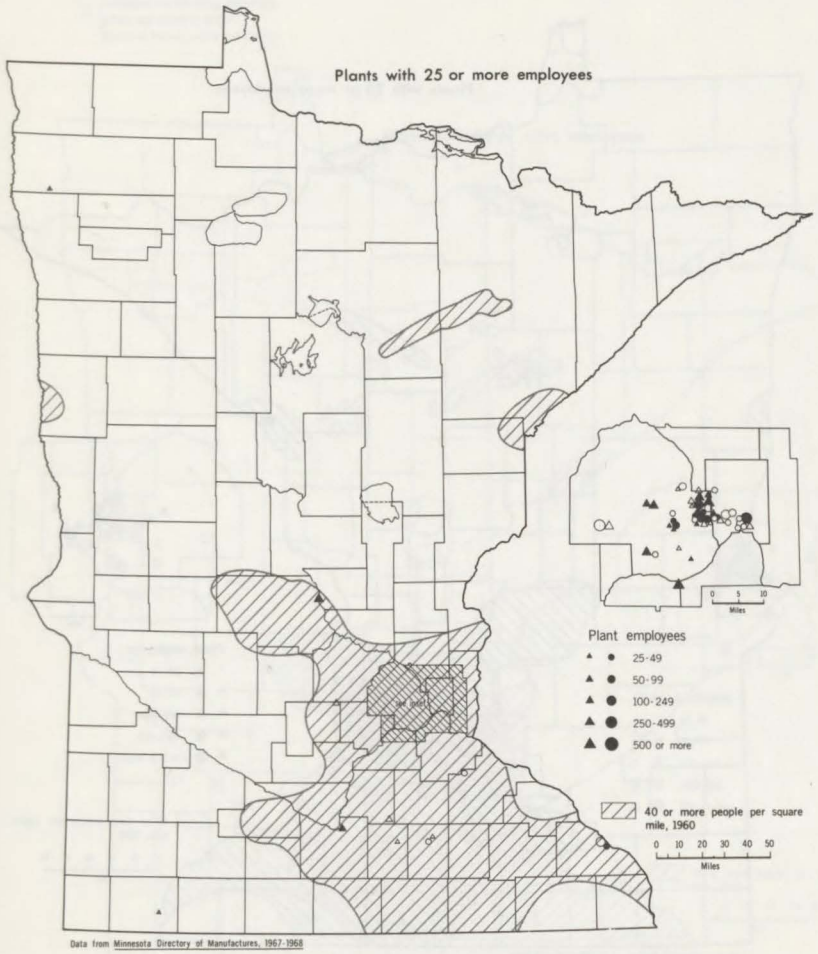
- Hand and edge tools
  Hardware
- Metal doors, sashes, frames, molding and trim
  Aluminum awnings
- Ornamental iron products
- Bolts, screws, and washers



Data from Minnesota Directory of Manufactures, 1967-1968

METAL TREATING, WIRE PRODUCTS AND OTHER MISCELLANEOUS FABRICATED METAL PRODUCTS

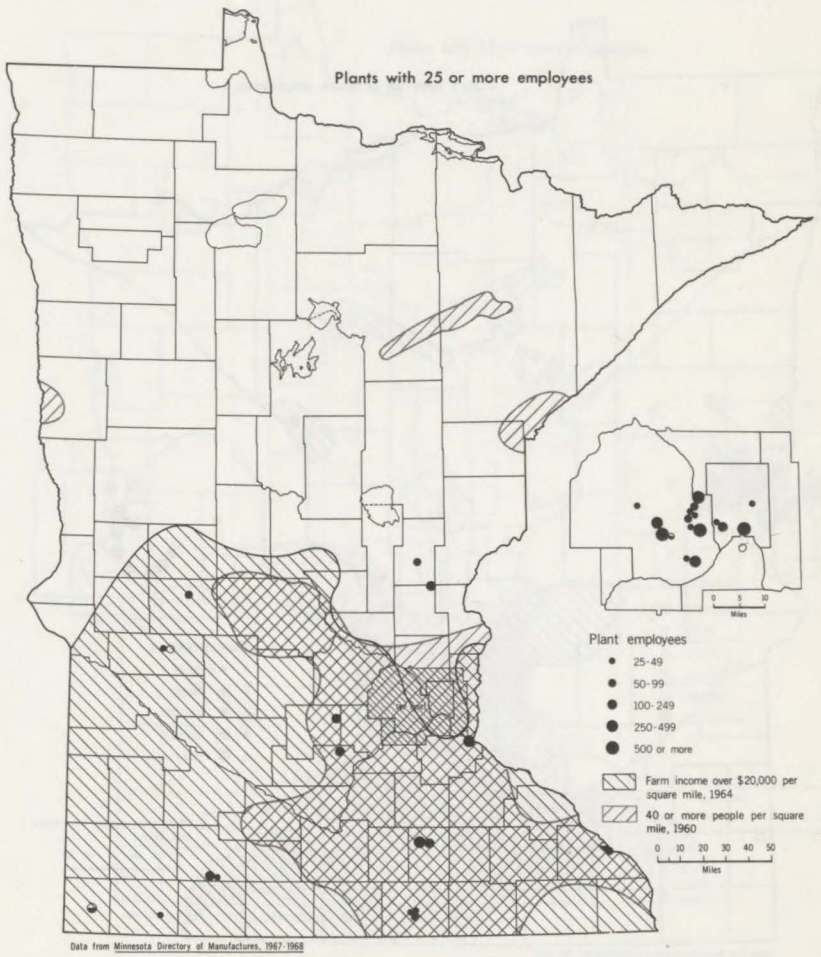
- ● Electroplating, plating, anodizing and coloring Coating, engraving, and allied services
- ○ Plumbing and heating equipment
- ▲ Wire products
- △ All other miscellaneous fabricated metal products



Data from Minnesota Directory of Manufactures, 1967-1968

FARM MACHINERY

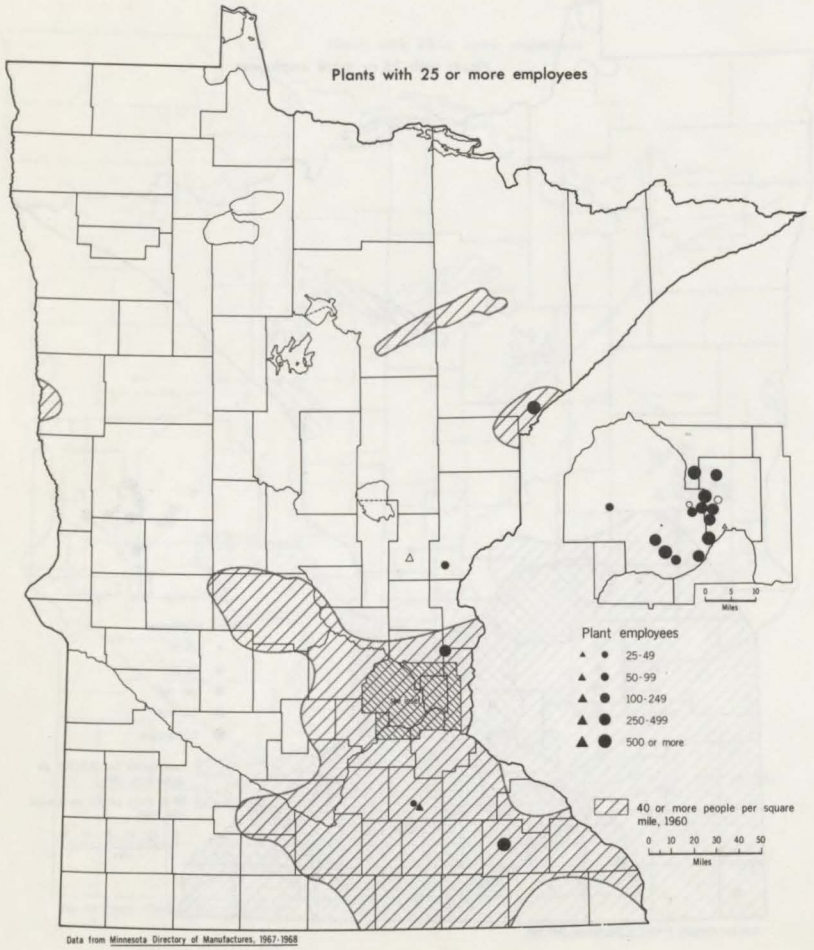
- ● Farm machinery and equipment
- ○ Poultry equipment
- ◒ Both



Data from Minnesota Directory of Manufactures, 1967-1968

OFFICE MACHINERY

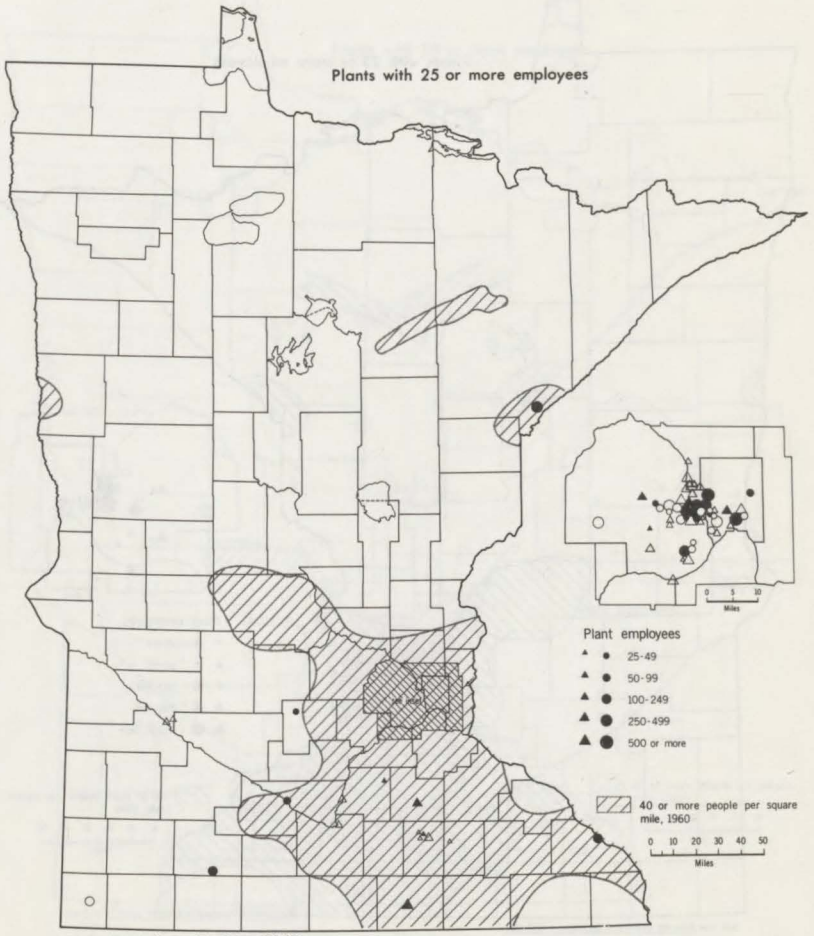
- Computing and accounting machines
- Scales and balances
- Office machines
- Vending machines



Data from Minnesota Directory of Manufactures, 1967-1968

INDUSTRIAL MACHINERY

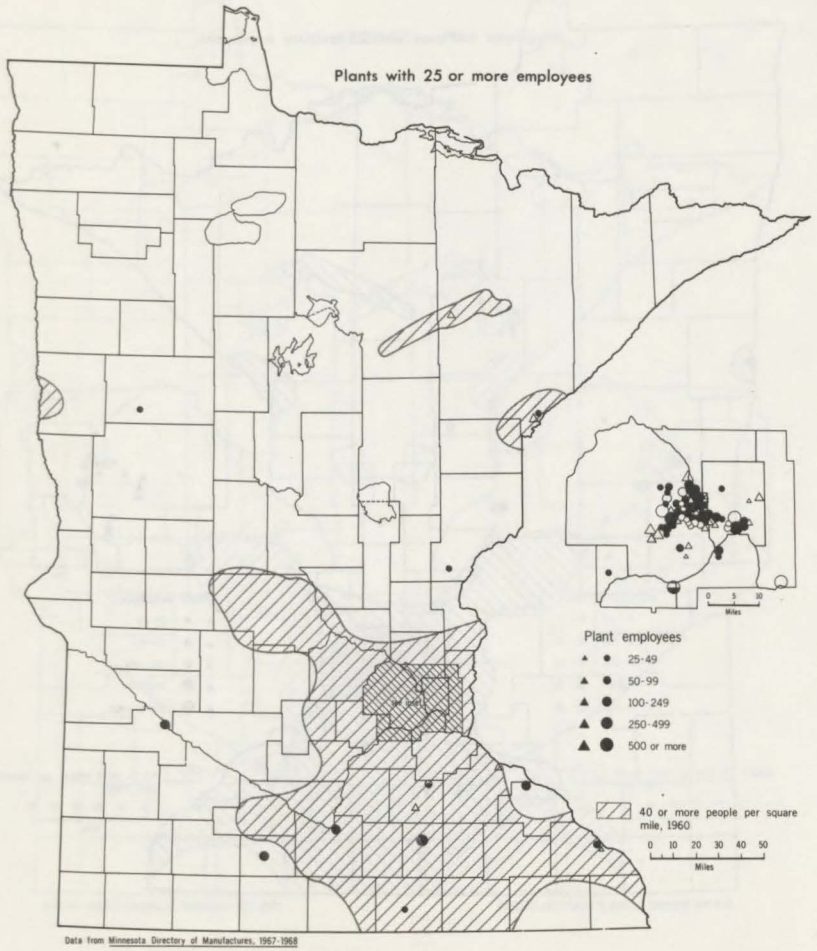
- Construction machinery and equipment
- Mining machinery and equipment
- Well drilling equipment
- Commercial laundry, dry cleaning, and pressing machines
- Industrial vacuum cleaners
- Floor cleaning and maintenance machines
- Industrial refrigeration and air conditioners
- Water softeners and conditioning equipment
- Pumps, compressors and pumping equipment
- Blowers, exhaust and ventilating fans



Data from Minnesota Directory of Manufactures, 1967-1968

MACHINE TOOLS, WOOD INDUSTRY MACHINERY AND MATERIAL HANDLING MACHINERY

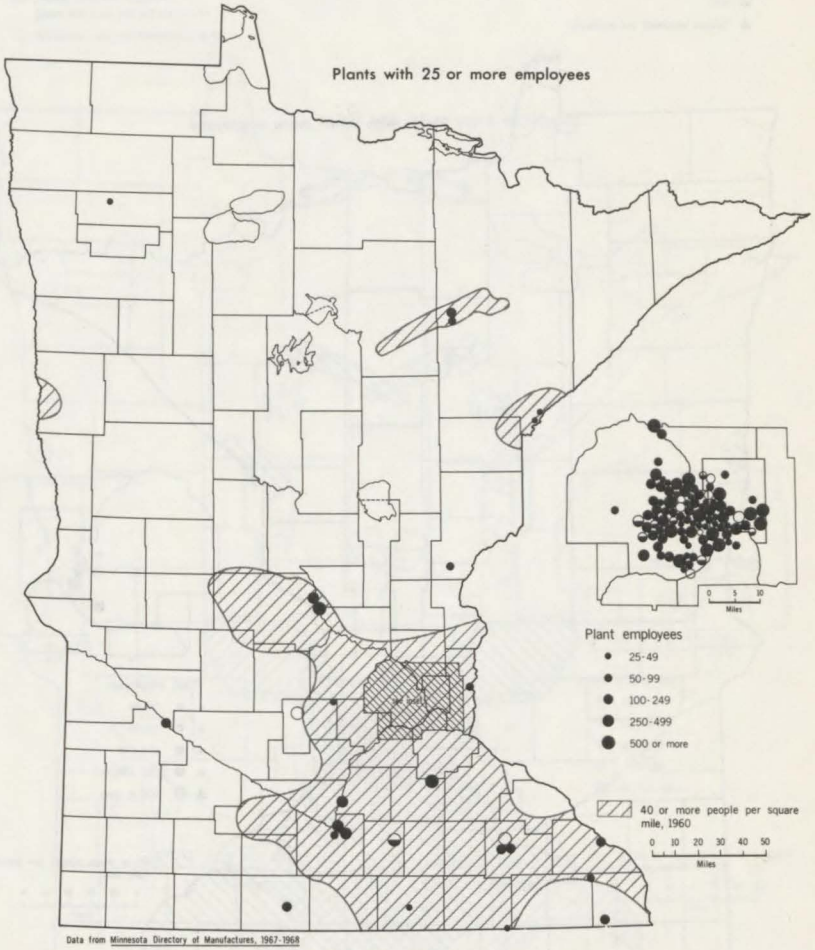
- Machine tools, including cutting types
- Special dies and tools
- Machine tool accessories
- Metalworking machinery
- Woodworking machinery
- Paper industry machinery
- Printing trades machinery and equipment
- Both
- Elevators and moving stairways
- Conveyors and conveying equipment
- Hoists and industrial cranes
- Industrial trucks, trailers and stackers



Data from Minnesota Directory of Manufactures, 1967-1968

ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES

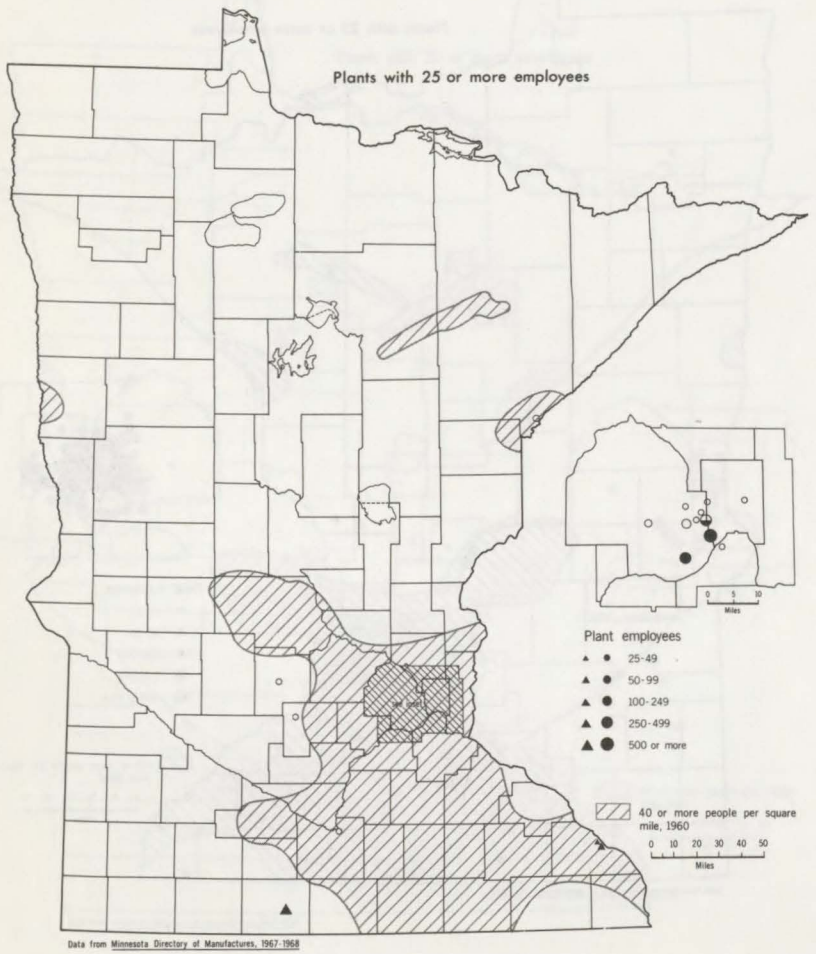
- All electrical machinery, except communications
- Radio and television receiving sets
- Radio and television transmitting equipment
- Telephone and telegraph apparatus
- Both



Data from Minnesota Directory of Manufactures, 1967-1968

LAND TRANSPORTATION EQUIPMENT

- Motor vehicles, including specialized vehicles
- Truck and bus bodies
- Truck trailers
- Both
- Railroad equipment and accessories



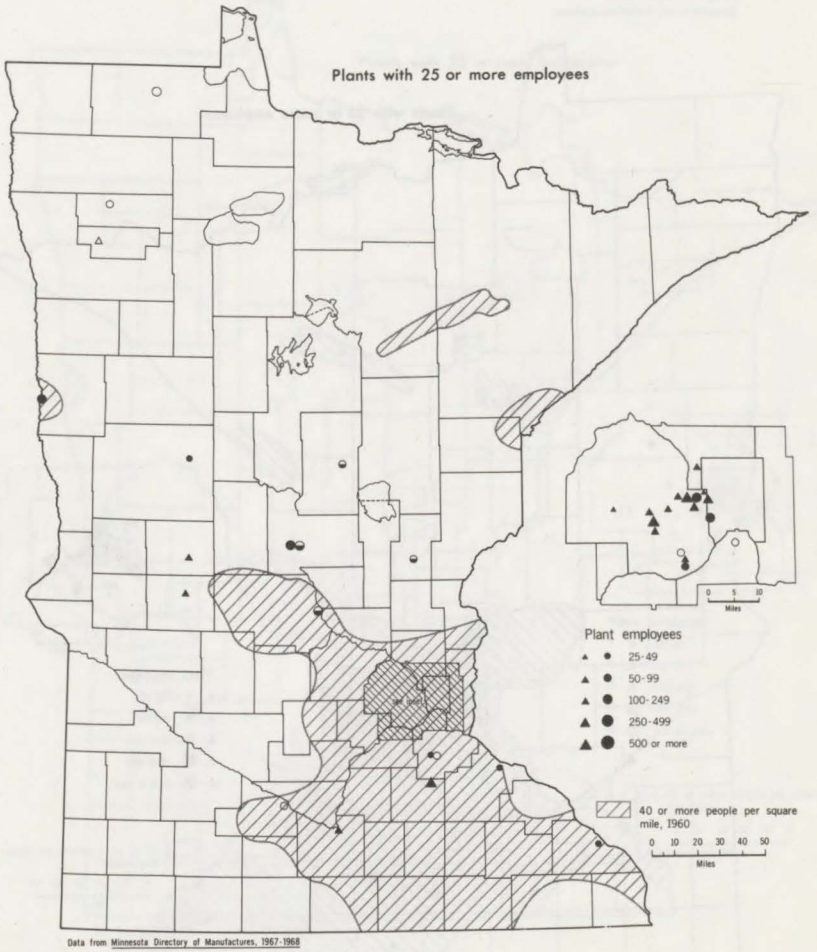
Data from Minnesota Directory of Manufactures, 1967-1968

WATER AND AIR TRANSPORTATION EQUIPMENT, UTILITY TRAILERS, AND MOBILE HOMES

- Boat building
- Boat and utility trailers
- Both

Aircraft
- Aircraft parts and engines

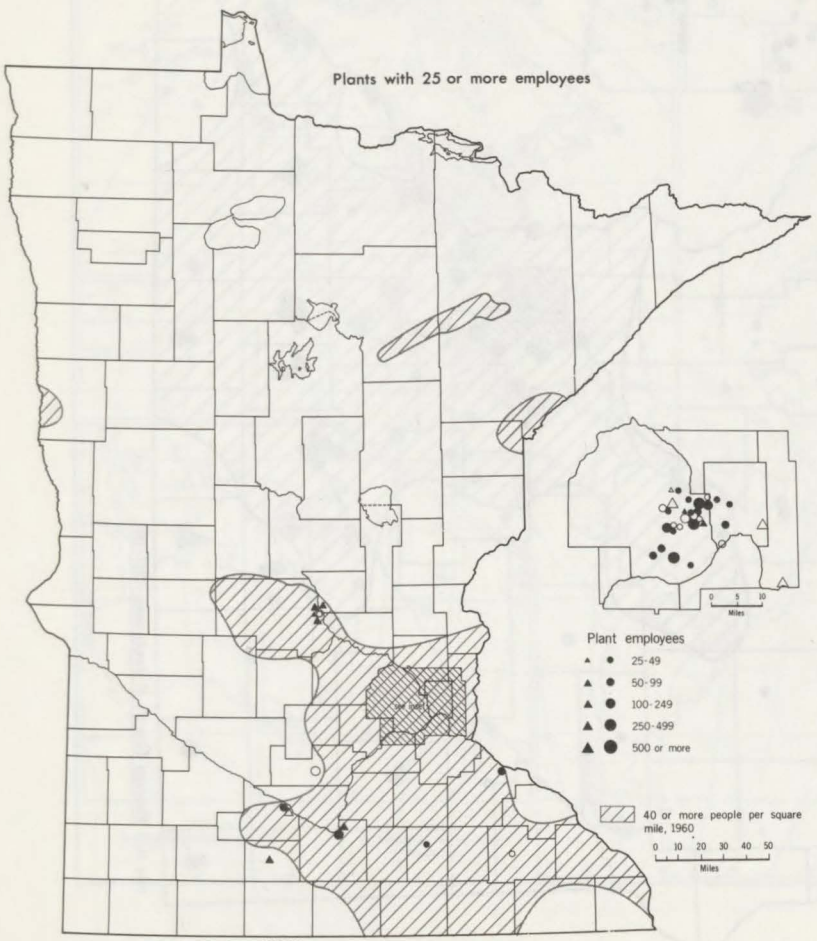
Missile parts
- Mobile homes



Data from Minnesota Directory of Manufactures, 1967-1968

PROFESSIONAL, SCIENTIFIC AND CONTROLLING INSTRUMENTS, AND PHOTOGRAPHIC AND OPTICAL GOODS

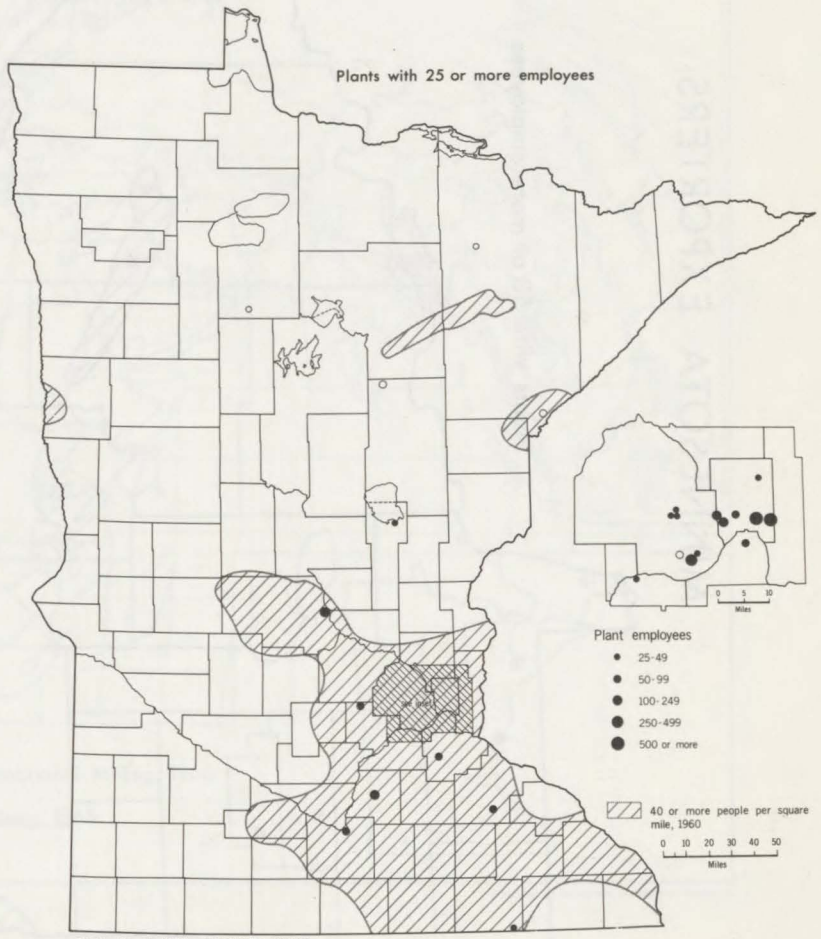
- ● Professional and scientific instruments
  Mechanical measuring and controlling instruments
- ○ Surgical and medical instruments and supplies
  Dental equipment and supplies
- ▲ Optical instruments and lenses
  Opthalmic goods
- △ Photographic equipment and supplies



Data from Minnesota Directory of Manufactures, 1967-1968

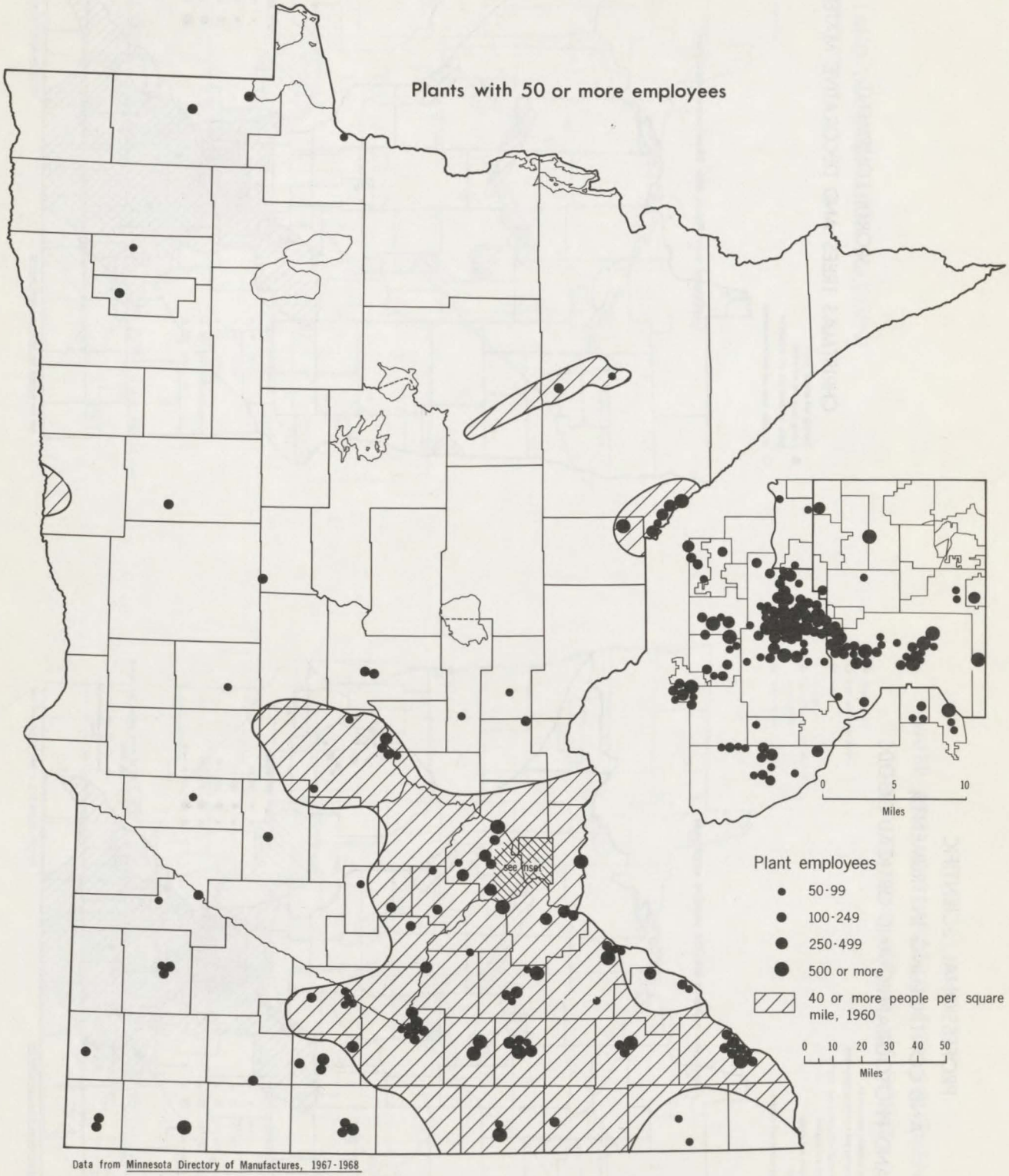
SPORTS EQUIPMENT CHRISTMAS TREES AND DECORATIVE MATERIAL

- ● Sporting and athletic goods
  Fishing tackle and equipment
  Water and snow skis and accessories
- ○ Christmas trees and decorative material



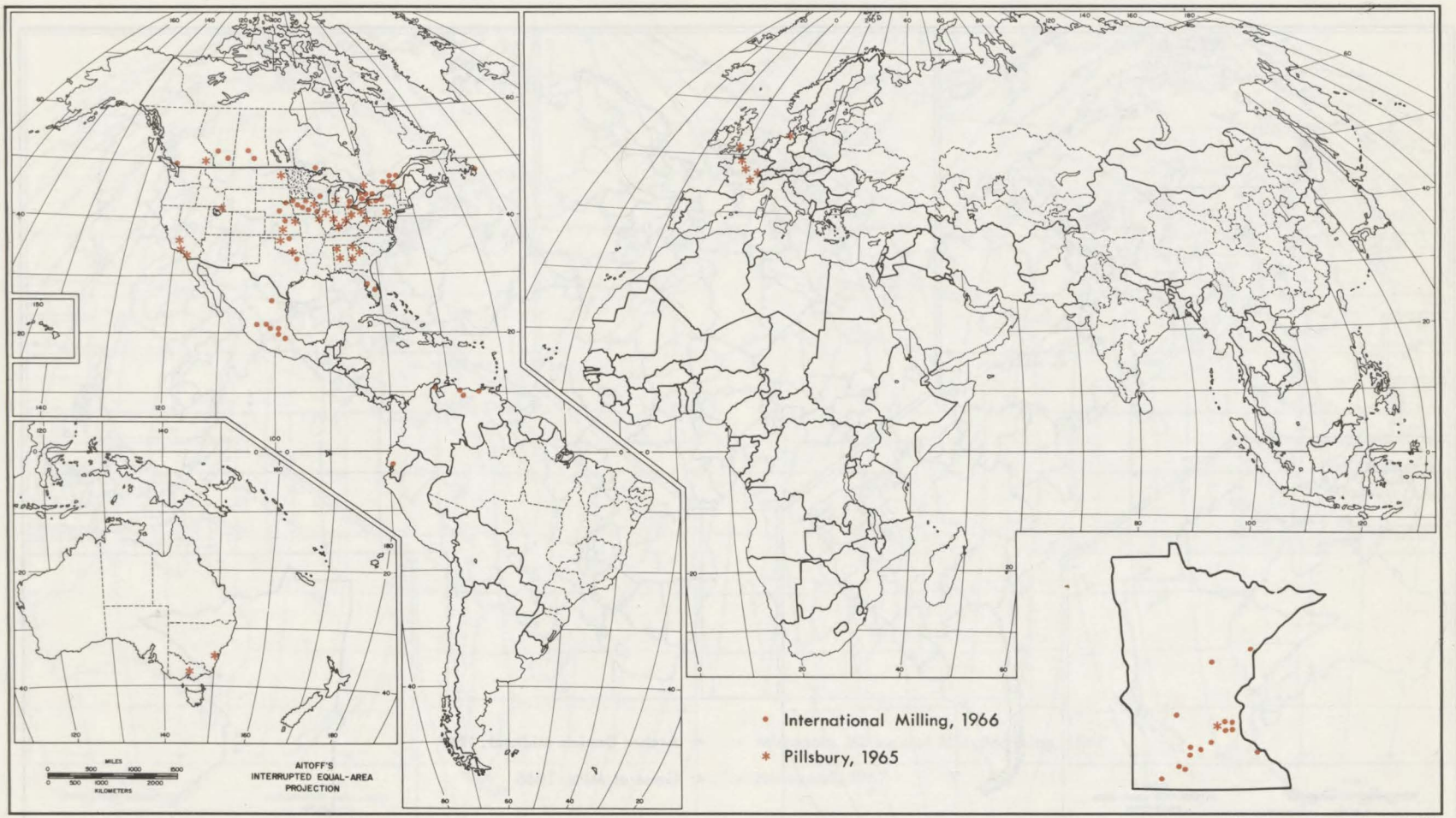
Data from Minnesota Directory of Manufactures, 1967-1968

MINNESOTA EXPORTERS



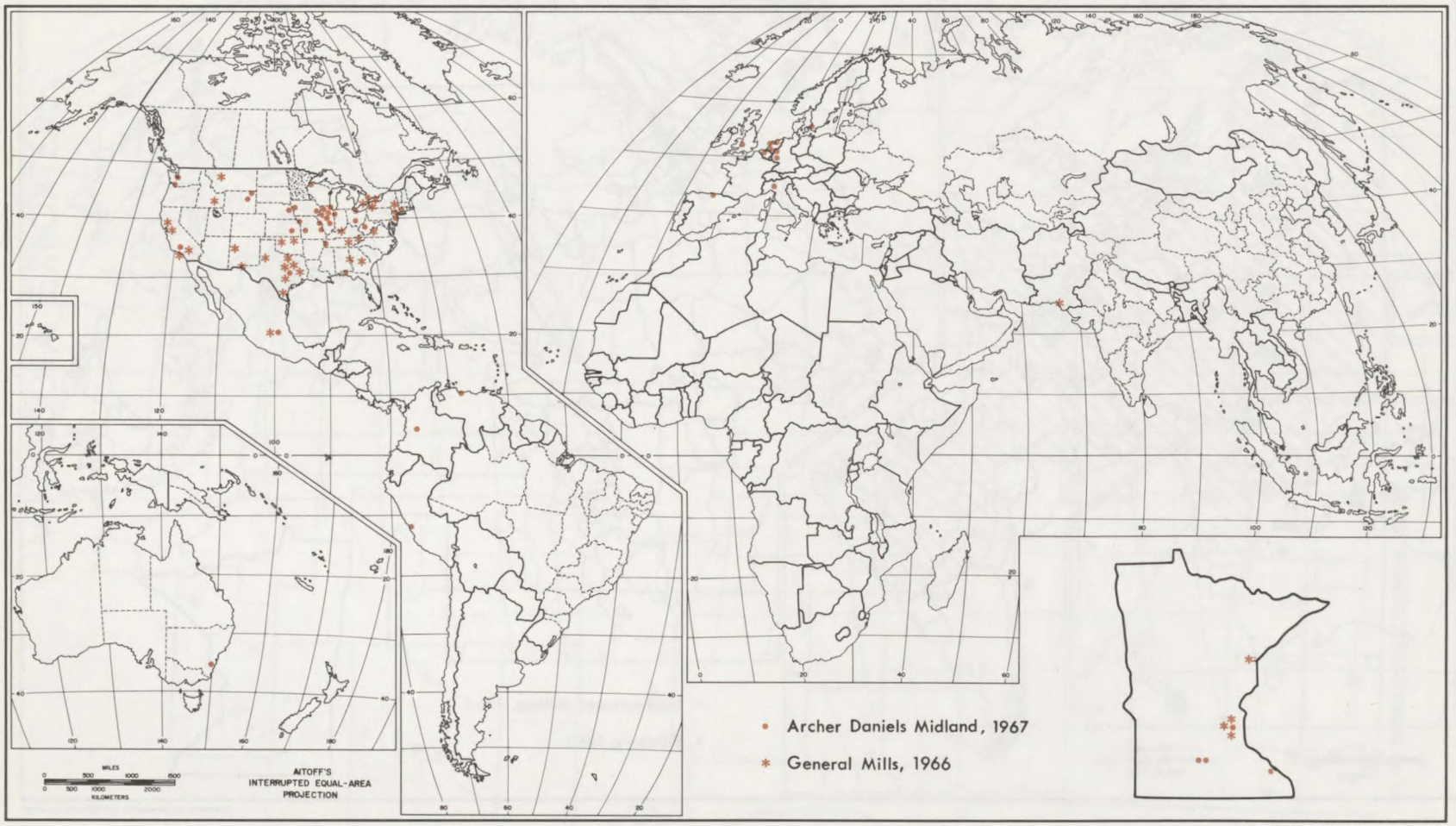
Data from Minnesota Directory of Manufactures, 1967-1968

INTERNATIONAL AND NATIONAL PLANTS OF MAJOR TWIN CITY BASED FIRMS



DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF MINNESOTA

INTERNATIONAL AND NATIONAL PLANTS OF MAJOR TWIN CITY BASED FIRMS



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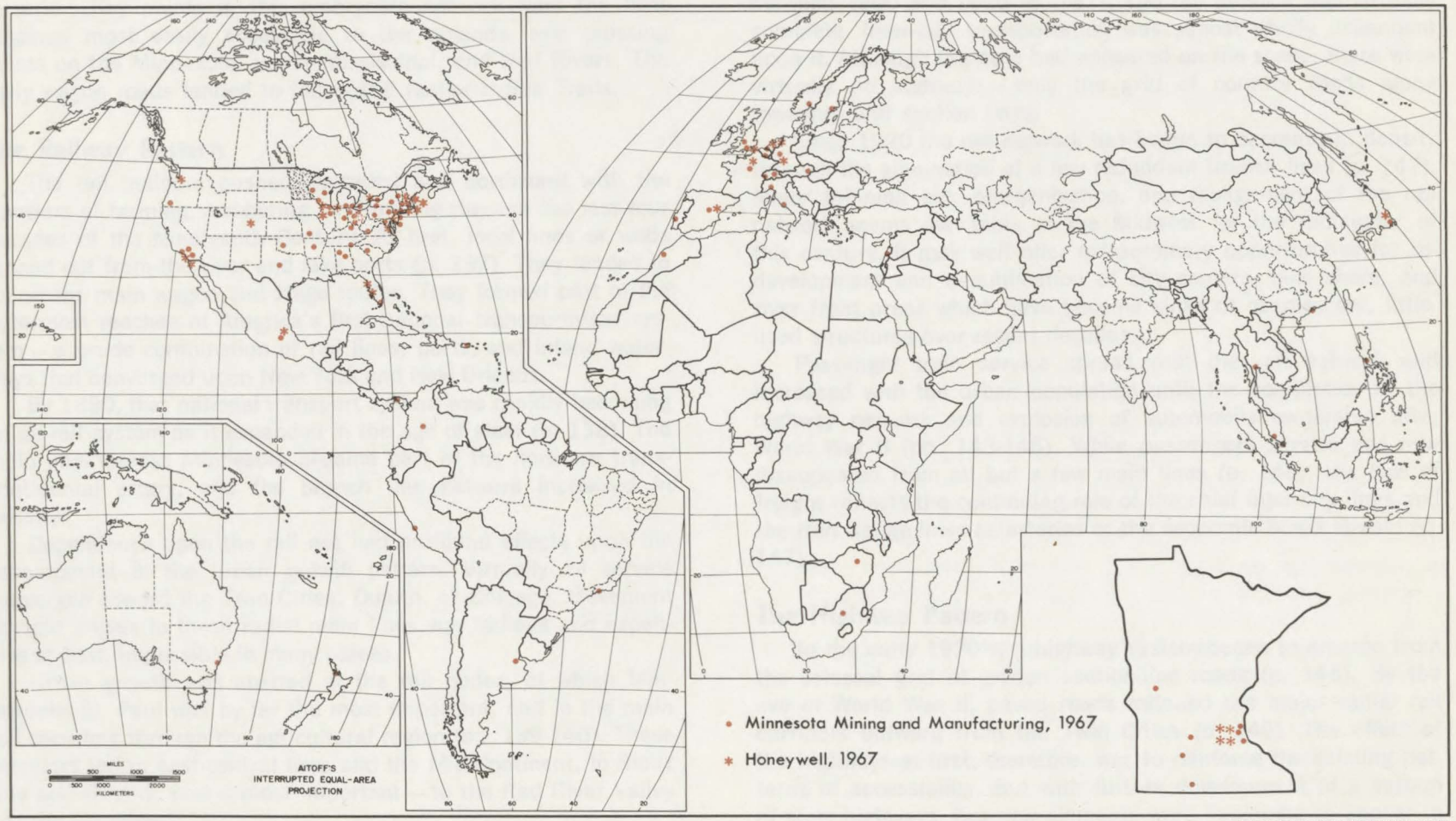
INTERNATIONAL AND NATIONAL PLANTS OF MAJOR TWIN CITY BASED FIRMS



DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF MINNESOTA

Chapter 9

THE TRANSPORTATION NETWORK

Before the railroads, Minnesota's pioneer white settlers cleared oxcart and wagon trails (p. 136). The main overland routes reached inland from the Mississippi and the head of Lake Superior. Key points in this embryonic network were the boat landings most easily accessible to the uplands, and crossing points on the Minnesota, upper Mississippi, and Red Rivers. The early wagon roads tended to follow still earlier Indian Trails.

The Railway Pattern

The rail builders pushed westward and northward with the frontiers of farming, lumbering, and mining through the last four decades of the Nineteenth Century. At first, local lines or webs fanned out from the river and lake ports (p. 137). They tended to follow the main wagon and stage routes. They formed part of the outermost reaches of America's first national transportation system — a crude combination of rail lines, ports, and inland waterways that converged upon New York and New Orleans.

By 1880, that national transport system was rapidly becoming an all-rail system as it expanded in the age of steel (p. 138). The main lines across Minnesota became part of the northern transcontinental artery, and the branch line network increased in density.

Dependence upon the rail net had profound effects upon the development of the urban growth pattern. Virtually all service converged toward the Twin Cities, Duluth, or Chicago. Movement at right angles to these radial main lines was tedious and expensive at best, impossible in many places.

Urban growth was abetted at the rail nodes, of which Minneapolis-St. Paul was by far the most important, and in the main rail corridors through the agricultural region (pp. 139-140). These corridors led to east-central Iowa and the Mid-Continent, to Sioux City and Omaha, and — most important — to the Red River Valley and the Northwest.

Pieshaped interstitial areas, between these corridors, opened toward the south-central and west-south-central parts of the state. Even the county seats in these areas, as well as many to the north of the Twin Cities-Red River corridor, were quite isolated from the metropolitan centers and from one another.

Only a few more branch lines and iron ore lines were added between 1900 and 1920 (p. 141). The rail network was virtually complete. Inter-city transportation was almost wholly dependent upon it. Although the auto had appeared on the scene, there were virtually no highways — only the grid of country roads along township and section lines.

Since 1920 the rail network has begun to decrease in density through the elimination of a few redundant branch lines (p. 142). Major thinning out, reorganization, and realignment of the rail network seems inevitable in the Midwest for the remainder of this century. It may well offer extraordinary opportunities for redevelopment and beautification of city centers, lake shore, and river front areas which have become sinks of obsolescent, little-used structures over recent decades.

Passenger train service spread with the rail network and increased with the urban population until the completion of the highway network and explosion of automobile ownership after World War II (pp. 143-145). While passengers service has now disappeared from all but a few main lines (p. 146), the flow of freight reflects the continuing role of the chief inter-city links and the Iron Range lines as arteries of the economic blood stream (p. 147).

The Highway Pattern

In the early 1920's, a highway system began to emerge from the colossal grid of graded section-line roads (p. 148). By the eve of World War II, paved roads followed the major radial rail corridors outward from the Twin Cities (p. 149). The effect of the highways at first, therefore, was to reinforce the existing patterns of accessibility. But with further development of a system of state highways, two new elements were beginning to appear in the intercity transportation network. From the ubiquitous section line grid, selected roads were being upgraded along north-south and east-west lines between many different pairs of county seats

which had not been connected directly in the rail era. Also, radials were being paved along routes which had not previously been served by major rail lines because they had not been in the paths from Minneapolis-St. Paul to other major Midwest or Pacific Northwest cities.

Highway development today permits, for all practical purposes, equal freedom of movement from the main population centers of any county to those of any other county (p. 150). Accessibility to the state's population depends upon location within the over-all population distribution patterns, and not upon the directions and interconnections of particular transportation systems or major corridors. Average speed of movement, for all classes of transport, has also increased sharply in the auto era.

As a result of these changes, a much-widened range of locational choice has been open to business firms, individuals, and public agencies. The comparative advantage of location within a "main line" corridor, or the disadvantage of location outside one, has been wiped out.

The developing network of freeways appears once again to be establishing the historic corridors of accessibility along the routes from the Twin Cities to other major national centers (p. 151). But the Federal Interstate Highway System will be gradually supplemented by other freeways and expressways. Furthermore, interchange between freeways and the remainder of the road system does not pose such problems as interchange between trains, in the rail corridors, and wagons, on the local road systems, posed in the earlier era. Hence, the long-run effect of the freeway and expressways will probably be to reinforce the pattern of options established in the auto era and to increase yet further the speed, capacity, and flexibility of the total system.

The pattern of private automobile traffic closely follows the distribution of population (p. 152). Traffic density reaches a sharp peak in the Twin Cities metropolitan commuter shed and is relatively high throughout the urbanizing regions of the southeastern one-third of the state. Truck traffic is somewhat less flexible; its routes are more confined to the main urban corridors (p. 153).

Air Routes, Pipelines, Power and Waterways

Air transportation routes resemble the main rail and highway links. However, technology limits the number and spacing of stops on the airlines more than it has on rail lines and roads (p. 154). Hence, air transport has been a force favoring increased geographical clustering of growth or regional or national offices, industrial research or laboratory facilities, and distribution of high value-low bulk goods.

Air routes link the Twin Cities directly with all other metropolitan centers of over one million population in the United States and with the wholesaling centers throughout the metropolitan trade and service area (pp. 155-156). The Twin Cities rank near the top among the centers of one million or more population in air passenger traffic per capita.

The shipment of cargo by air — the latest development in cargo transportation which has progressed from the wagon to the rail to the truck — is still in its embryonic stage. The Twin Cities are presently connected with the major manufacturing cities of the East and with Pacific-Northwest cities and the Orient (p. 157). More flights are planned as the economy shifts to the containerization of low-bulk and/or high-valued manufactured goods.

The pipeline network serves most importantly to bring energy from distant source regions to the major market areas of southern and western Minnesota, Duluth, and the Range Cities (p. 158). The chief flows include gas from the Mid-Continent fields, crude oil from the North Dakota and Alberta fields, and refinery products to and from Midwest markets and production centers. Opening of the major new fields in Alberta had an important effect on the relative location of Minnesota population centers within the national production, market, and price structure. It resulted in major growth of refining facilities — especially at the Twin Cities — and shifted the state from a position at the end of the line from the Mid-Continent fields to that of "point of competition" between Mid-Continent and Alberta gas and crude.

The high voltage electrical transmission system, like the pipeline system, represents a means of transferring energy from source to market. In this case however, production is much more closely related to market — the population centers and heavy industry (p. 159). Notable exceptions to this close relationship are the major interstate lines which form the Upper Mississippi Valley Power Pool and the imputs into western Minnesota from the

Missouri Basin Project. While production is no longer dependent on water power, most production sites are still water-oriented.

Water-borne shipping is now limited mostly to bulk commodities (Table 13). Lake Superior shipping is dominated by the massive stream of iron ore and taconite pellets which moves down the lake enroute to the Chicago area and lower lakes ports (pp. 160-161). Grain shipments comprise about one-seventh of the tonnage out of Duluth-Superior; general cargo a small but important remainder. Coal and petroleum products dominate the incoming flow, with, again, a small but significant accompanying flow of general cargo.

In the Twin Cities area, Mississippi up-river barge traffic is mainly in coal, petroleum products, and mineral fertilizer; down-river cargo is mostly grain (pp. 162-163). There is also a heavy local traffic in sand and gravel.

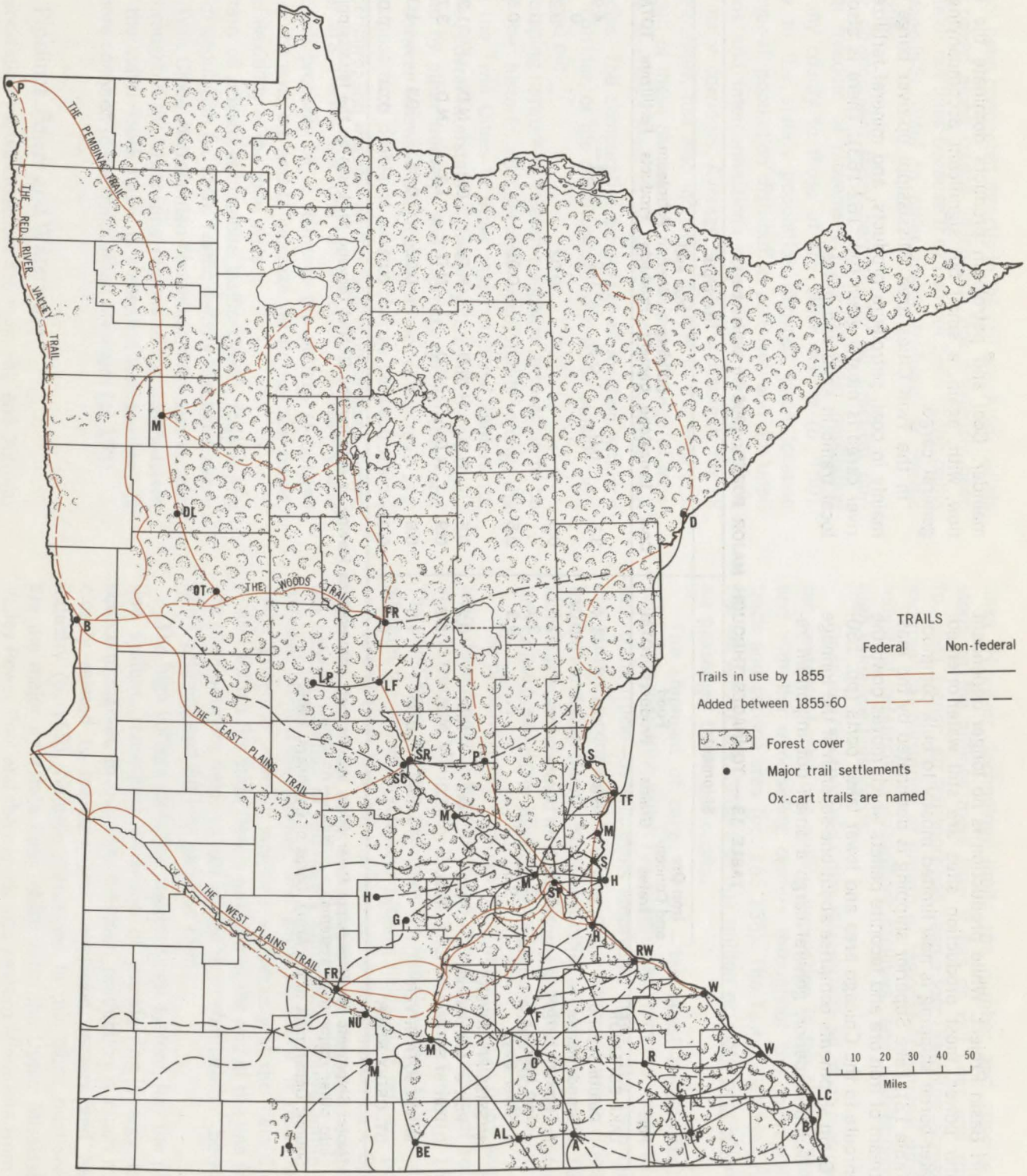
TABLE 13 — TONNAGES THROUGH MAJOR PORTS, 1966 (in million tons)

	Shipments				Receipts						
Port	Iron Ore and Concentrates	Grains	Food Products	TOTAL	Coal	Limestone	Building Cement	Iron and Steel Products	Petroleum Products	Fertilizers	TOTAL
LAKE SUPERIOR											
Duluth-Superior	34.9	5.8	0.3	41.4	3.3	0.9	0.3	0.2	0.01—	..	4.9
Grand Marais	...	..	..	0.04	..	..	..	..	..	..	0
Taconite Harbor	11.8	..	..	11.8	0.3	..	..	0.02	..	..	0.3
Two Harbors	3.1	..	..	3.1	..	..	..	..	..	..	0
Silver Bay	9.3	..	..	9.3	0.5	..	..	0.01—	..	..	0.5
MISSISSIPPI RIVER*											
Port of Minneapolis	N.D.	0.1	N.D.	0.2	0.5	N.D.	N.D.	N.D.	0.2	N.D.	1.3
Port of St. Paul	N.D.	1.0	N.D.	1.2	0.9	N.D.	N.D.	N.D.	1.1	N.D.	3.7
MINNESOTA RIVER	..	1.4	0.05	1.5	0.9	..	..	0.02	0.05	0.1	1.3
ST. CROIX RIVER	..	..	...	0	0.01—	..	..	0.01—	..	0.01	0.02

*Note: Shipments for Mississippi River ports include only commodities leaving or entering the District (beyond St. Louis on the Mississippi or into other major river systems). N.D. — no data.

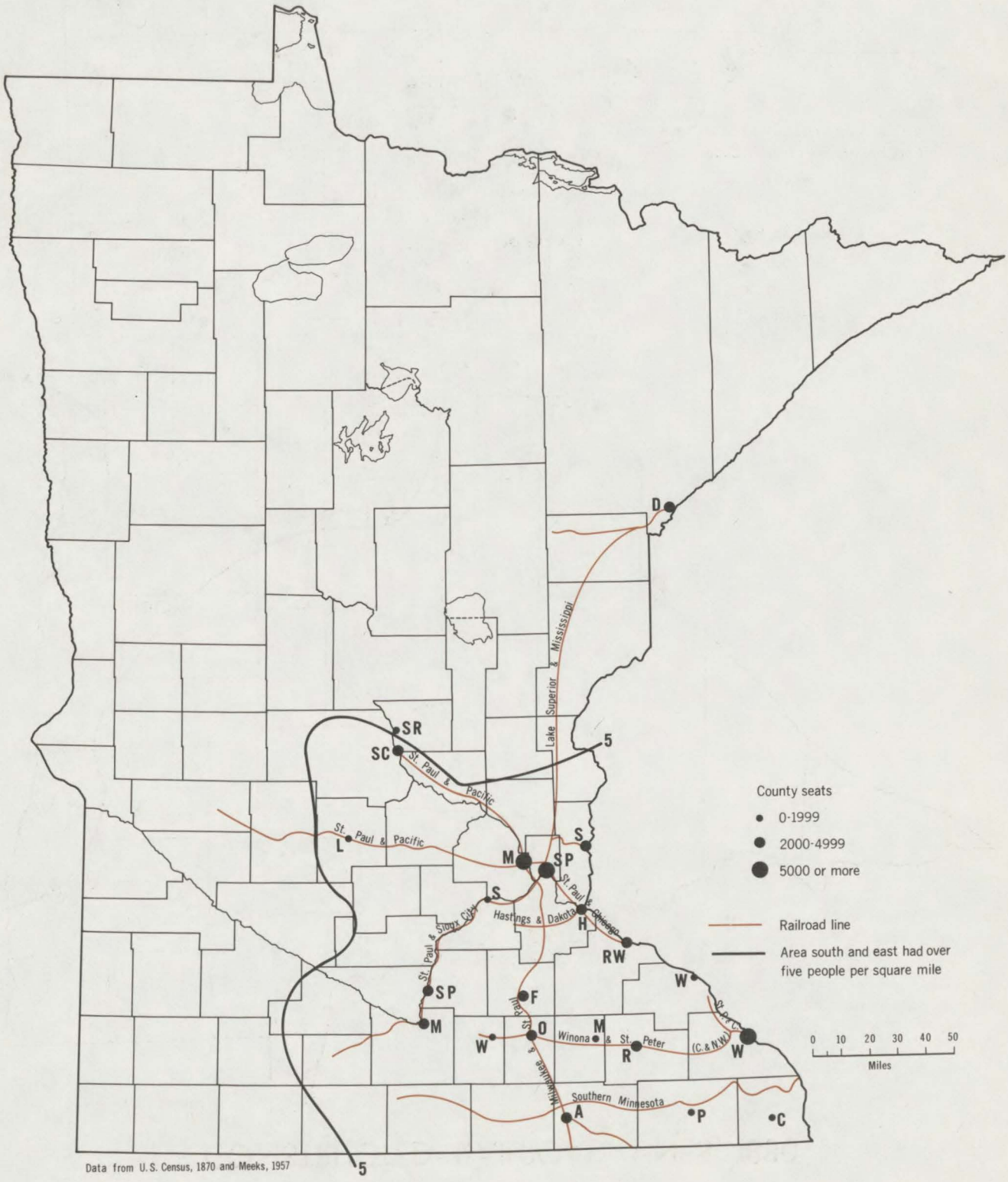
Source: Department of the Army, Corps of Engineers, 1966.

PRE-RAILROAD SETTLEMENT TRAILS



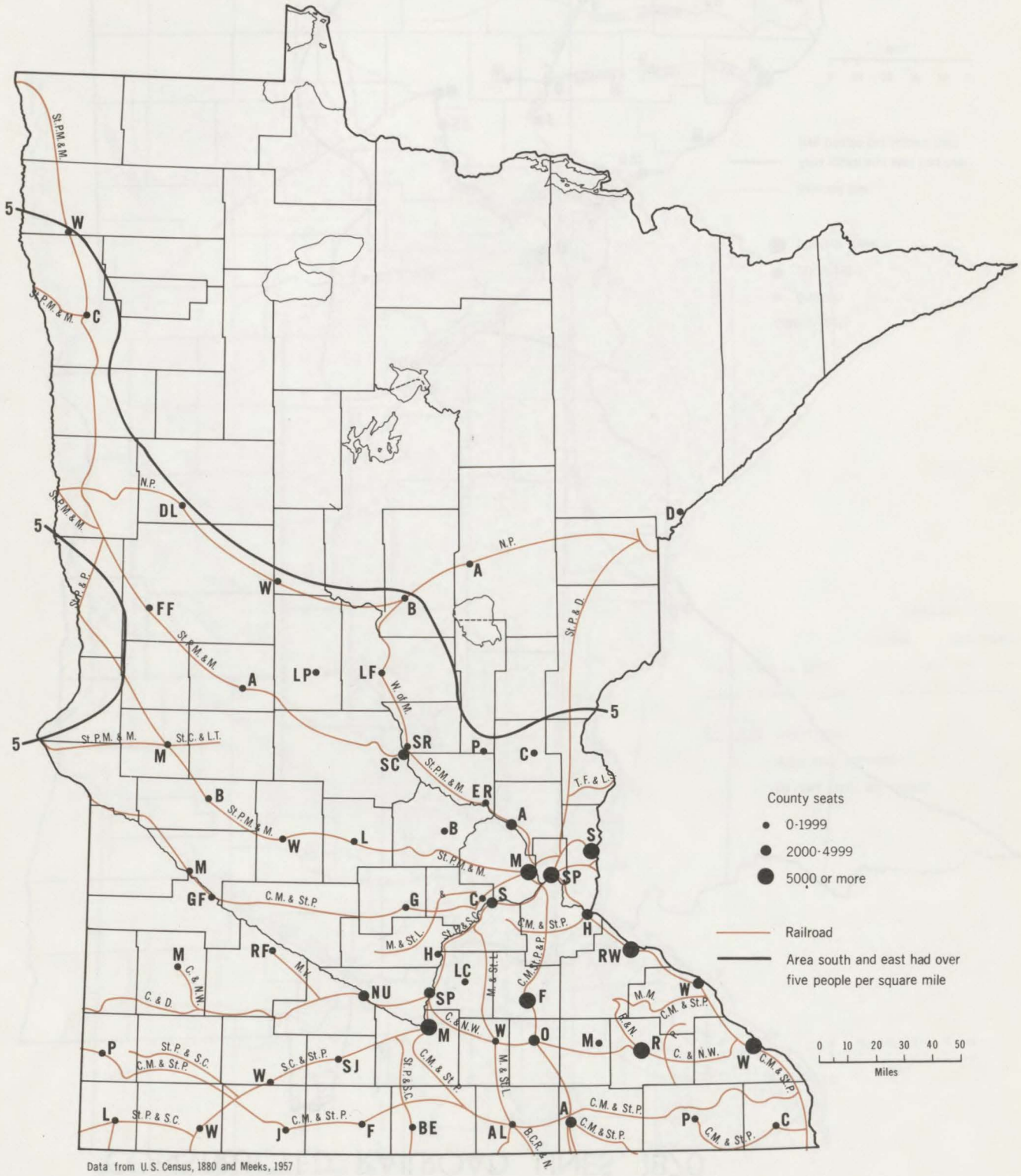
Data from Marschner, 1930, Larsen, 1958, and Folwell, 1956

CONSTRUCTED RAILROAD LINES, 1870



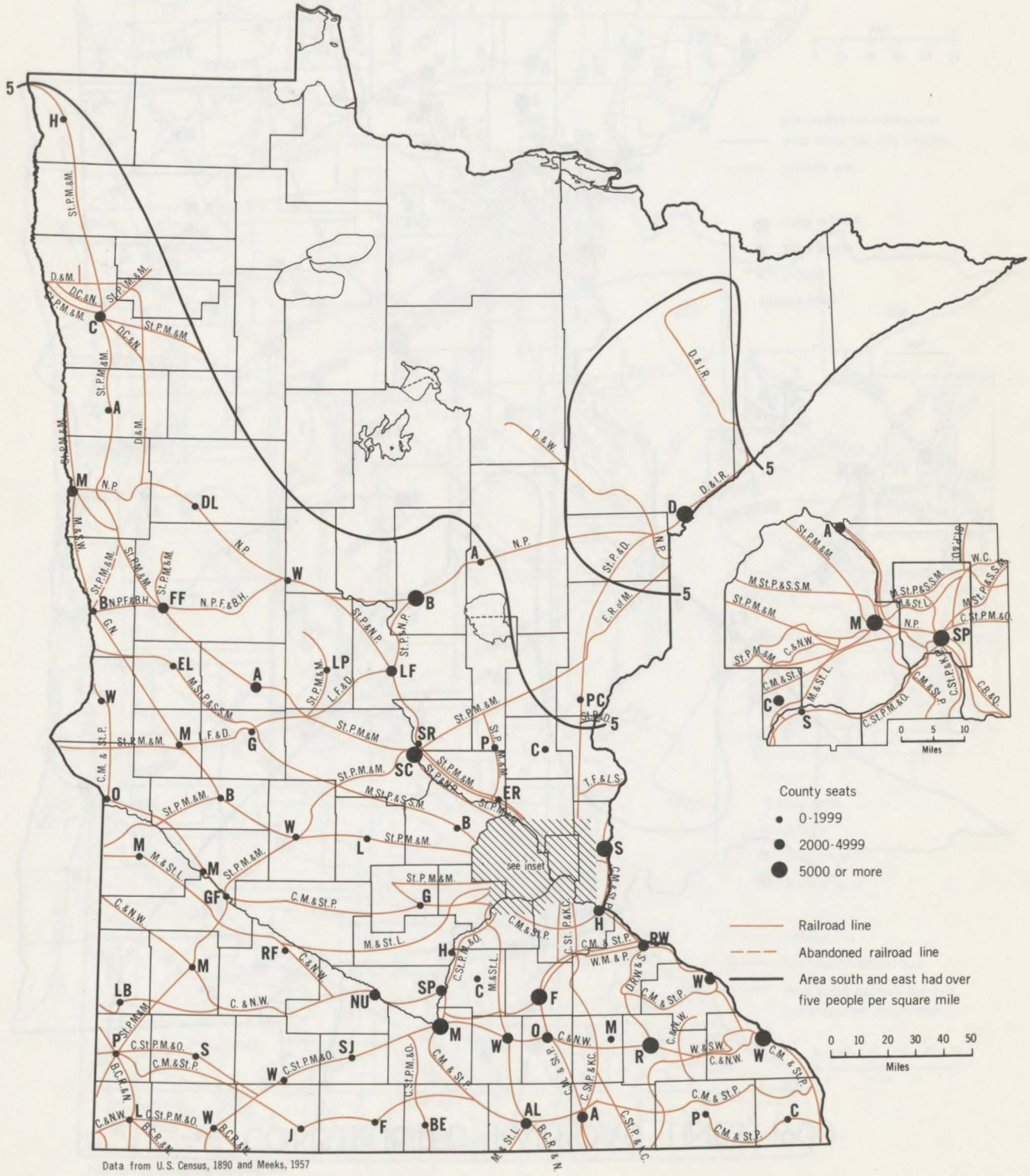
Data from U.S. Census, 1870 and Meeks, 1957

CONSTRUCTED RAILROAD LINES, 1880



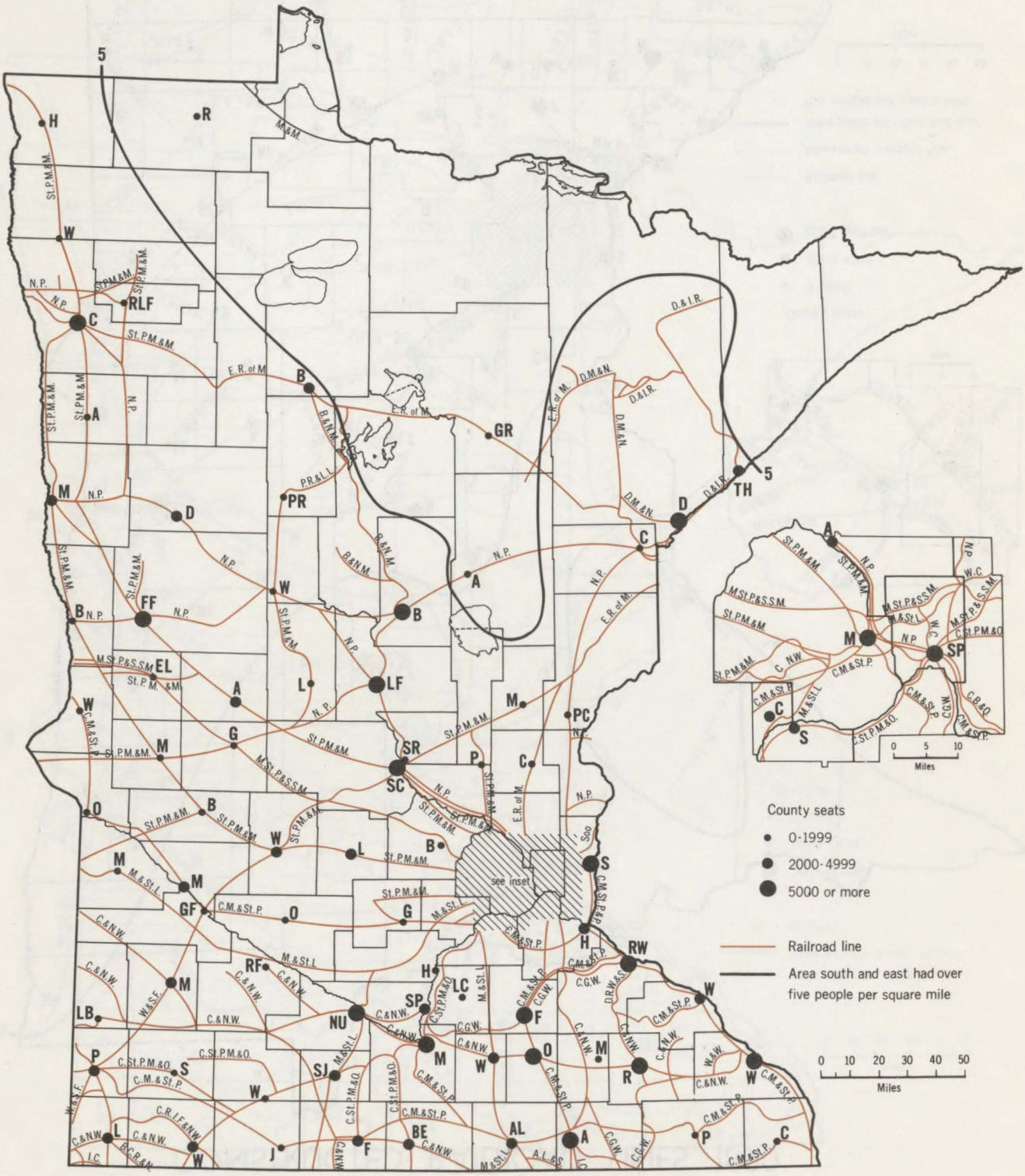
Data from U.S. Census, 1880 and Meeks, 1957

CONSTRUCTED RAILROAD LINES, 1890



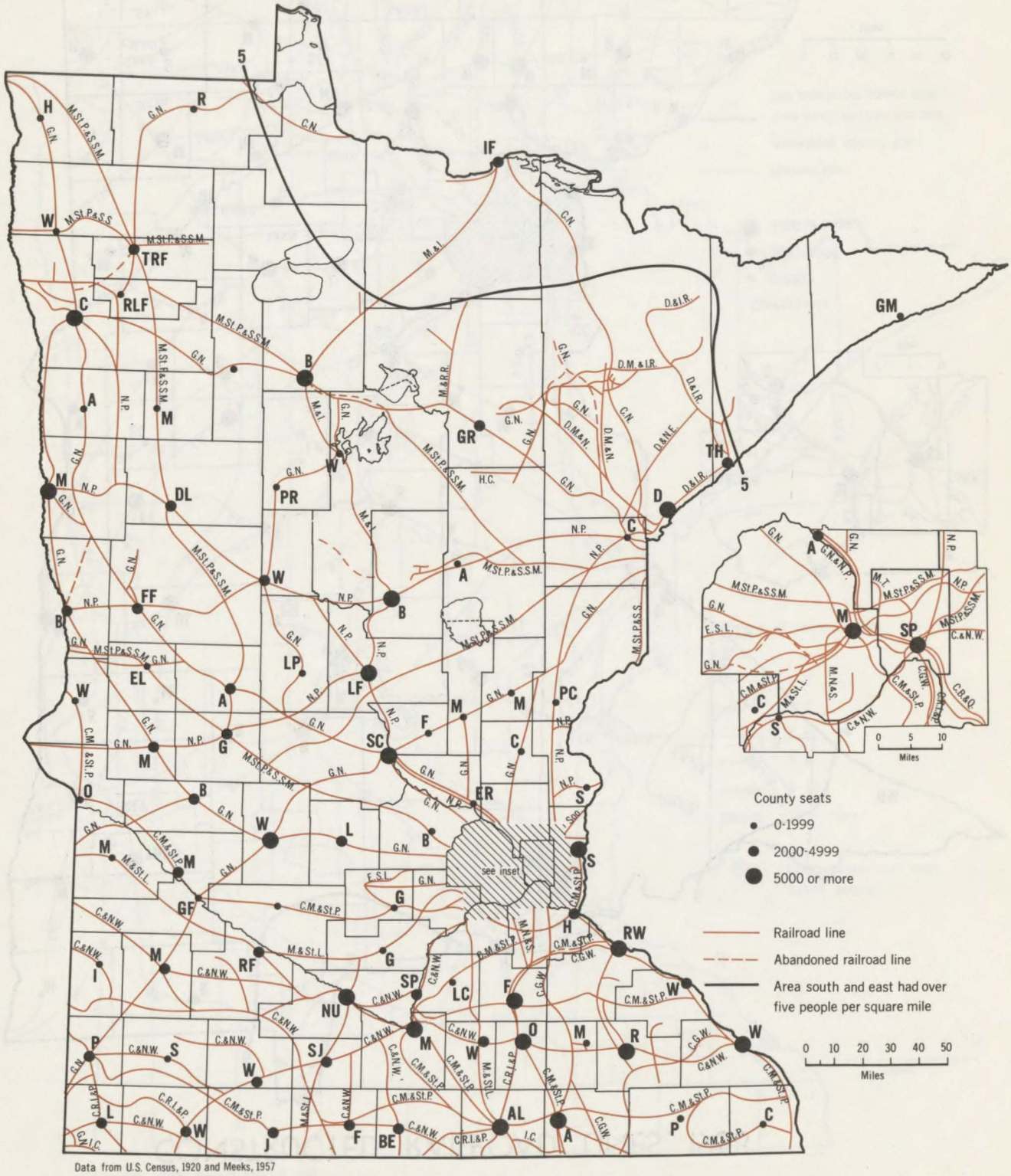
Data from U.S. Census, 1890 and Meeks, 1957

CONSTRUCTED RAILROAD LINES, 1900



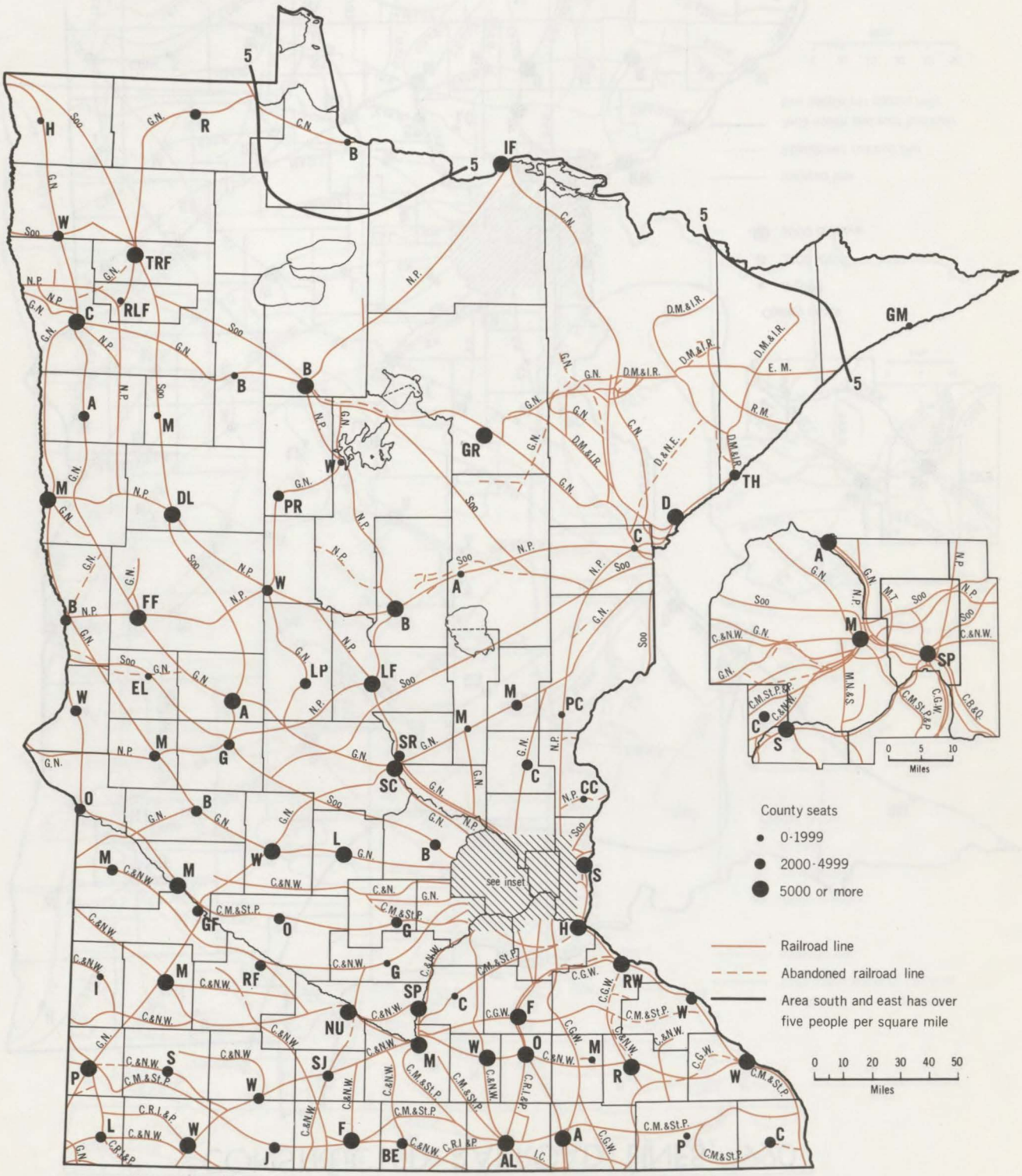
Data from U. S. Census, 1900 and Meeks, 1957

CONSTRUCTED RAILROAD LINES, 1920



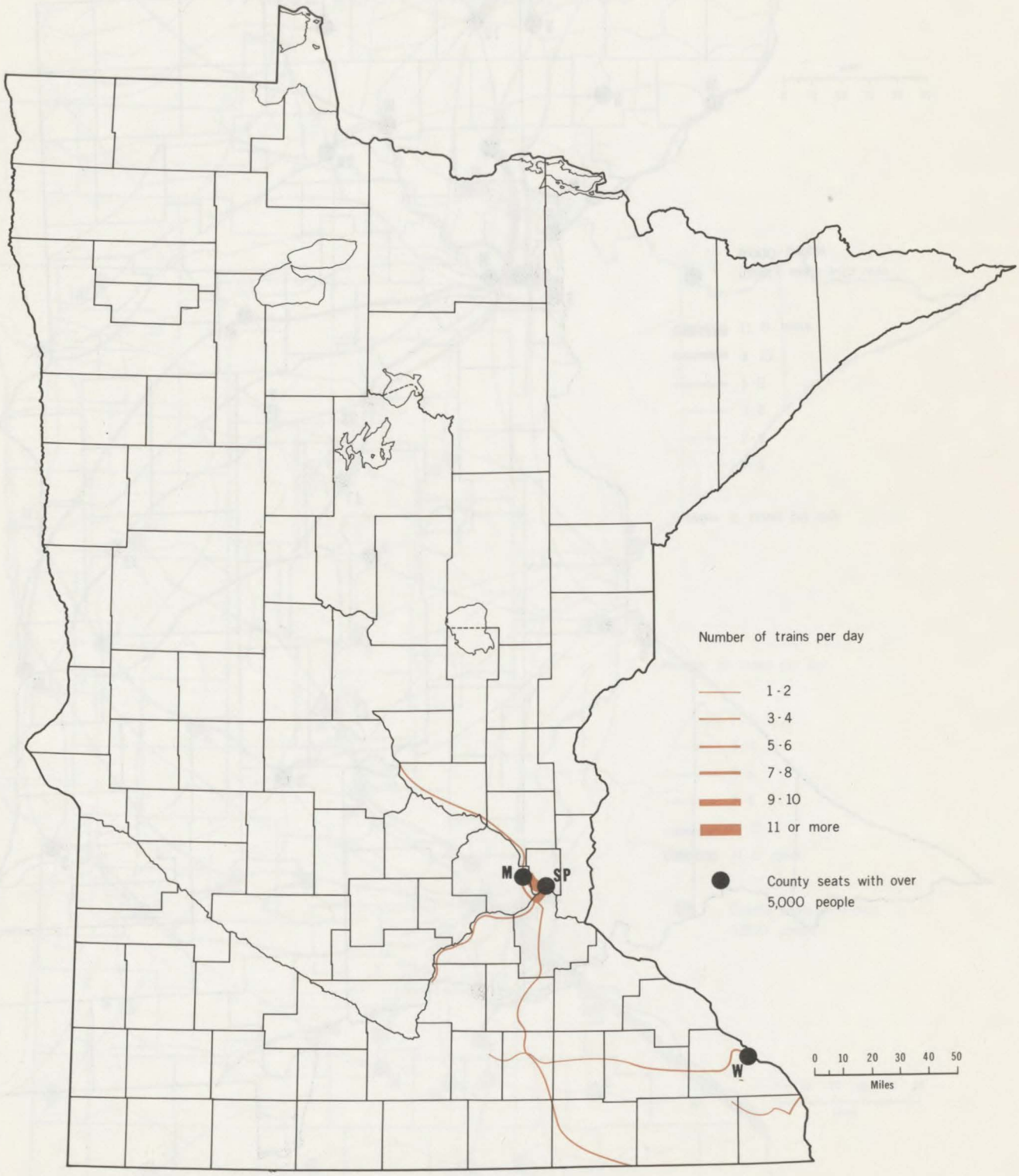
Data from U.S. Census, 1920 and Meeks, 1957

CONSTRUCTED RAILROAD LINES, 1968



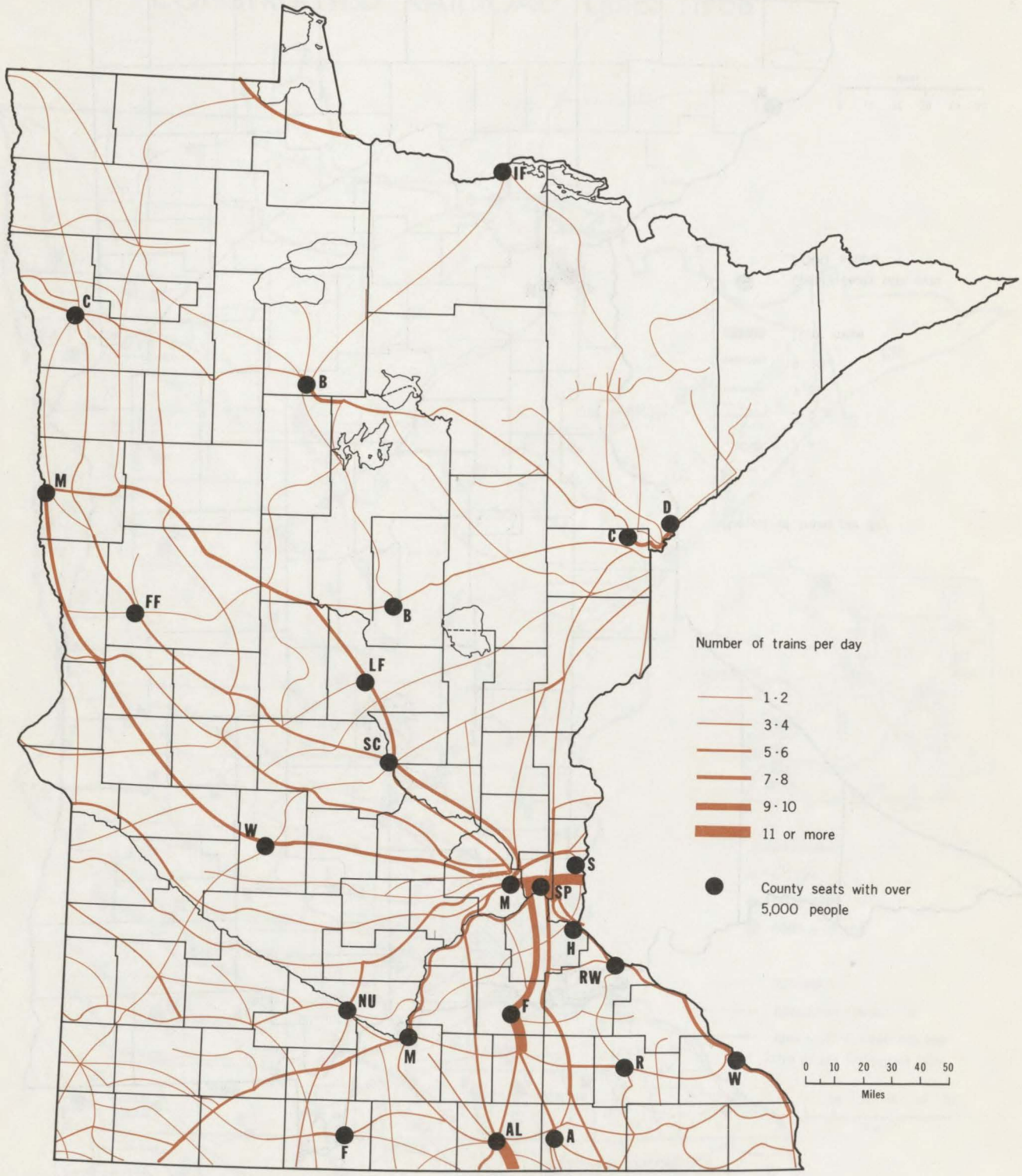
Data from U.S. Census, 1960 and Official State Highway Map, 1968

PASSENGER TRAINS, 1868



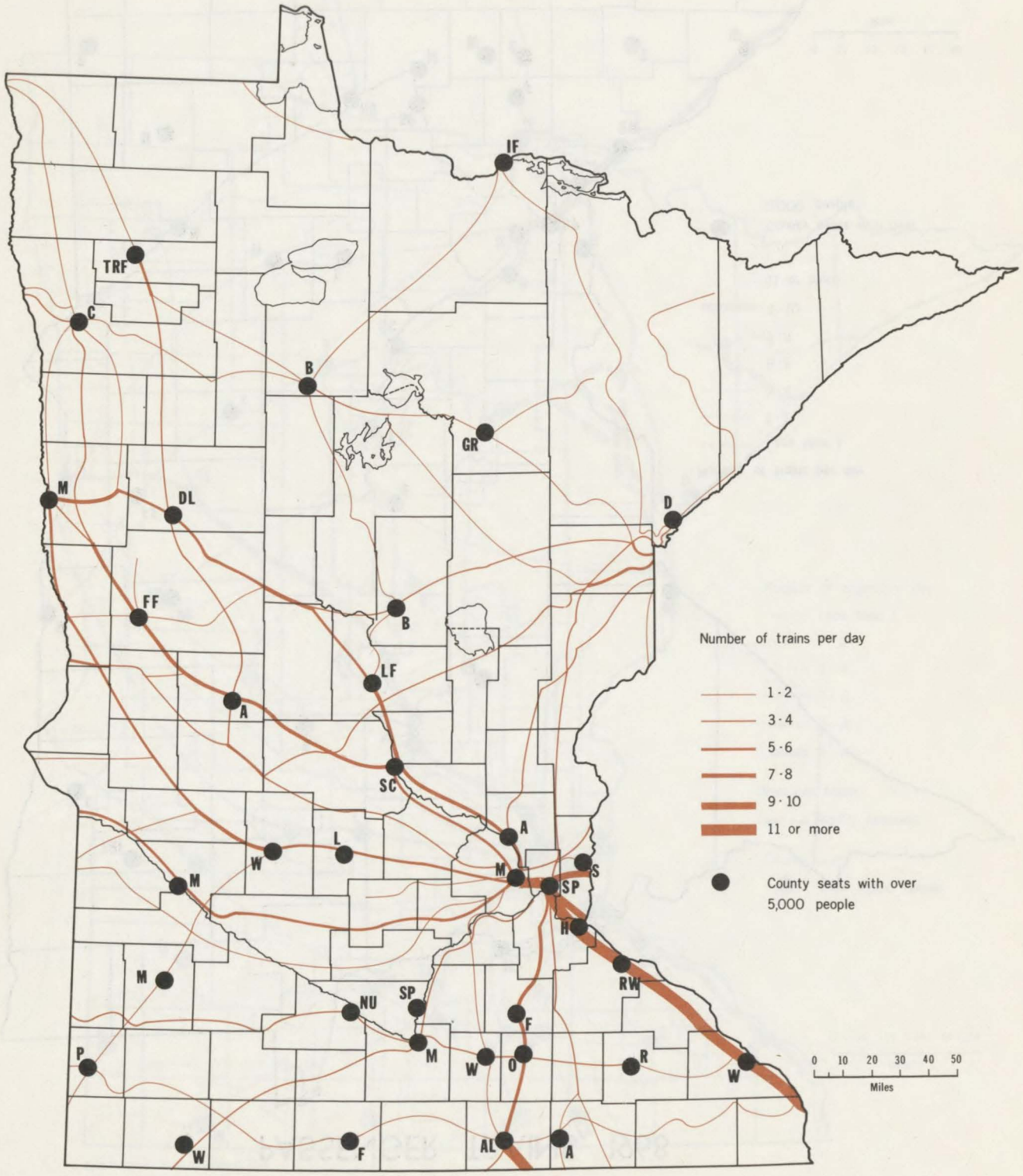
Data from Official Guide of Railways, 1868

PASSENGER TRAINS, 1934



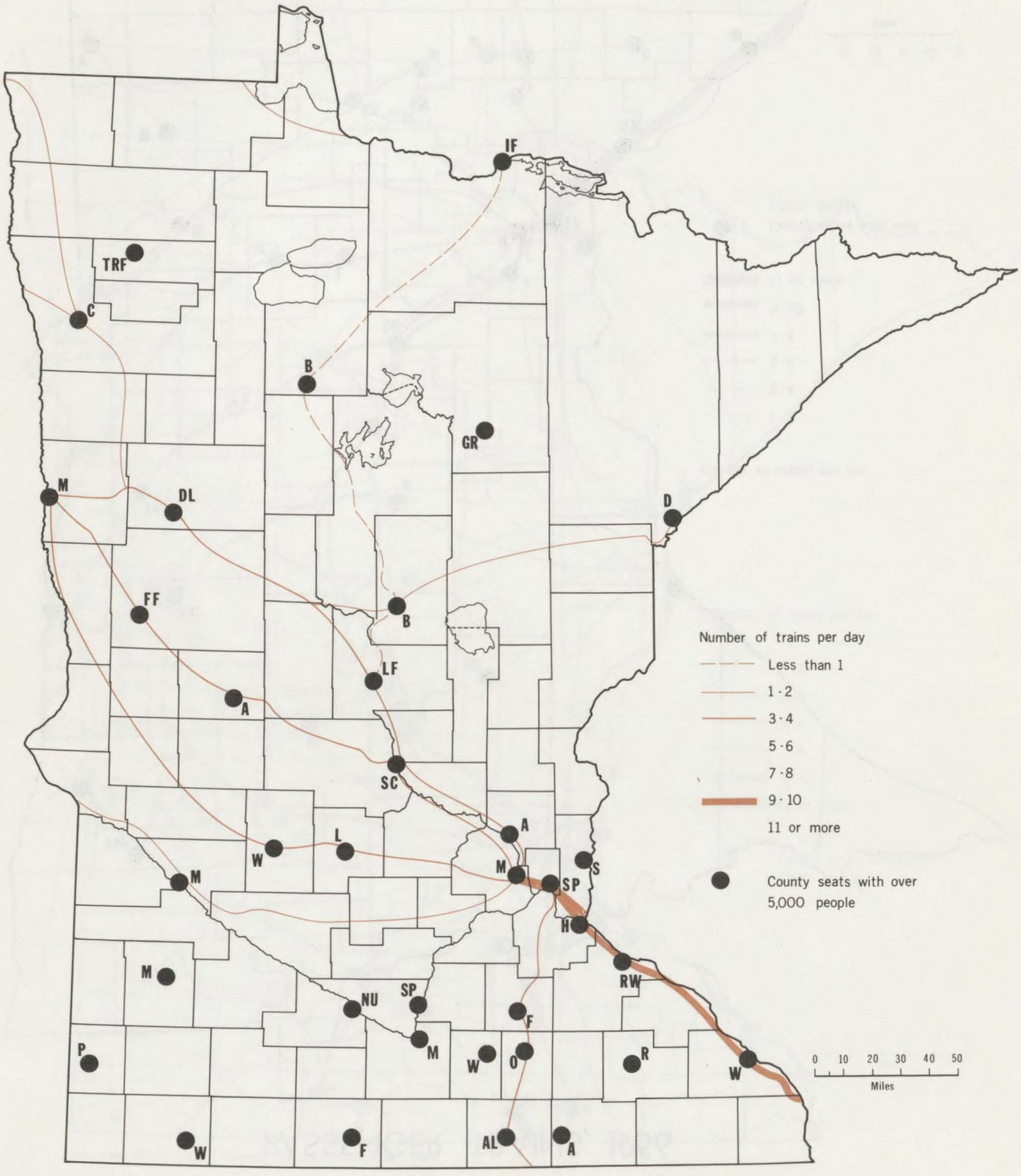
Data from Official Guide of Railways, 1934, (Kaups & Rikkinen, 1968)

PASSENGER TRAINS, 1956



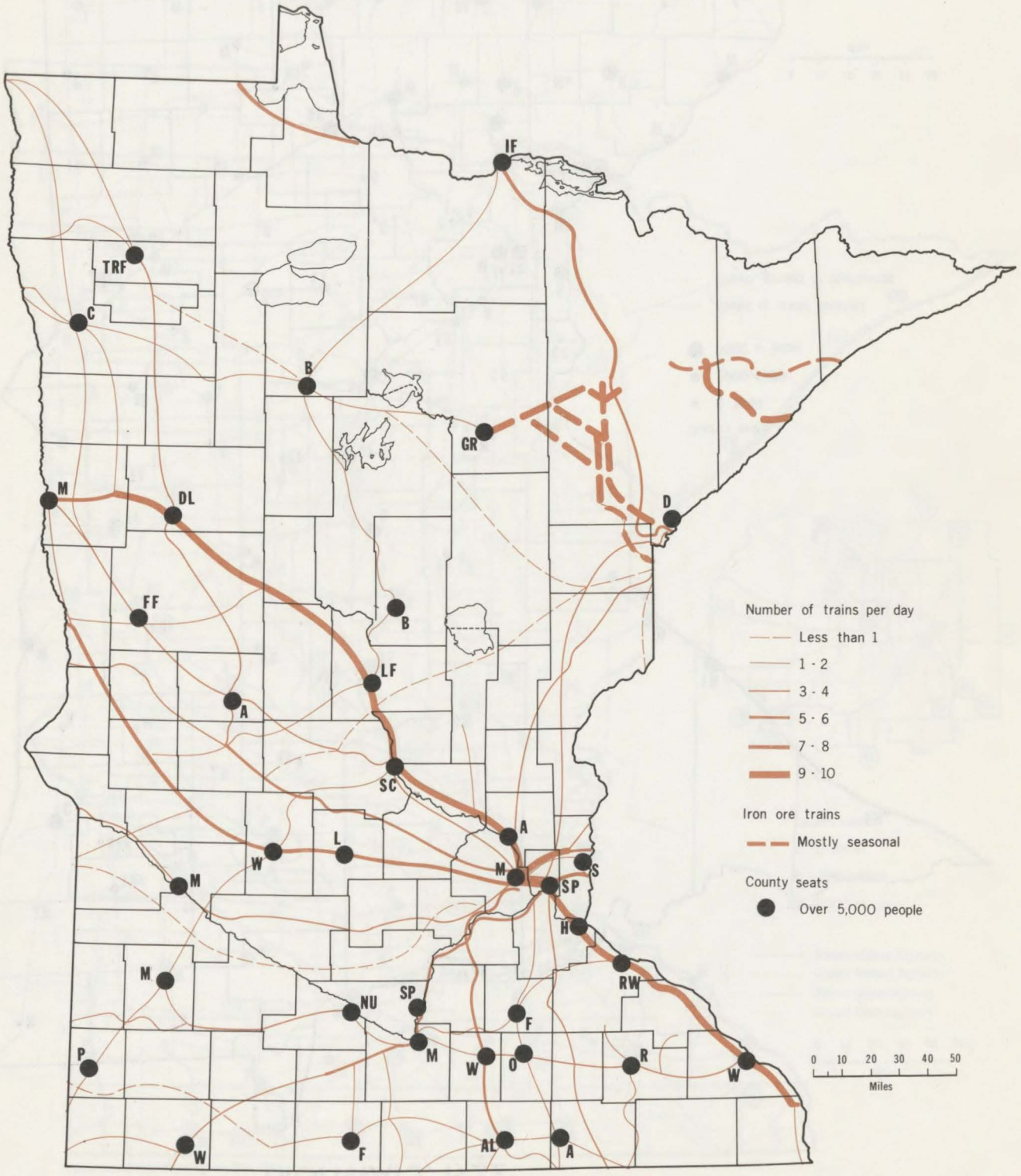
Data from Official Guide of Railways, 1956, (Kaups & Rikkinen, 1968)

PASSENGER TRAINS, 1968



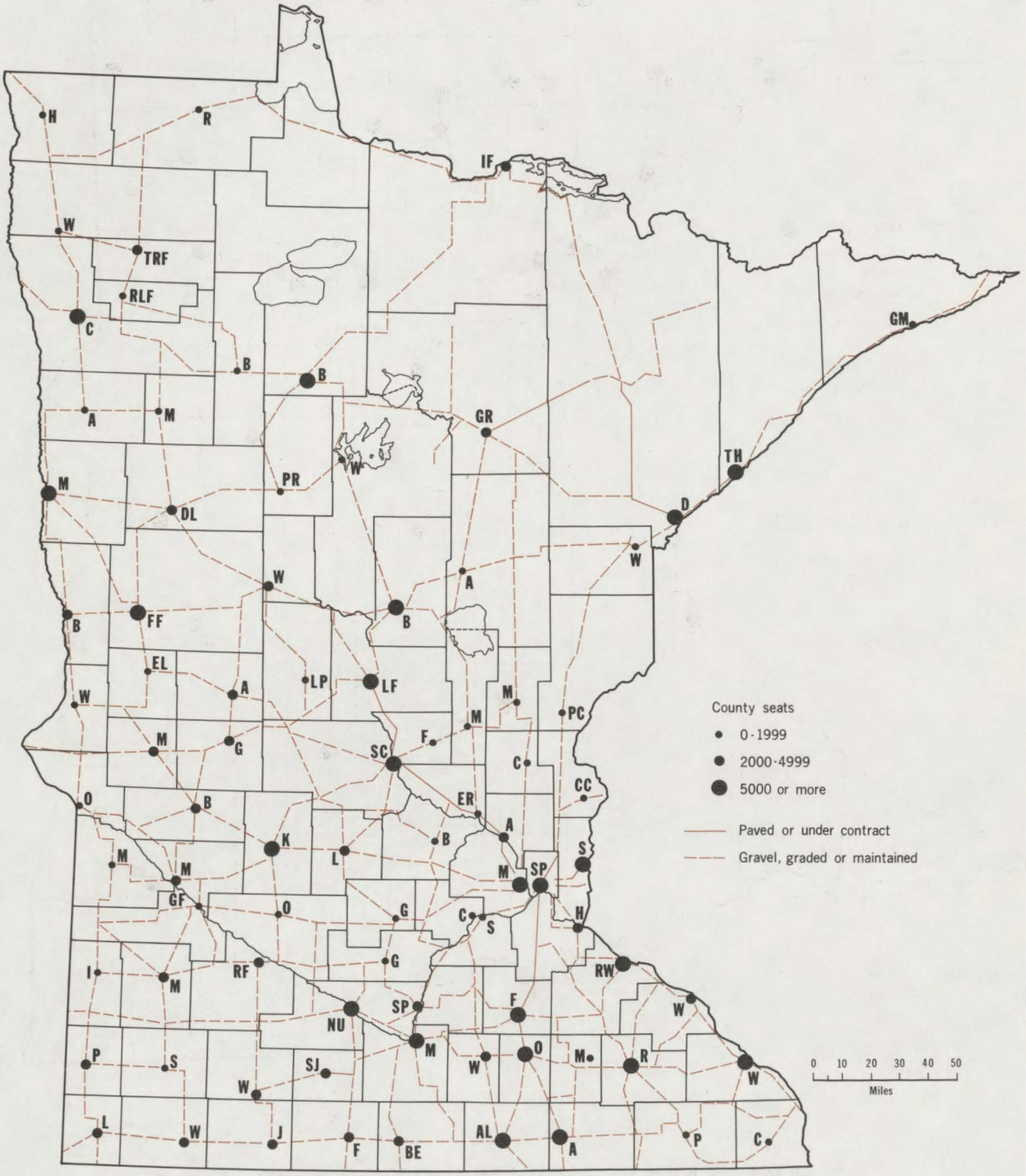
Data from Official Guide of Railways, 1968

SCHEDULED FREIGHT TRAINS, 1968



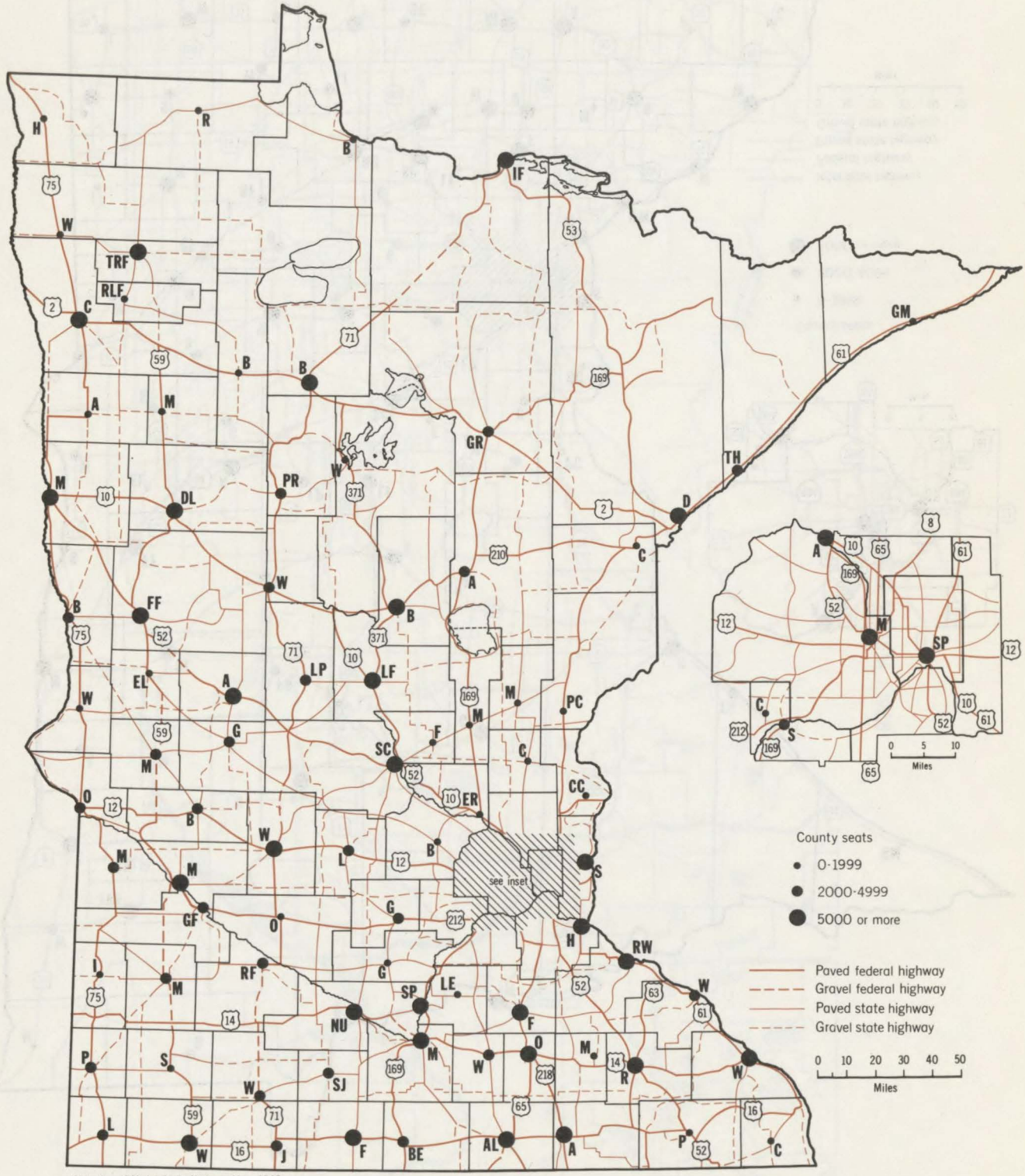
Data from Railroad Companies, 1968

HIGHWAYS, 1922



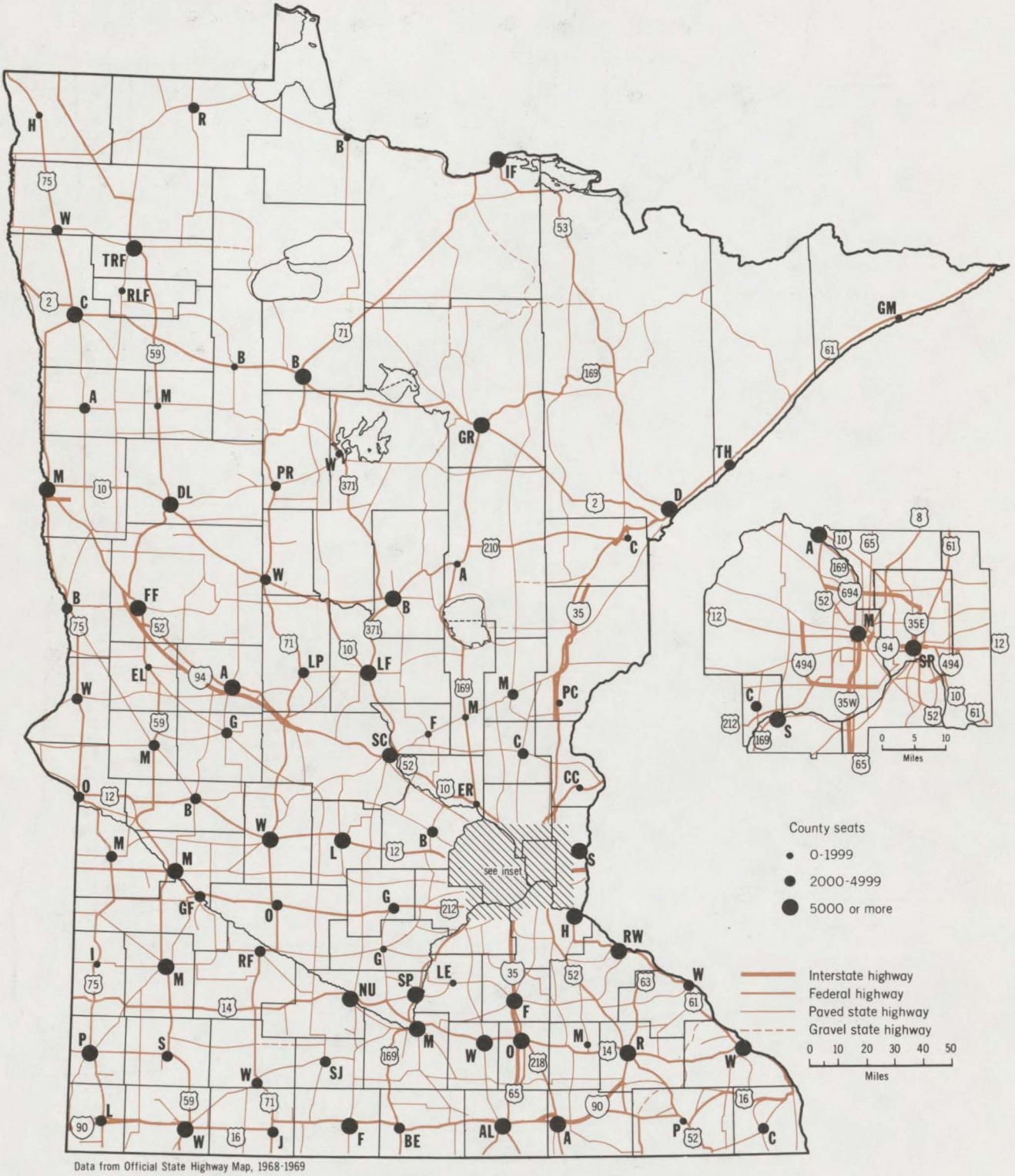
Data from Official State Highway Map, 1922

HIGHWAYS, 1940



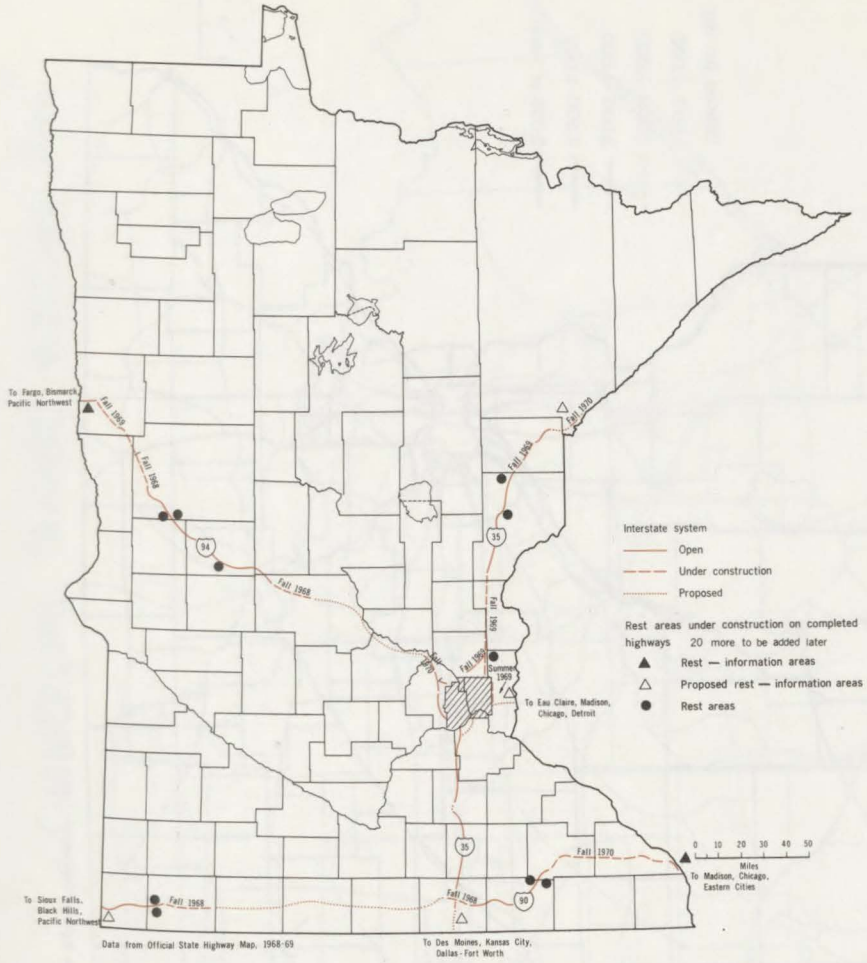
Data from Official State Highway Map, 1940

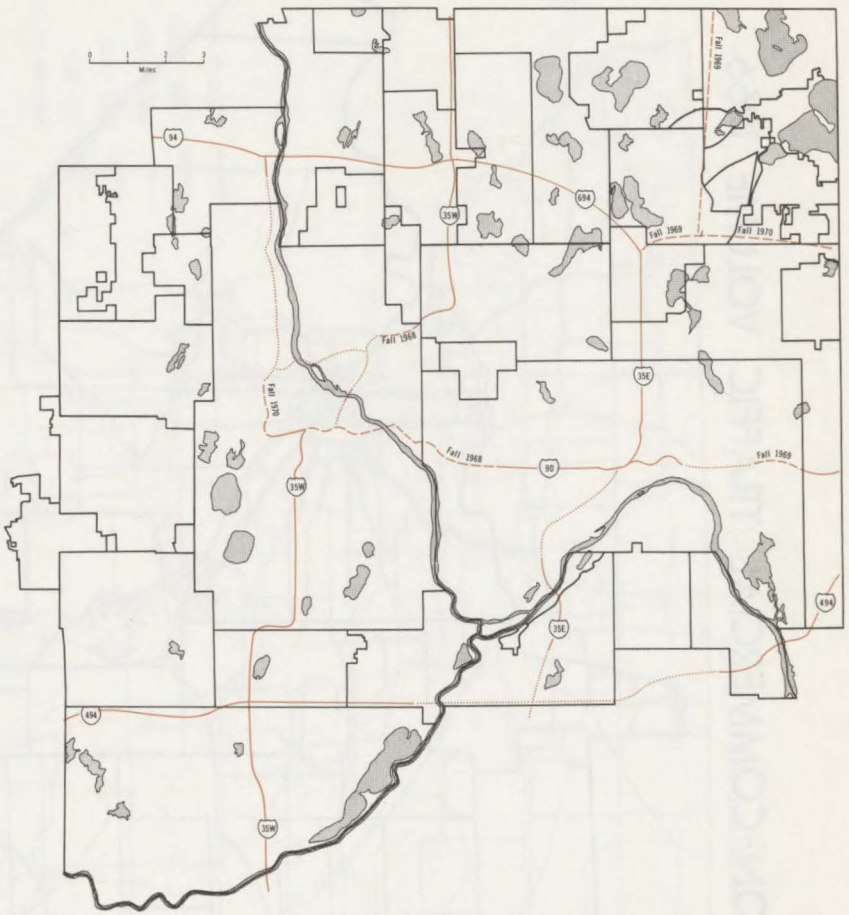
HIGHWAYS, 1968



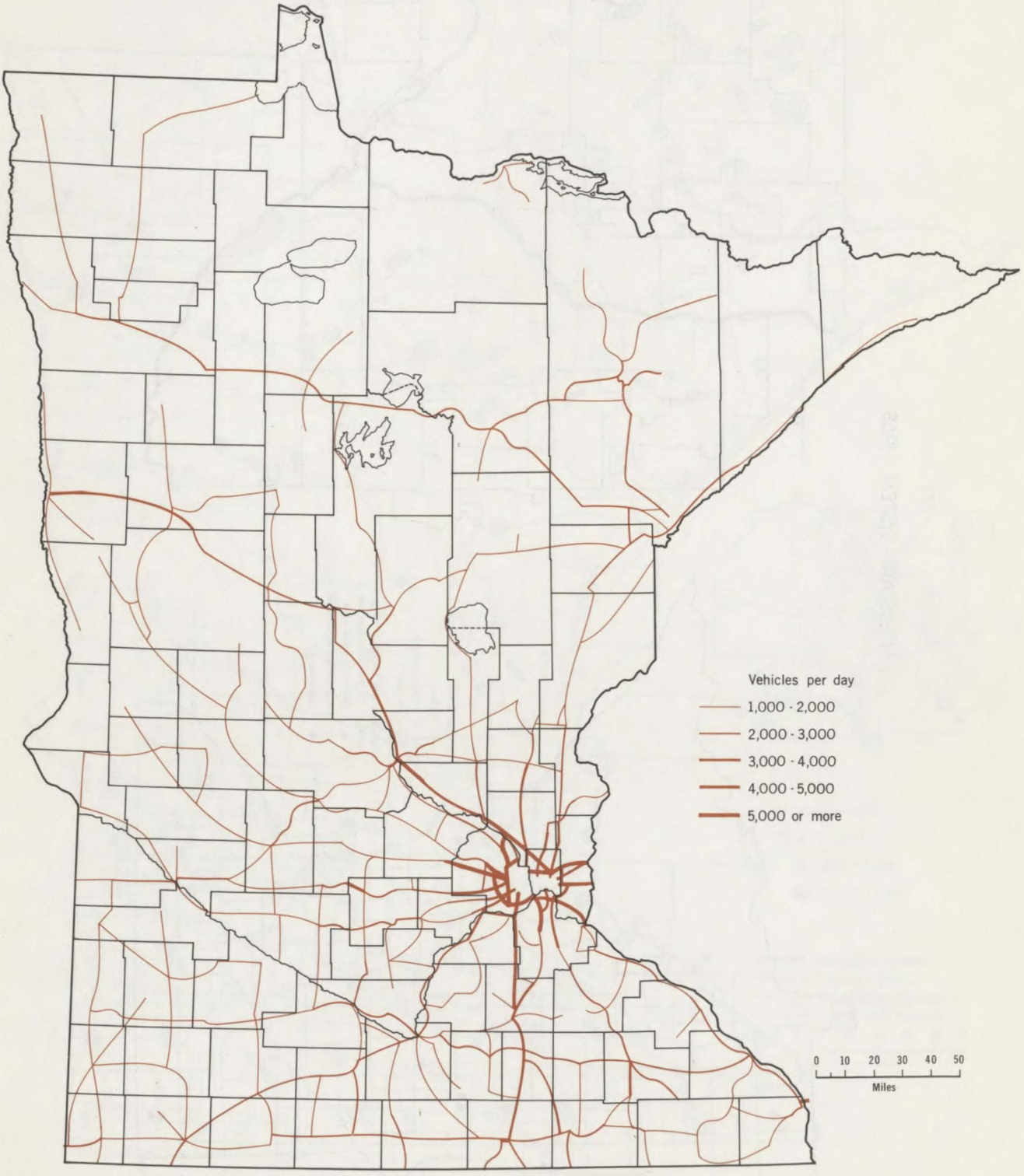
Data from Official State Highway Map, 1968-1969

INTERSTATE SYSTEM, 1968



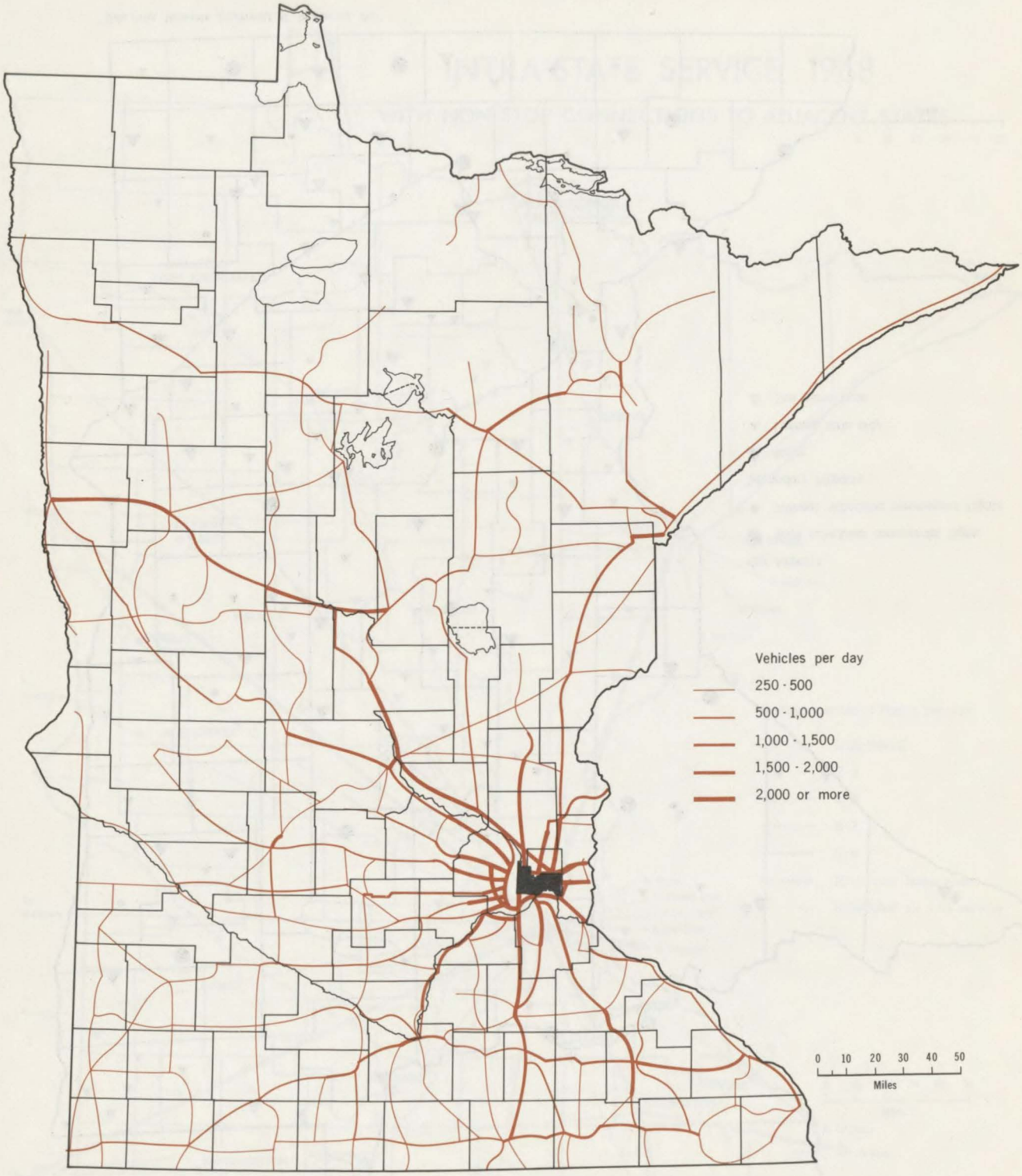


NON-COMMERCIAL TRAFFIC VOLUME, 1966



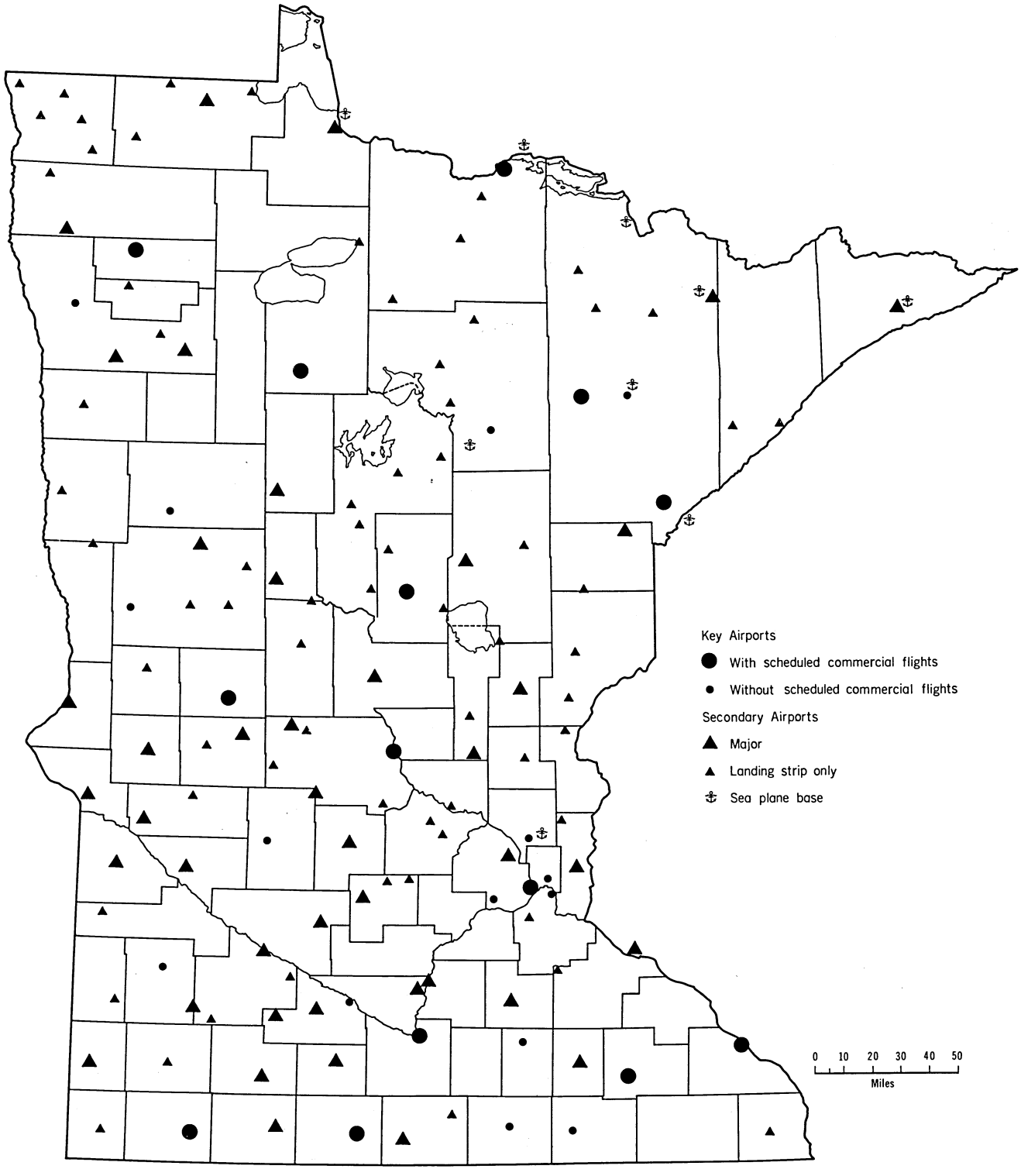
Data from Highway Department Traffic Flow Map, 1966

COMMERCIAL TRAFFIC VOLUME, 1966

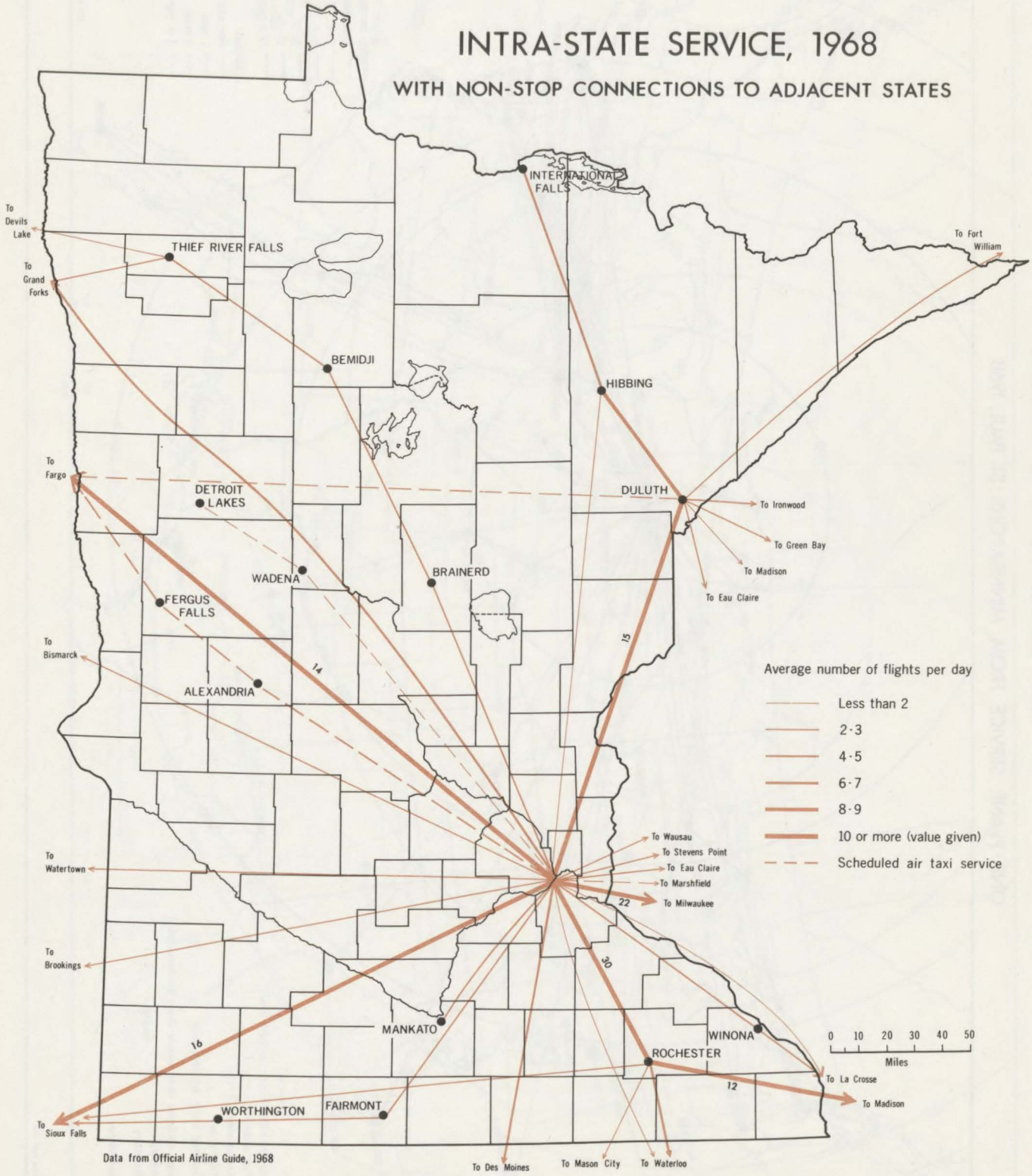


Data from Highway Department Traffic Flow Map, 1966

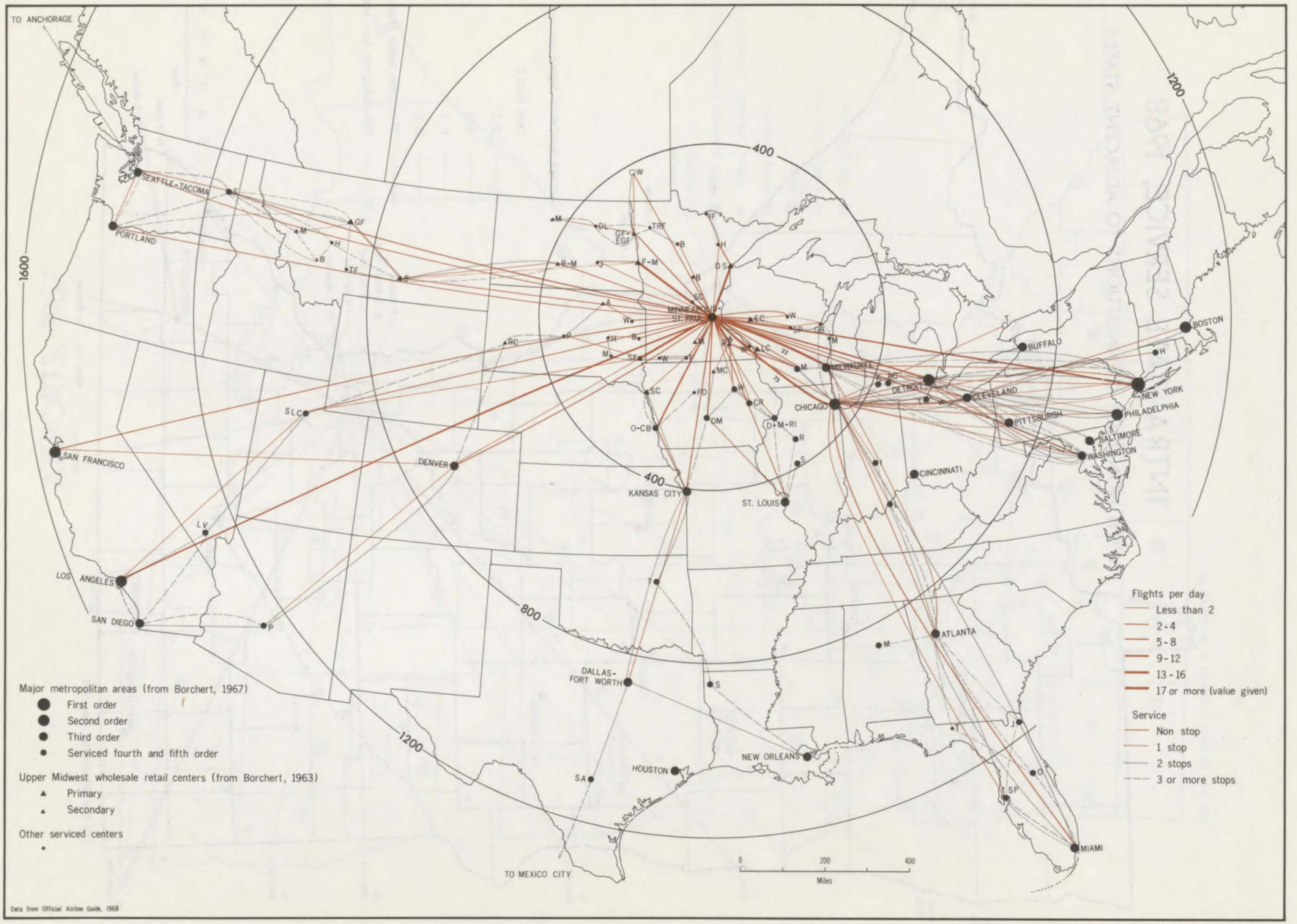
AIRPORTS, 1967



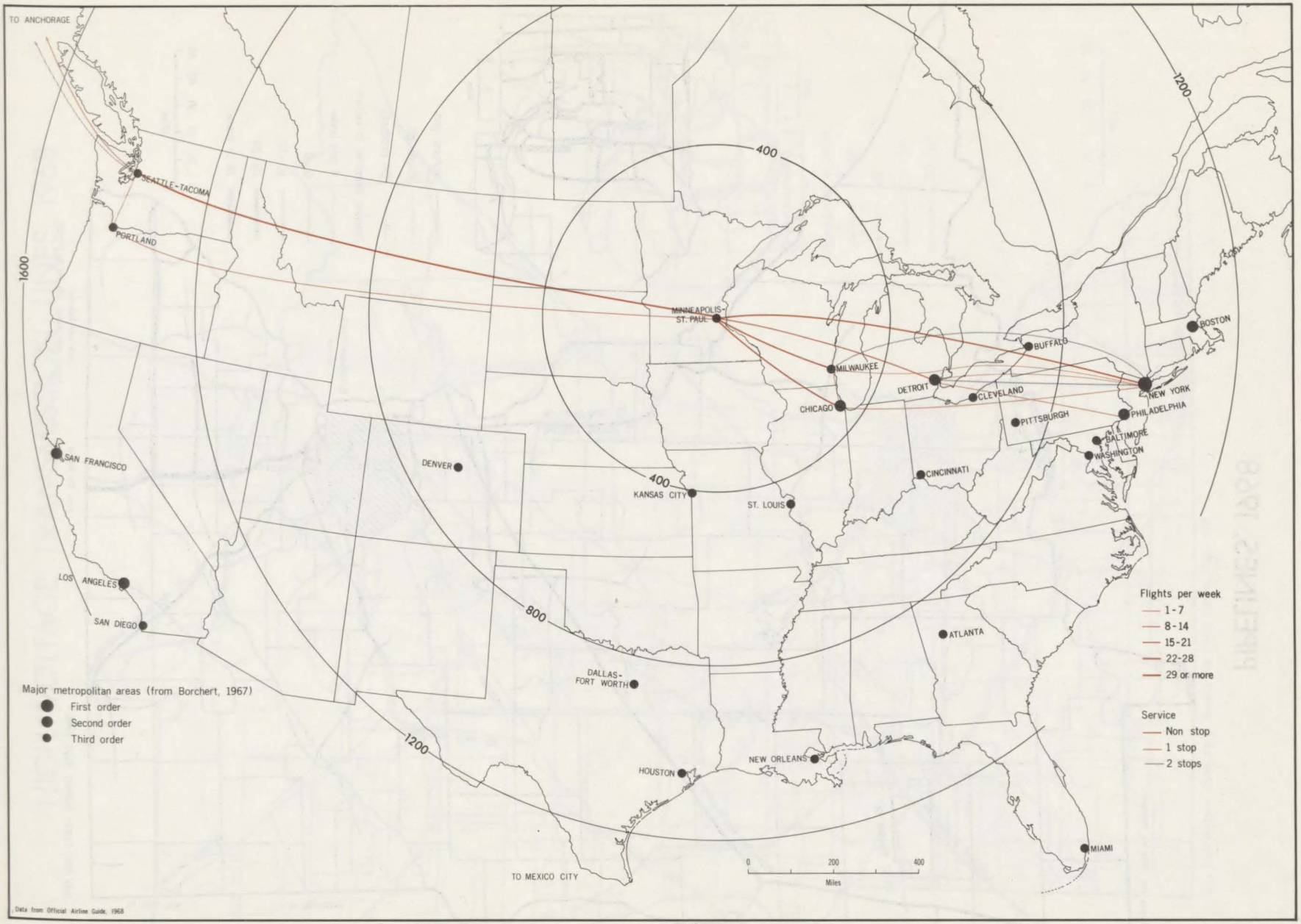
Data from Minnesota Department of Aeronautics, 1967


INTRA-STATE SERVICE, 1968
WITH NON-STOP CONNECTIONS TO ADJACENT STATES
INTERNATIONAL FALLS
To Devils Lake
THIEF RIVER FALLS
To Grand Forks
To Fort William
BEMIDJI
HIBBING
To Fargo
DETROIT LAKES
DULUTH
To Ironwood
To Green Bay
To Madison
To Eau Claire
WADENA
BRAINERD
FERGUS FALLS
To Bismarck
ALEXANDRIA
15
14
Average number of flights per day
Less than 2
2-3
4-5
6-7
8-9
10 or more (value given)
Scheduled air taxi service
To Wausau
To Stevens Point
To Eau Claire
To Marshfield
To Milwaukee
22
To Watertown
To Brookings
30
MANKATO
WINONA
ROCHESTER
16
12
To La Crosse
To Madison
0 10 20 30 40 50
Miles
WORTHINGTON
FAIRMONT
To Sioux Falls
Data from Official Airline Guide, 1968
To Des Moines
To Mason City
To Waterloo

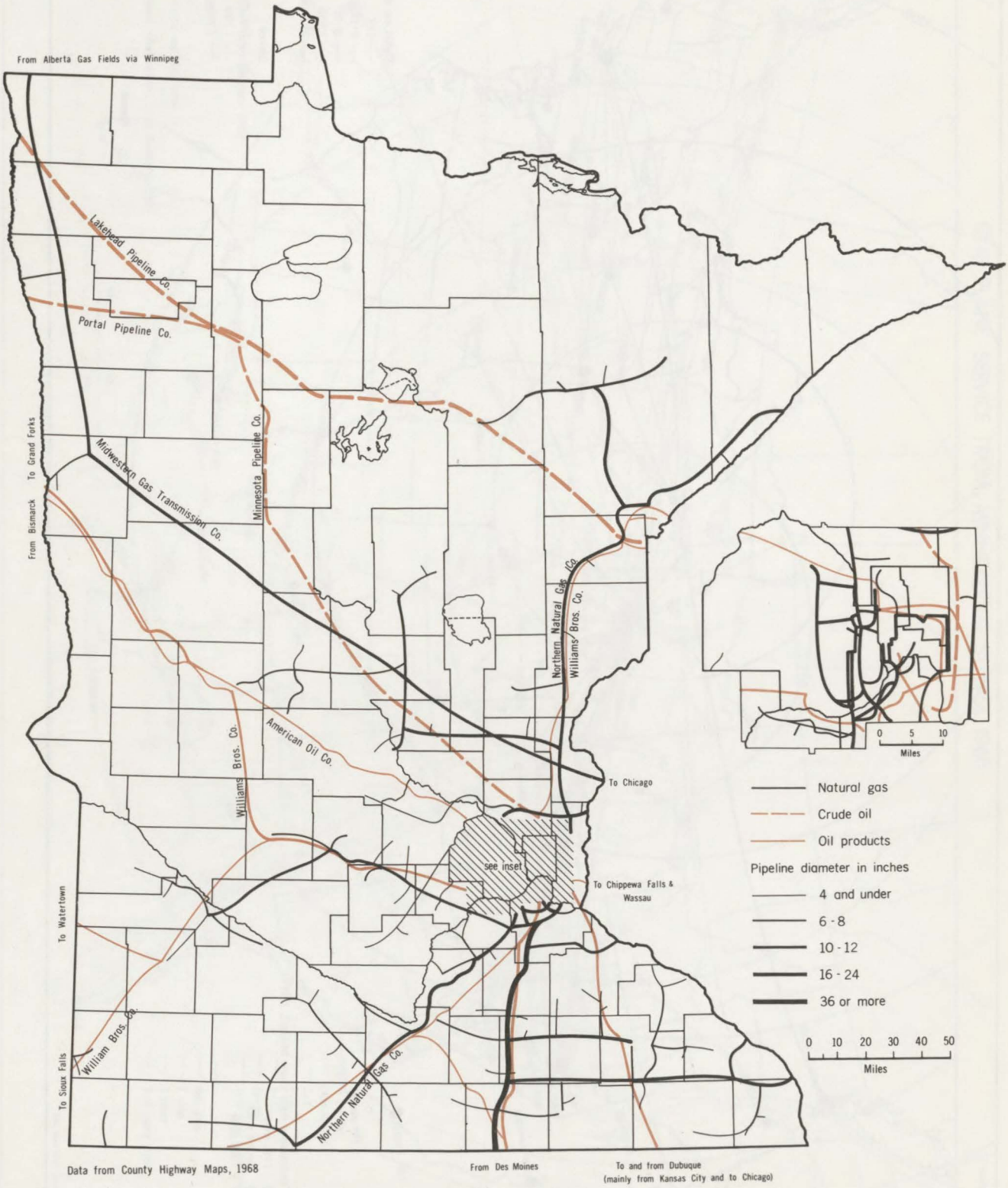
ONE-PLANE SERVICE FROM MINNEAPOLIS-ST. PAUL, 1968



SCHEDULED AIR CARGO SERVICE, 1968

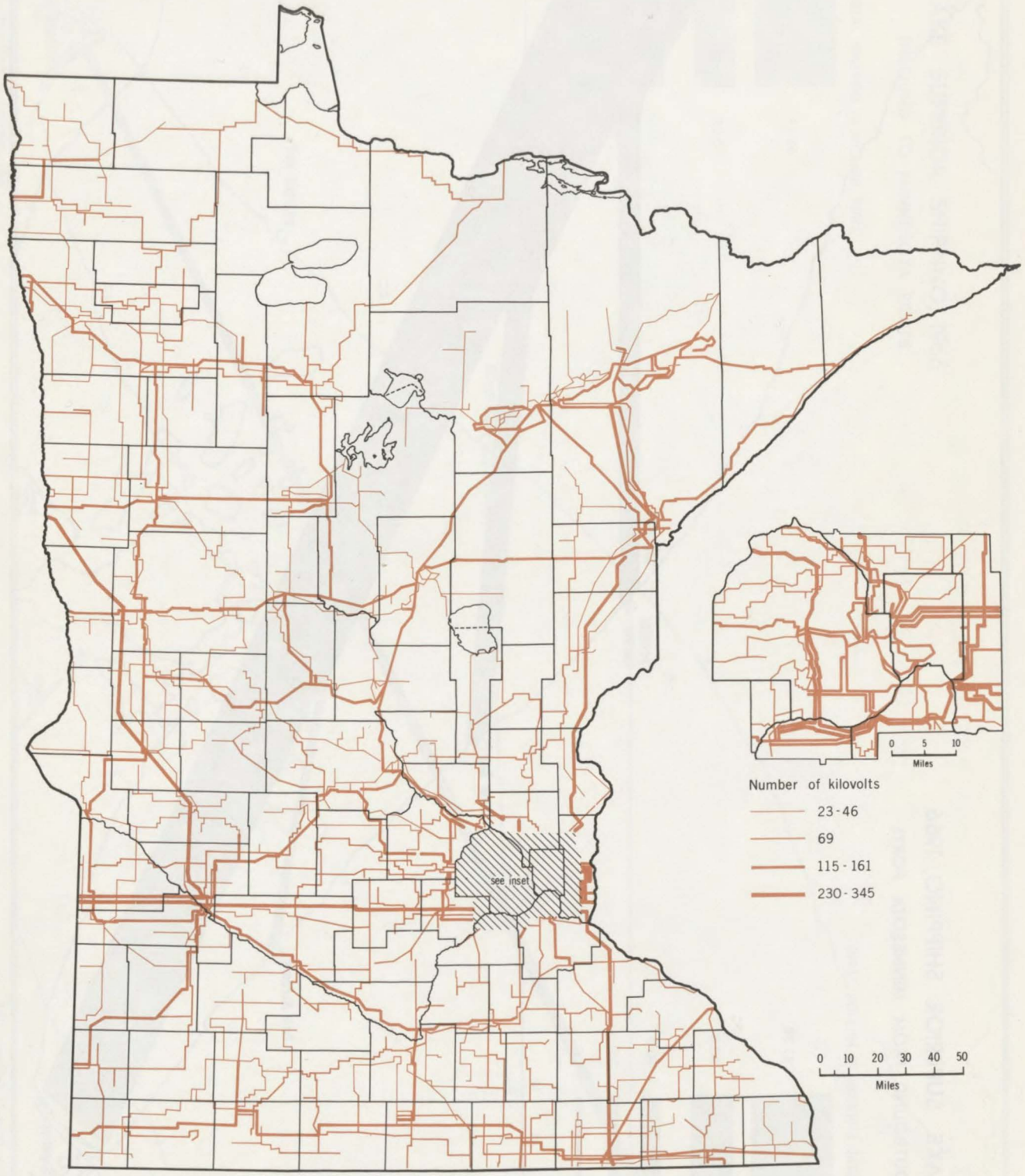


PIPELINES, 1968

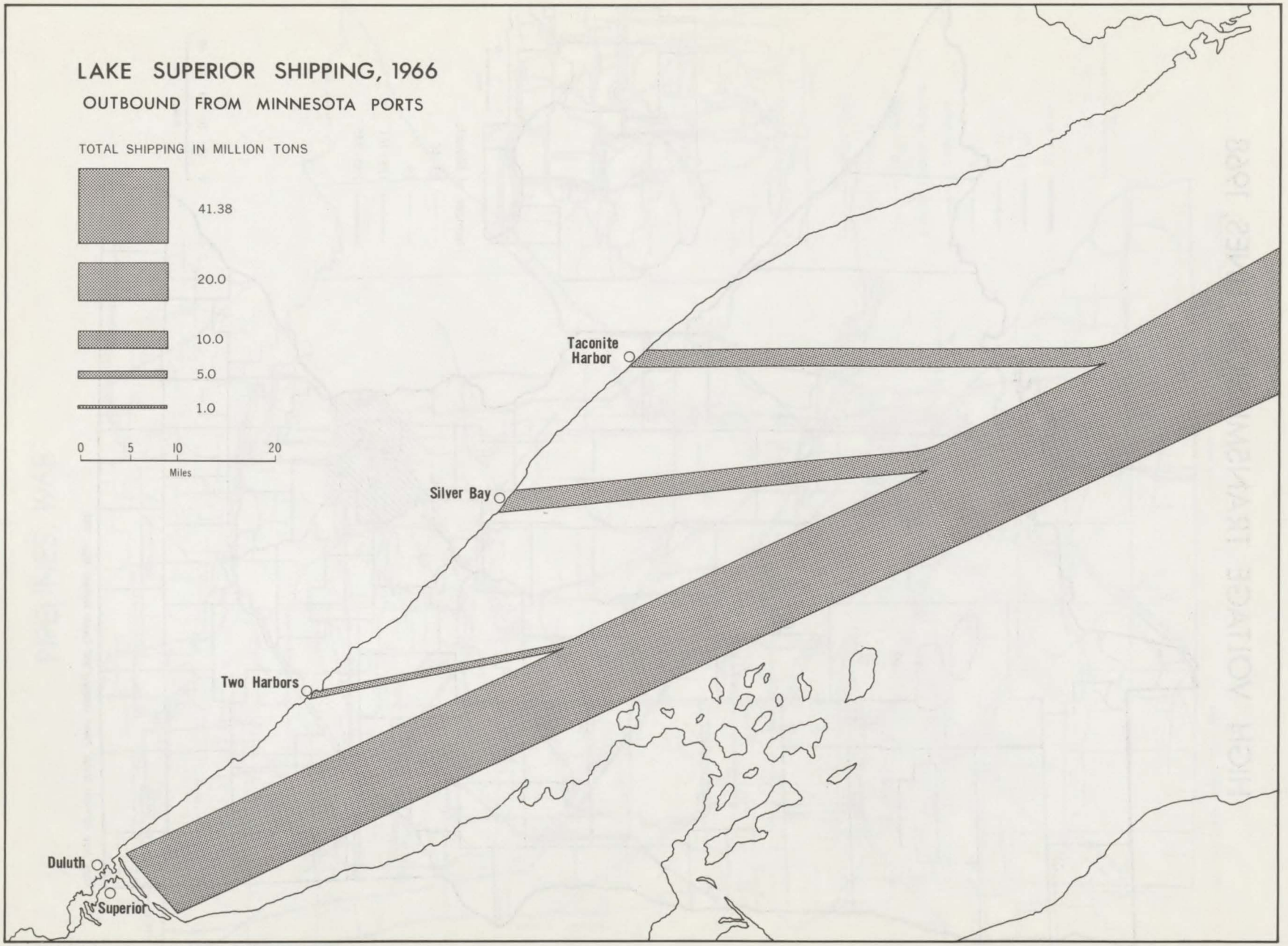


Data from County Highway Maps, 1968

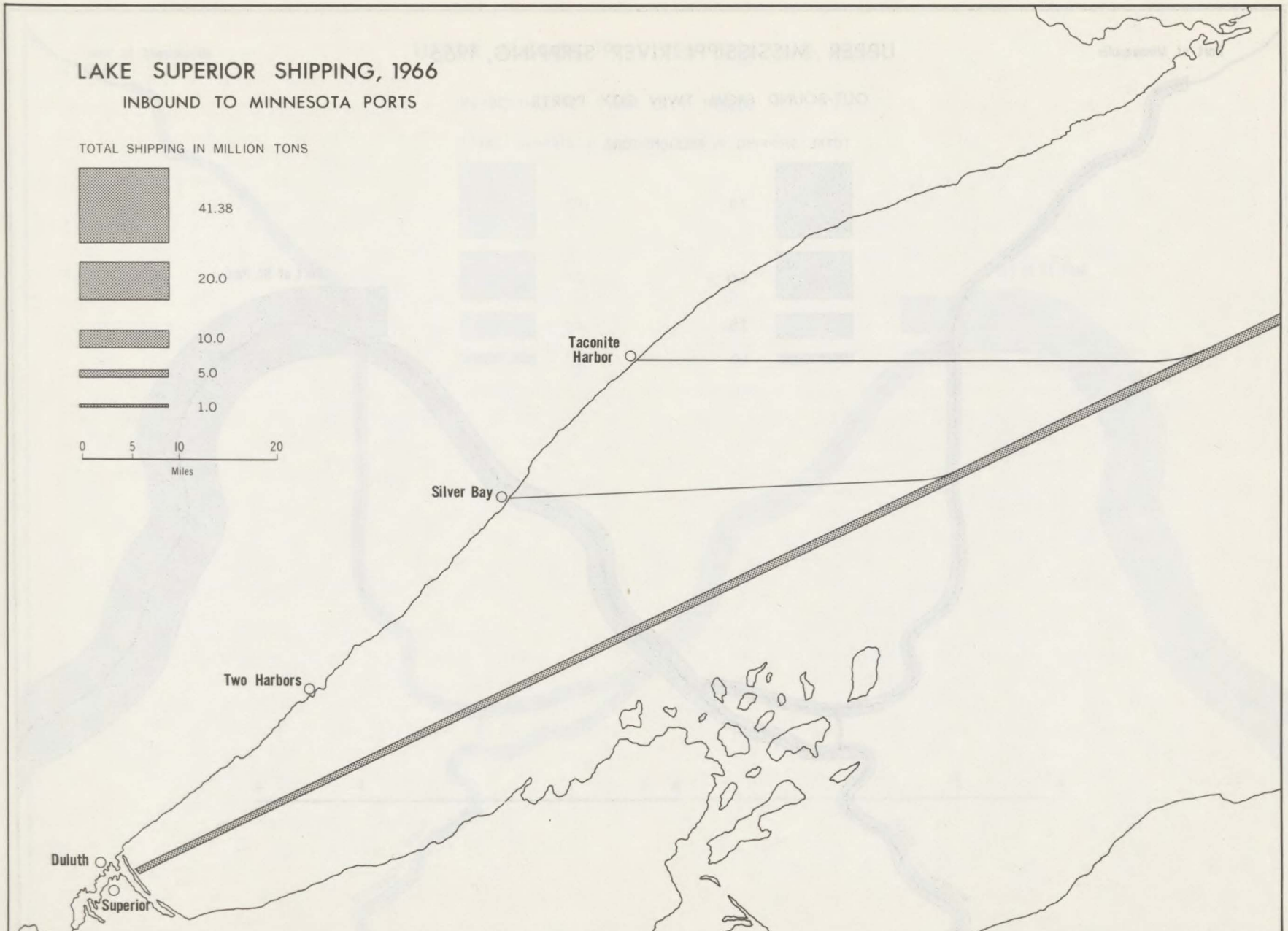
HIGH VOLTAGE TRANSMISSION LINES, 1968



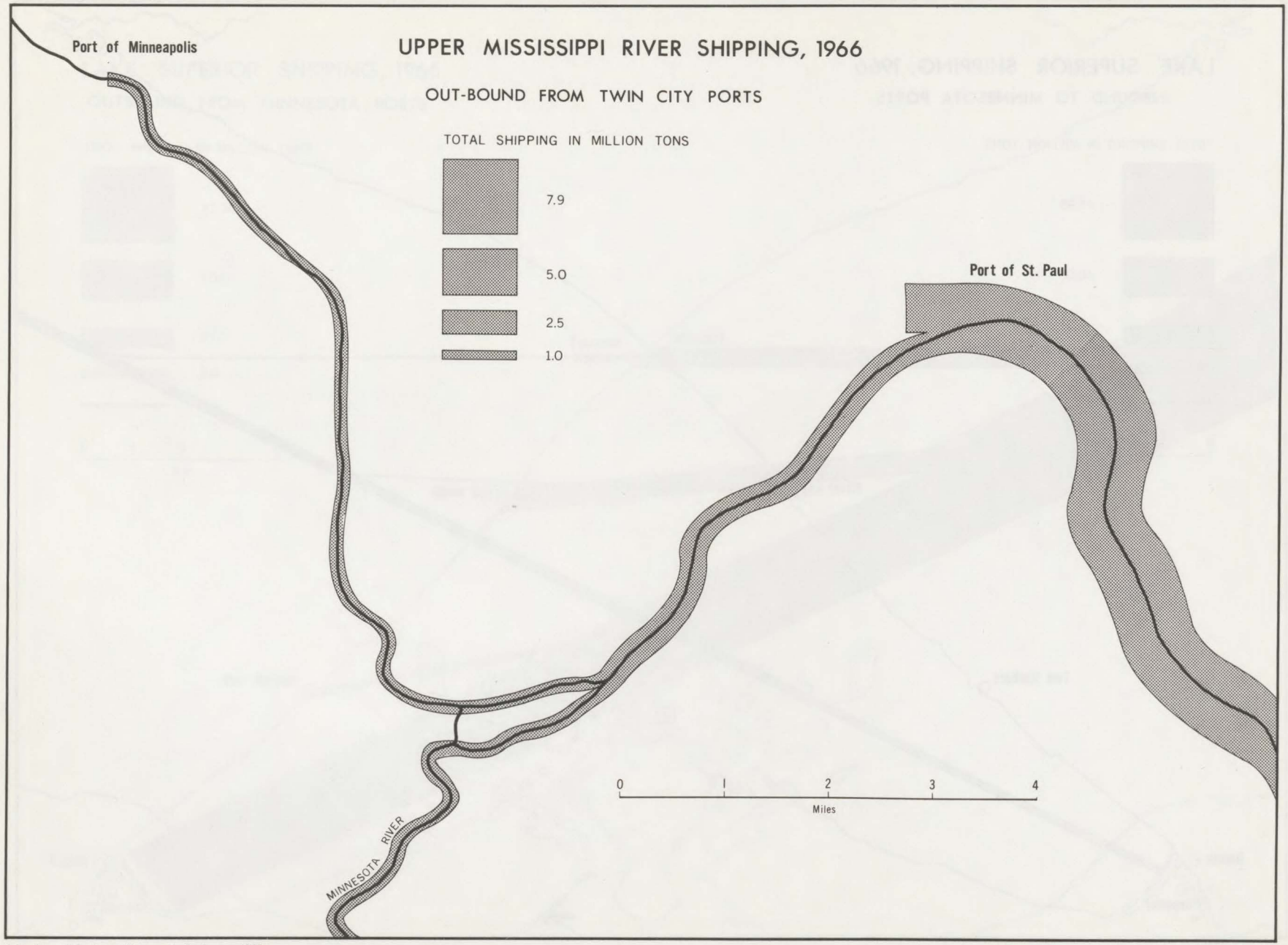
Data from Northern States Power Company and County Highway Maps, 1968



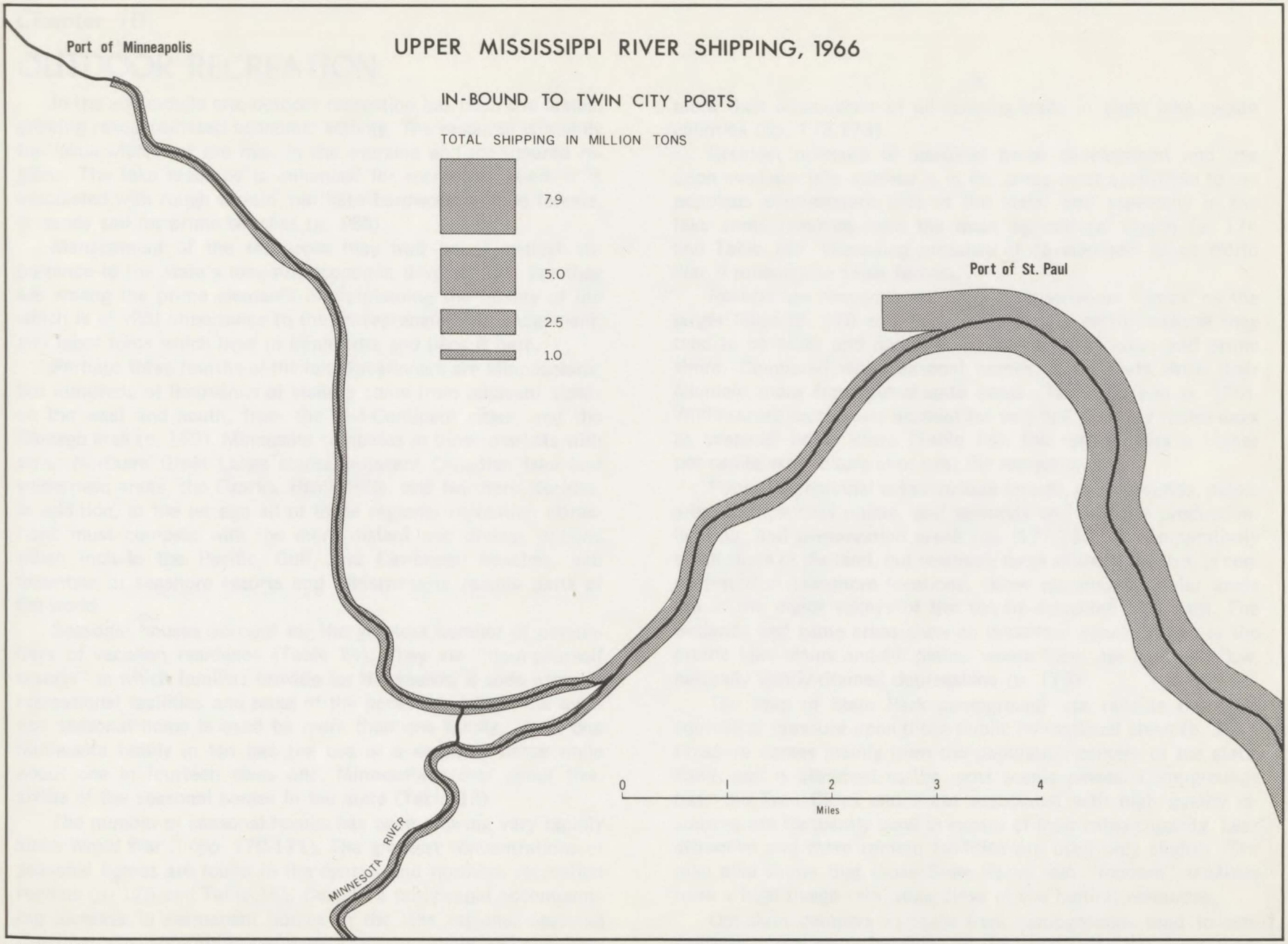
Data from U.S. Army Corps of Engineers, 1966



Data from U.S. Army Corps of Engineers, 1966



Data from U.S. Army Corps of Engineers, 1966



Data from U.S. Army Corps of Engineers, 1966

Chapter 10

OUTDOOR RECREATION

In the automobile era, outdoor recreation has been the fastest growing resource-based economic activity. The resource is mainly the lakes which dot the map in the moraine and ice-scoured regions. The lake resource is enhanced for recreation where it is associated with rough terrain, northern hardwood or pine forests, or sandy soil for prime beaches (p. 168).

Management of the resources may well be of critical importance to the state's long-run economic development. For they are among the prime elements in maintaining the quality of life which is of vital importance to the entrepreneurial, management, and labor force which lives in Minnesota and likes it here.

Perhaps three-fourths of the lake vacationers are Minnesotans, but hundreds of thousands of visitors come from adjacent states on the west and south, from the Mid-Continent cities, and the Chicago area (p. 169). Minnesota competes in those markets with other Northern Great Lakes states, adjacent Canadian lake and wilderness areas, the Ozarks, Black Hills, and Northern Rockies. In addition, in the jet age all of these regional recreation attractions must compete with the more distant and diverse options which include the Pacific, Gulf, and Caribbean beaches, and mountain or seashore resorts and wilderness in remote parts of the world.

Seasonal houses account for the greatest number of person-days of vacation residence (Table 14). They are "do-it-yourself resorts" in which families provide for themselves a wide array of recreational facilities and most of the necessary labor. The average seasonal home is used by more than one family; about one Minnesota family in ten has the use of a seasonal home while about one in fourteen owns one. Minnesotans own about five-sixths of the seasonal homes in the state (Table 15).

The number of seasonal homes has been growing very rapidly since World War II (pp. 170-171). The greatest concentrations of seasonal homes are found in the central and northern recreation regions (p. 175 and Table 16). Despite a fairly rapid accompanying increase in permanent homes in the lake regions, seasonal dwellings now outnumber permanent in one county and comprise more than one-quarter of all housing units in eight lake region counties (pp. 172-173).

Greatest pressure of seasonal home development and use upon available lake surface is in the areas most accessible to the populous southeastern part of the state, and especially in the lake areas removed from the main agricultural region (p. 174 and Table 16). Increasing pressure of development since World War II reflects the same factors.

Resorts are concentrated, more than seasonal homes, on the larger lakes (p. 175 and Table 17). This is partly because they tend to be older and had first choice of prime lakes and prime shore. Compared with seasonal homes, the resorts draw their clientele more from out-of-state areas (Table 18 and p. 176). While resort vacationers account for only half as many visitor-days as seasonal home users (Table 14), the resorter has a higher per-capita expenditure at or near the recreation site.

Public recreational areas include forests, campgrounds, picnic areas, lake access points, and wetlands and wild life production, hunting, and preservation areas (pp. 177-180). A comparatively small share of the land, but relatively large share of the use, is concentrated at lakeshore locations. Other especially popular areas are in the major valleys of the stream-dissected southeast. The wetlands and game areas show an important concentration in the prairie lake plains and till plains, where there are many shallow, naturally poorly-drained depressions (p. 179).

The map of State Park campground use reflects the main sources of pressure upon these public recreational areas (p. 181). Pressure comes mainly from the population centers of the state, itself, and is attracted to the most scenic places. Campgrounds near the Twin Cities and those associated with high quality resources are frequently used in excess of their rated capacity. Less attractive and more remote facilities are used only slightly. The map also shows that those State Parks with "modern" facilities have a high usage rate, regardless of the natural resources.

Out-state campers in State Park campgrounds tend to concentrate in two major locations (p. 182 and Table 19). First, large

TABLE 14 — ESTIMATED VOLUME OF VACATIONING IN MINNESOTA, 1964

Type of Lodging	Persons (in thousands)	Percent of Total	Person Days (in thousands)	Percent of Total	Average Duration of Stay (days)
Resorts	1,051	29	6,222	21	5.9
Family Camping: State Parks	282	8	507	2	1.8
Other (Nat'l Forest, Private)	231	6	1,465	5	6.3
Group Camping	115	3	1,159	4	10.0
Hotels & Motels	567	15	2,513	8	4.4
Friends & Relatives	1,067	29	5,473	18	5.1
Seasonal Homes	380	10	12,125	42	31.9
TOTAL	3,693	100	29,464	100	

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1.

TABLE 15 — PERMANENT ADDRESS OF MINNESOTA SEASONAL HOME OWNERS

State or Region of Residence (see p. 176)	Percent of All Lakeshore Homes	Number of Seasonal from U.S. Census, 1960 (in thousands)
Minnesota	83.6	60.7
Adjacent States:	8.9	6.5
North Dakota	5.2	3.8
Iowa	3.7	2.7
Rest of Region	0.1—	
Illinois-Indiana	2.0	1.4
Mid-Continent	2.5	1.8
All Other States	3.0	2.2
Total Out-State	16.4	11.9
GRAND TOTAL	100.0	72.6

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1.

TABLE 16 — NUMBER OF SEASONAL HOMES

Recreation Region (see p. 175)	All Seasonal Homes[1]		Waterfront Seasonal Homes[2]	
	Number	Percent	Number	Percent
Border	8,719	12	5,606	10
North Central	5,927	8	5,119	9
East Central	7,080	10	5,788	10
Central	14,513	20	10,797	19
West Central	15,265	21	13,926	24
South Central	6,799	9	6,669	12
Twin Cities Metro	5,110	7	3,687	6
Rest of State	9,194	13	6,019	10
TOTAL	72,607	100	57,611	100

Notes:

[1] Source: U.S. Census of Housing, 1960.

[2] Source: MORRC Survey of Minnesota State Highway Department County Highway Maps. Average date of maps ca. 1958.

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1.

TABLE 17 — NUMBER OF RESORTS LICENSED BY MINNESOTA DEPARTMENT OF HEALTH, 1964

Recreation Region (see p. 175)	Number	Percent of Total
Border	431	13
North Central	409	13
East Central	280	9
Central	842	26
West Central	791	25
South Central	219	7
Twin Cities Metro	75	2
Rest of State	154	5
TOTAL	3,201	100

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1.

volumes of campers are found in those State Parks which are strategically located near the major, national tourist routes across the state. Second, out-state campers from more local states tend to visit easily accessible parks with favored natural resources and/or "modern" facilities.

The geographic range of wild life – another important recreational resource – strongly reflects the distribution of forest and agricultural habitats, as it once reflected the pattern of forest and prairie (pp. 183-186). Waterfowl production has shifted away from many prairie till plain areas as a result of drainage and use of shallow depressions for agricultural production. It seems likely, also, that detailed maps might show substantial "urbanization" of some of the common wild life species in response to relatively large food supplies and protection.

TABLE 18 — STATE OF ORIGIN FOR MINNESOTA RESORT GUESTS, 1964

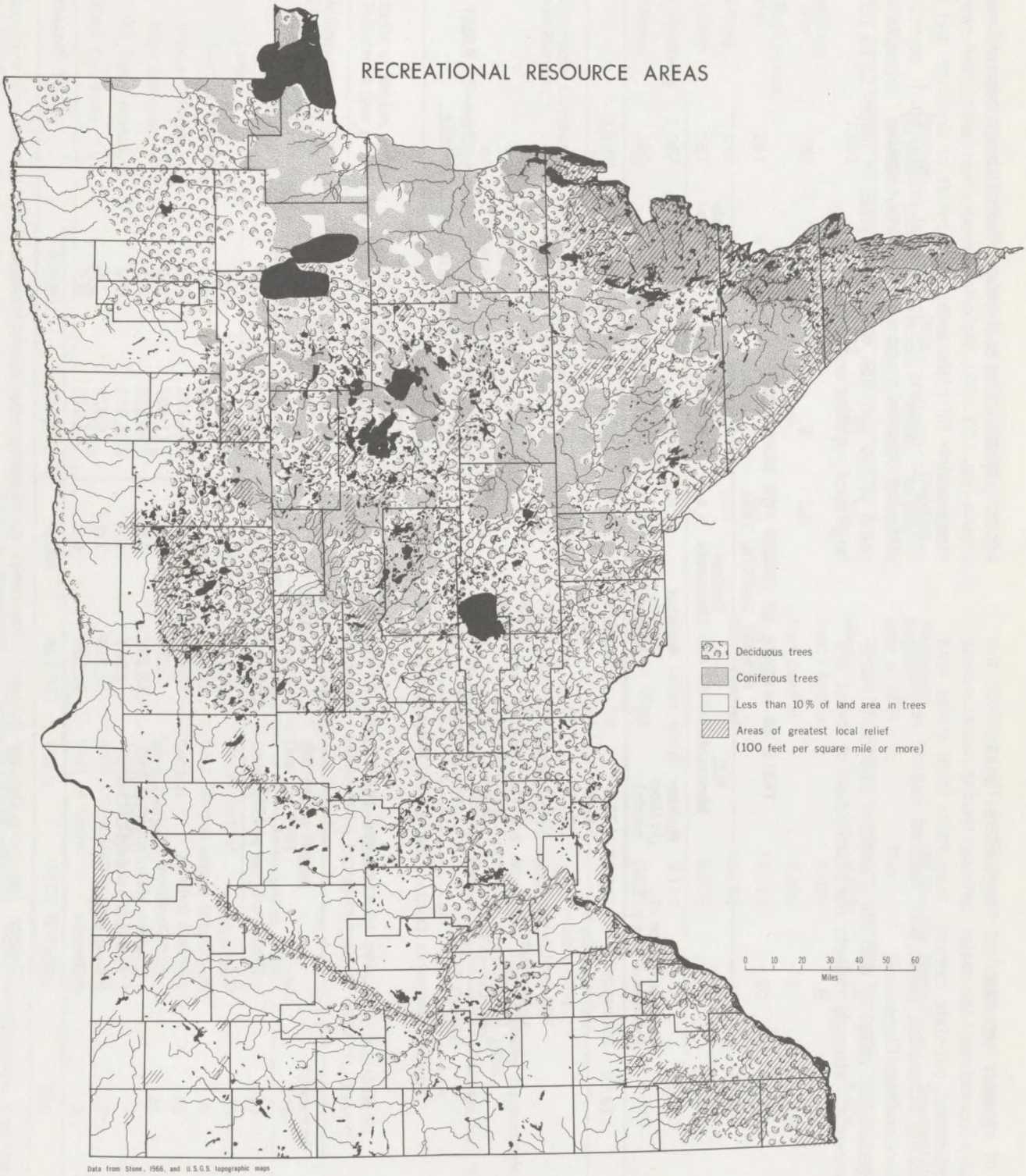
State or Region of Residence (see p. 176)	N.E. Minnesota		Central Minnesota		Rest of State		State Total	
	Number (in thousands)	%	Number (in thousands)	%	Number (in thousands)	%	Number (in thousands)	%
Minnesota	176.5	52	312.9	50	46.0	51	535.4	51
Adjacent States	53.4	16	139.5	22	15.8	18	208.7	21
Illinois-Indiana	70.5	20	74.9	12	14.5	16	159.9	15
Mid-Continent	13.1	4	71.5	12	5.8	6	90.4	8
Other States	16.3	5	11.2	2	6.2	7	33.7	3
Canada	11.0	3	10.8	2	2.0	2	23.8	2
Total Out-of-State	164.3	48	307.9	50	44.3	49	516.5	49
GRAND TOTAL	340.8	100	620.8	100	90.3	100	1,051.9	100

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1.

TABLE 19 — STATE OF ORIGIN FOR MINNESOTA STATE PARK CAMPERS, 1961 AND 1966

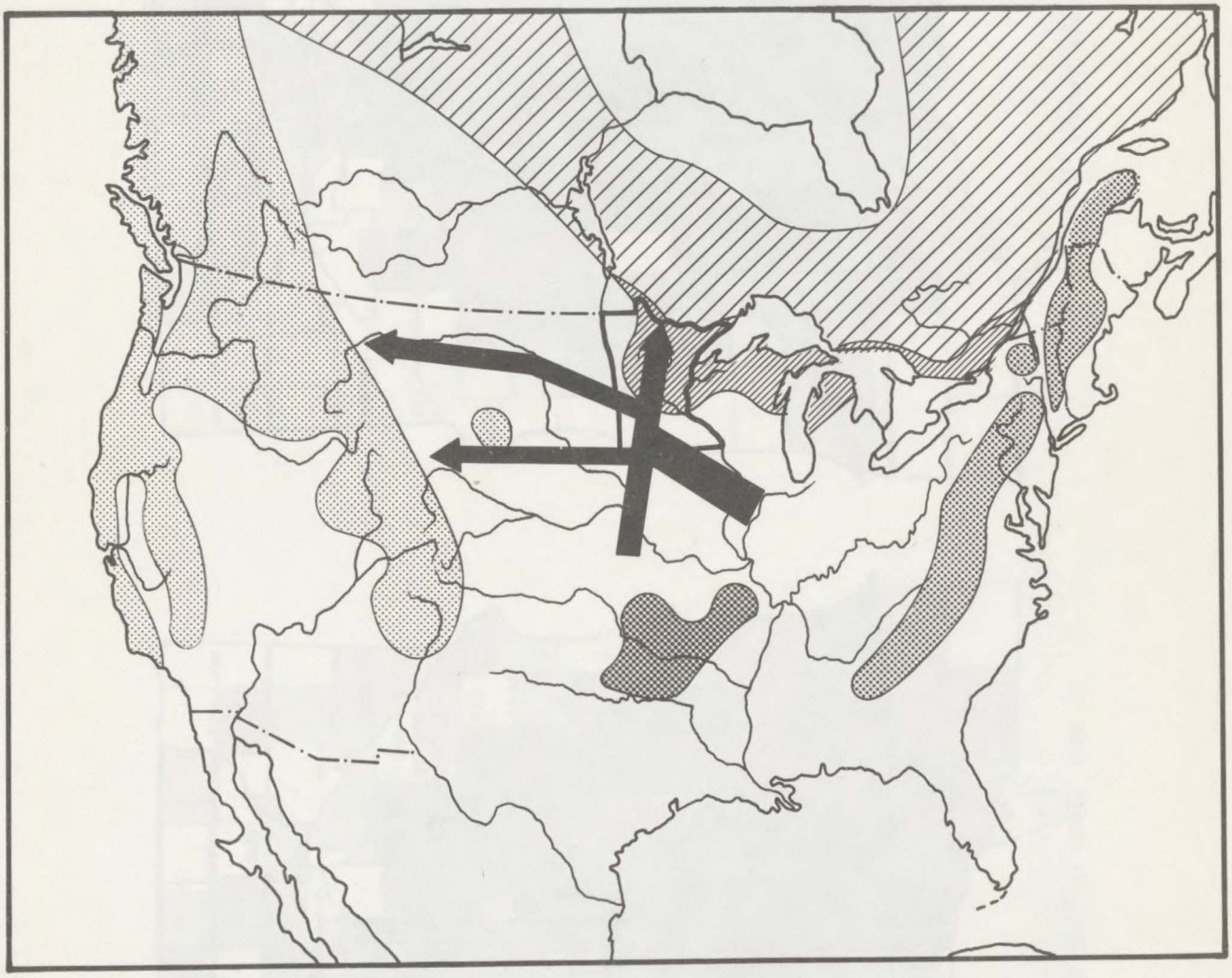
State or Region of Residence (see p. 176)	1961		1966	
	Number of Campers	Percent of Total	Number of Campers	Percent of Total
Minnesota	102,160	58.0	218,147	60.2
Adjacent States	27,474	15.5	58,048	16.0
Illinois-Indiana	12,016	6.8	26,175	7.2
Mid-Continent	5,281	2.9	11,627	3.2
Eastern Manufacturing Belt	13,366	7.5	25,895	7.1
Pacific-Northwest-California	2,581	1.4	4,913	1.3
Rest of U.S.	2,249	1.2	5,972	1.6
Canada	11,059	6.2	14,410	3.9
GRAND TOTAL	176,186	100.0	362,031	100.0

Source: Minnesota Outdoor Recreation Resources Commission, Staff Report Number 1 and Minnesota Department of Conservation, 1966.



Data from Stone, 1966, and U.S.G.S. topographic maps

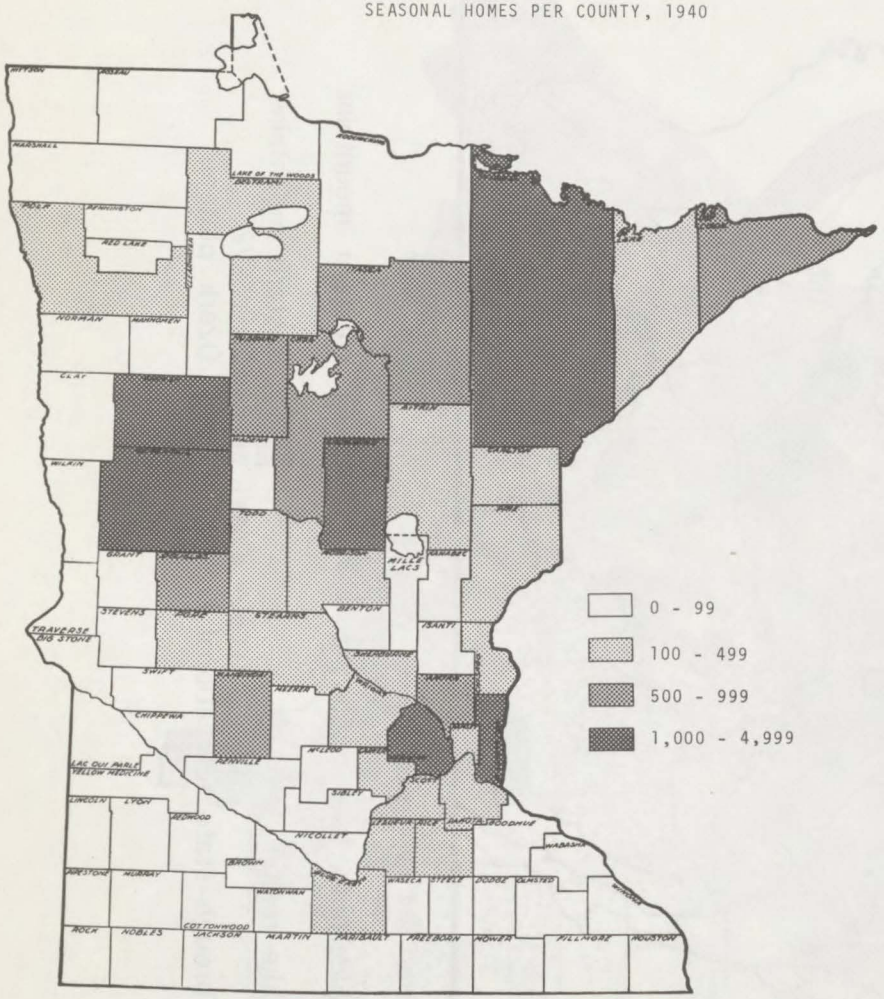
INLAND RECREATION RESOURES AND THROUGH-STATE RECREATIONAL TRAFFIC



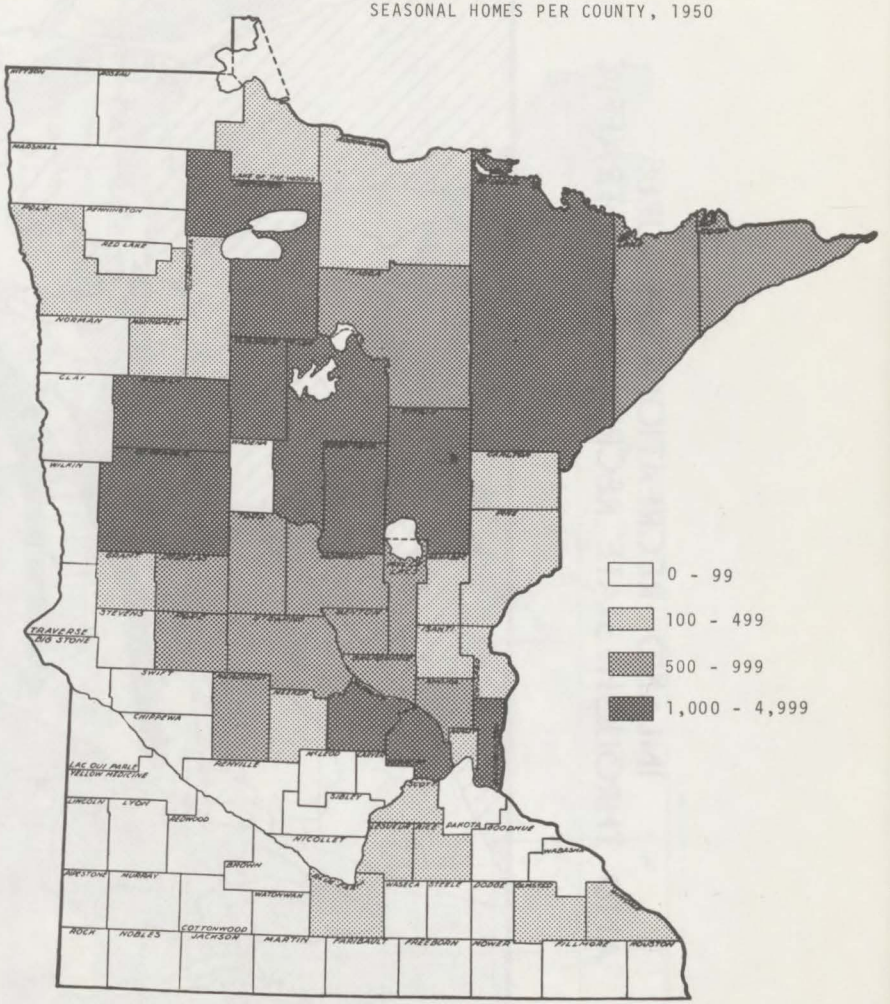
Data from Borchert and Edman, 1967

- Wilderness lake region
- Lake region
- Through-state recreational traffic
- Western mountains
- Eastern mountains
- Ozark plateau

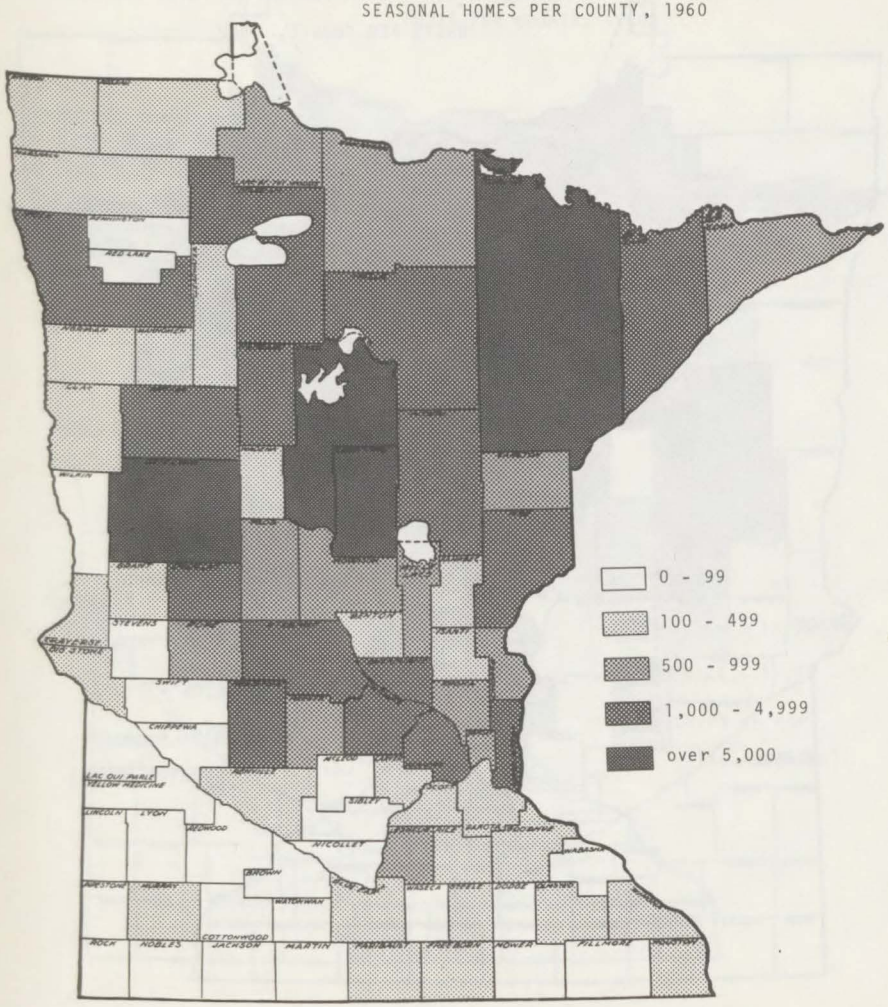
SEASONAL HOMES PER COUNTY, 1940



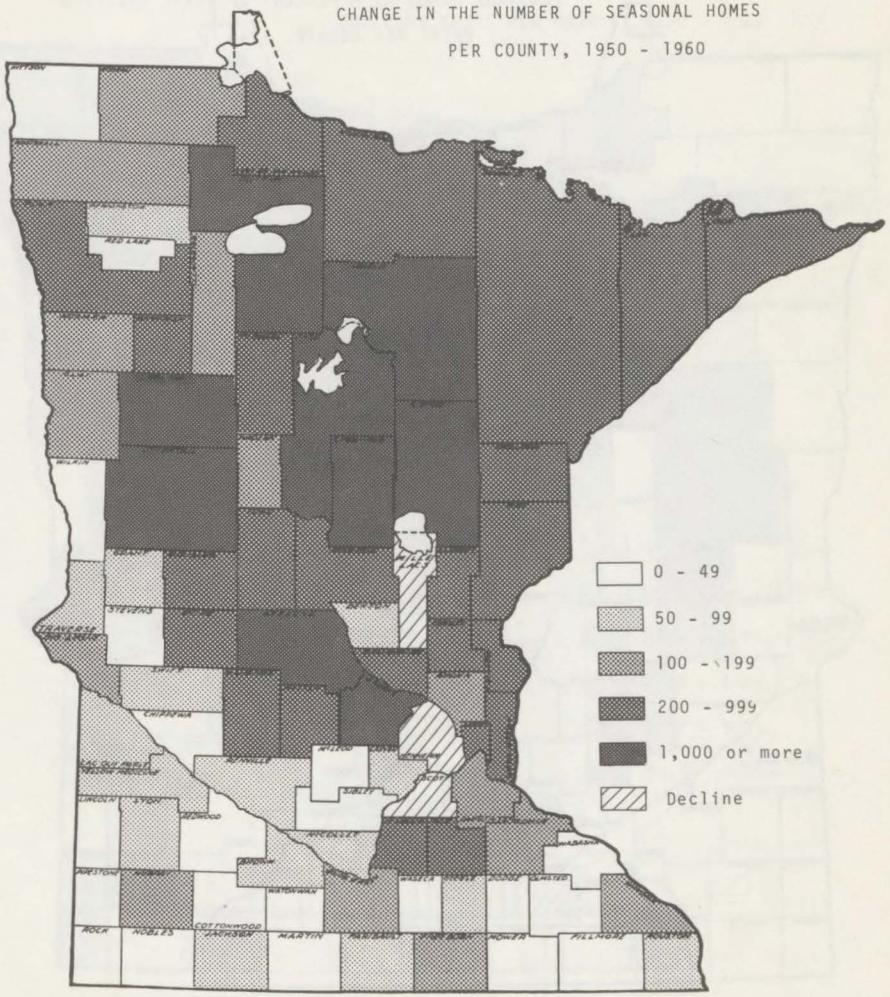
SEASONAL HOMES PER COUNTY, 1950



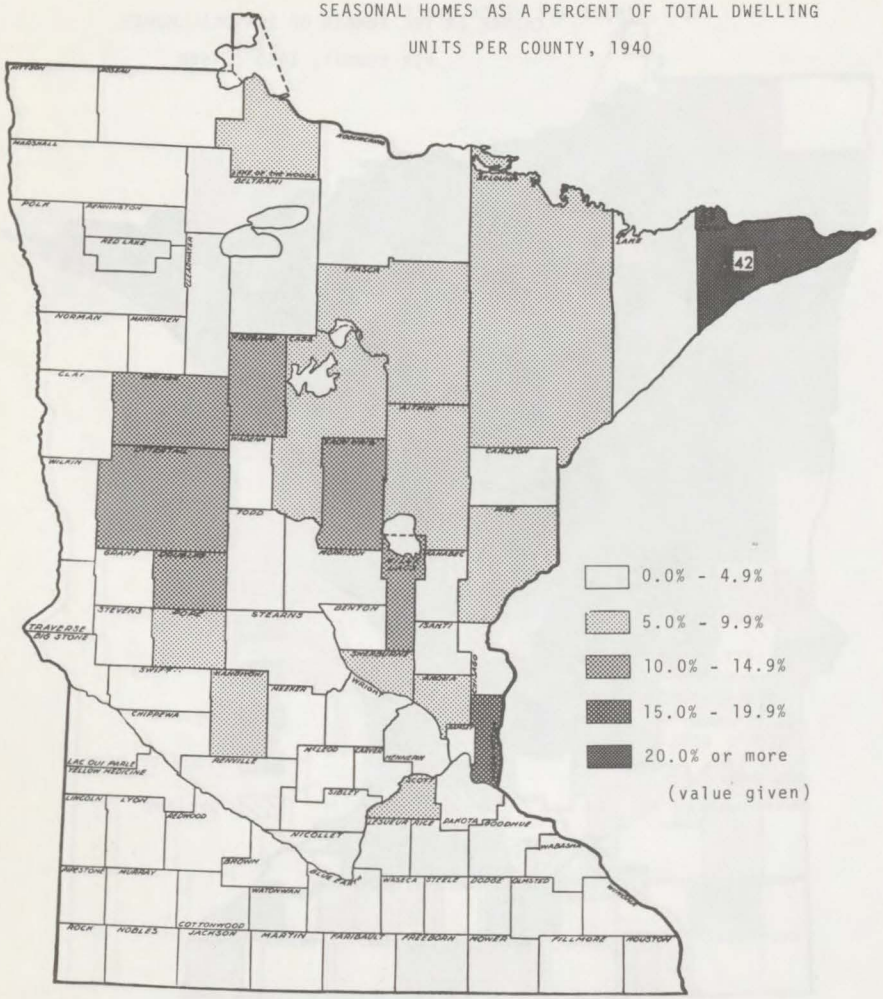
SEASONAL HOMES PER COUNTY, 1960



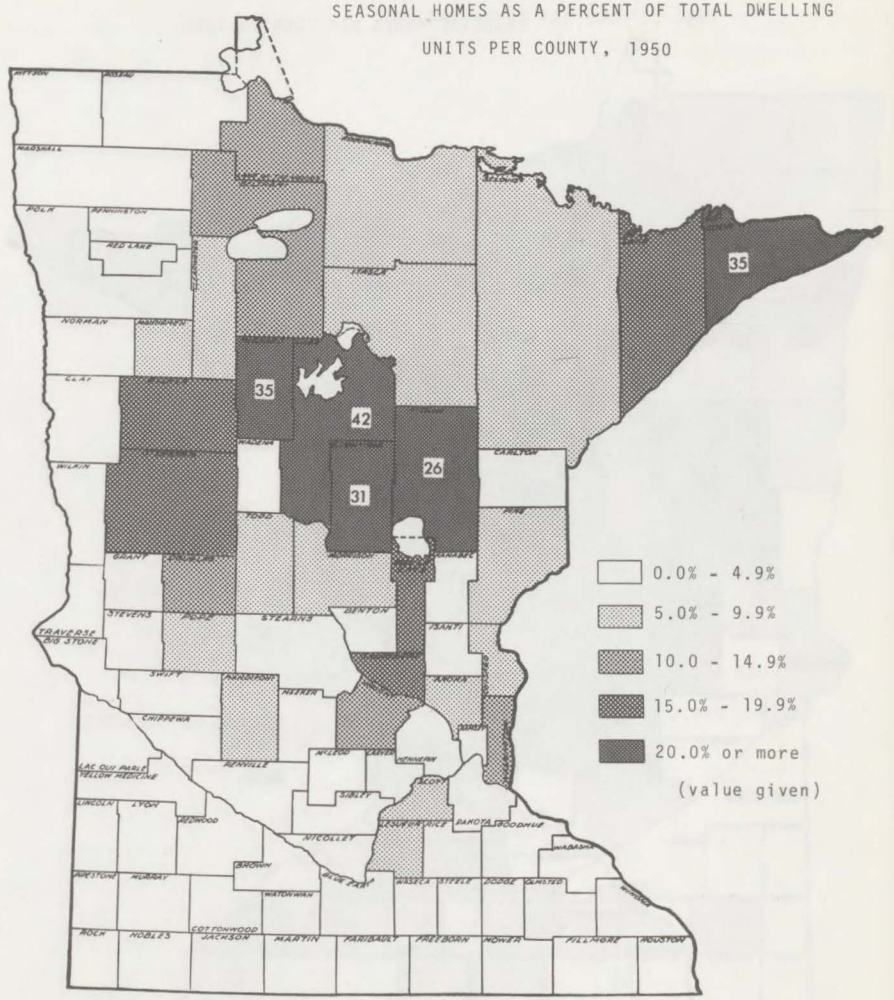
CHANGE IN THE NUMBER OF SEASONAL HOMES PER COUNTY, 1950 - 1960



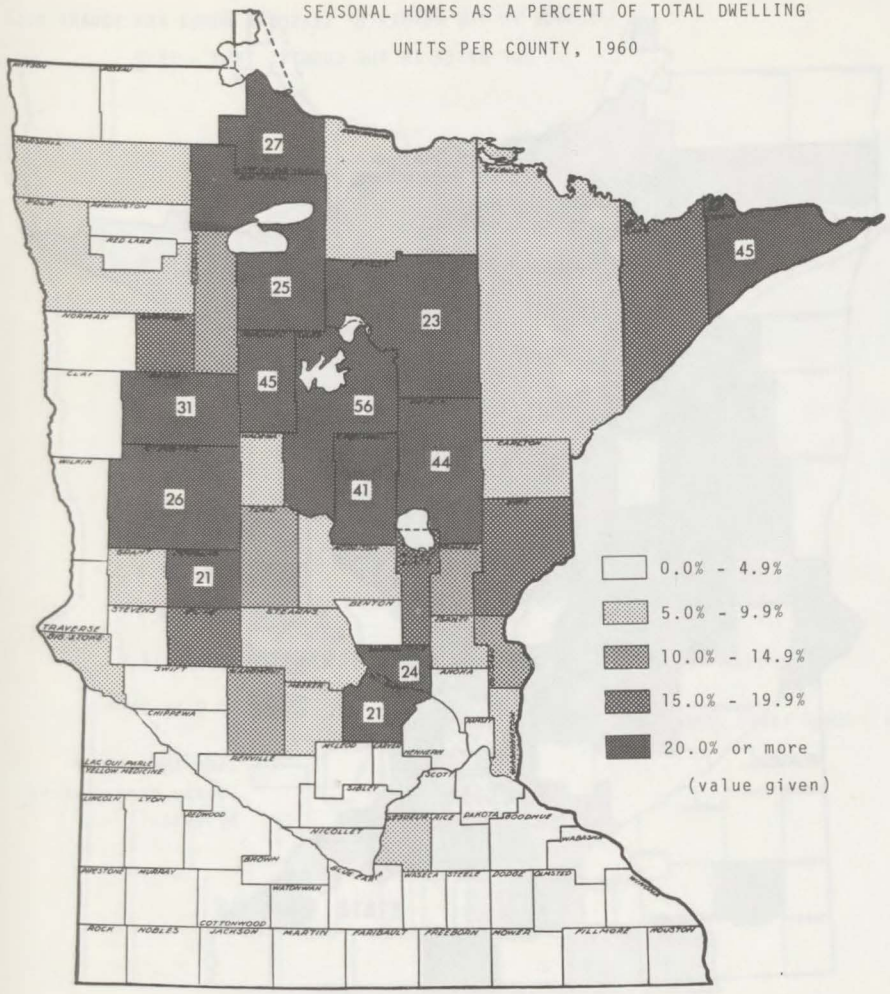
SEASONAL HOMES AS A PERCENT OF TOTAL DWELLING UNITS PER COUNTY, 1940



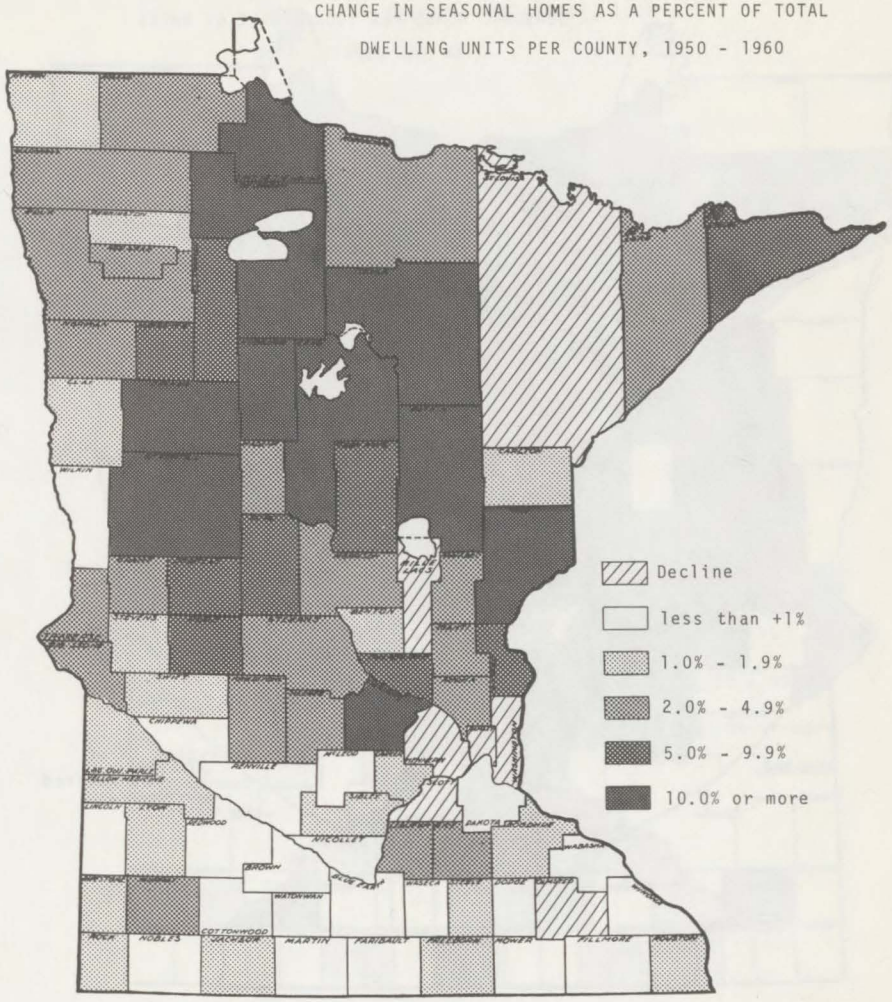
SEASONAL HOMES AS A PERCENT OF TOTAL DWELLING UNITS PER COUNTY, 1950



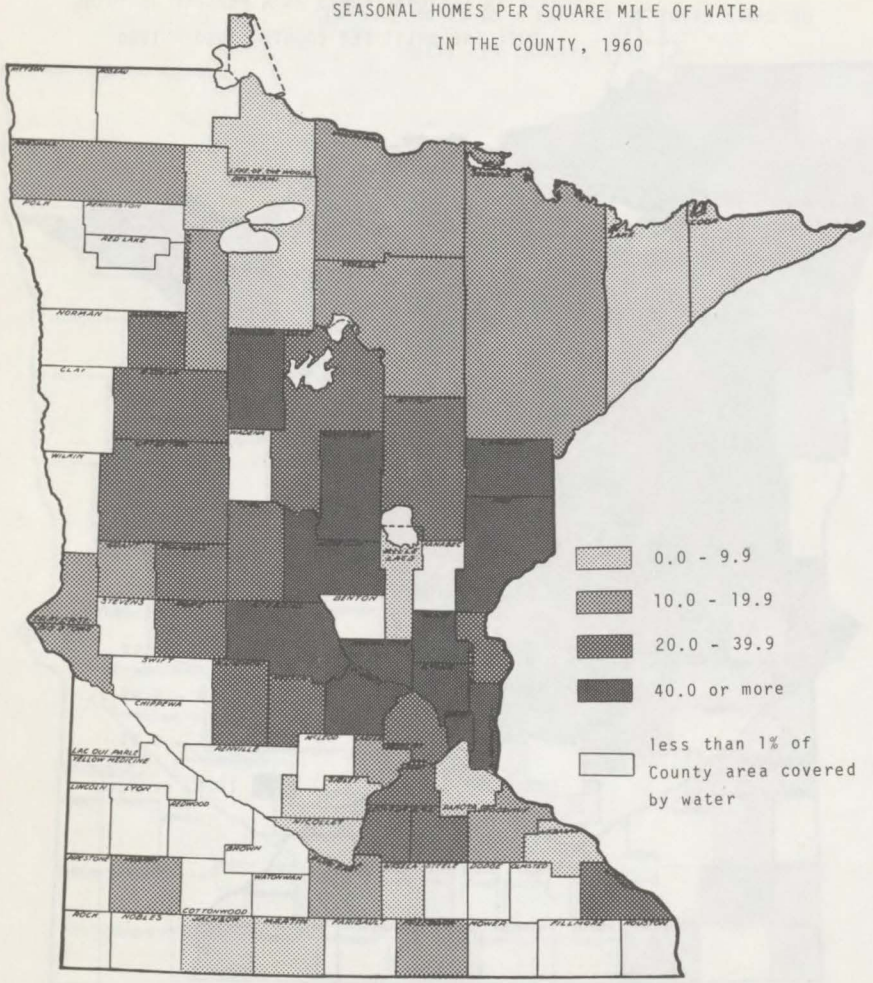
SEASONAL HOMES AS A PERCENT OF TOTAL DWELLING UNITS PER COUNTY, 1960



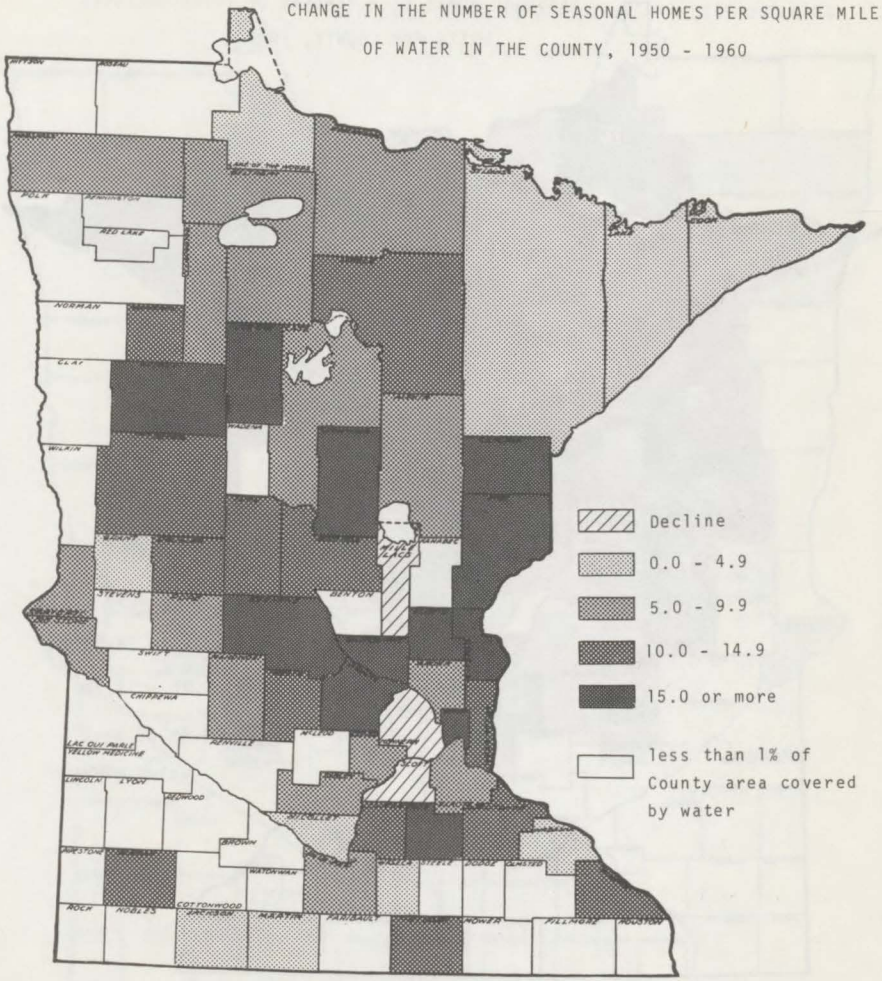
CHANGE IN SEASONAL HOMES AS A PERCENT OF TOTAL DWELLING UNITS PER COUNTY, 1950 - 1960



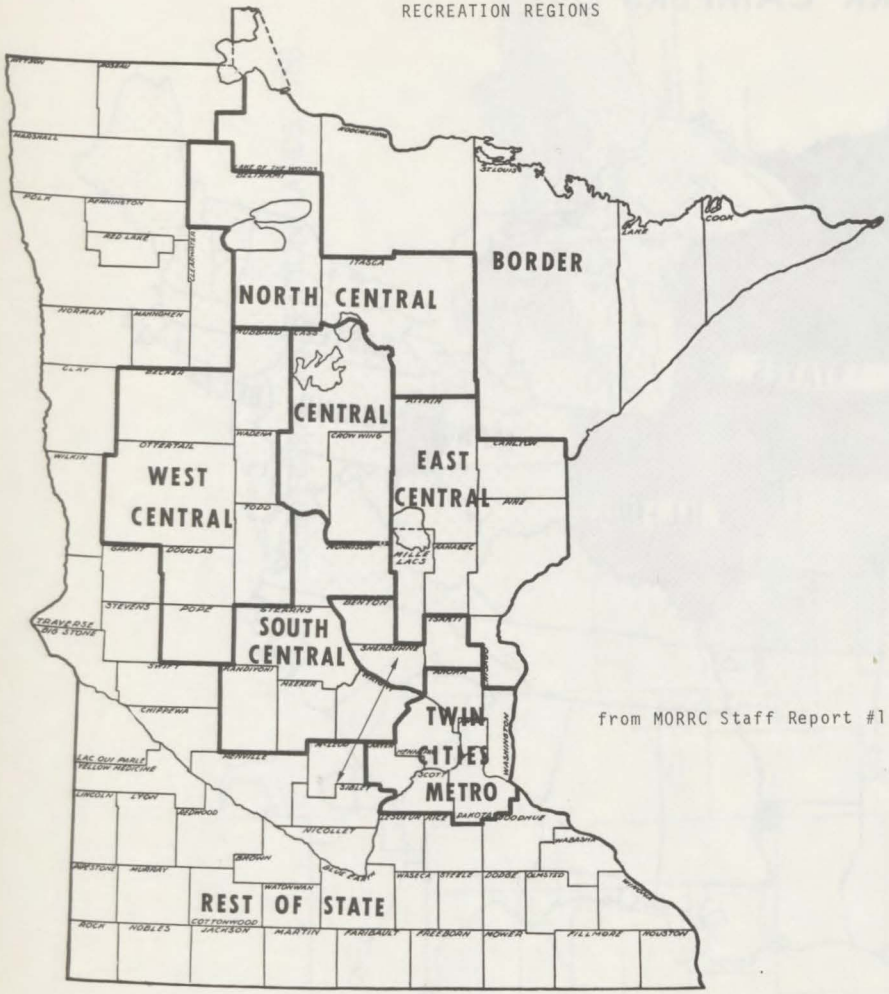
SEASONAL HOMES PER SQUARE MILE OF WATER IN THE COUNTY, 1960



CHANGE IN THE NUMBER OF SEASONAL HOMES PER SQUARE MILE OF WATER IN THE COUNTY, 1950 - 1960

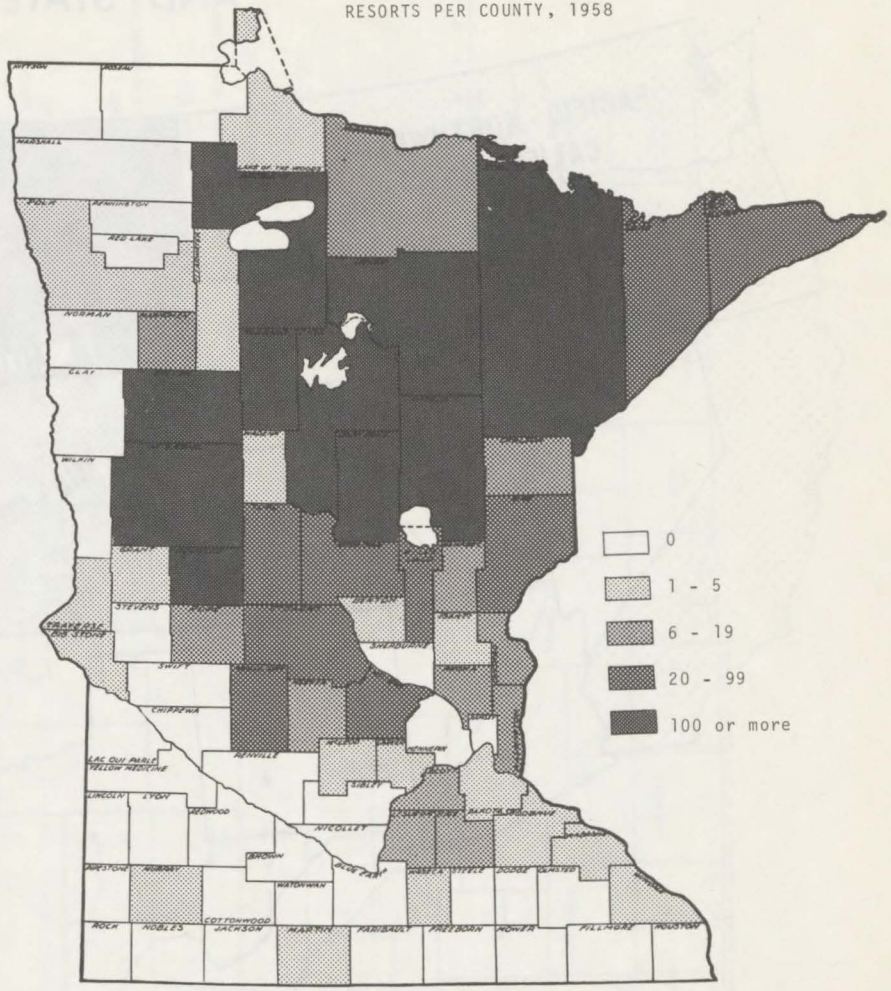


RECREATION REGIONS

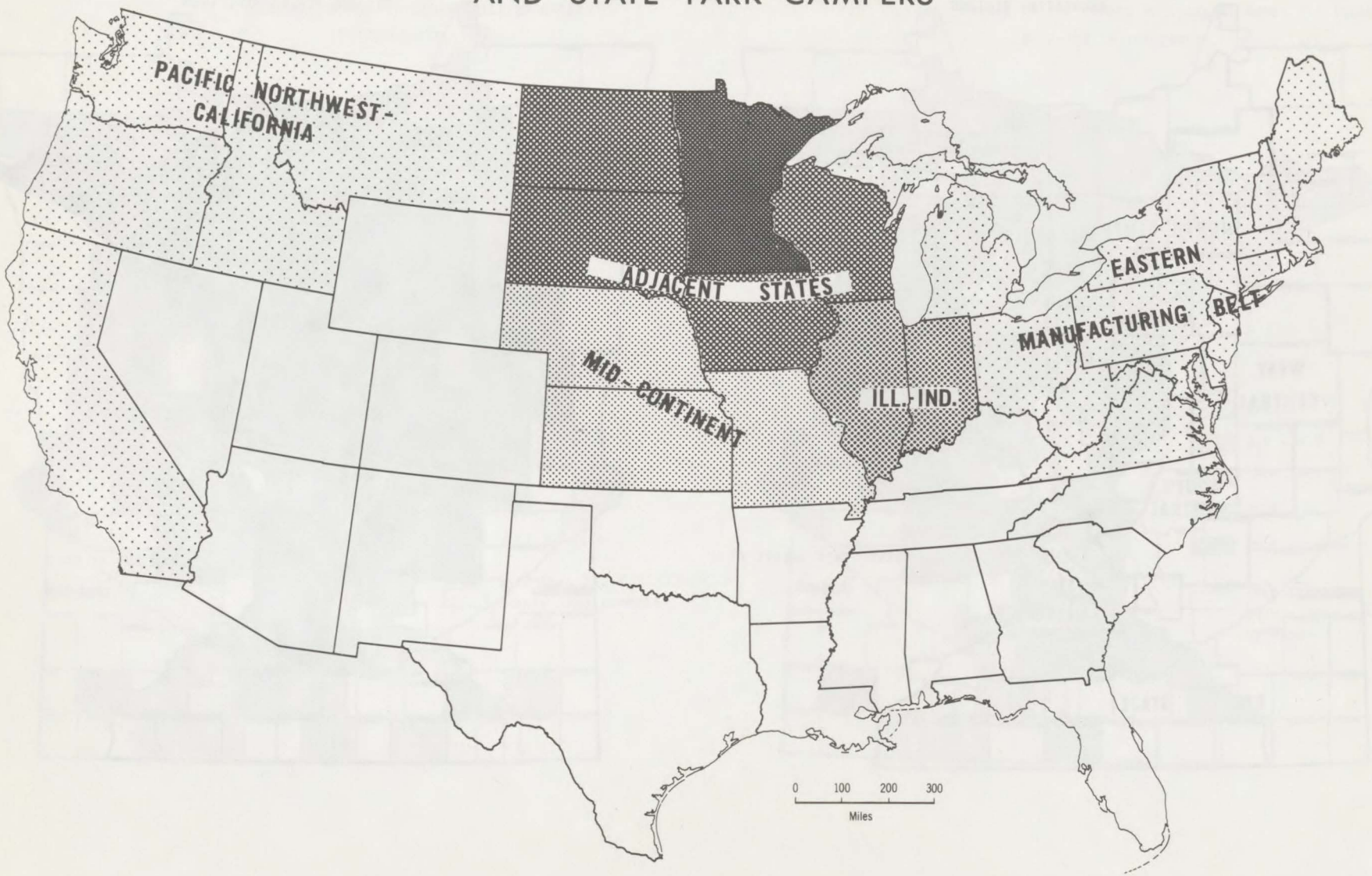


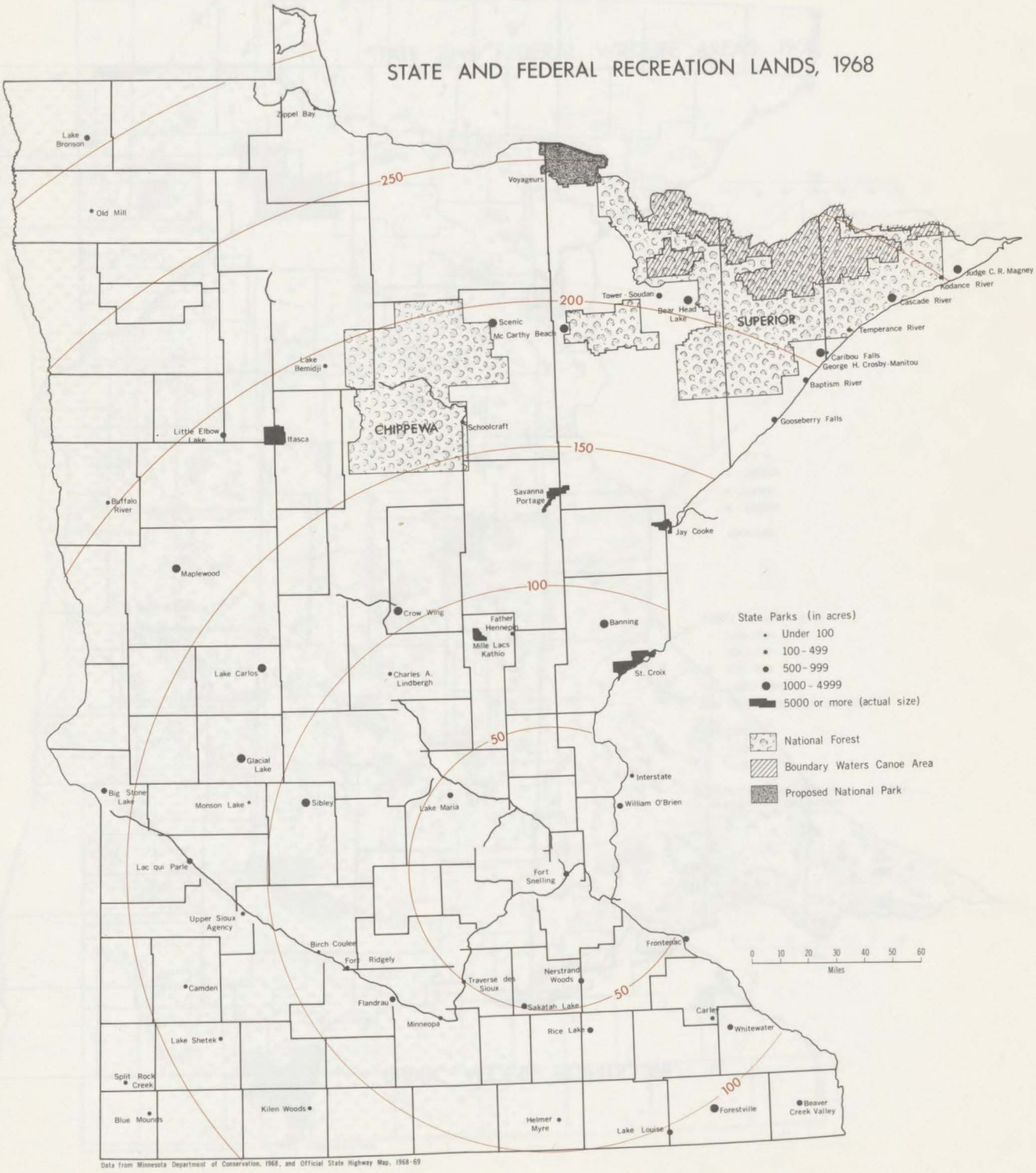
from MORRC Staff Report #1

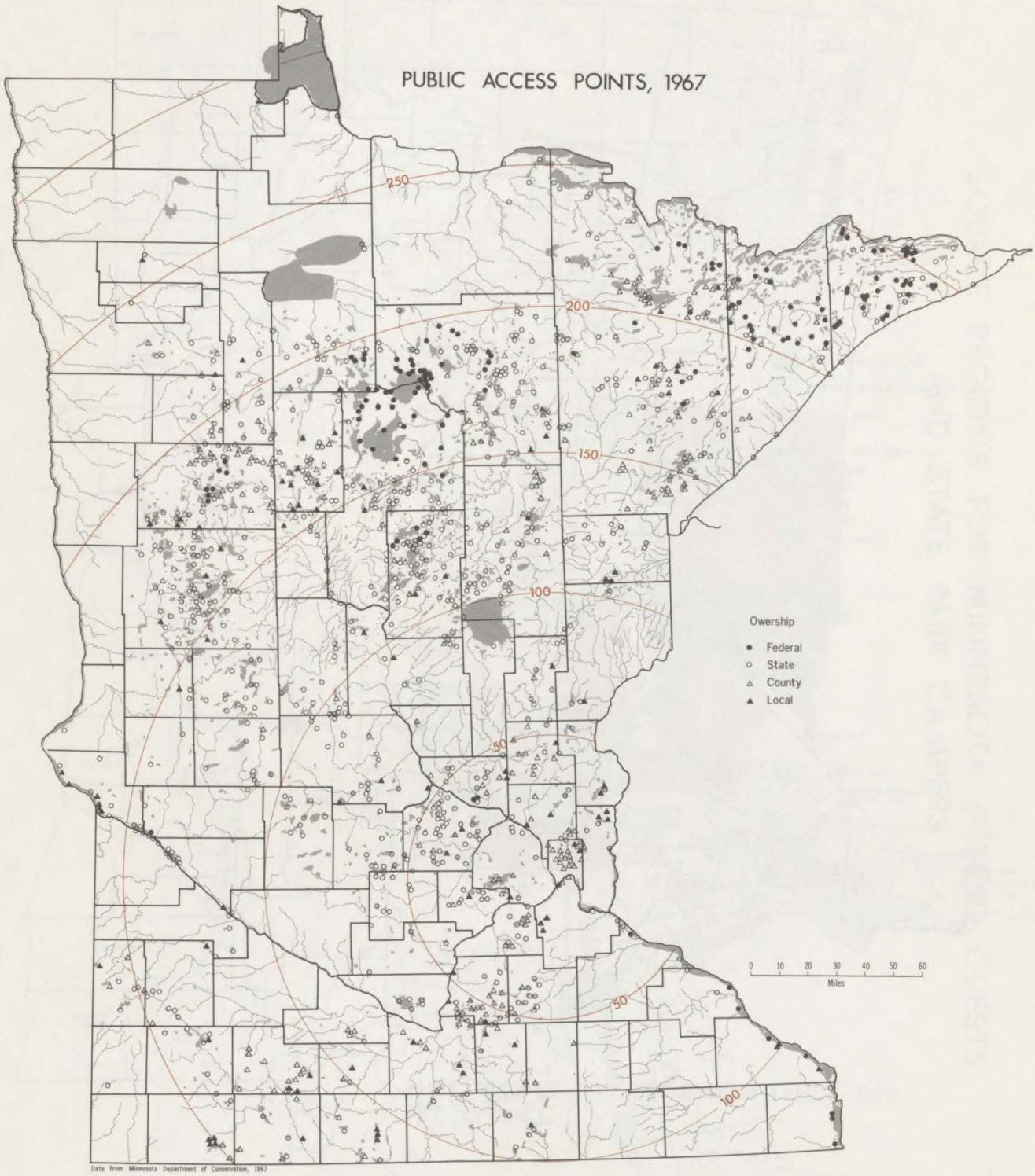
RESORTS PER COUNTY, 1958

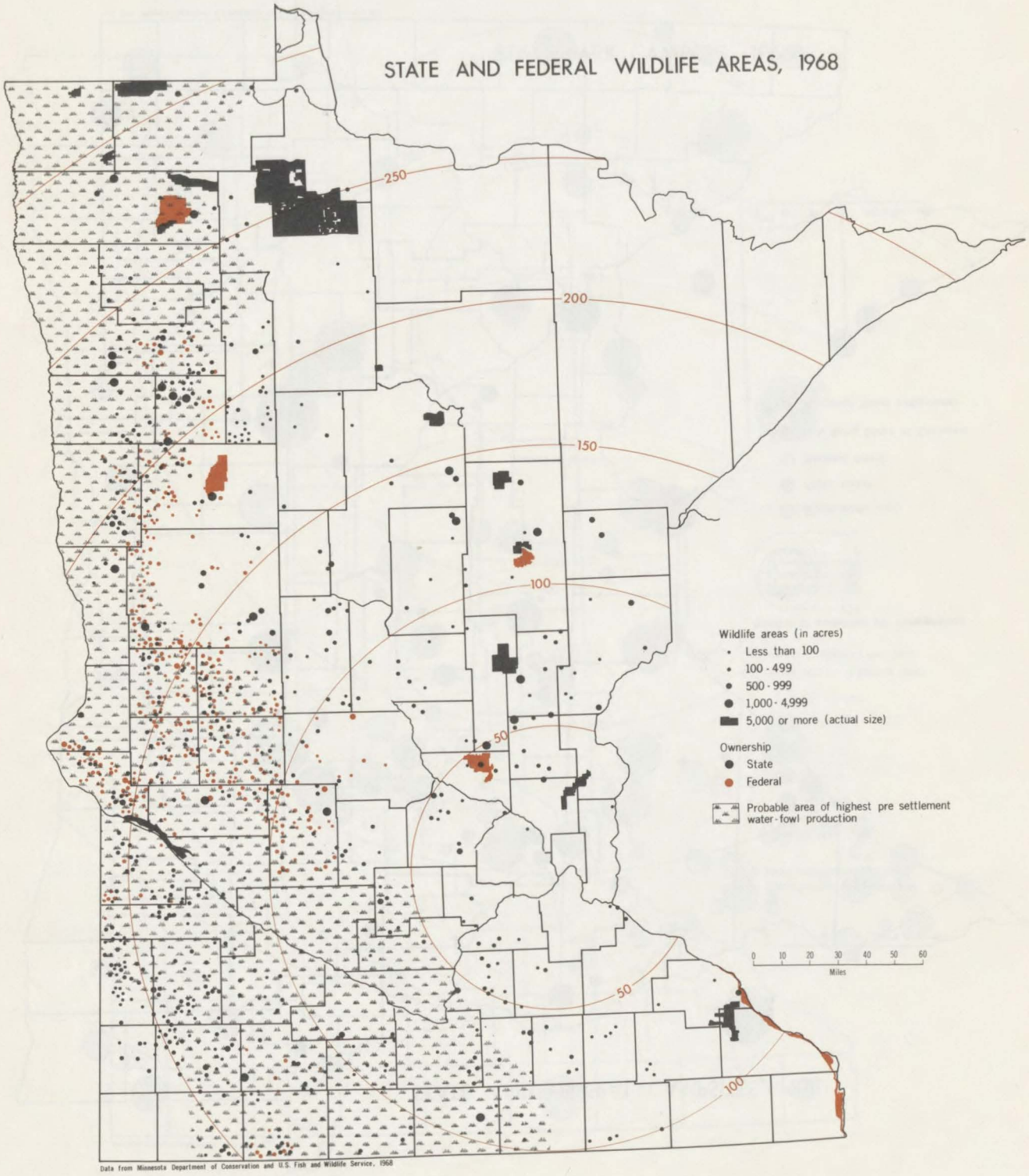


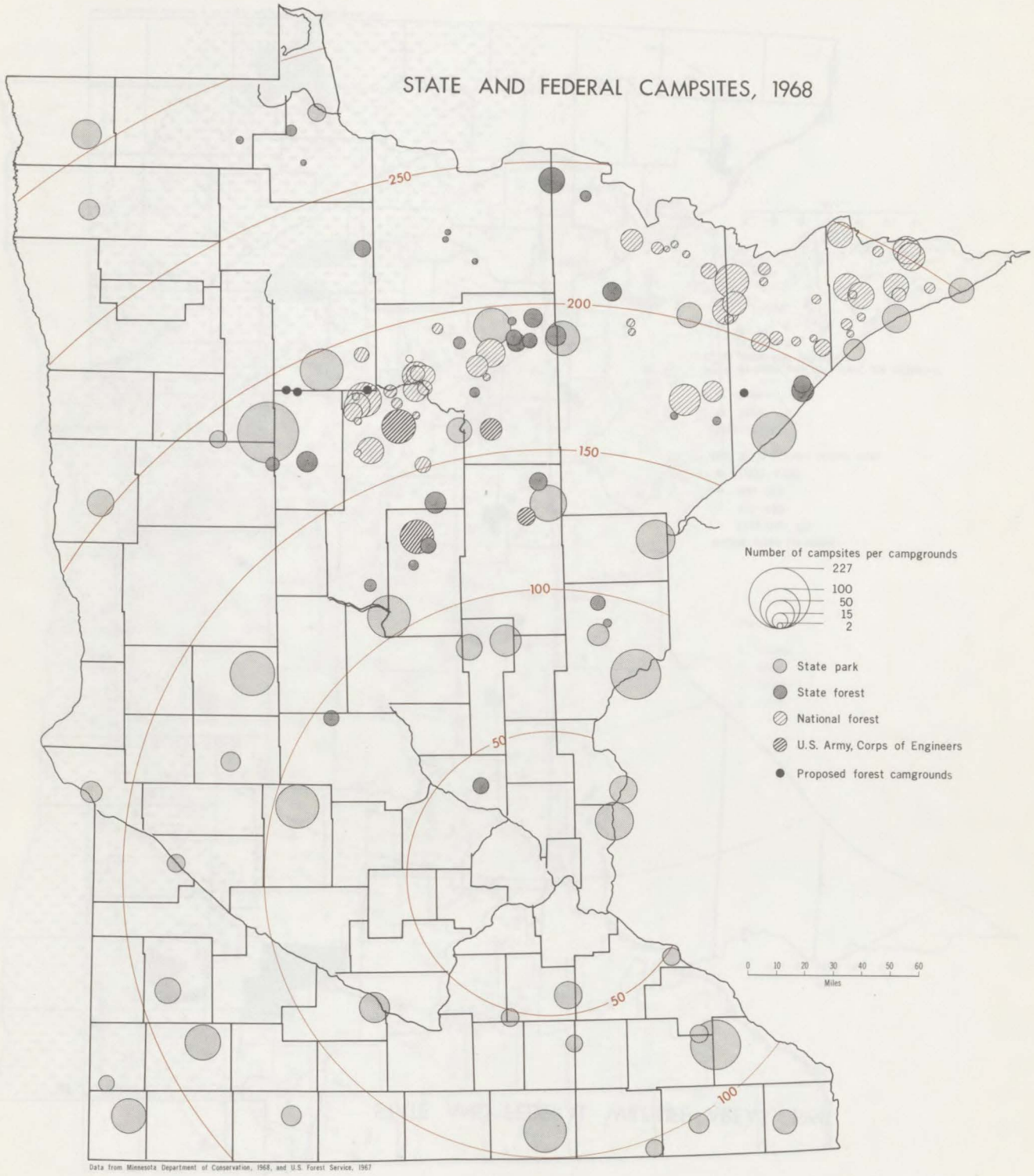
SOURCE REGIONS FOR MINNESOTA RESORT GUESTS AND STATE PARK CAMPERS



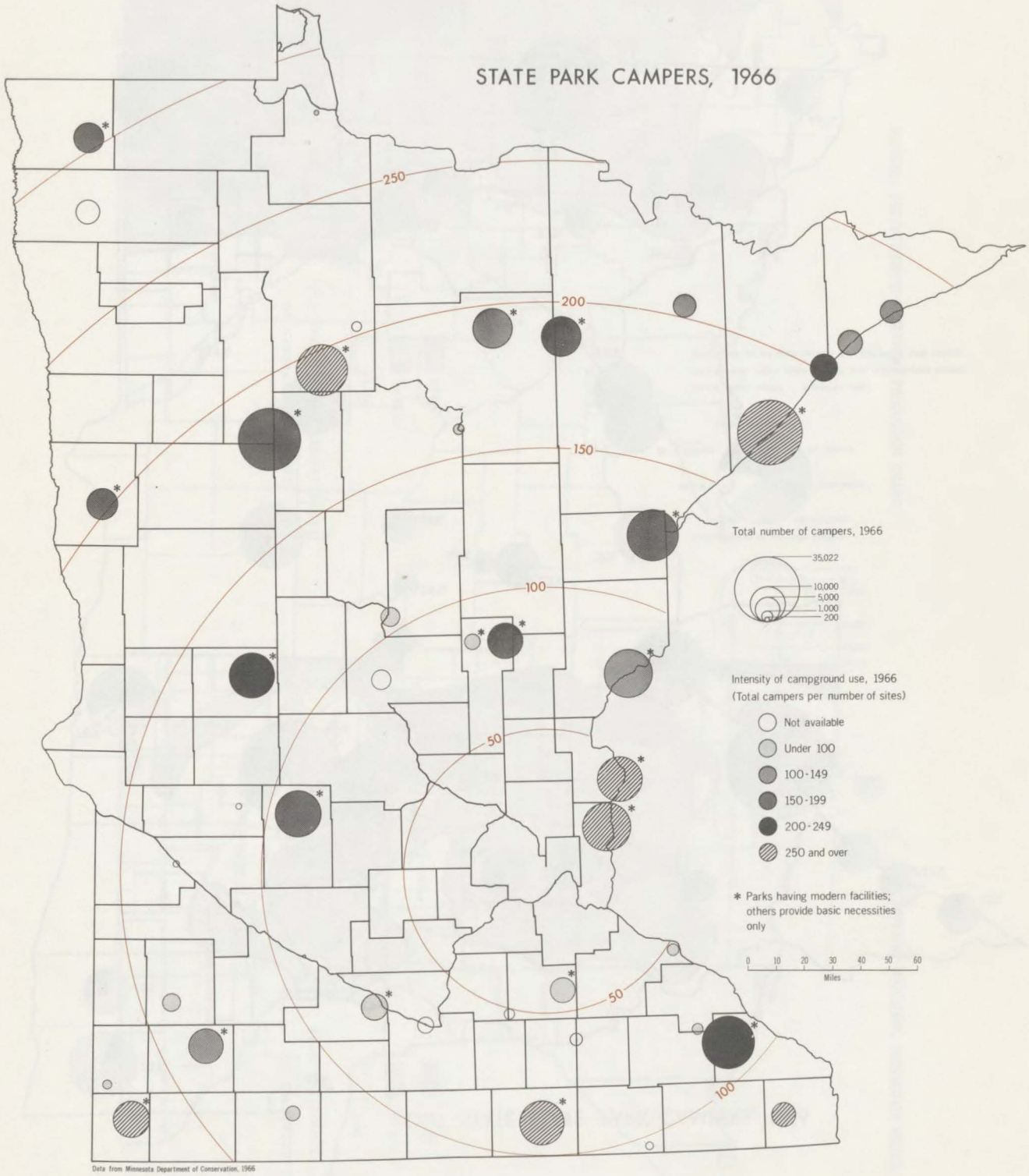

STATE AND FEDERAL RECREATION LANDS, 1968
Zippel Bay
Lake Bronson
Old Mill
Voyageurs
250
200
150
100
50
Tower - Soudan
Bear Head Lake
SUPERIOR
Judge C. R. Magney
Kodance River
Cascade River
Temperance River
Caribou Falls
George H. Crosby-Manitou
Baptism River
Gooseberry Falls
Scenic
Mc Carthy Beach
Lake Bemidji
CHIPPEWA
Schoolcraft
Little Elbow Lake
Itasca
Buffalo River
Savanna Portage
Jay Cooke
Maplewood
Crow Wing
Father Hennepin
Mille Lacs Kathio
Banning
St. Croix
Lake Carlos
Charles A. Lindbergh
Glacial Lake
Interstate
Big Stone Lake
Monson Lake
Sibley
Lake Maria
William O'Brien
Lac qui Parle
Fort Snelling
Upper Sioux Agency
Birch Coulee
Fort Ridgely
Fronteac
Traverse des Sioux
Nerstrand Woods
Camden
Flandrau
Sakatah Lake
Carlet
Minneopa
Rice Lake
Whitewater
Lake Shetek
Split Rock Creek
Blue Mounds
Kilen Woods
Helmer Myre
Lake Louise
Forestville
Beaver Creek Valley
State Parks (in acres)
Under 100
100 - 499
500 - 999
1000 - 4999
5000 or more (actual size)
National Forest
Boundary Waters Canoe Area
Proposed National Park
0 10 20 30 40 50 60
Miles
Data from Minnesota Department of Conservation, 1968, and Official State Highway Map, 1968-69

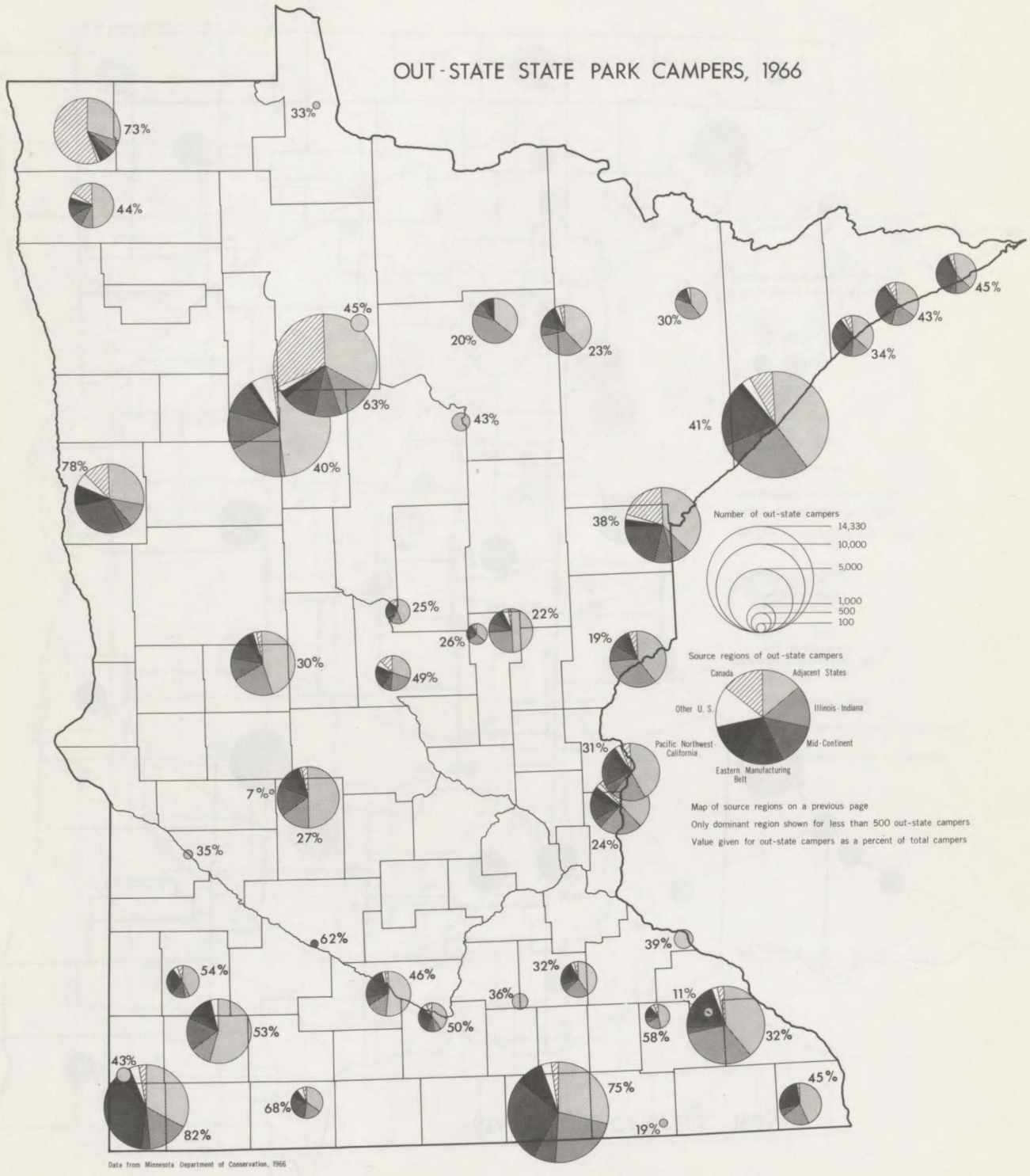

PUBLIC ACCESS POINTS, 1967
250
200
150
100
50
50
100
Owership
Federal
State
County
Local
0 10 20 30 40 50 60
Miles
Data from Minnesota Department of Conservation, 1967


STATE AND FEDERAL WILDLIFE AREAS, 1968
250
200
150
100
50
50
100
Wildlife areas (in acres)
Less than 100
100 - 499
500 - 999
1,000 - 4,999
5,000 or more (actual size)
Ownership
State
Federal
Probable area of highest pre settlement water-fowl production
0 10 20 30 40 50 60
Miles
Data from Minnesota Department of Conservation and U.S. Fish and Wildlife Service, 1968



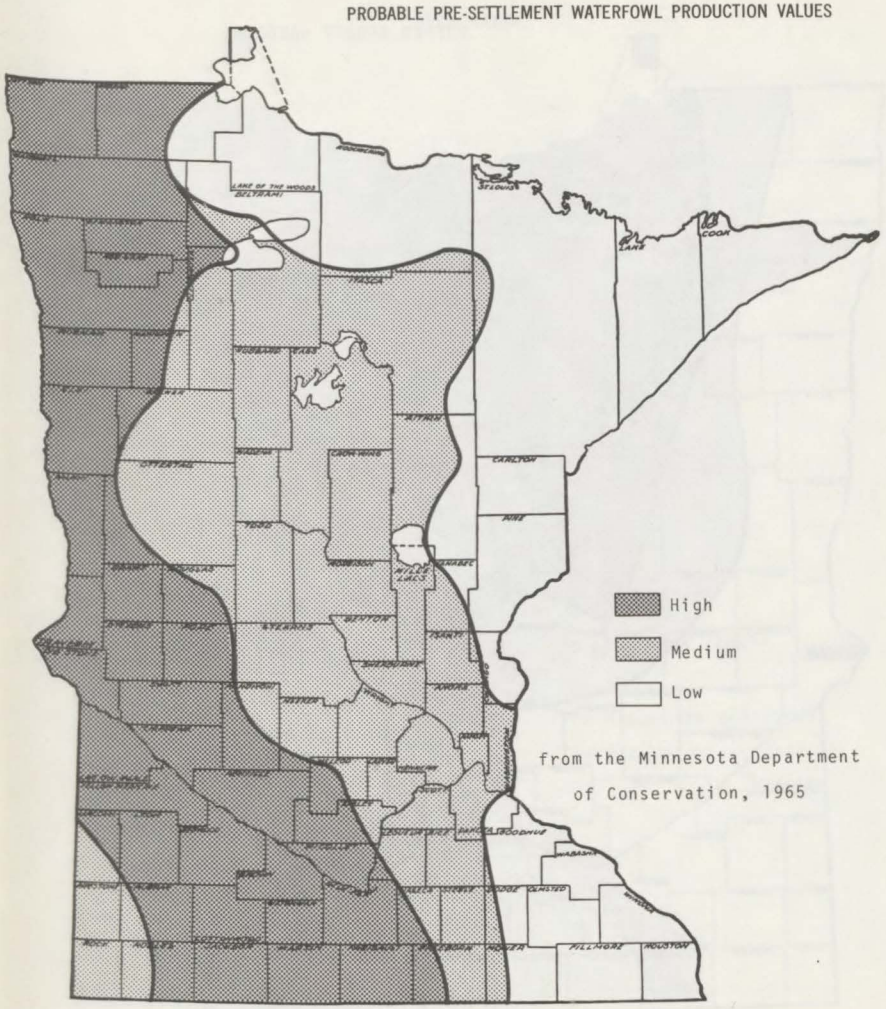
Data from Minnesota Department of Conservation, 1968, and U.S. Forest Service, 1967


STATE PARK CAMPERS, 1966
250
200
150
100
50
50
100
Total number of campers, 1966
35,022
10,000
5,000
1,000
200
Intensity of campground use, 1966
(Total campers per number of sites)
Not available
Under 100
100-149
150-199
200-249
250 and over
* Parks having modern facilities; others provide basic necessities only
0 10 20 30 40 50 60
Miles
Data from Minnesota Department of Conservation, 1966



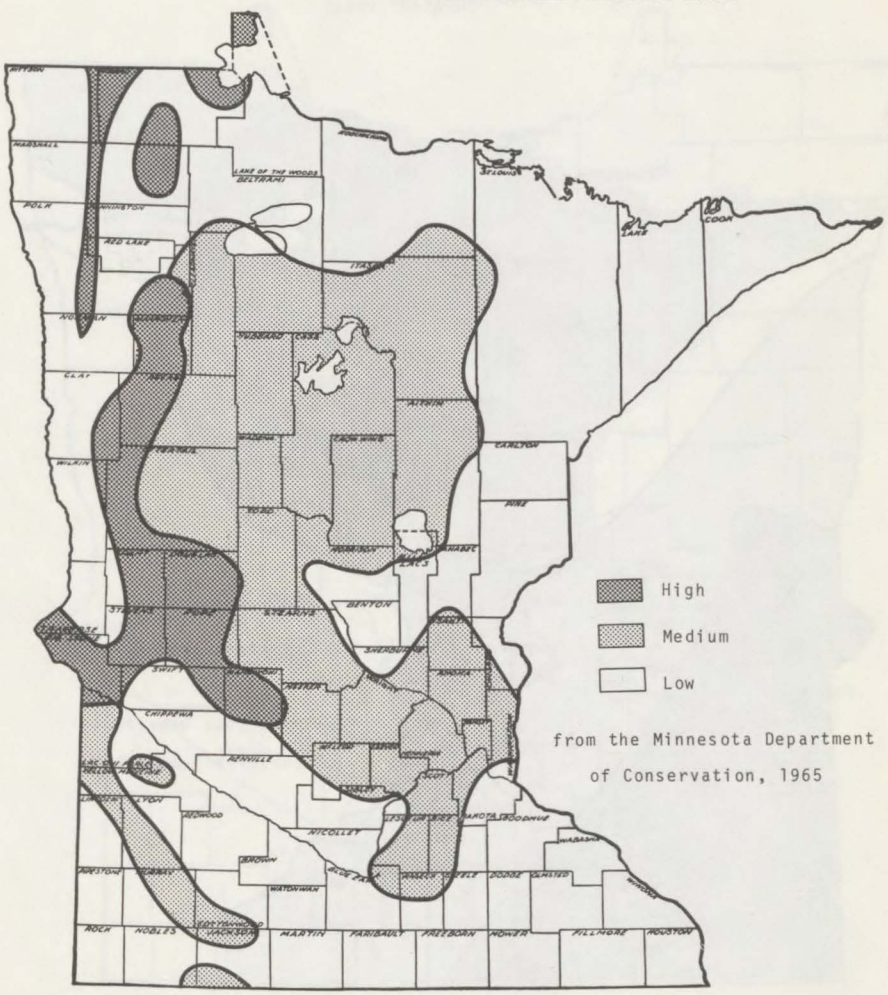
Data from Minnesota Department of Conservation, 1966

PROBABLE PRE-SETTLEMENT WATERFOWL PRODUCTION VALUES



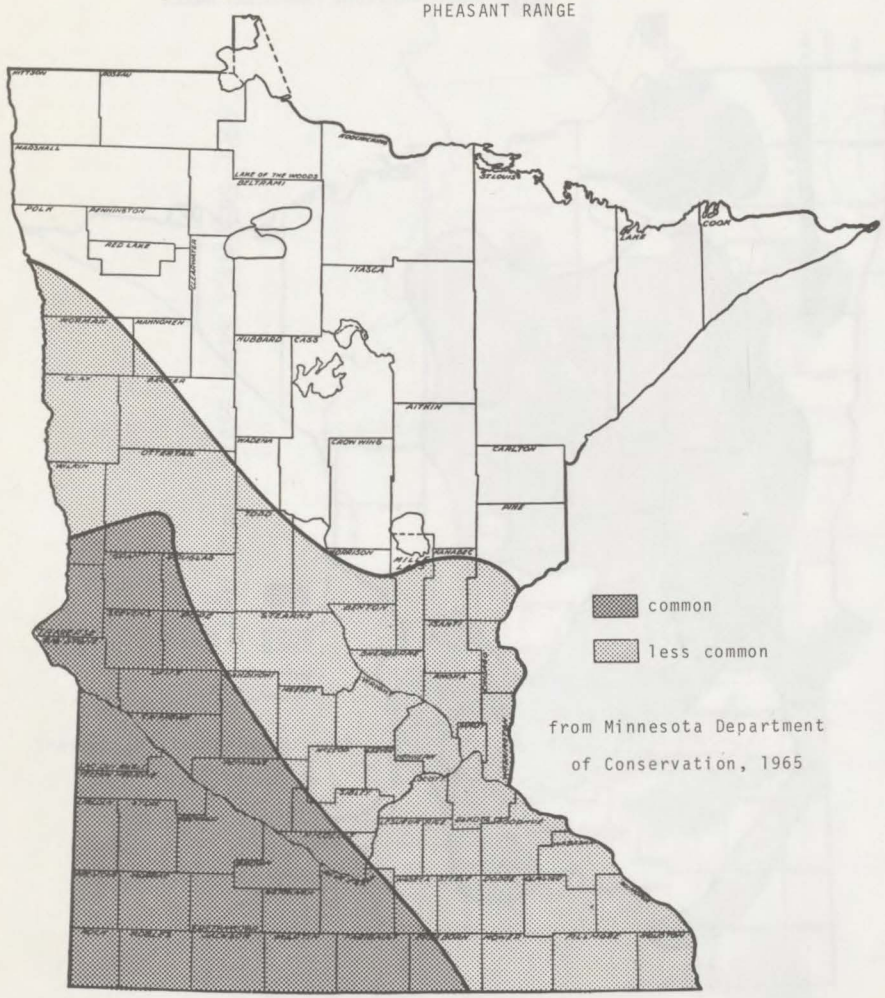
from the Minnesota Department of Conservation, 1965

PRESENT WATERFOWL PRODUCTION VALUES



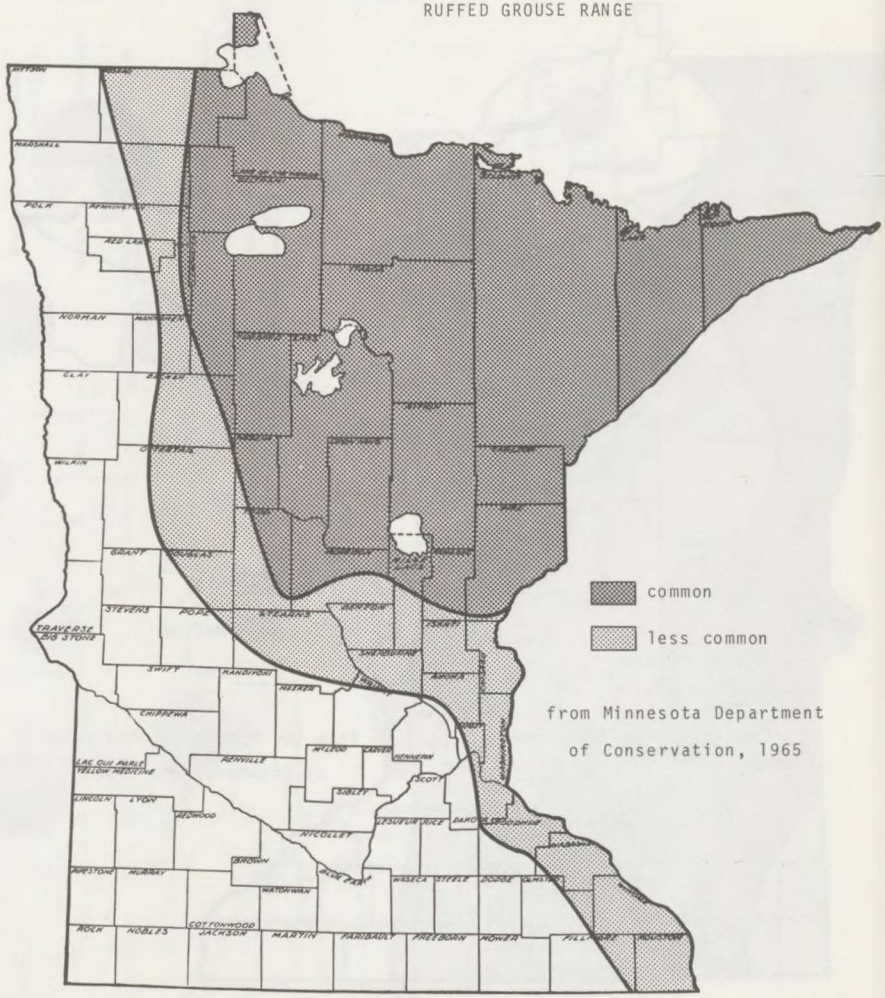
from the Minnesota Department of Conservation, 1965

PHEASANT RANGE



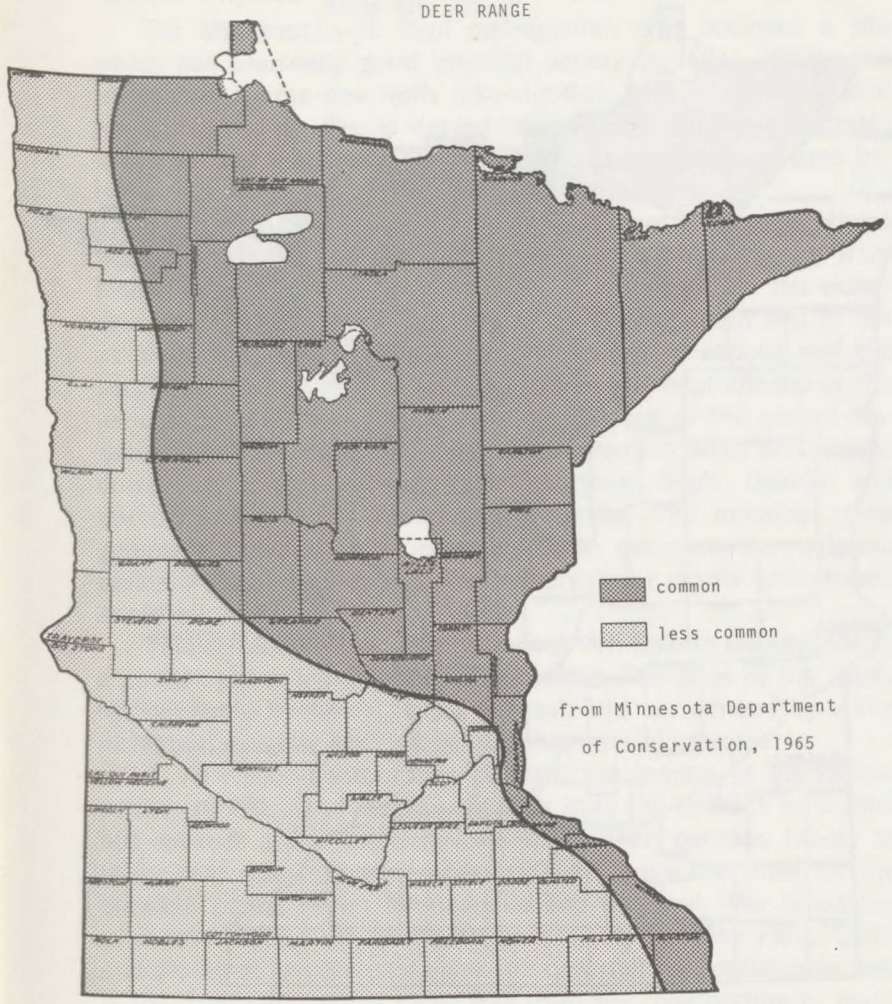
from Minnesota Department
of Conservation, 1965

RUFFED GROUSE RANGE



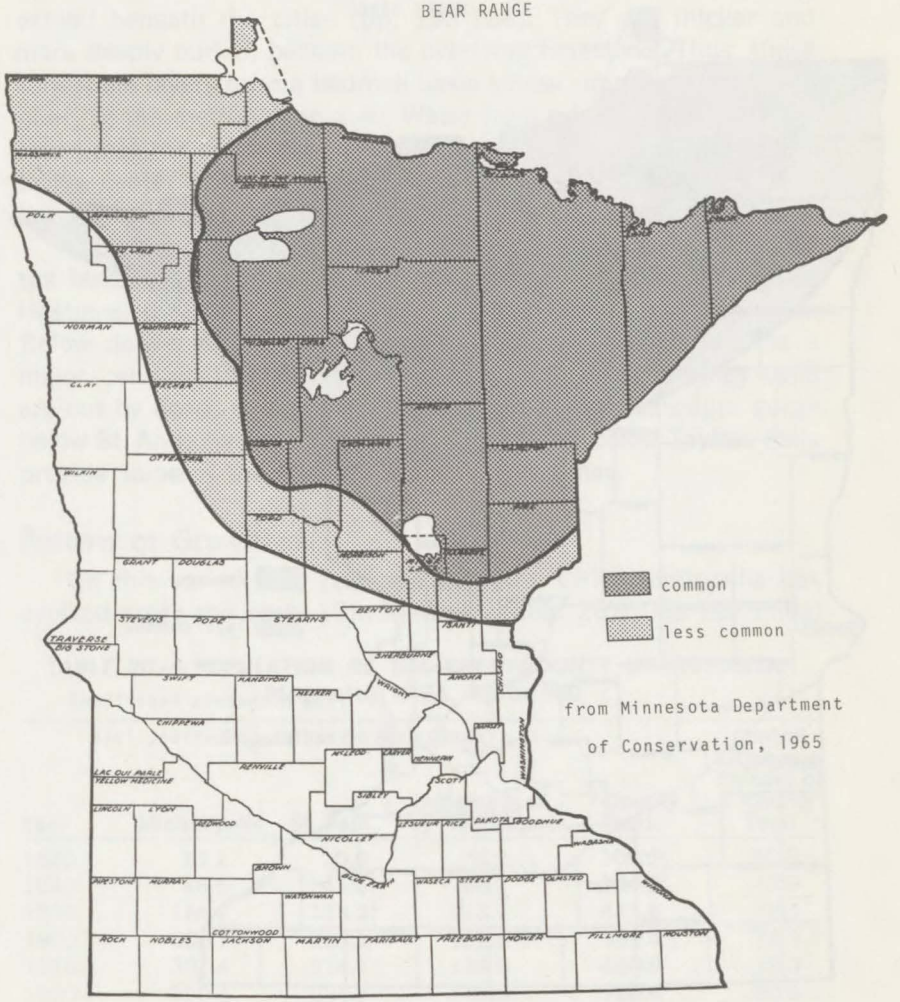
from Minnesota Department
of Conservation, 1965

DEER RANGE



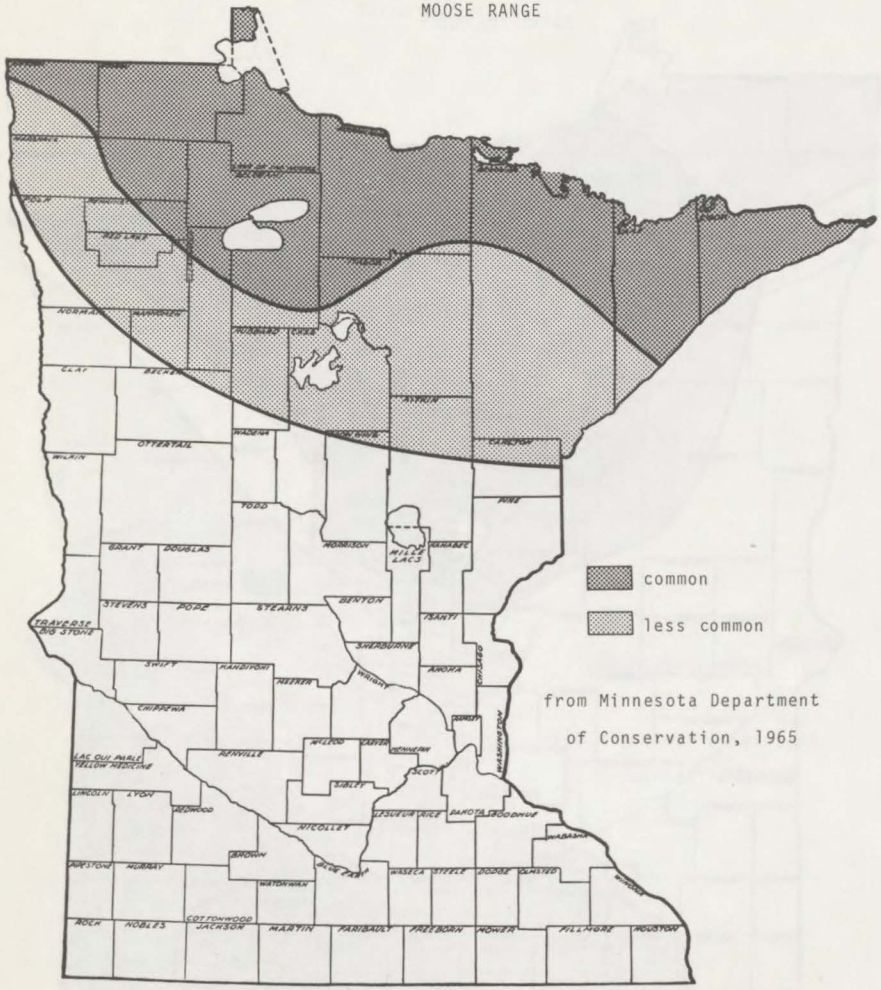
from Minnesota Department of Conservation, 1965

BEAR RANGE



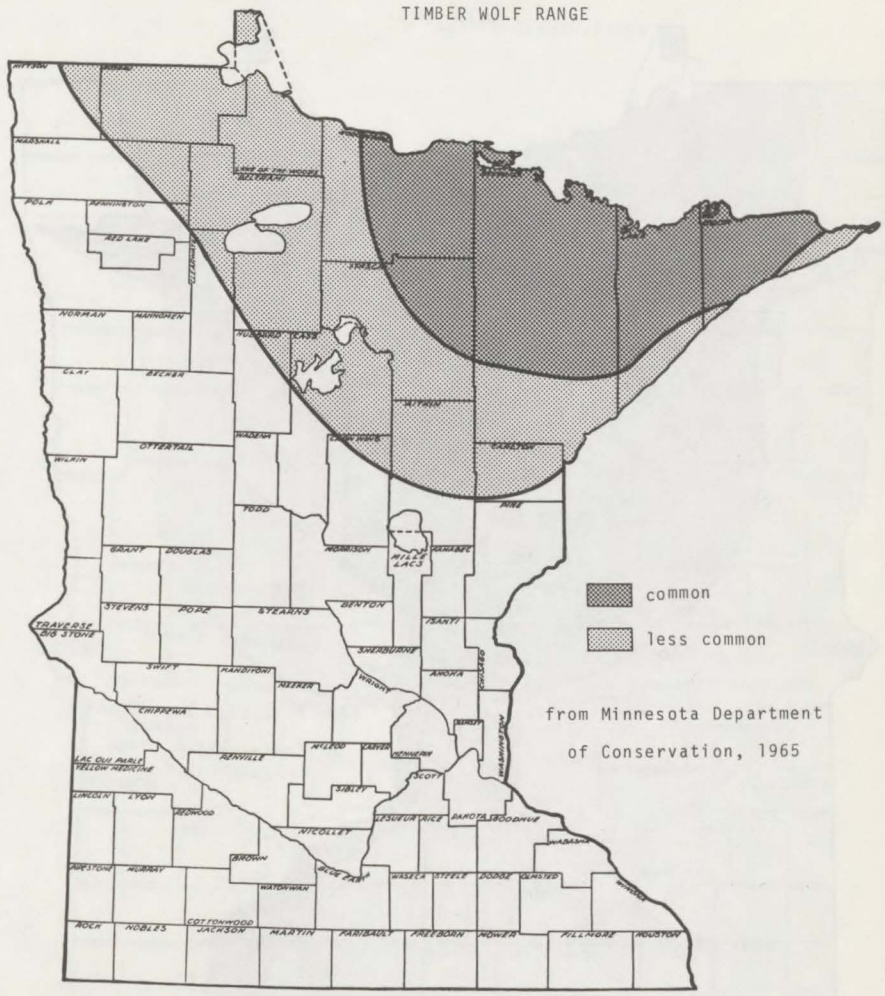
from Minnesota Department of Conservation, 1965

MOOSE RANGE



from Minnesota Department of Conservation, 1965

TIMBER WOLF RANGE



from Minnesota Department of Conservation, 1965

Chapter 11

TWIN CITIES METROPOLIS

Unique Physical Setting Among Midwest Cities

The Minneapolis-St. Paul metropolitan area occupies a site which has unusually great physical variety (p. 191). Within the metropolitan area one finds lake-studded, heavily rolling glacial moraine close to deeply carved ravines and gorges – contrasts which are not matched elsewhere within such a compact area between the Alleghenies and the Northern Rockies.

Much of the area can be visualized as an amphitheater whose floor is a flattish glacial outwash plain. It opens northward from North Minneapolis, Fridley, and Brooklyn Center onto the extensive Anoka sand plain. The floor at the closed, south end of the amphitheater includes much of both south Minneapolis and the southwestern part of St. Paul. The rim of the amphitheater is the generally higher, and always rougher, surface of the glacial moraines. The moraines, studded with hundreds of lakes and ponds, cover central and west Hennepin, northern Scott, Dakota, and Carver, and most of Washington counties. The moraines were generally forested in pioneer times; in contrast, the outwash plains, with their sandy soil, were mainly under prairie or scattered scrub oak and brush.

The Vermillion River Basin, in southern Dakota County, forms a similar but much smaller amphitheater. The floor of the valley is dominated by sandy glacial outwash and surrounded by a rim of higher, rougher land which is mainly glacial moraine.

A variety of bedrock lies beneath the mantle of glacial deposits (p. 192). The moraines deeply bury the bedrock as a rule; but outwash plains often form a thin veneer, perhaps twenty to thirty feet deep. Layers of hard, gray limestone underlie the outwash plains within Minneapolis and St. Paul. The limestone is exposed along the Mississippi below St. Anthony Falls. Slabs and blocks of this limestone are still quarried for landscaping use; in the 19th century the stone was used for construction of many buildings in both St. Paul and Minneapolis. Porous, yellow or white sandstone lies beneath the glacial outwash material in both the Anoka sand plain and Vermillion valley. Because the Twin Cities are built on a geologic basin, sandstone beds which lie near the surface all around the edges of the Twin Cities metropolis also extend beneath the cities (pp. 193-194). They are thicker and more deeply buried, beneath the overlying limestone. Thus, these sandstone layers form a bedrock basin whose rims are at the periphery of the metropolitan area. Water from rain and melting snow soaks into the sandstone where it is near the surface, percolates to the center of the basin, fills the pores in the standstone, and provides the very large artesian water supply beneath the cities.

The Mississippi and its tributaries add still more variety to the terrain. From Carver and Shakopee to downtown St. Paul to Hastings, the Minnesota-Mississippi occupy a wide, deep trench. Below downtown St. Paul the valley floor widens to provide a major, centrally located resource of level land; and the valley walls are cut by deep, stream-dissected ravines. The Mississippi gorge below St. Anthony Falls and the St. Croix valley below Taylors Falls provide some of the Midwest's finest panoramas.

Pattern of Growth

On this varied land resource the Twin Cities metropolis has evolved since the early 19th century (Table 20). One key initial

TABLE 20 — POPULATION OF THE SEVEN-COUNTY METROPOLITAN PLANNING AREA, 1870-1960

	Population (in thousands)				Central Cities as a Percent of 7-County Total
Year	Minneapolis	St. Paul	Remainder of 7-Counties	7-County Total	
1870	13.1	20.0	76.2	109.3	30.3
1880	46.9	41.5	96.2	184.6	47.9
1890	164.7	133.2	113.7	411.6	72.4
1900	202.7	163.1	126.6	492.4	74.3
1910	301.4	214.7	134.6	650.8	79.3
1920	380.6	234.7	145.6	760.9	80.9
1930	464.4	271.6	181.7	917.6	80.2
1940	492.4	287.7	207.1	987.2	79.0
1950	521.7	311.3	372.1	1,205.1	69.1
1960	482.9	313.4	793.0	1,589.3	50.1

Source: U.S. Census of Population, Census years indicated.

point was at downtown St. Paul; the practical head of pioneer steamboat navigation. Also, Trout Creek valley provided the last easy access to the uplands from the river below St. Anthony Falls. The other key point was the great water power resource at the Falls, and the adjacent shoals and islands just upstream, which formed the first easy bridging point enroute from St. Paul to the northwest. That site became downtown Minneapolis.

Rail lines joined the two downtowns and also concentrated in the Mississippi flats below downtown St. Paul and above St. Anthony Falls. Two other important trackage belts followed the upper valley of Trout Creek (St. Paul's east side) and the flat outwash plains through St. Louis Park and Hopkins.

Urban subdivision and development spread from these two major initial settlements. The two urbanized areas combined had grown to nearly 50 square miles by 1874, but five miles of open country remained between them (p. 195). They had coalesced by 1900 and spread over 150 square miles (p. 196). The urbanized area at present encompassed about 650 square miles, and the two historic central business districts – along with numerous outlying towns – are deeply embedded in the metropolitan mass.

Expansion before the automobile era followed the rail and streetcar transportation routes and level land. Both rail movement and building excavation costs were highly sensitive to steep slopes. Among the hundreds of outlying lakes, only Minnetonka and White Bear attracted urban development; for their size could attract enough traffic to sustain suburban train and streetcar service.

By 1940 new projections of low-density settlement, along paved roads into the countryside, reflected the growing importance of the automobile (p. 197). Since World War II low- and medium-density areas have accounted for most of the growth (pp. 198-200). Subdivision has spread over the high-amenity, rolling wooded, lake and moraine lands. Extension of the road and street grid and development of the network radial and circumferential expressways has opened up these high-amenity areas.

Population density was restricted in two ways by lakes and moraine lands (p. 201). First, they provided open space within the old, high-density districts of the cities. Secondly, they attracted settlement selectively to hundreds of miles of widely scattered lakeshore outside the central cities, hence greatly enlarging the suburban commuter range. As a result, the Minneapolis-St. Paul urbanized area has one of the lowest average population density among American metropolitan centers of one million or more people.

It is apparent that the highest-density areas in the metropolis also tend to be the oldest, where the greatest capital investments were made during the street car era. It remains to be seen what will happen to these densities as older buildings are replaced and the pattern is reorganized to fit the technology and tastes of the present and future.

Social and Functional Differentiation

As the city has spread from its original nuclei, its social and functional differentiation has become vivid and complex. In the street car era there was a strong tendency for low-income residential regions to be located near the railway districts and central business district. This was partly because of the tendency for industrial laborers to live near their jobs and partly because housing values tended to be depressed by proximity to industry, railway zones, and the downtown fringe. There was also a strong tendency for the highest income residential belts to begin on high ground on the side of downtown most removed from the railway – industrial zones, to extend over the most track-free land, and to culminate in river-bluff or lakeshore locations. Thus, the main high-income spoke in Minneapolis extended from Lowry Hill through the southwestern lake districts, in St. Paul from the Cathedral along Summit Avenue and the Mississippi bluffs.

The elements of this pattern have persisted to the present time (pp. 202-204). However, the income pattern is more complicated in that half of today's urban area which has been settled in the automobile era. Freedom from the radial corridors and level land constraints of the earlier era has enabled many widely-scattered hill and lake districts to attract a share of upper income families. New industrial nodes have developed at intersections of major radial and circumferential highways and rail lines; and relatively low-priced housing has developed near some of these. Clusters of winterized lake cabins, built in the Model-T era and winterized during the depression, persist as anachronistic pockets of low-value housing in the outer suburbs. So do the old houses

and converted store buildings that mark former farm trade centers now engulfed by suburban expansion.

These geographic patterns of income are highly correlated with age, occupation, education, and housing of the population. Thus, they reflect the complex socio-economic structure of today's metropolis.

Income changes in the 1950's reinforced the pattern which had developed out of the past (pp. 205-206). They reflected the enormous increase in general affluence, on the one hand, and the slightly increased dollar gap between the richest and poorest areas, on the other hand. It is clear that the widening suburban ring, between core city and agricultural countryside, which appears on preceding maps as the region of major population growth, is also the area of major income growth. In short, the majority of households enjoyed rapid gains in affluence during the post-war II period; and, as they did, they sought the suburban way of life.

The changing patterns of shopping facilities, industrial development, and apartment construction reflect the same underlying forces that have influenced residential expansion and differentiation — great population growth and a revolution in transportation technology.

Shopping facilities and manufacturing in the streetcar and rail era were concentrated at the central business district and along the rail and transit corridors which radiated from it (pp. 207-211). Need for more floor space, parking, and new types of structures has led to many decisions to expand elsewhere or to pull out of obsolescent structures in the older parts of the city. Those structures are abandoned to smaller or lower-rent enterprises. The relocated firms are attracted to expressway intersections or rail-expressway junctions, and often to compete with residential development for amenity sites on hillside or lakeshore.

Apartment dwellings formerly clustered near the central business districts and along the street car access lines (p. 212). They are also expanding to suburban areas which have either proximity to a new outlying business center or especially good highway access to other employment concentrations or both (p. 213 and Table 21).

One important aspect of the functional differentiation of the metropolis, as it has grown, has been its division into scores of local governmental unity (use clear overlay). The division is reflected by the complex patchwork of political boundaries overlapped by the mass of the subdivided area and the major residential, industrial, and commercial regions (see Land Use map in back pocket). These major land uses reflect the historical development of the metropolitan area, especially in the central cities. However, a major molding force of this pattern has been the independent zoning controls used by most political units in the metropolitan area. Many problems, metropolitan-wide in nature, have been adversely affected by this great patchwork of governments. While many examples could be cited, some of the more commonly discussed have been selected — parks, central sewage and central water. Some of the consequences of this political division are reflected on the maps.

The land use map shows areas specifically set aside for parks. The two central cities used their large tax base to plan and acquire large areas for parks and open space reserves early in the automobile era. These were mainly near the outer edges of the cities, in areas which had not yet been built up but were within each city's jurisdiction.

In the fragmented pattern of municipal jurisdiction which characterizes the auto-era additions to the metropolis, this kind of large-scale acquisition was economically and politically infeasi-

TABLE 21 — CONSTRUCTION OF DWELLING UNITS, MINNEAPOLIS-ST. PAUL STANDARD METROPOLITAN STATISTICAL AREA, 1960-1968

	Type of Housing Unit				
	Single Family		Multiple Family		
Year	Number (in thousands)	Percent of Total	Number (in thousands)	Percent of Total	Total
1960	8.8	68.9	4.0	31.1	12,721
1961	7.5	56.8	5.7	43.2	13,151
1962	7.8	49.6	7.9	50.4	15,681
1963	8.2	50.6	8.0	49.4	16,176
1964	8.0	47.7	8.1	52.3	16,739
1965	6.9	47.6	7.6	52.4	14,577
1966	5.5	55.0	4.5	45.0	9,958
1967	6.7	41.5	9.5	58.5	16,166
1968 (first half)	3.4	34.3	6.6	65.7	10,041

Source: U.S. Census, *Housing Construction Statistics, 1889-1964* and *Construction Reports,* Series C 42, 1965-1968 yearly summaries.

ble for most of the individual suburban cities and villages. The task could, however, be carried out by a unit as large as a county. The new outer ring of large public reserves reflects, in major part, the work of county park programs organized in the past decade and also, the fact that extensive, politically uncoordinated suburban areas nearer the metropolitan center had been already built up before these programs were undertaken.

Divided and uncoordinated municipalities have also been unable, thus far, to cope with the need to expand sewer and water utilities to keep up with the growth of the metropolis (pp. 214-215). The needed pattern of expansion is obvious. But there has existed no framework in which to make the necessary decisions.

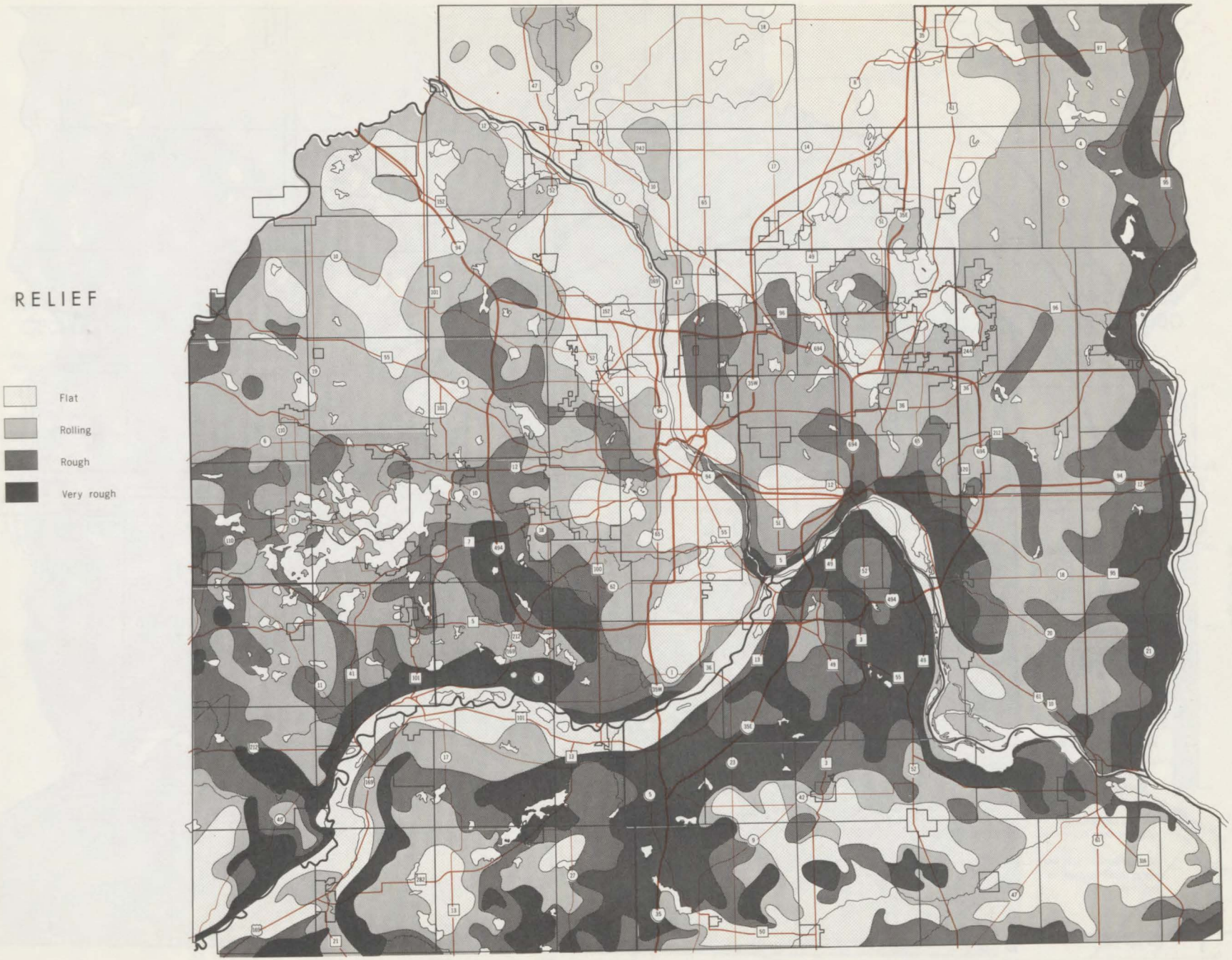
Meanwhile the metropolitan circulation system continued to embrace a widening area in the mid-1950's (pp. 216-217). Net migration toward the periphery also went on (p. 218 and Table 22). And the growth of the metropolis continued to feed on streams of migrants from other centers across the nation and from the region (pp. 219-220). Indications are that these same trends have accelerated in the 1960's.

TABLE 22 — TWIN CITIES LOCAL MIGRATION, 1955-1960 (in thousands of person-moves)

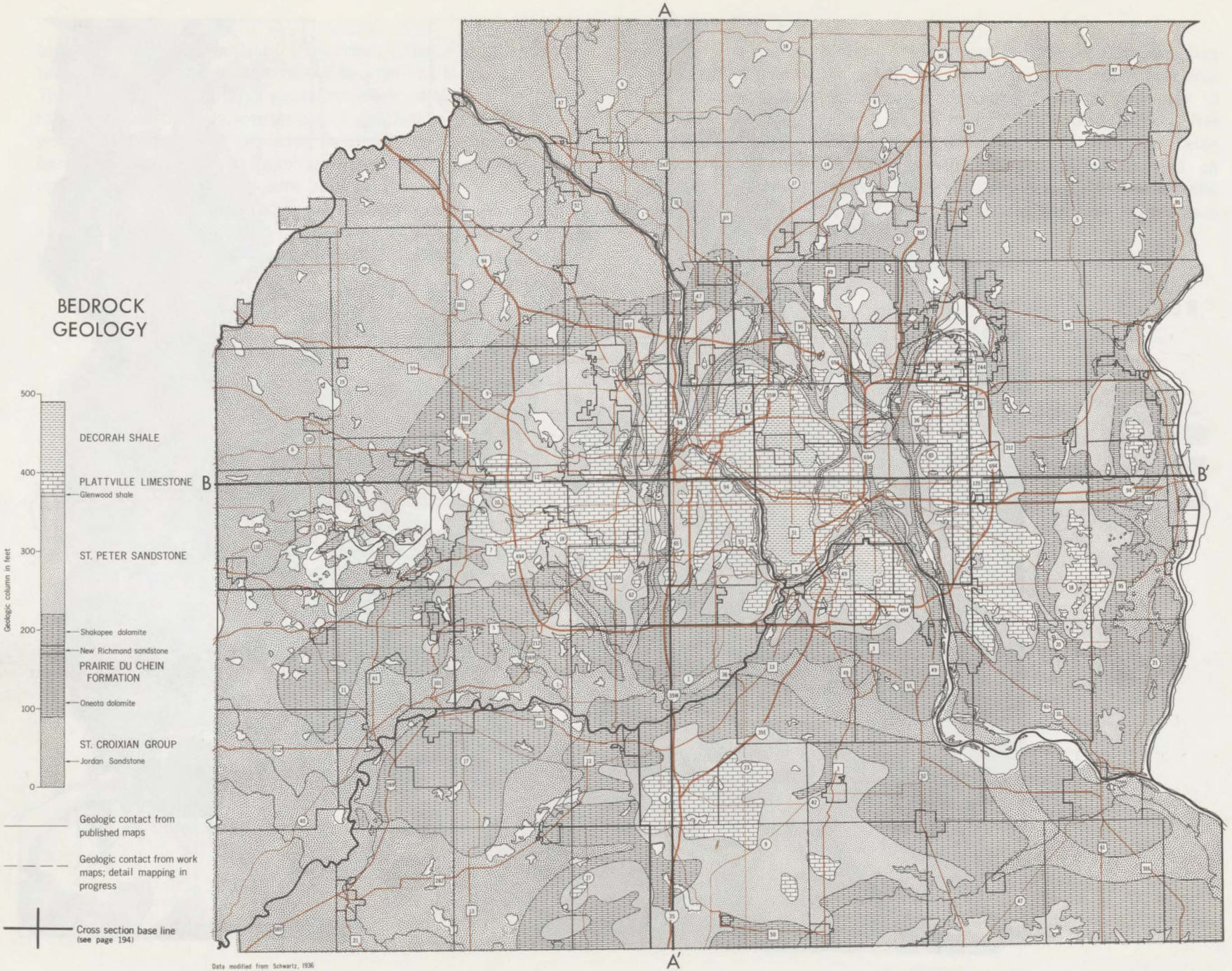
FROM \ TO		Minne-apolis	St. Paul	Inner Suburbs (1) N.W.	Inner Suburbs (2) N.E.	Inner Suburbs (3) S.E.	Inner Suburbs (4) S.W.	Outer Suburbs (5) N.W.	Outer Suburbs (6) N.E.	Outer Suburbs (7) S.E.	Outer Suburbs (8) S.W.	Out-migration to all other Regions in TCMA
Minneapolis		128.9	4.1	30.9	6.7	1.0	32.1	0.9	1.2	0.3	3.0	80.1
St. Paul		4.0	49.0	2.4	15.3	8.6	3.2	0.3	4.5	1.7	0.3	40.2
Inner Suburbs	Northwest (1)	3.5	0.3	23.2	1.9	0.1—	2.4	0.9	0.8	0.1	0.5	10.4
	Northeast (2)	0.6	3.7	0.7	14.4	0.8	0.3	0.1	1.2	0.5	0.1	7.8
	Southeast (3)	0.1	1.6	0.1	0.6	8.5	0.7	0.1—	0.2	1.7	0.1	5.1
	Southwest (4)	7.0	0.5	3.8	0.8	0.4	21.8	0.5	0.1	0.1	2.8	16.0
Outer Suburbs	Northwest (5)	0.2	0.1—	0.3	0.1	0.1	0.1	2.0	0.1—	0.1—	0.2	0.9
	Northeast (6)	0.3	1.2	0.4	1.3	0.4	0.1	0.2	7.6	0.6	0.1—	4.5
	Southeast (7)	0.1	0.7	0.1	0.3	1.1	0.2	0.1	0.4	6.1	0.1—	2.9
	Southwest (8)	1.5	0.2	0.9	0.2	0.1	1.7	0.6	0.1—	0.1—	8.8	5.2
In-migration from all other Regions of TCMA		17.3	12.2	39.4	27.0	12.5	40.7	3.6	8.4	4.9	7.0	

Source: Upper Midwest Economic Study, Urban Report Number 6.

RELIEF



Data from U.S.G.S. Topographic Maps, 1949-58


BEDROCK GEOLOGY
Geologic column in feet
500
400
300
200
100
0
DECORAH SHALE
PLATTVILLE LIMESTONE
Glenwood shale
ST. PETER SANDSTONE
Shakopee dolomite
New Richmond sandstone
PRAIRIE DU CHEIN FORMATION
Oneota dolomite
ST. CROIXIAN GROUP
Jordan Sandstone
Geologic contact from published maps
Geologic contact from work maps; detail mapping in progress
Cross section base line
(see page 194)
A
A'
B
B'
Data modified from Schwartz, 1936

STRUCTURAL GEOLOGY

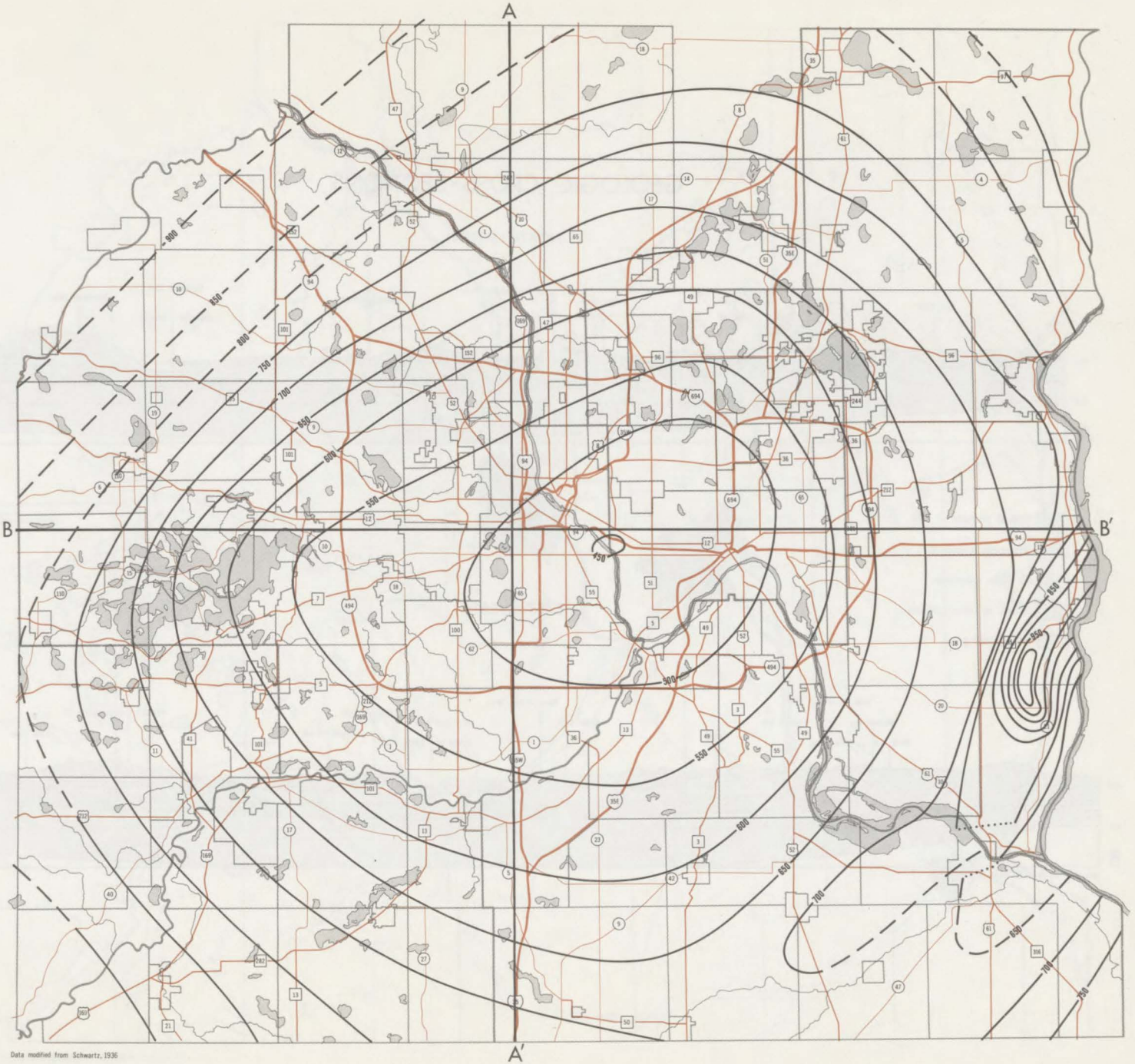
STRUCTURAL CONTOURS ON THE JORDAN SANDSTONE

Mapped contours

Assumed contours

Fault line

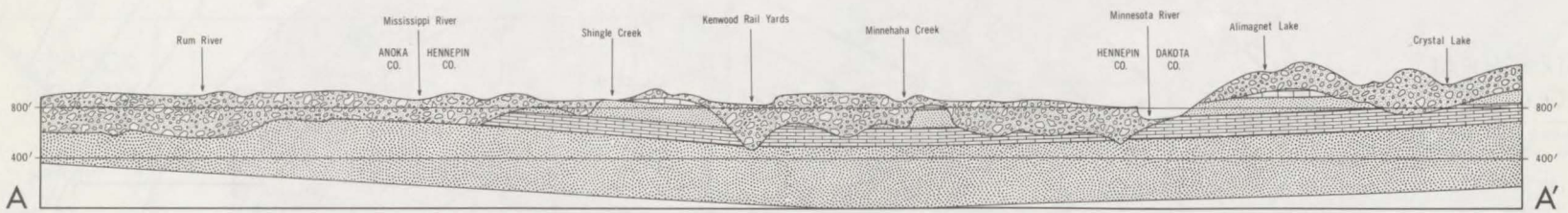
Cross section base line (see page 194)

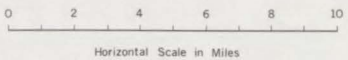


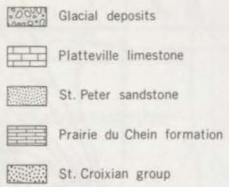
Data modified from Schwartz, 1936

GEOLOGIC CROSS-SECTIONS

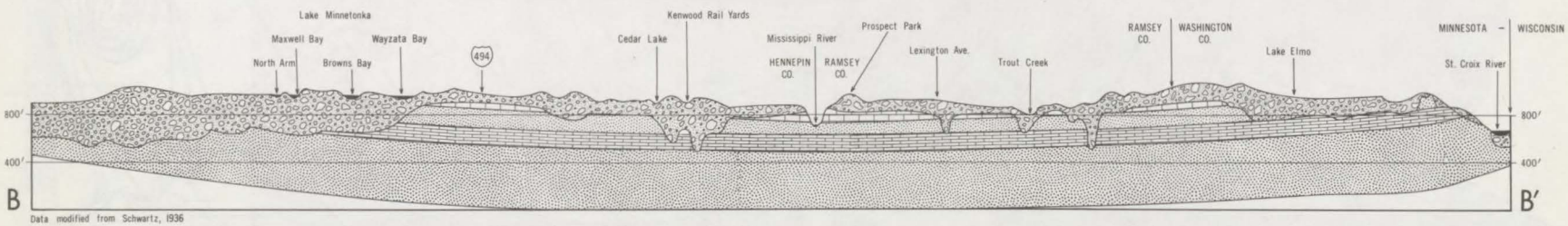
NORTH - SOUTH





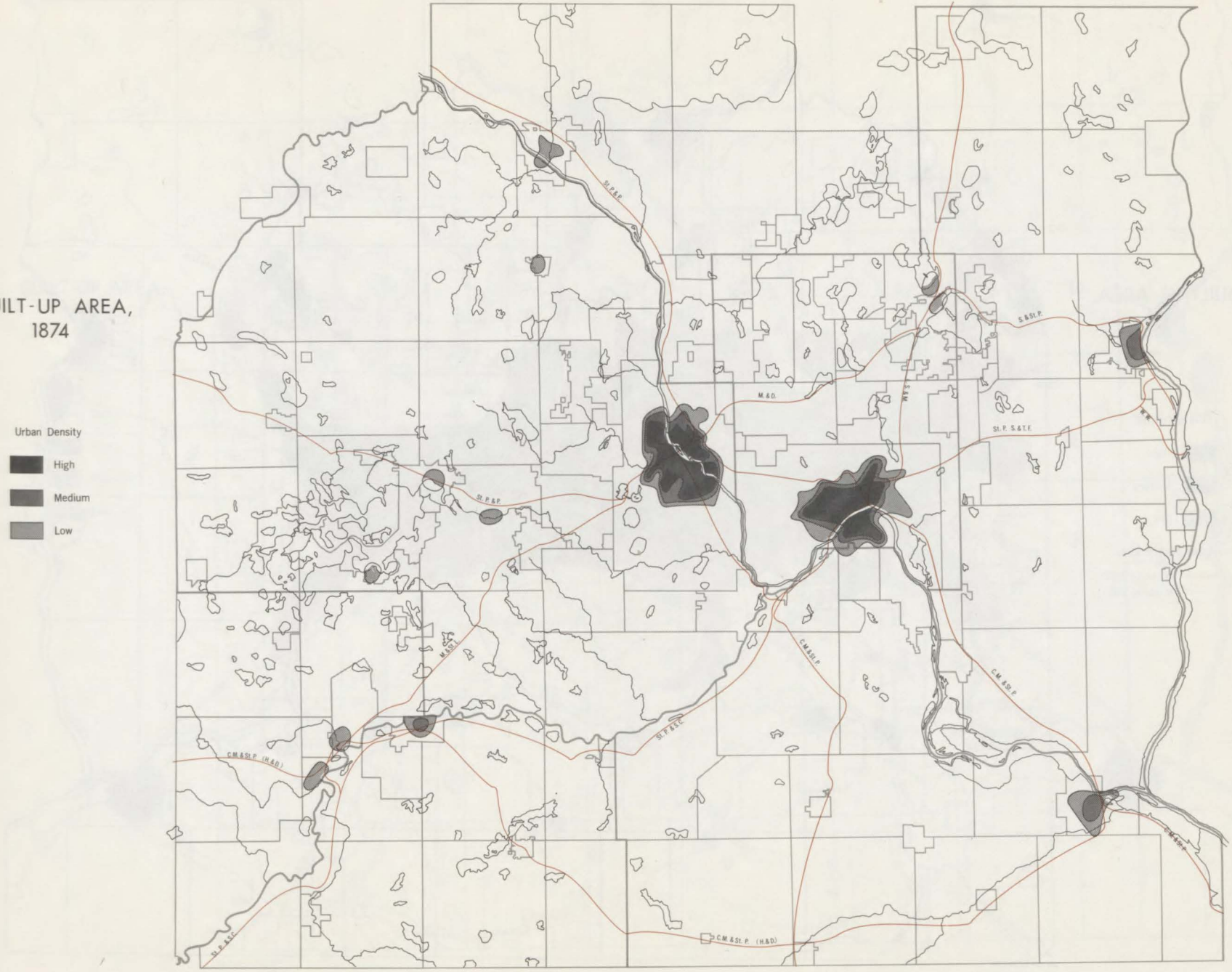


EAST - WEST



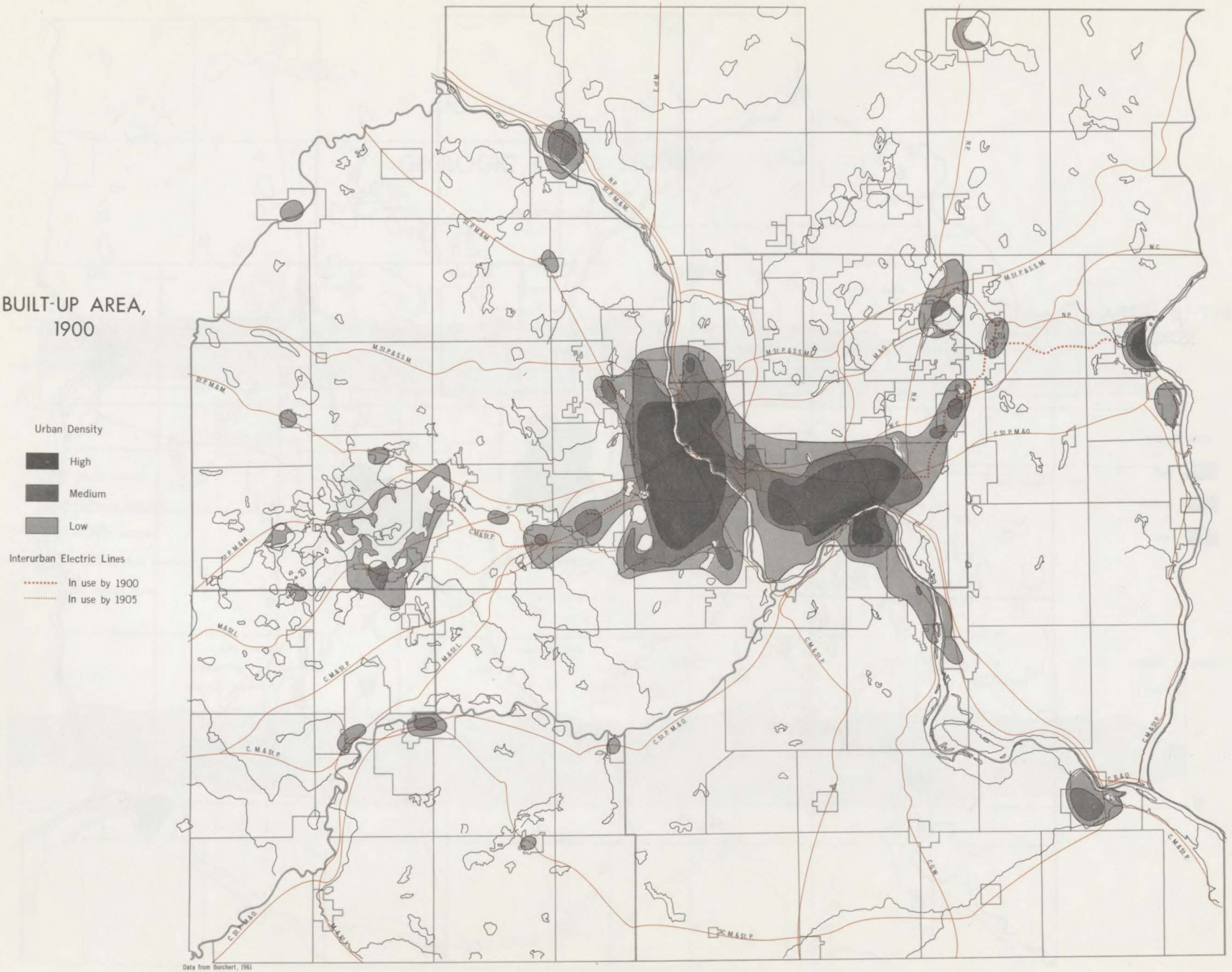
Data modified from Schwartz, 1936

BUILT-UP AREA, 1874

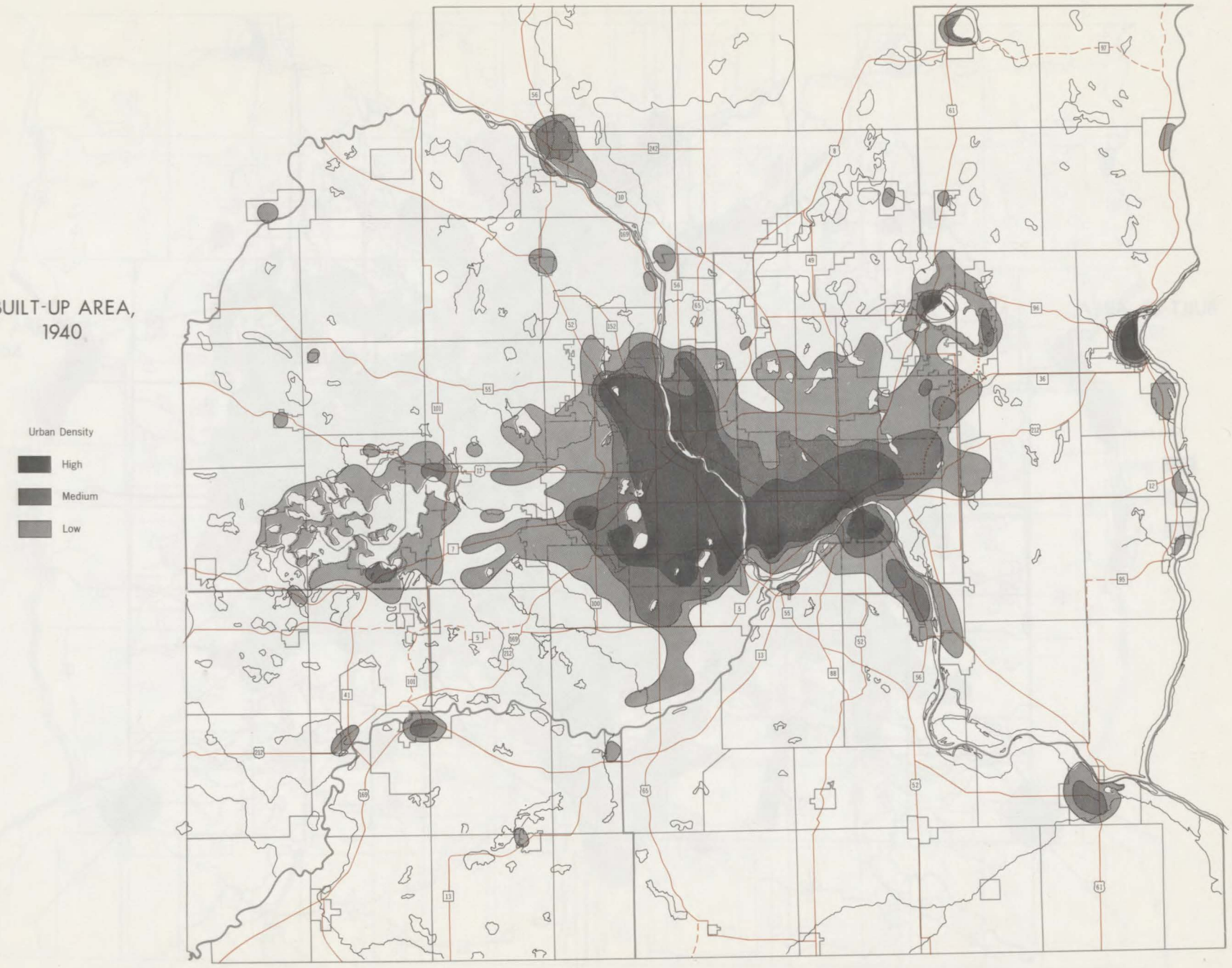


Data from Illustrated Historical Atlas of the State of Minnesota, 1874

BUILT-UP AREA, 1900

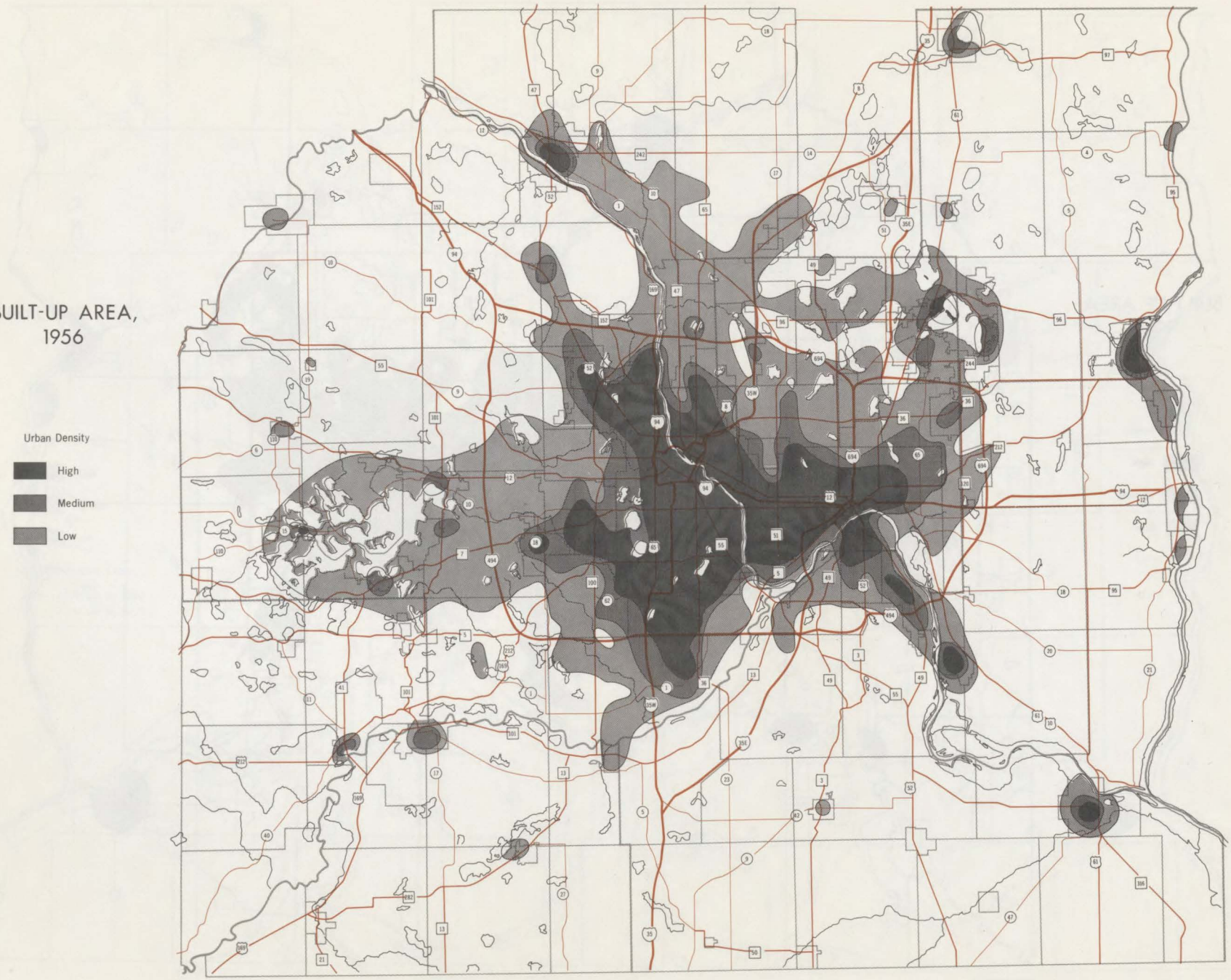


BUILT-UP AREA, 1940



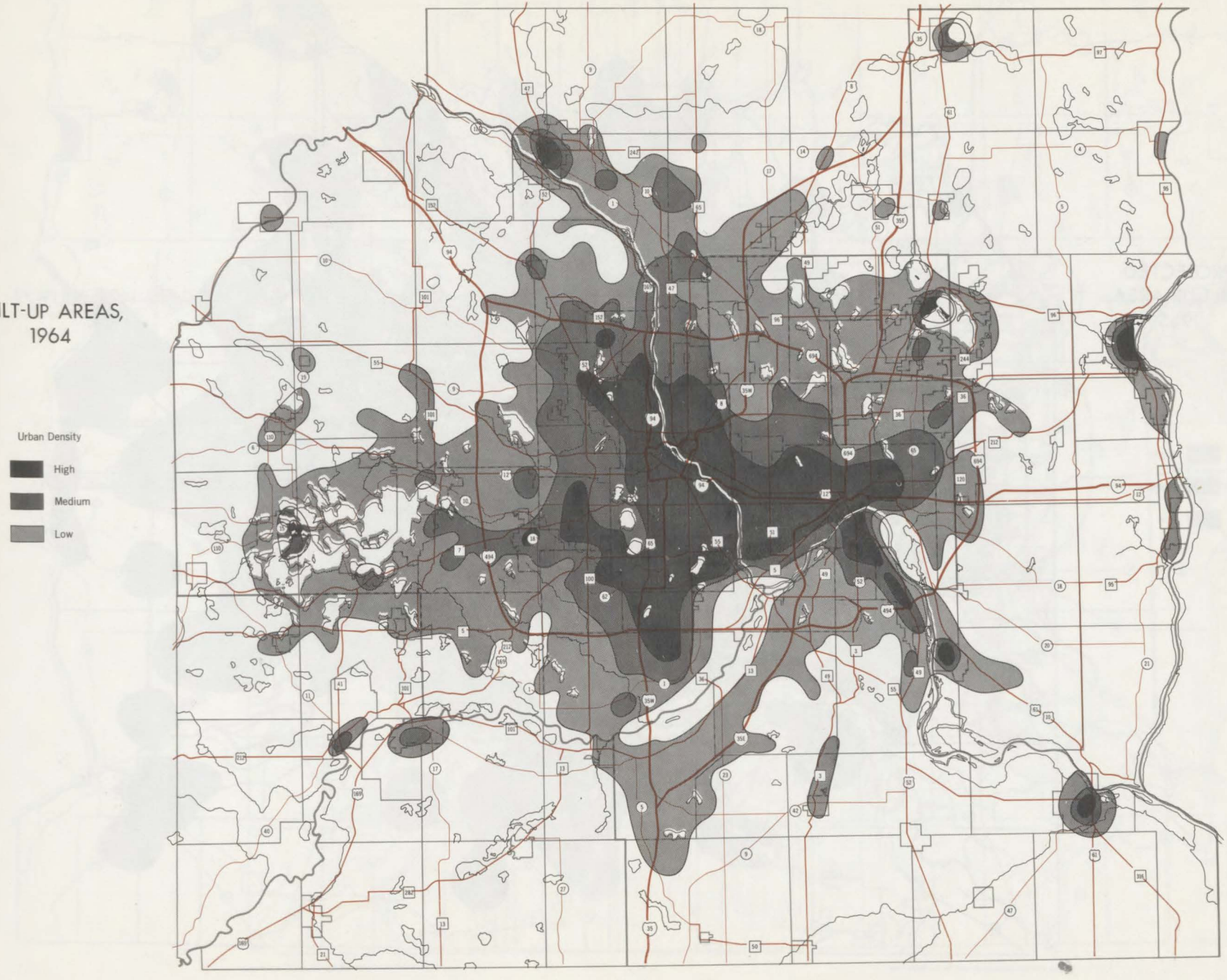
Data from Borchert, 1961

BUILT-UP AREA, 1956

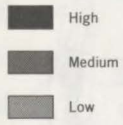


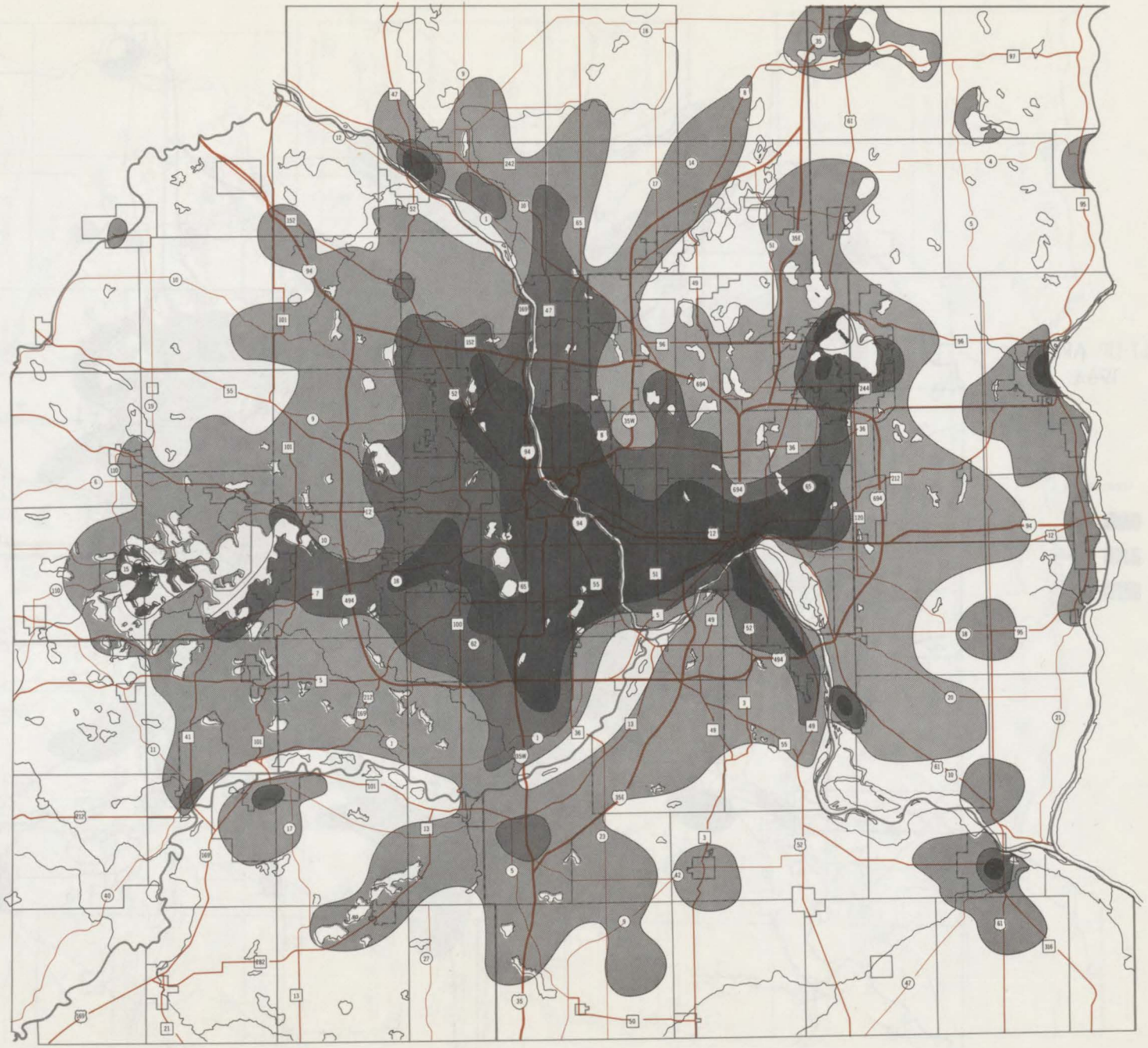
Data from Borchert, 1961

BUILT-UP AREAS, 1964



PROJECTED
BUILT-UP AREA,
1985

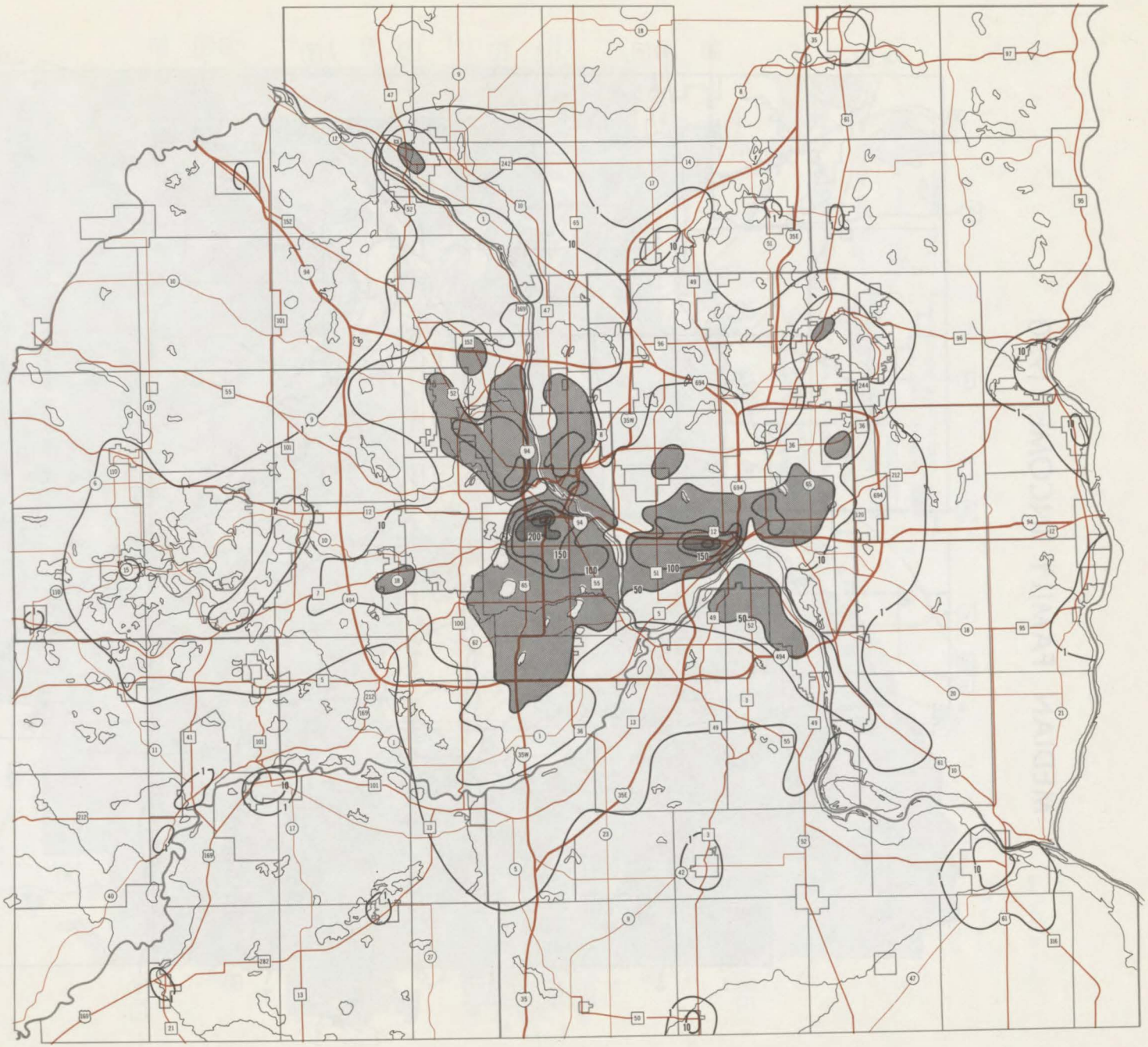




Data from Metropolitan Council, 1968, for low density fringe

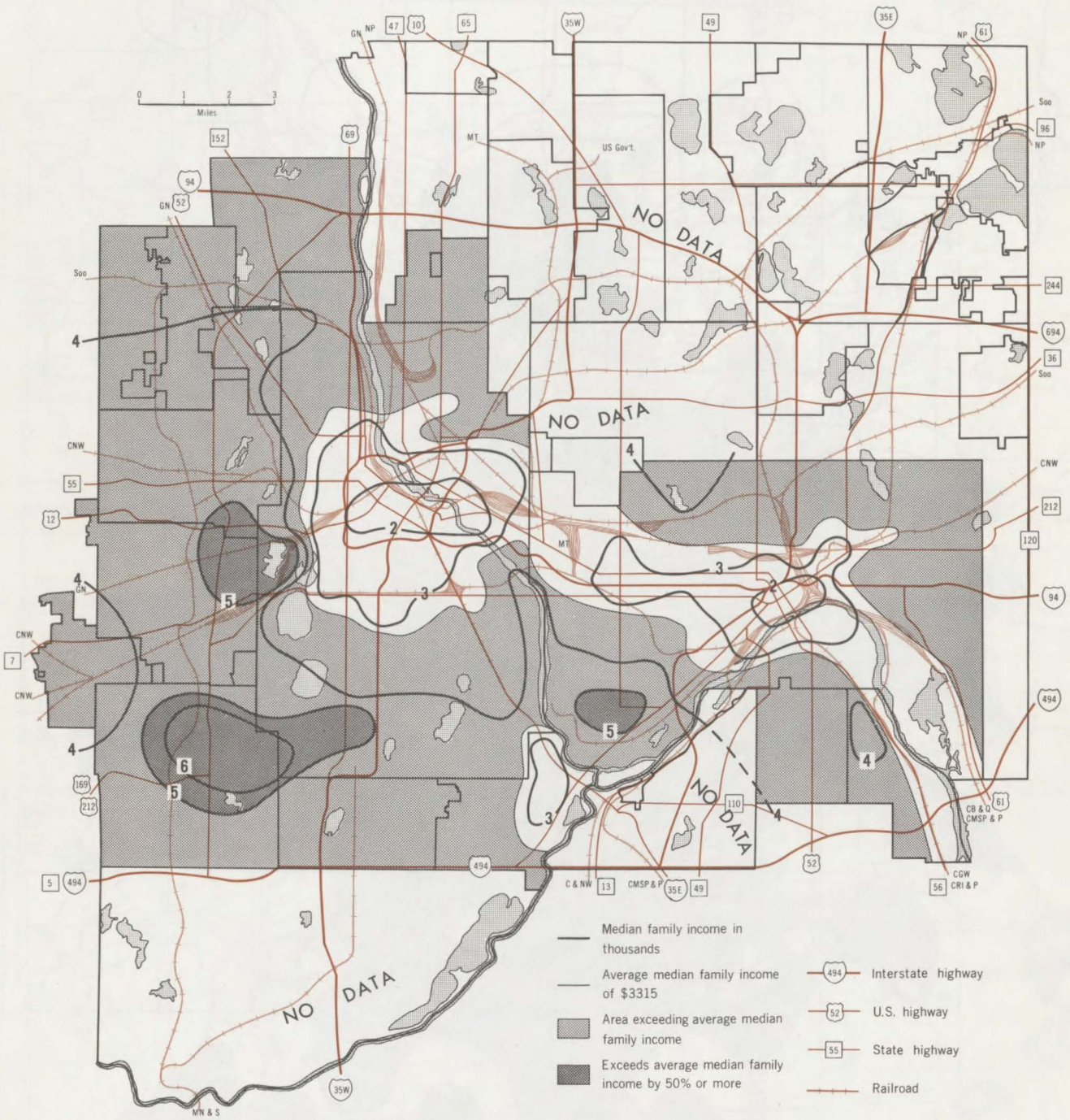
POPULATION DENSITY, 1960

—— Hundreds of people per square mile



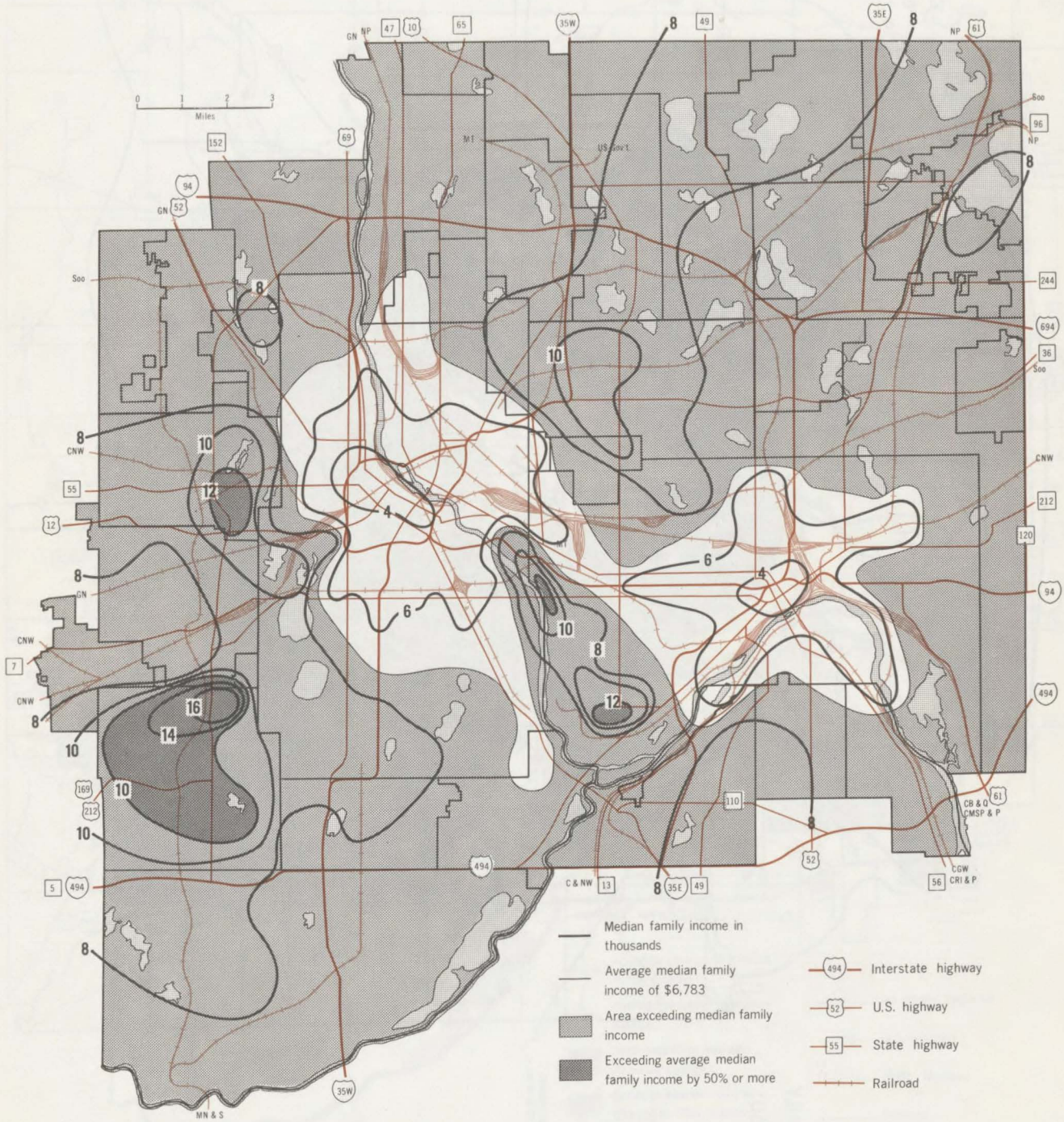
Data from U.S. Census, 1960, and Minnesota Highway Department, 1962

MEDIAN FAMILY INCOME, 1950



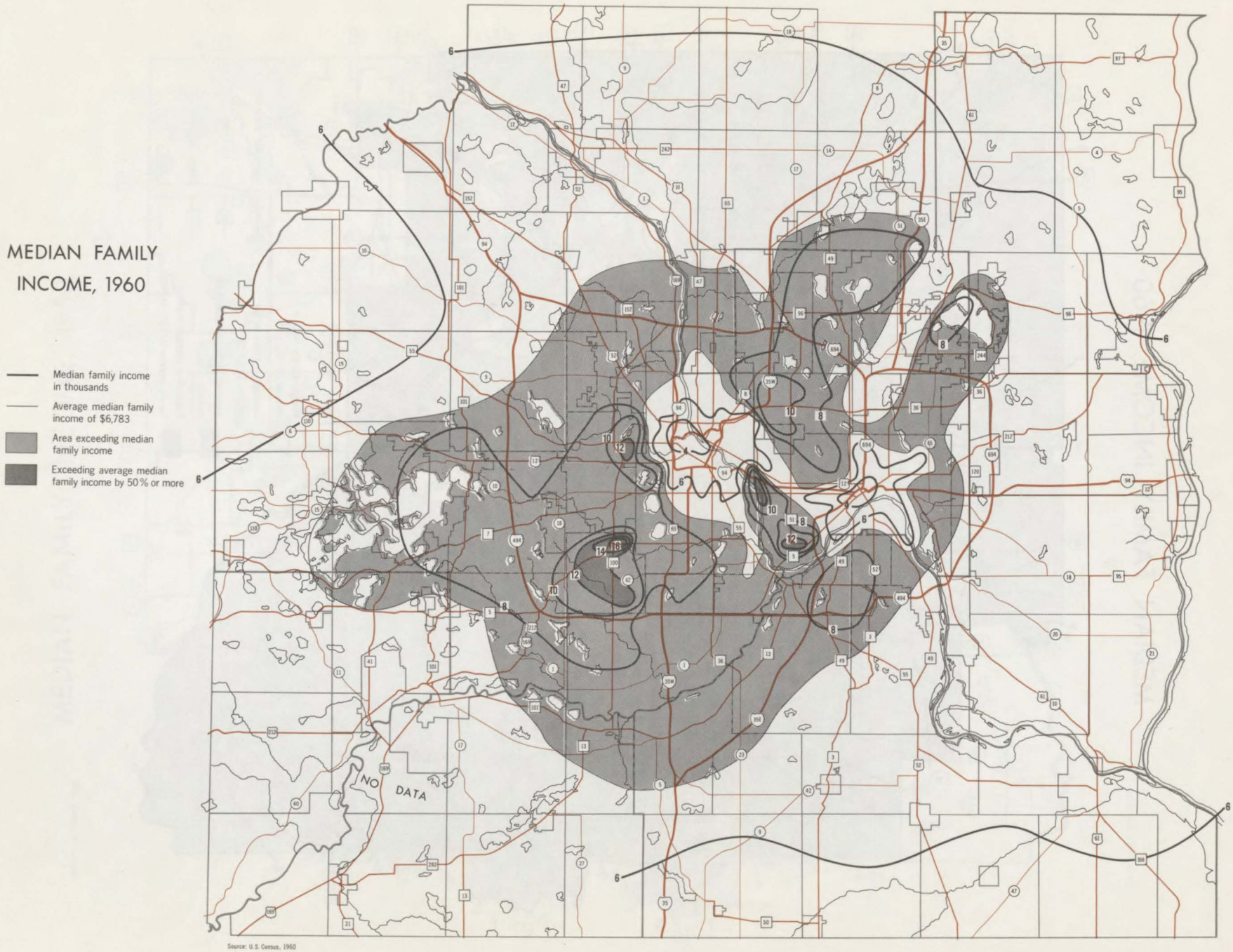
Source: U.S. Census, 1950

MEDIAN FAMILY INCOME, 1960



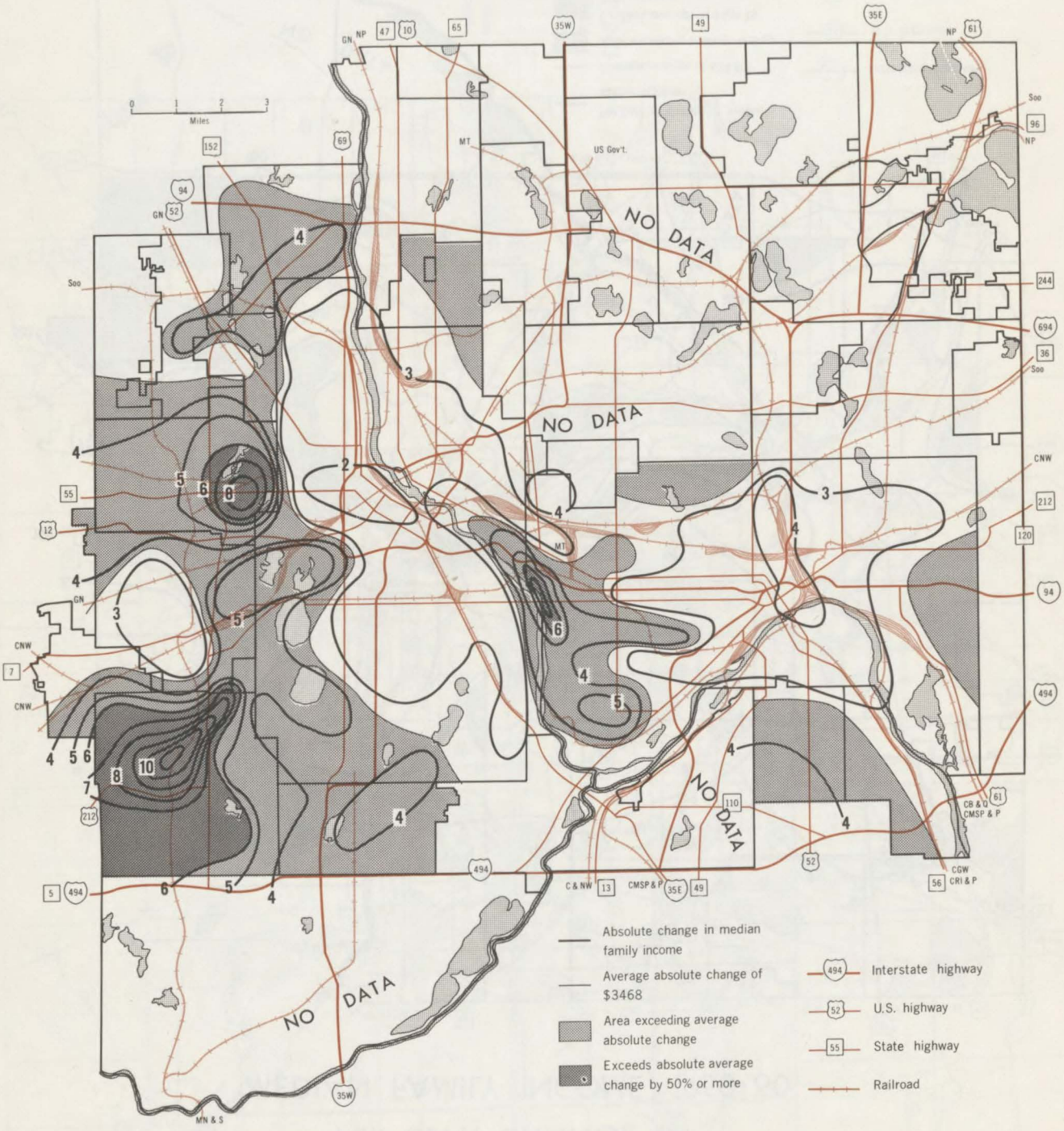
Source: U.S. Census, 1960

MEDIAN FAMILY INCOME, 1960



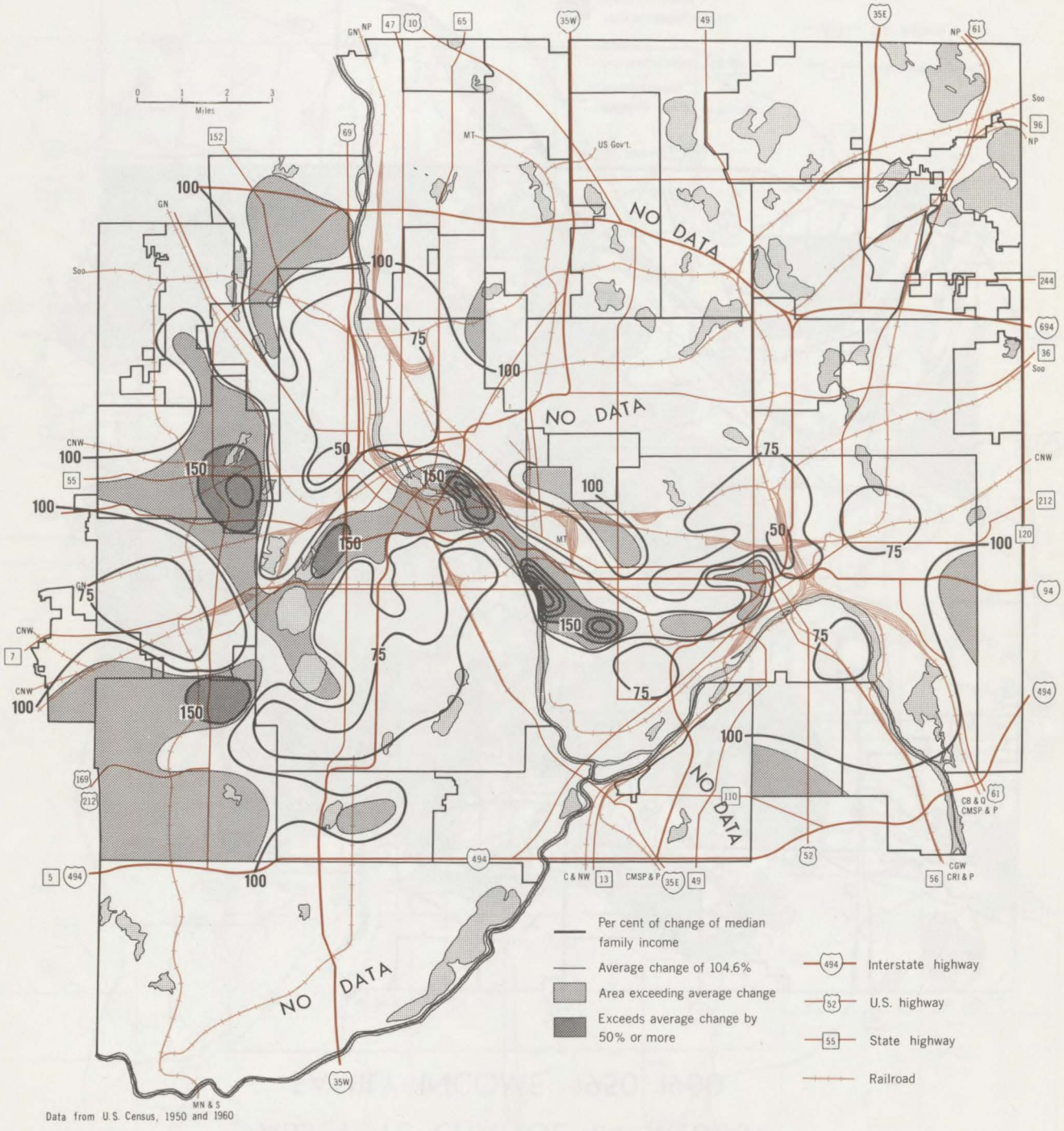
Source: U.S. Census, 1960

ABSOLUTE CHANGE IN MEDIAN FAMILY INCOME, 1950-1960



Source: U.S. Census, 1950 and 1960

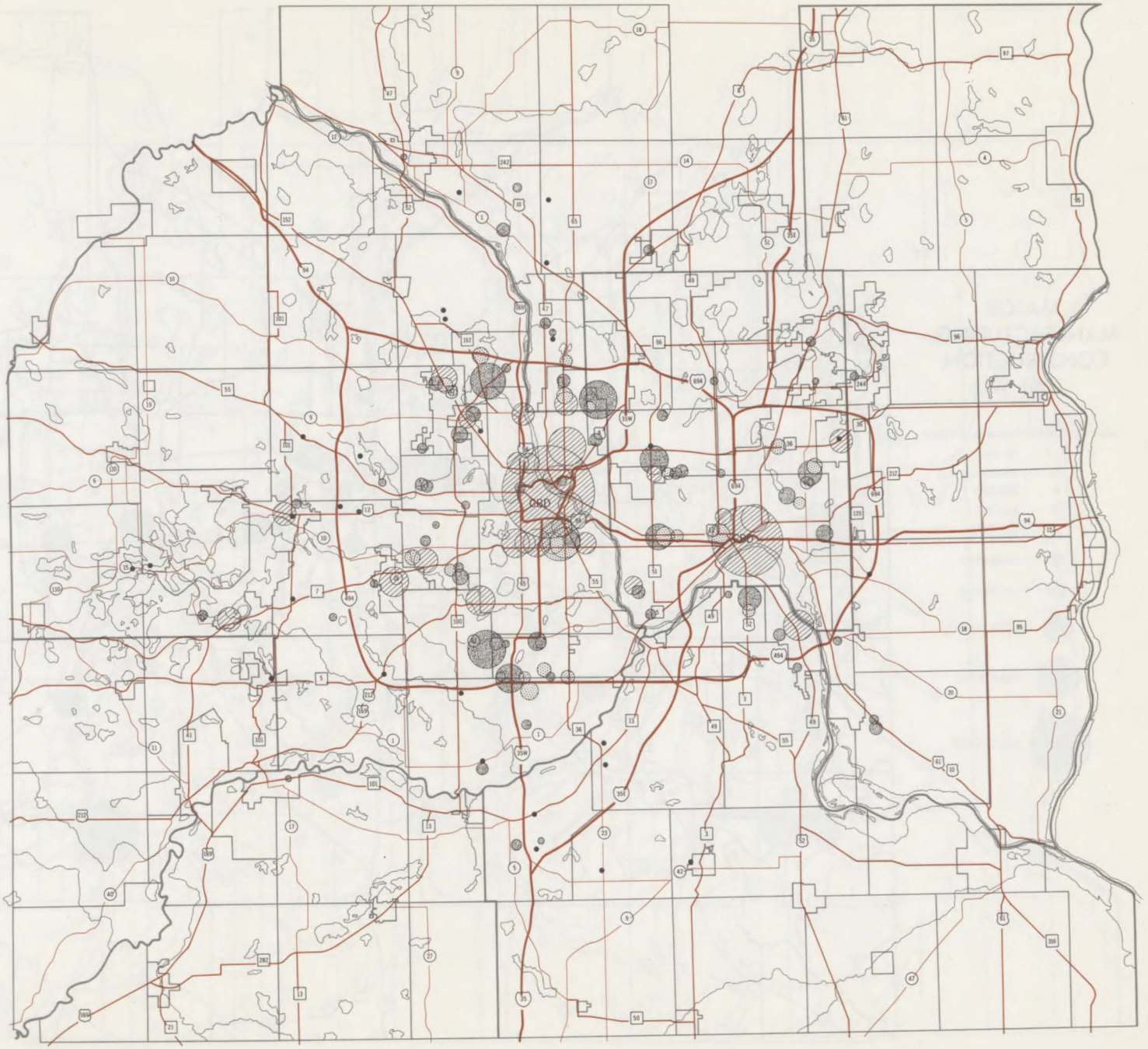
PER CENT CHANGE IN MEDIAN FAMILY INCOME, 1950-60



Data from U.S. Census, 1950 and 1960

MAJOR SHOPPING FACILITIES, 1964

- Shopping districts
- Shopping centers
- Discount department stores
- Proposed shopping facilities

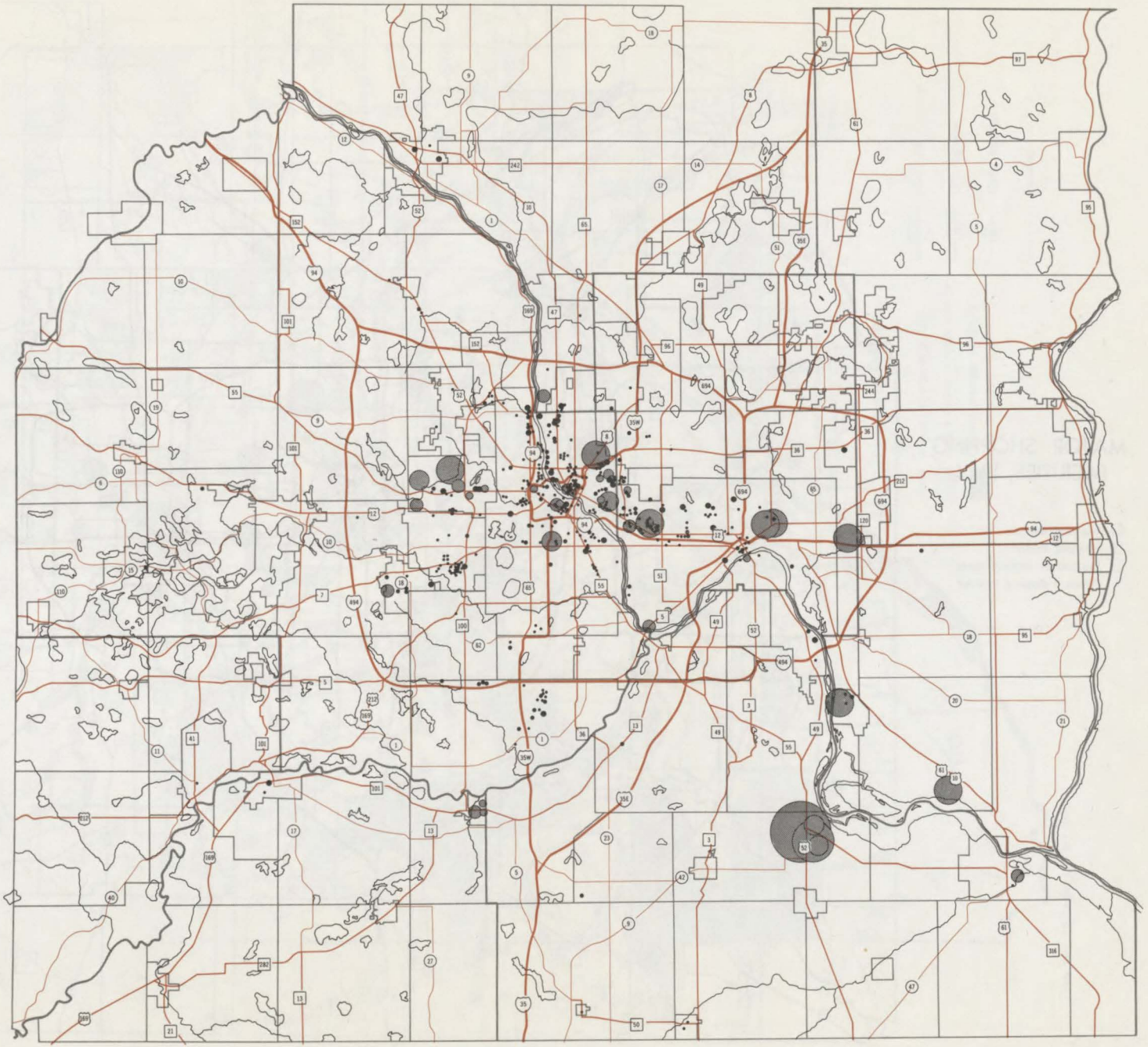


Data from Twin Cities Metropolitan Planning Commission, 1964

MAJOR MANUFACTURING CONSTRUCTION, 1946-59

Construction cost in thousands of dollars

- 25-100
- 100-250
- 250-500
- 500-750
- 750-1,000
- 1,000-1,500
- 1,500-2,000
- 2,000-7,000
- About 15,000
- About 25,000

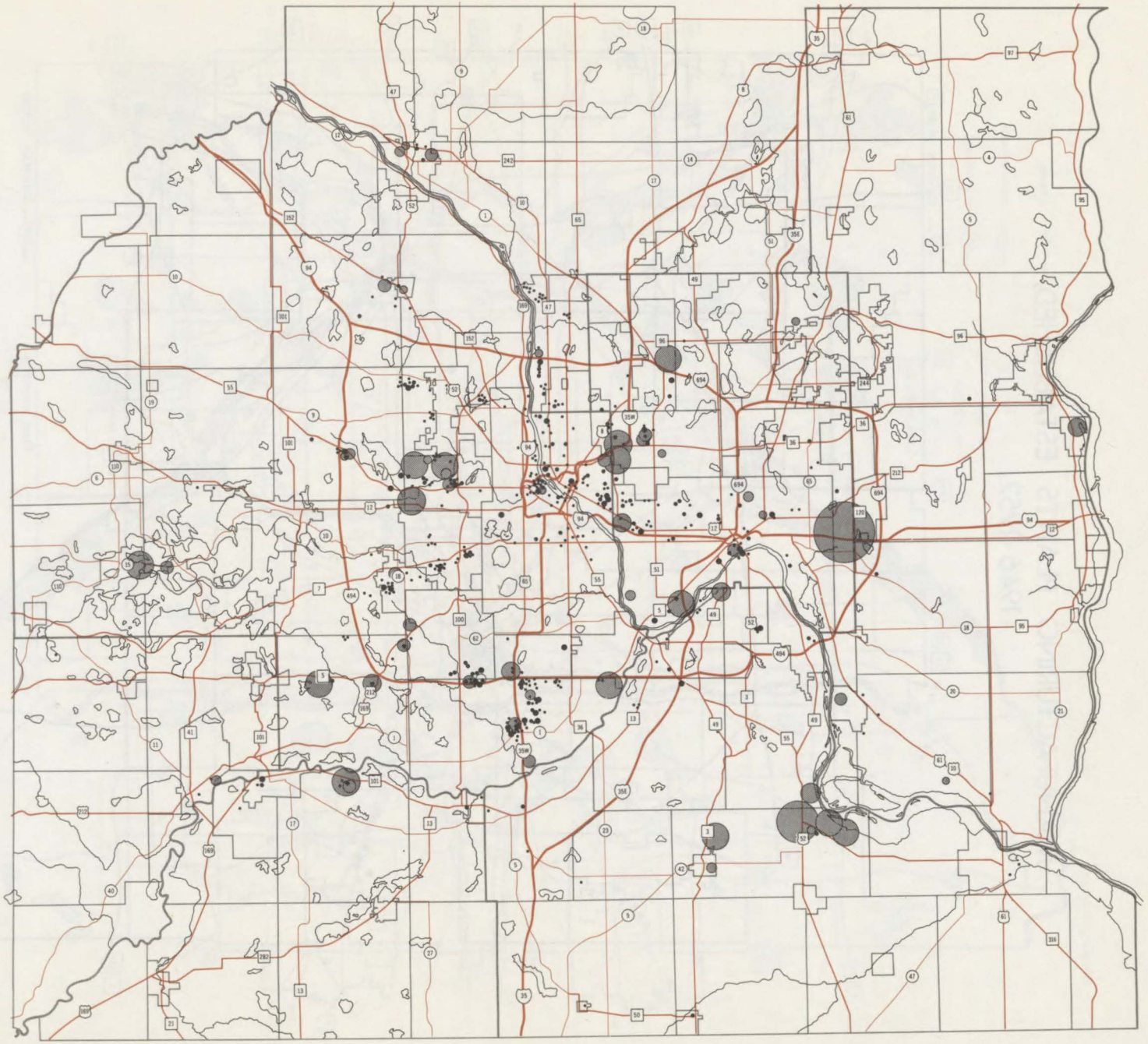


Data from Twin Cities Metropolitan Planning Commission, 1966

MAJOR MANUFACTURING CONSTRUCTION, 1960-65

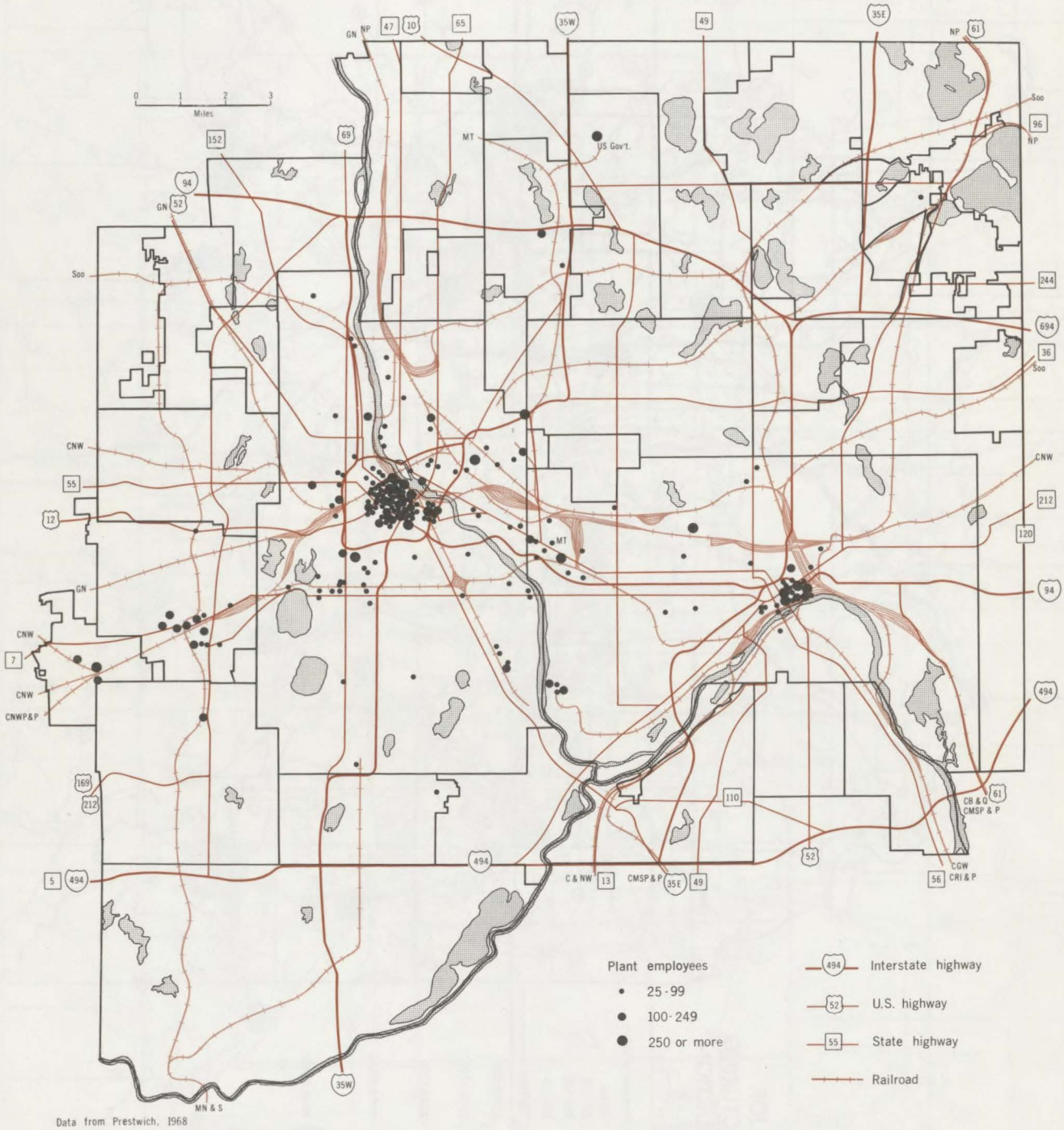
Construction cost in thousands of dollars

- 25-100
- 100-250
- 250-500
- 500-750
- 750-1,000
- 1,000-1,500
- 1,500-2,000
- 2,000-7,000
- About 15,000
- About 25,000



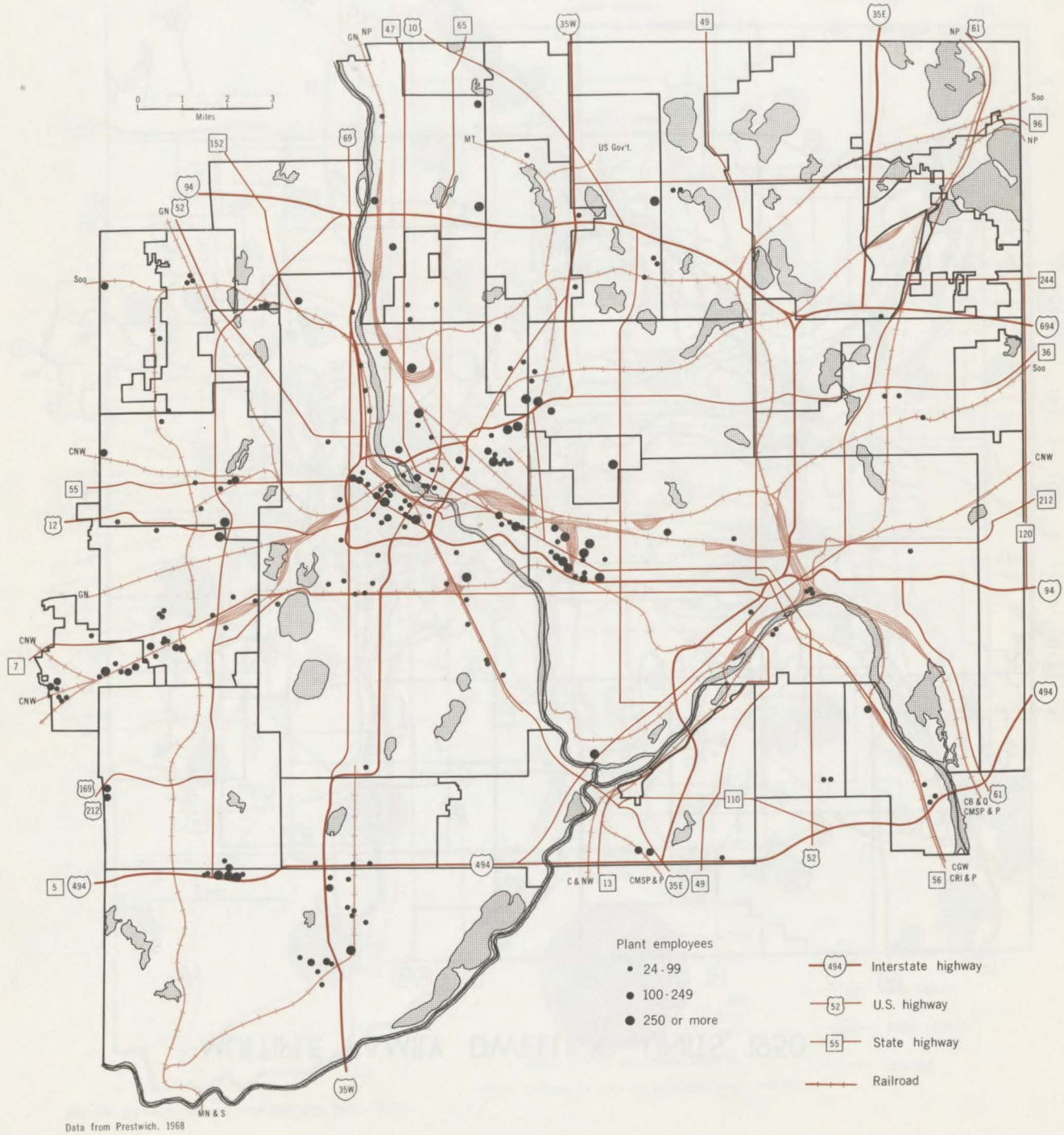
Data from Twin Cities Metropolitan Planning Commission, 1966

MANUFACTURING PLANTS ESTABLISHED, 1946-1952



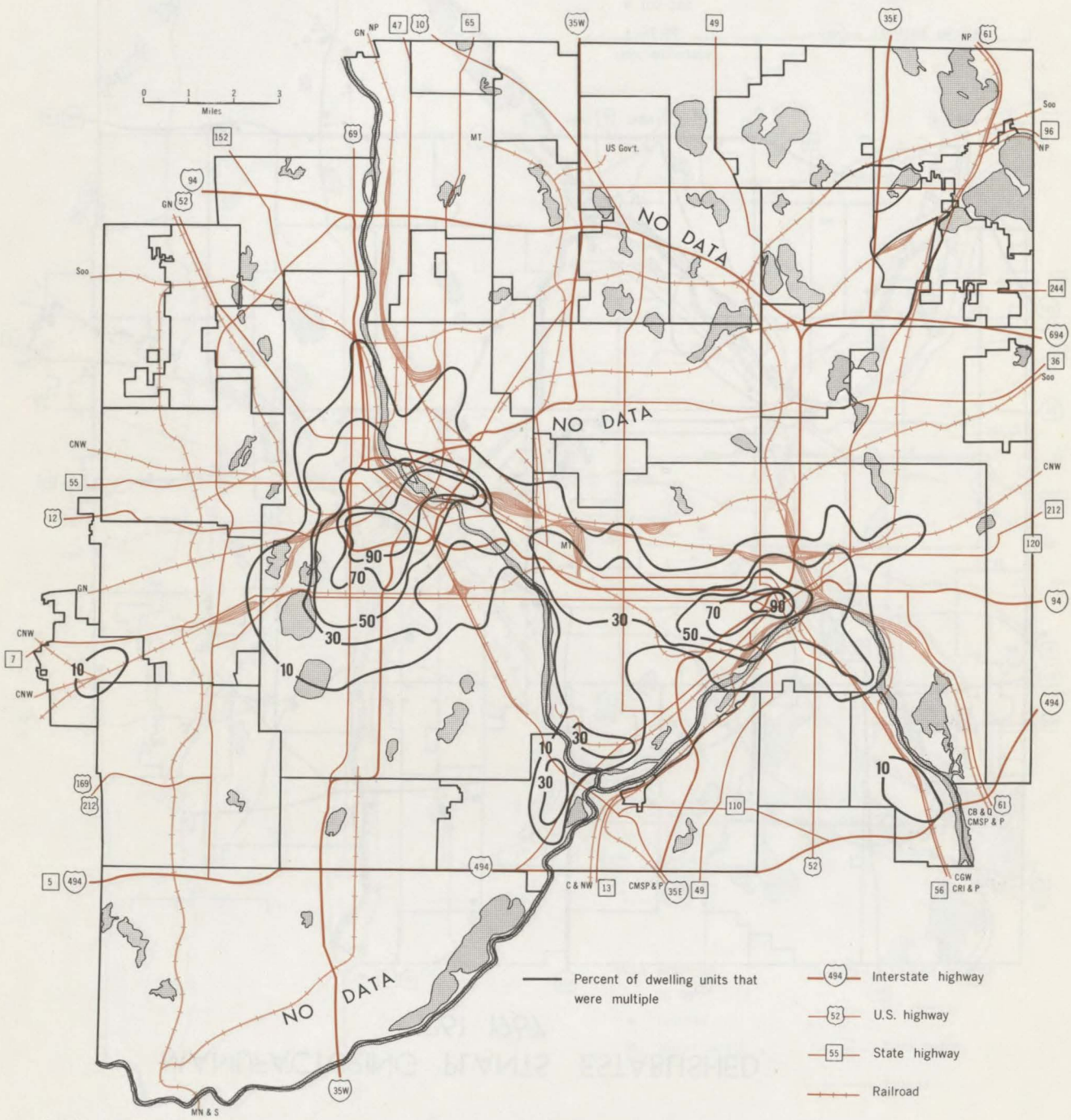
Data from Prestwich, 1968

MANUFACTURING PLANTS ESTABLISHED, 1961 - 1967



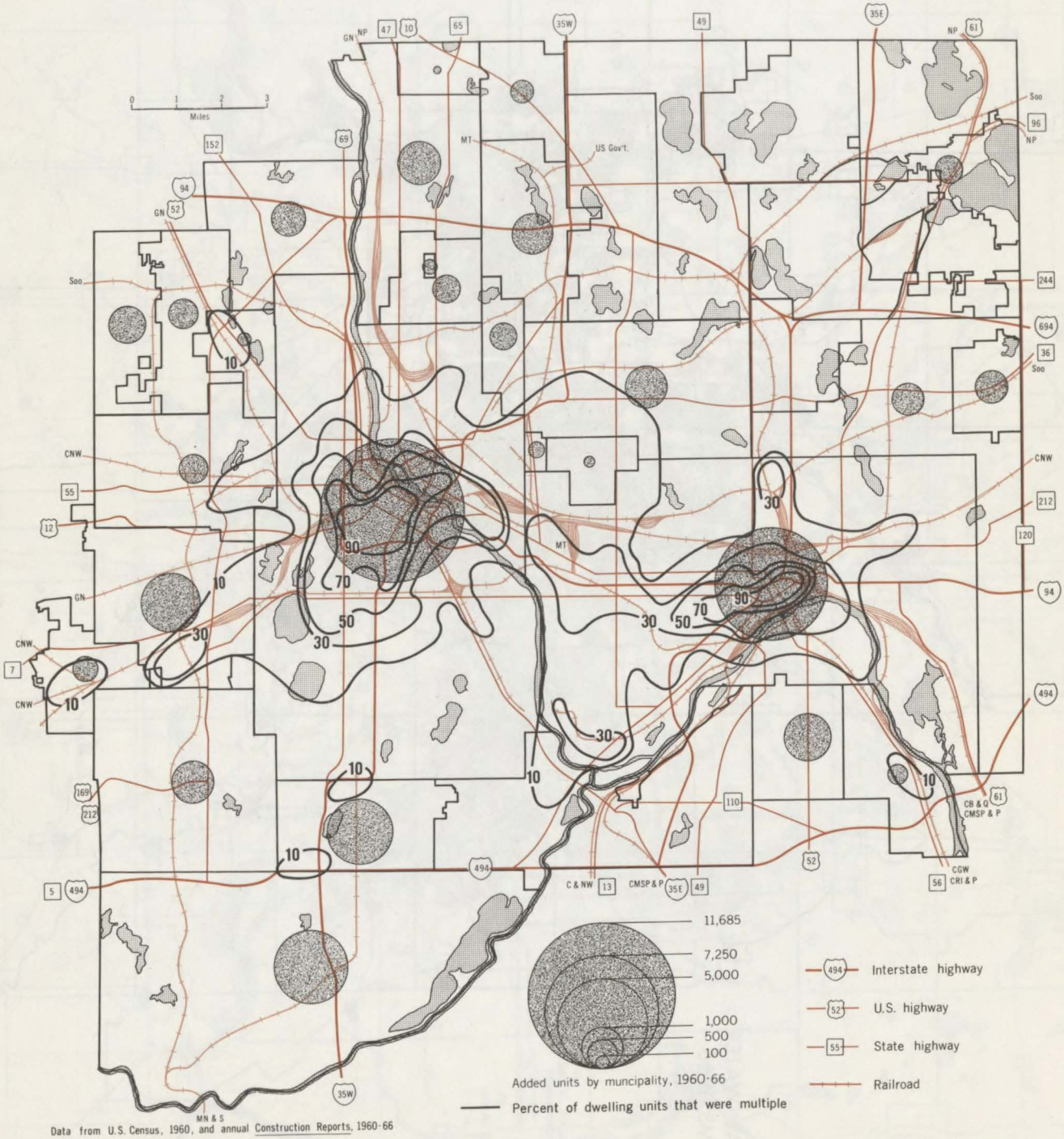
Data from Prestwich, 1968

MULTIPLE FAMILY DWELLING UNITS, 1950



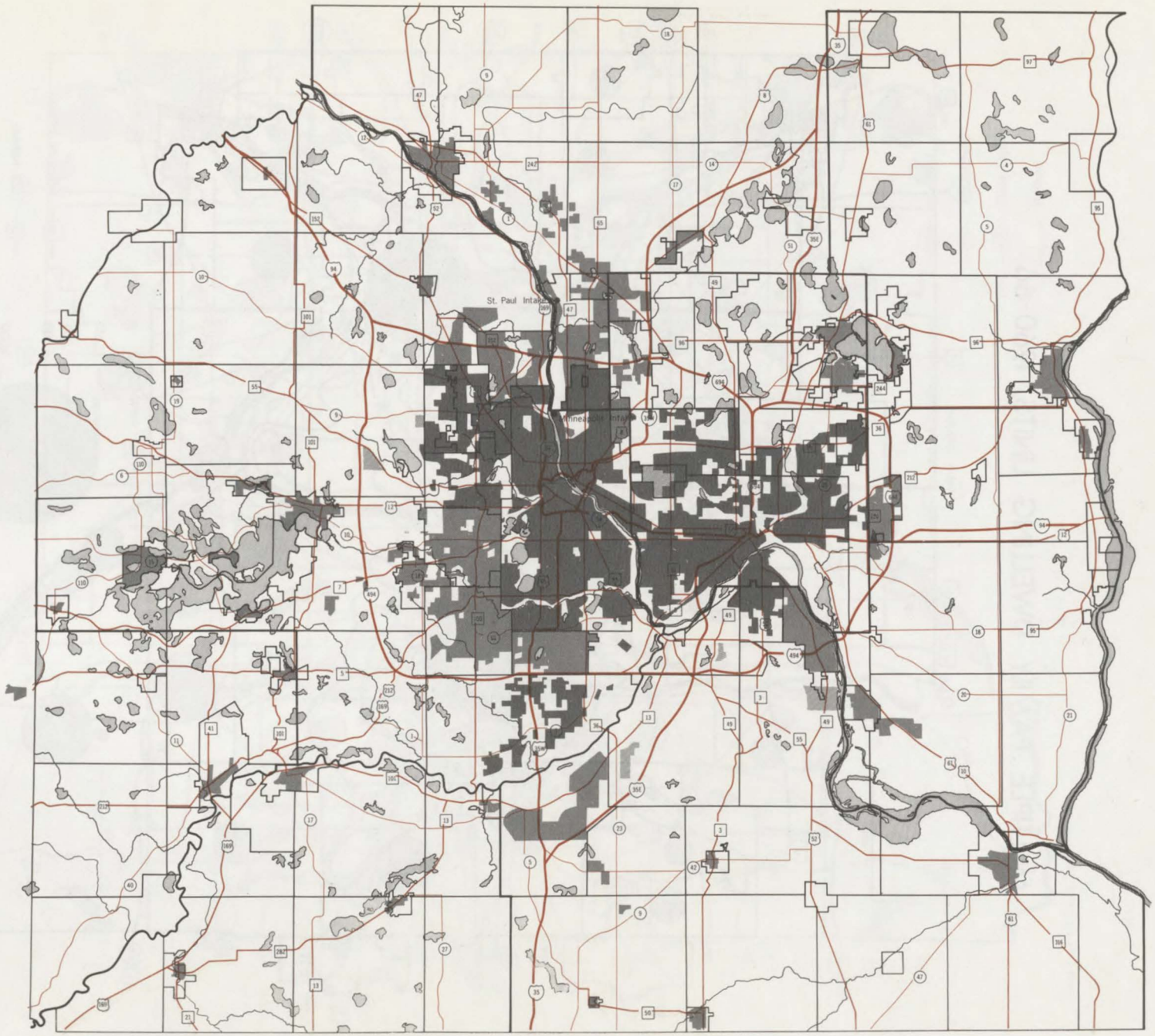
Data from U.S. Census, 1950

MULTIPLE FAMILY DWELLING UNITS, 1960-66



Data from U.S. Census, 1960, and annual Construction Reports, 1960-66

CENTRAL WATER SYSTEMS, 1966



Minneapolis, St. Paul and connected systems

Other municpal systems

Private systems

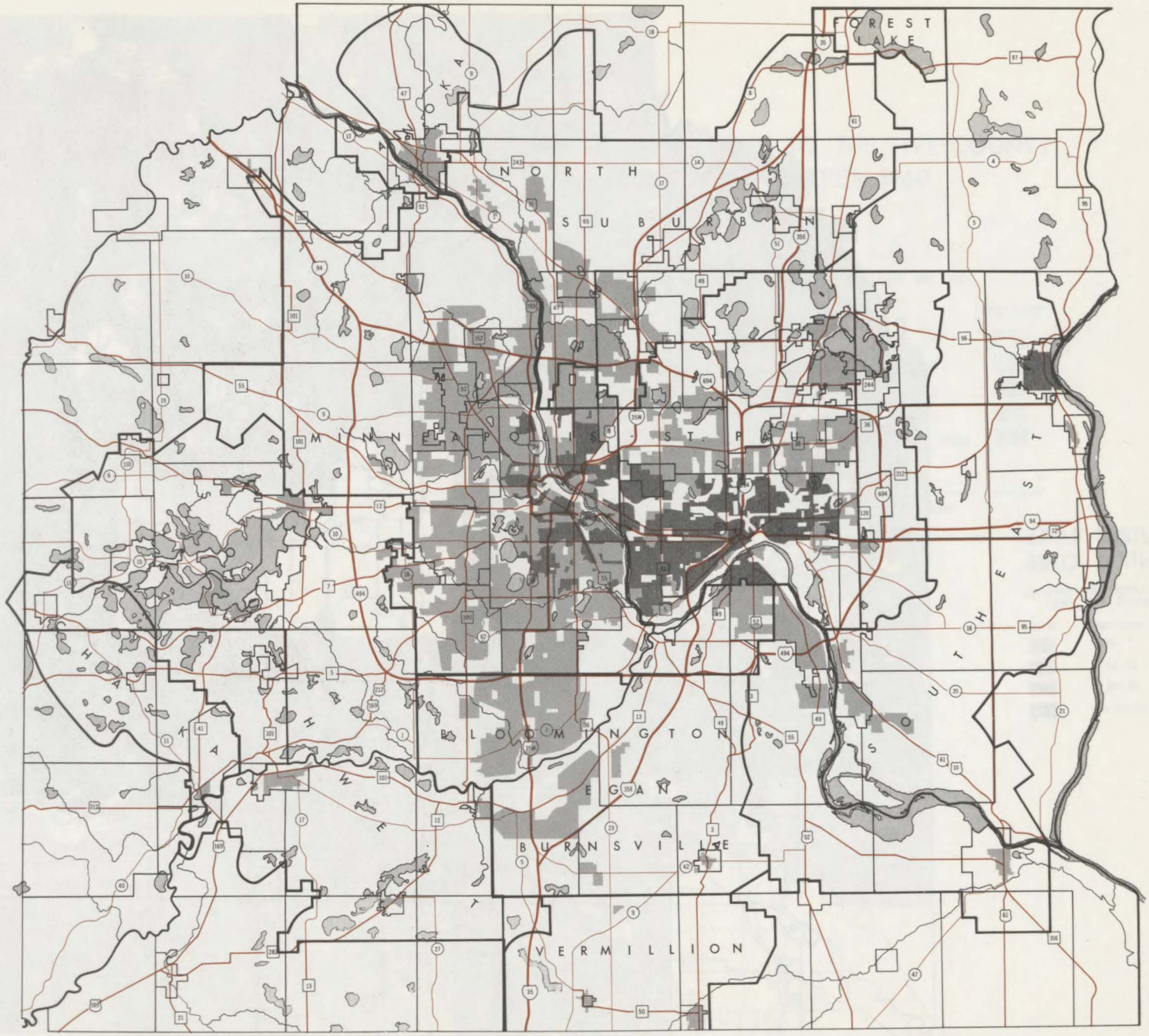
Data from Twin Cities Metropolitan Planning Commission, 1966

CENTRAL SEWERAGE SYSTEMS, 1966

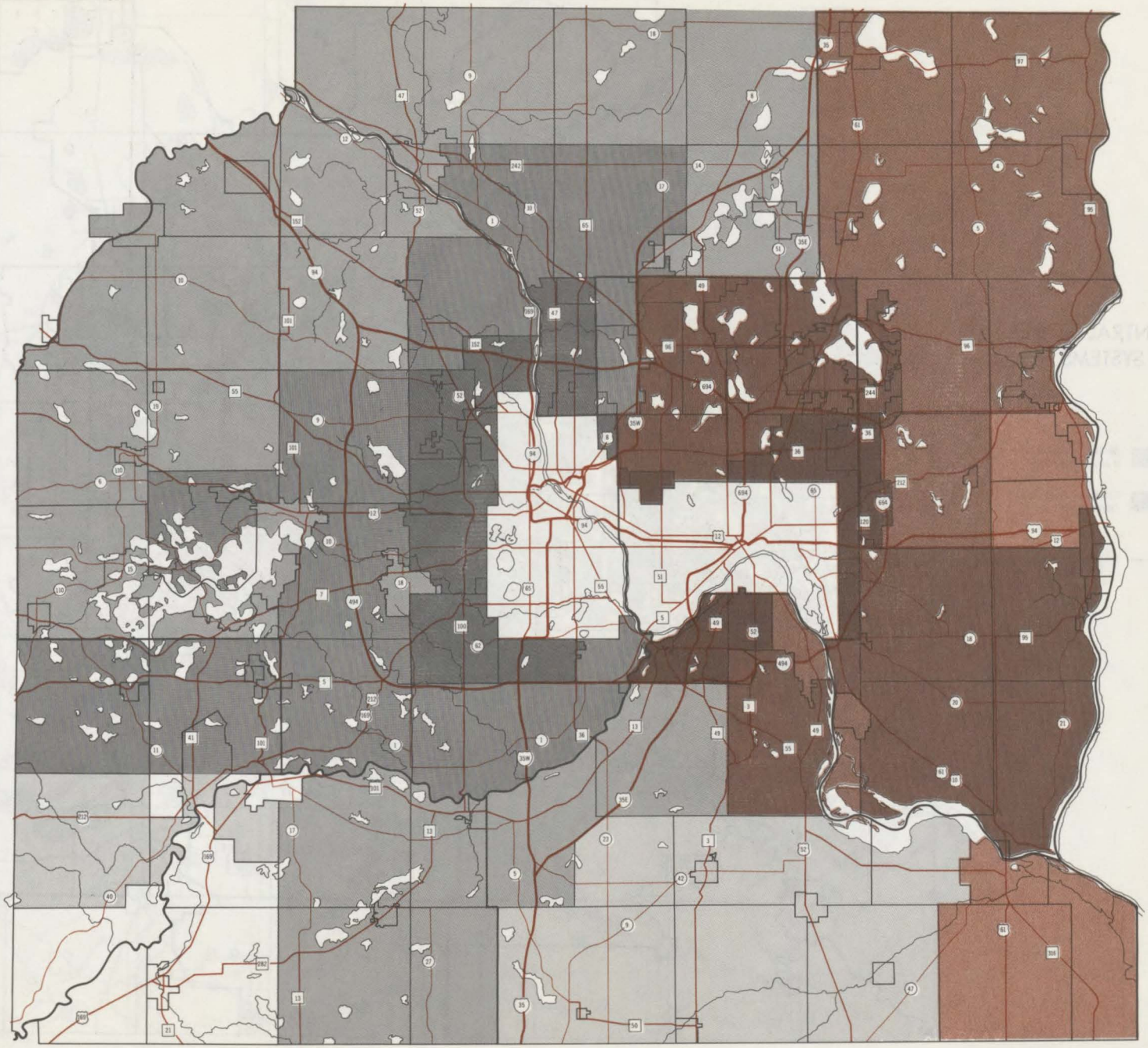
Sanitary sewer (storm sewer, if any, is separate)

Combined sanitary and storm sewer

Proposed sewerage regions



Data from Twin Cities Metropolitan Planning Commission, 1966, and Metropolitan Council, 1968

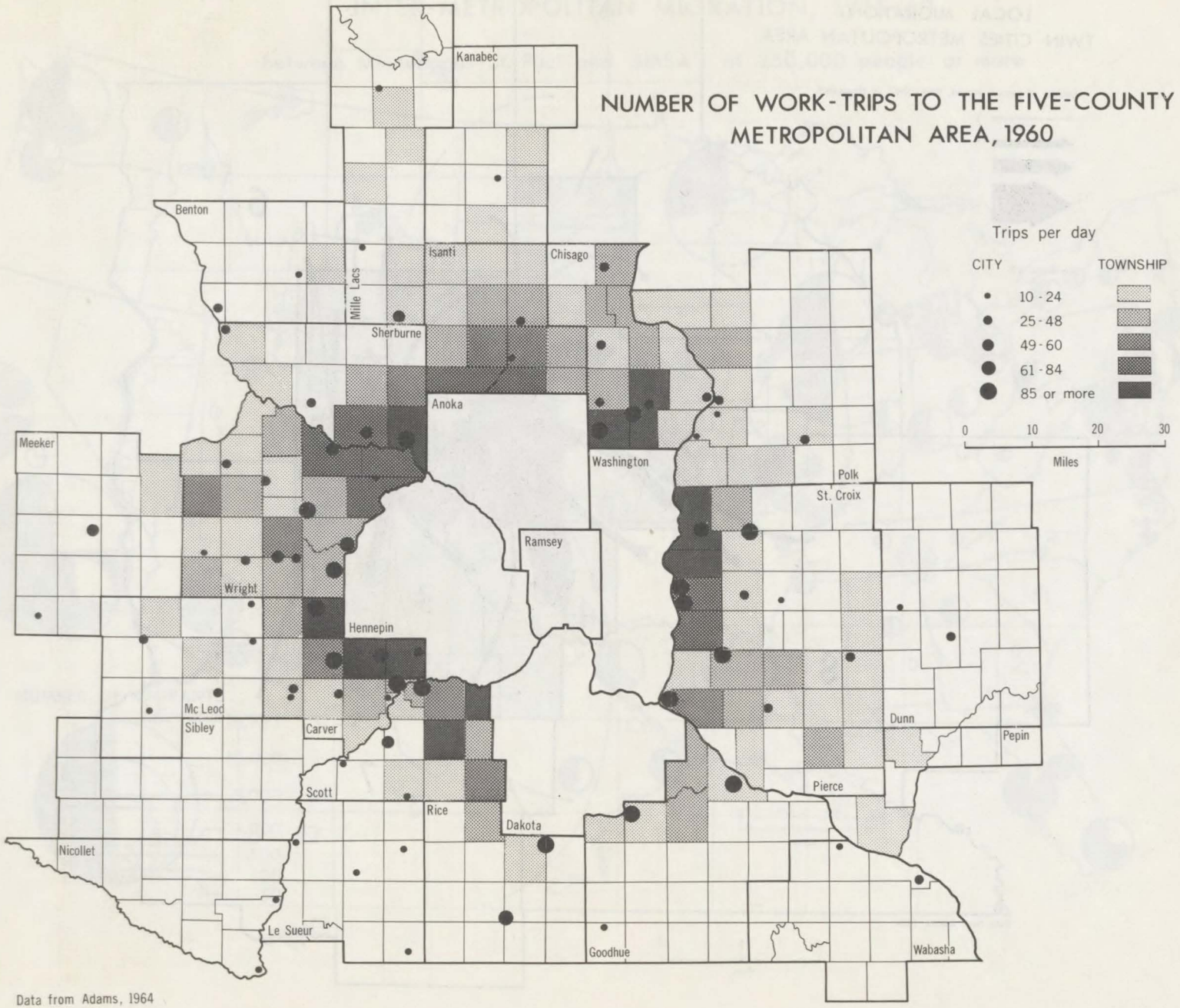


COMMUTING RATES TO CENTRAL CITIES

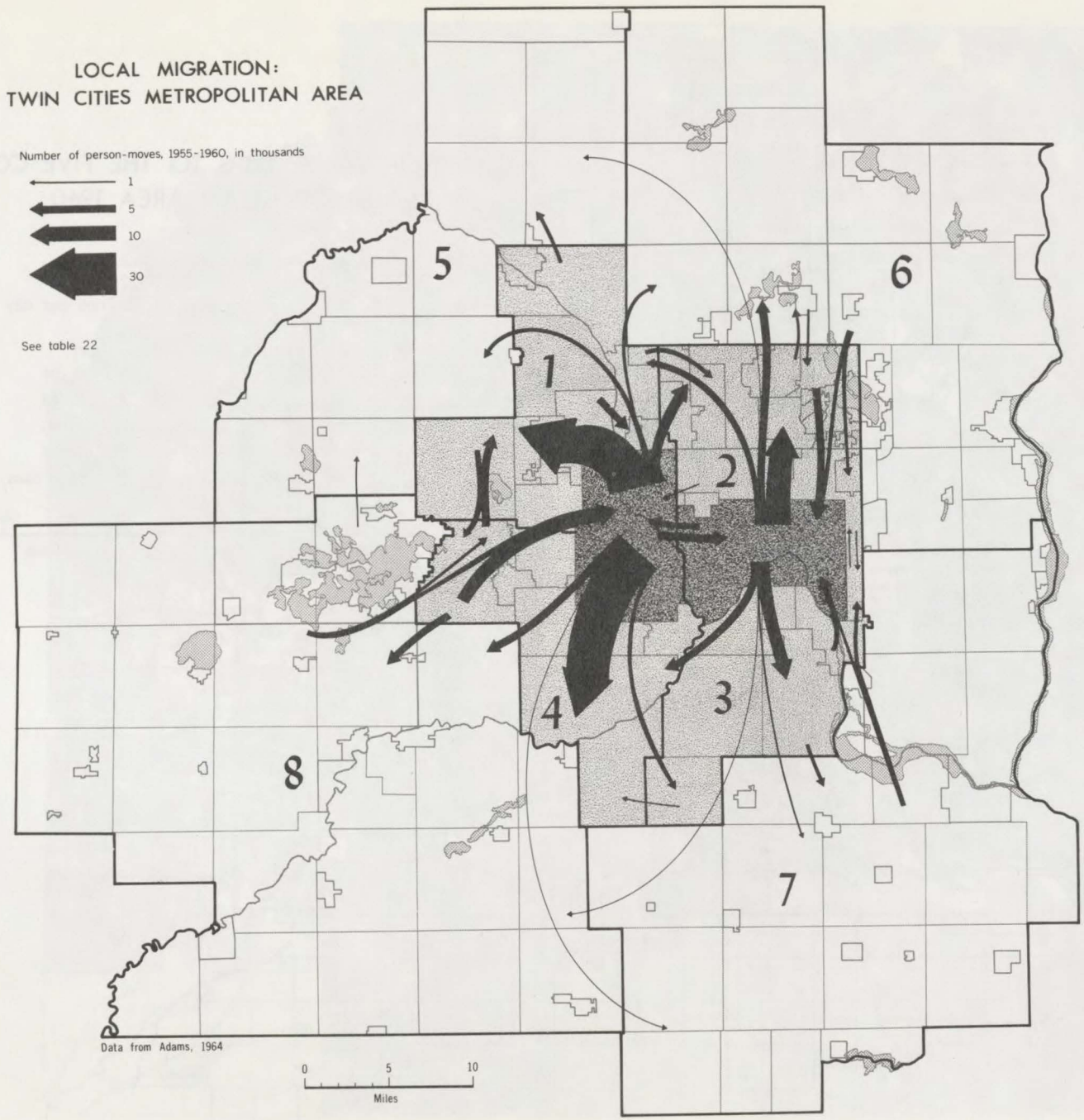
PERCENTAGE OF LABOR FORCE EMPLOYED IN MINNEAPOLIS OR ST. PAUL

Minneapolis	percentage	St. Paul
	5 - 14	
	15 - 34	
	35 - 54	
	55 and over	

Data from Adams, 1964

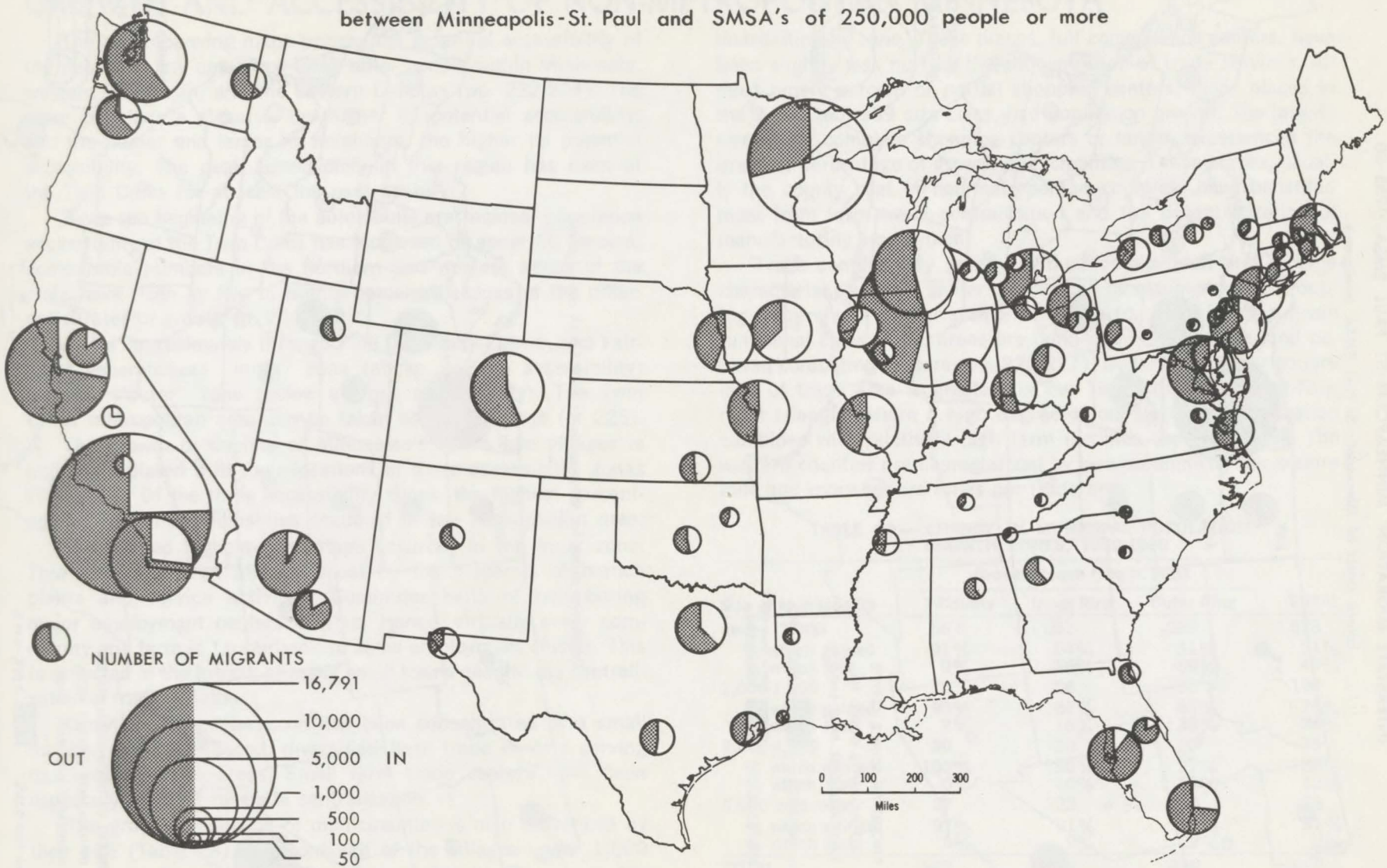


Data from Adams, 1964


LOCAL MIGRATION:
TWIN CITIES METROPOLITAN AREA
Number of person-moves, 1955-1960, in thousands
1
5
10
30
See table 22
5
6
1
2
4
3
8
7
Data from Adams, 1964
0
5
10
Miles

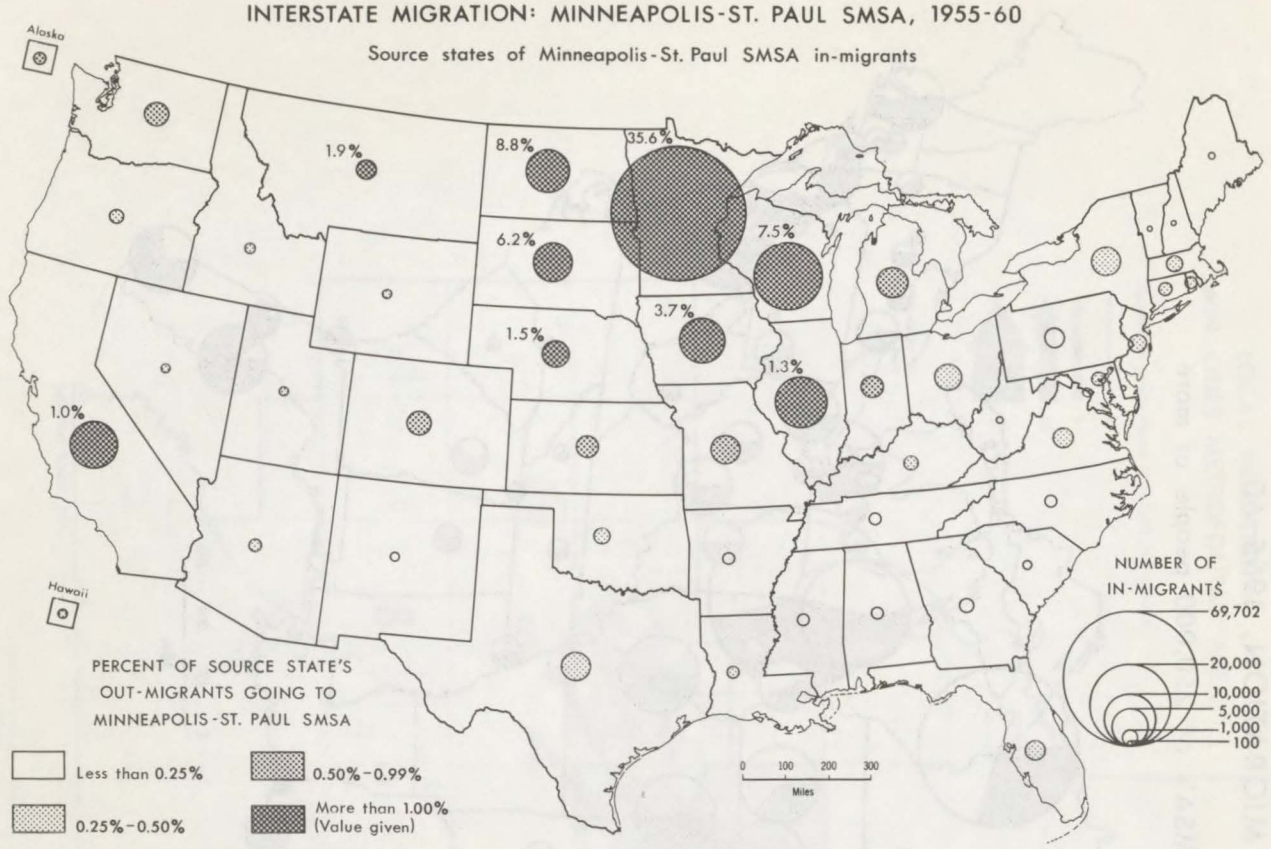
INTER-METROPOLITAN MIGRATION, 1955-60

between Minneapolis-St. Paul and SMSA's of 250,000 people or more

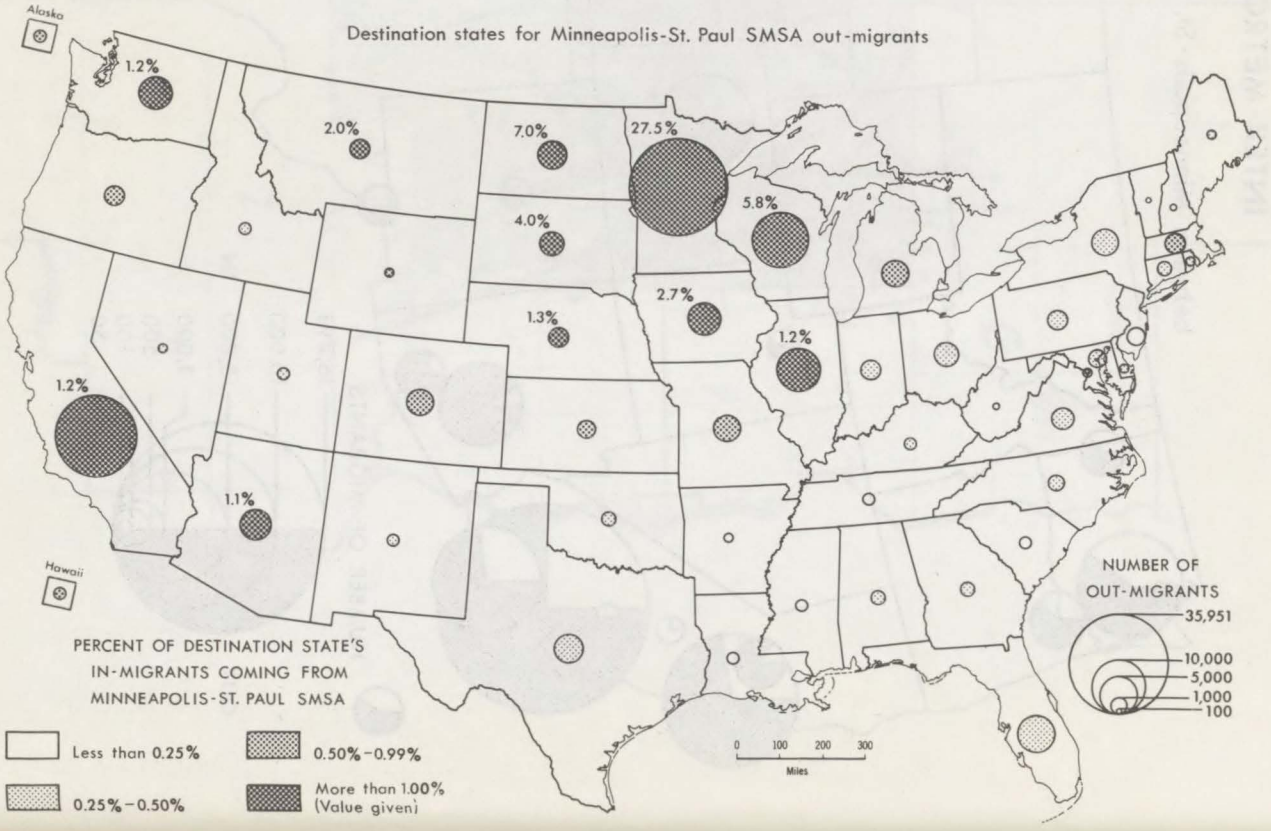


INTERSTATE MIGRATION: MINNEAPOLIS-ST. PAUL SMSA, 1955-60

Source states of Minneapolis-St. Paul SMSA in-migrants



Destination states for Minneapolis-St. Paul SMSA out-migrants



Chapter 12

GROWTH AND ACCESSIBILITY OF NON-METROPOLITAN MINNESOTA

The accompanying maps portray the potential accessibility of the people at any one place to all other people within Minnesota, western Wisconsin, and the eastern Dakotas (pp. 222-224). The more populous a place is, the higher its potential accessibility; and the nearer and larger its neighbors, the higher its potential accessibility. The peak accessibility in this region has been at the Twin Cities for at least the past century.

Since the beginning of the automobile era regional population accessibility at the Twin Cities has increased by about 50 percent; comparable numbers in the northern and western edges of the state have risen by five to twenty percent, because of the differential rates of growth (p. 224).

A line approximately through Pine City, Sauk Centre, and Fairmont separates as "inner" zone (above average accessibility) from an "outer" zone (below average accessibility). The Twin Cities metropolitan area can be taken as a third zone (p. 225).

The growth or decline of Minnesota's towns and villages is highly correlated with their locations in these accessibility zones (Table 23). Of the three accessibility zones, the highest percentage of growth municipalities occurred in the Metropolitan area.

The second highest percentage occurred in the inner zone. This zone has been affected most by the dispersal of branch plants and service activities. Commuter belts of neighboring major employment centers overlap. Hence, virtually every community and farm is "suburban" to some employment cluster. This is reflected in the growth of many small towns despite the centralization of trade activities.

Growth in the outer zone has been concentrated at a small number of widely-spaced, diversified farm trade centers serving multi-county trade areas. Small farm trade centers have been especially hard hit by trade centralization.

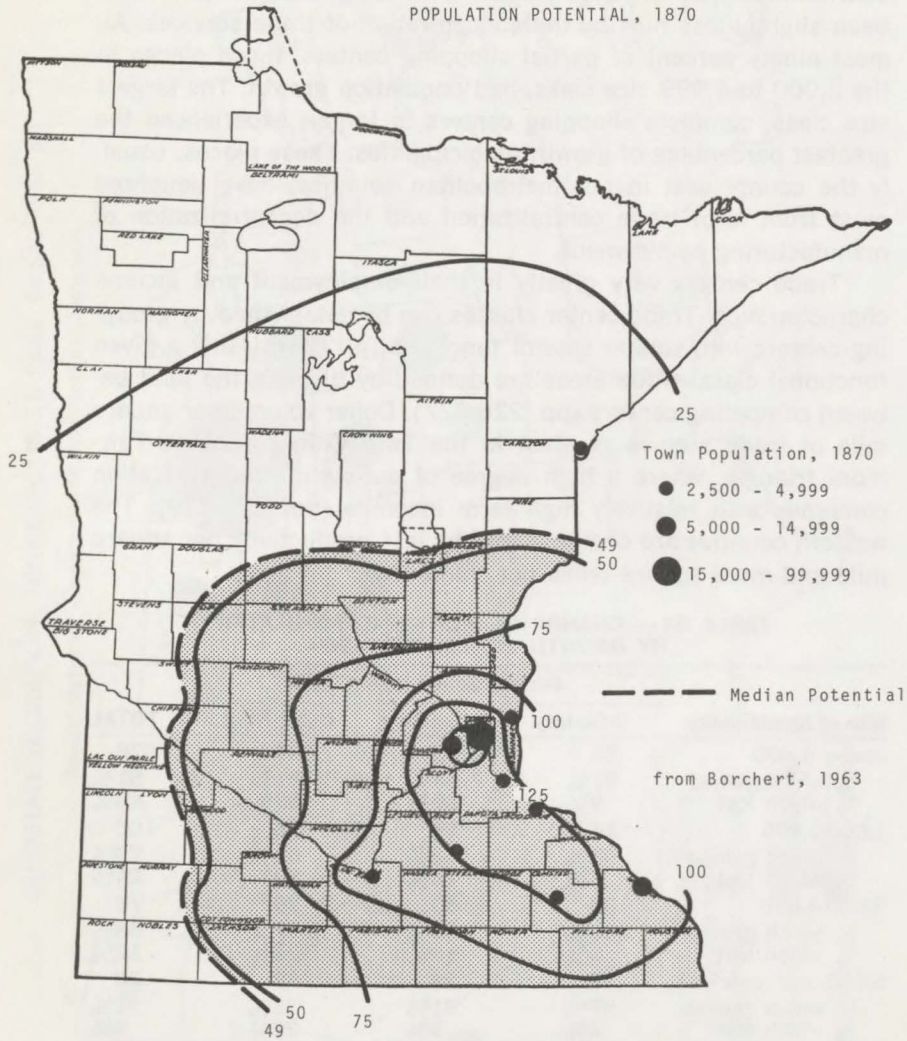
The growth or decline of municipalities is also influenced by their size (Table 23). Only one-half of the villages under 1,000 people grew during the 1950s. Most of this growth was in the 7-county and the inner zones. Almost three-fourths of the places in the 1,000 to 1,999 population class grew; again with the same distribution by zone. These places, full convenience centers, have been slightly less hurt by the concentration of trade services. Almost ninety percent of partial shopping centers, those places in the 2,000 to 4,999 size class, had population growth. The largest size class, complete shopping centers or larger, experienced the greatest percentage of growth municipalities. These places, usually the county seat in non-metropolitan counties, have benefited most from farm trade centralization and the decentralization of manufacturing employment.

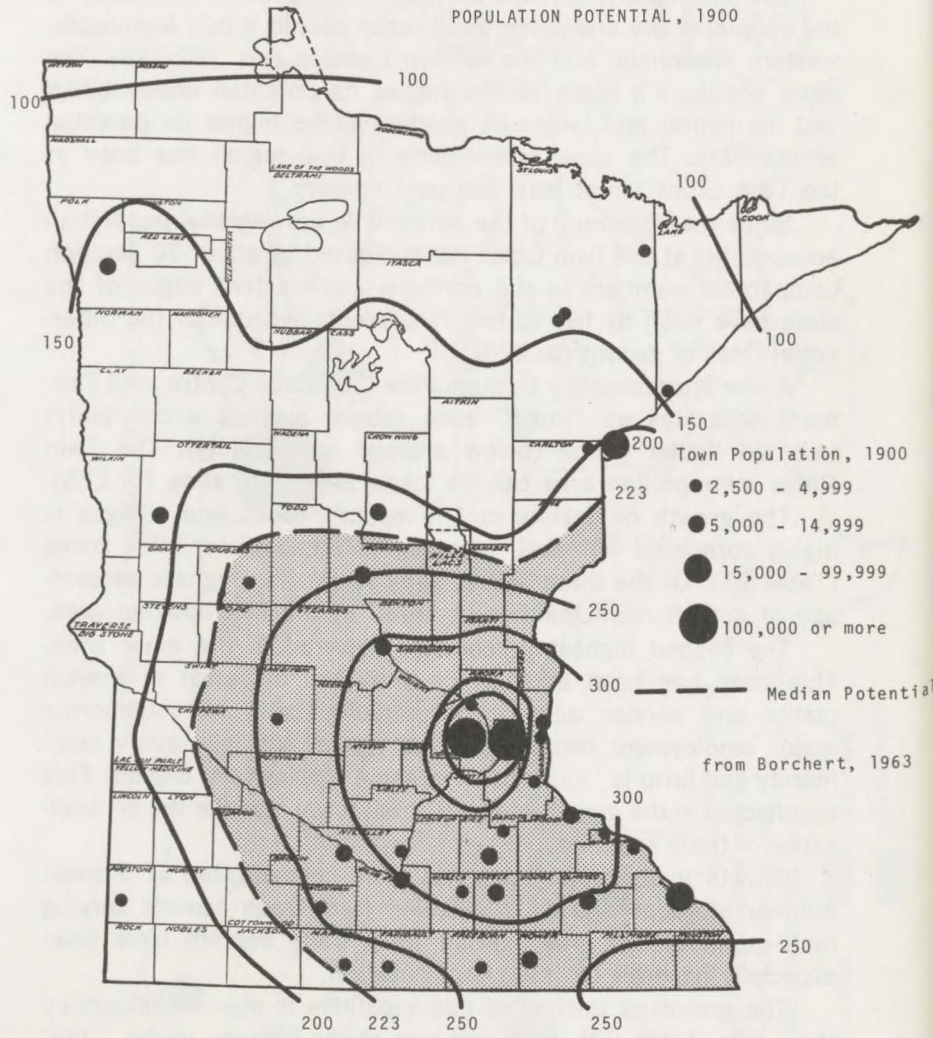
Trade centers vary greatly in their employment and income characteristics. Trade center classes can be established by grouping centers with similar sets of functions (p. 226). Using a given functional class, trade areas are defined by dividing the land between competing centers (pp. 226-227). Dollar volume per square mile of trade area is greatest in the Twin Cities-Rochester-Fairmont triangle, where a high degree of out-state industrialization combines with relatively high farm incomes (pp. 228-229). The western counties are characterized by less productivity per square mile and more square miles per trade area.

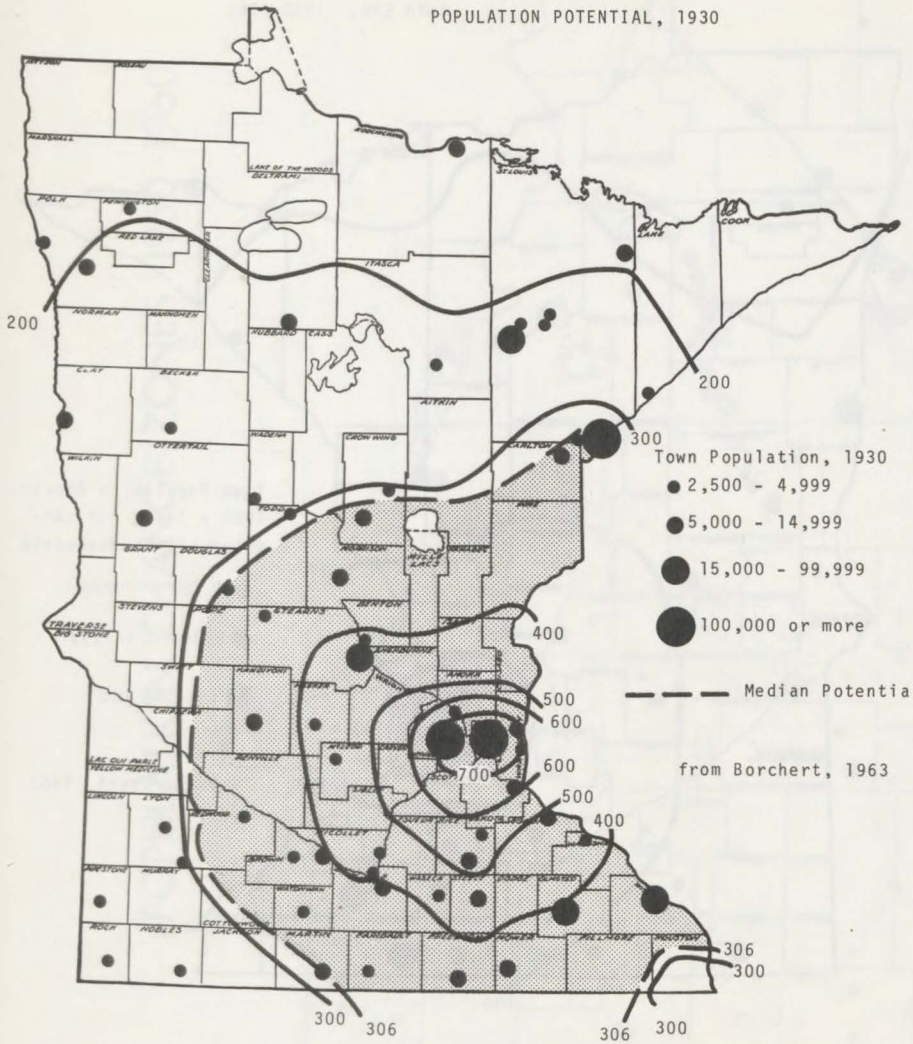
TABLE 23 — CHANGE IN MUNICIPAL POPULATION BY GROWTH ZONES, 1950-1960

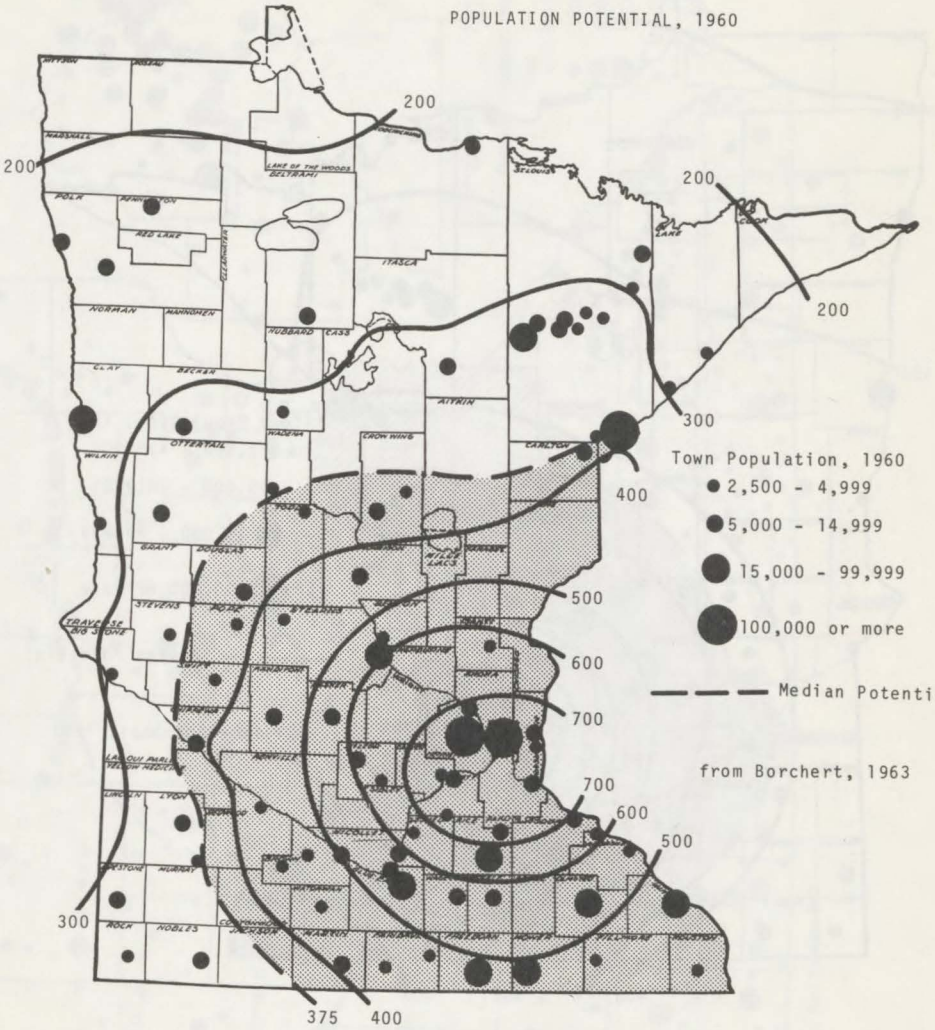
	Growth Zones (see p. 225)			
Size of Municipality	7-County	Inner Ring	Outer Ring	TOTAL
under 1,000	56	262	259	578
% which gained	91%	64%	31%	51%
% which lost	9%	36%	69%	49%
1,000-1,999	14	56	36	106
% which gained	93%	82%	61%	76%
% which lost	7%	18%	39%	24%
2,000-4,999	20	30	26	76
% which gained	100%	90%	77%	88%
% which lost	0%	10%	23%	12%
5,000 and over	37	23	18	78
% which gained	97%	91%	78%	91%
% which lost	3%	9%	22%	9%
TOTAL	127	372	339	838
% which gained	94%	70%	40%	62%
% which lost	6%	30%	60%	38%

Source: map on page 225.

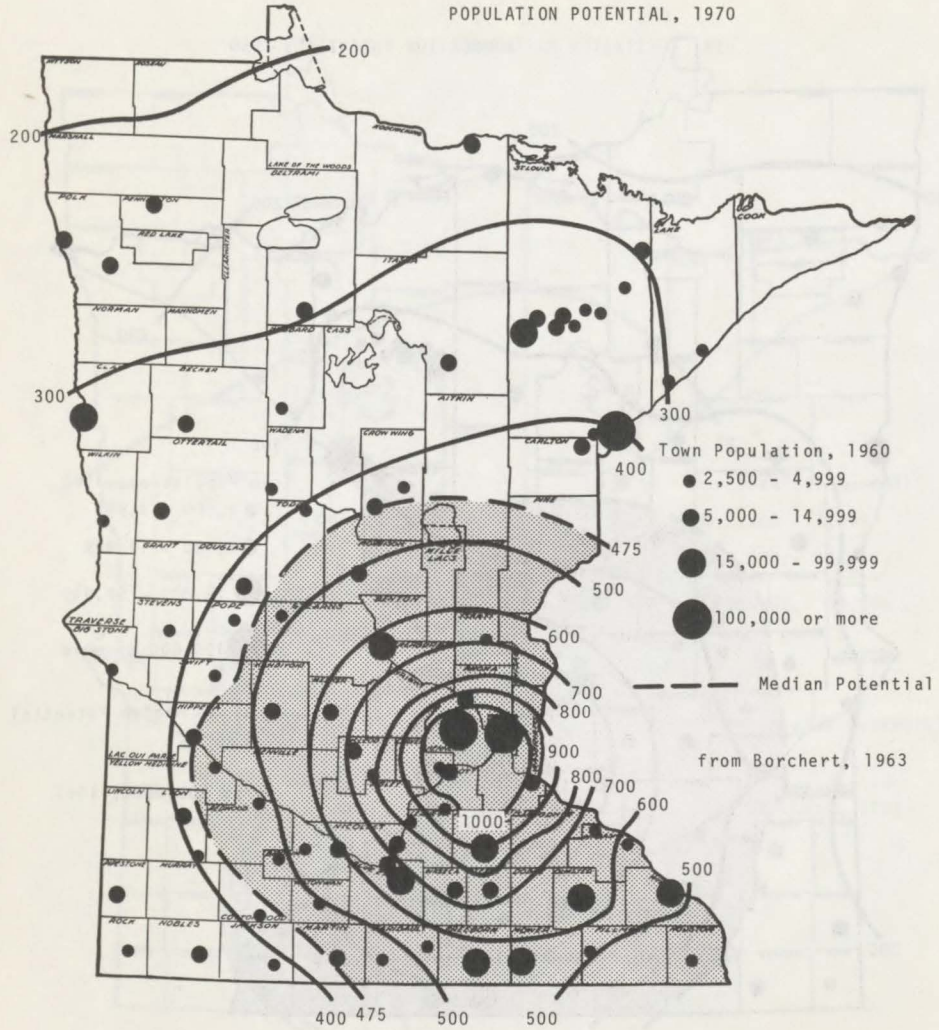

POPULATION POTENTIAL, 1870
Town Population, 1870
2,500 - 4,999
5,000 - 14,999
15,000 - 99,999
Median Potential
from Borchert, 1963
25
49
50
75
100
125


POPULATION POTENTIAL, 1900
Town Population, 1900
2,500 - 4,999
5,000 - 14,999
15,000 - 99,999
100,000 or more
Median Potential
from Borchert, 1963
100
150
200
223
250
300

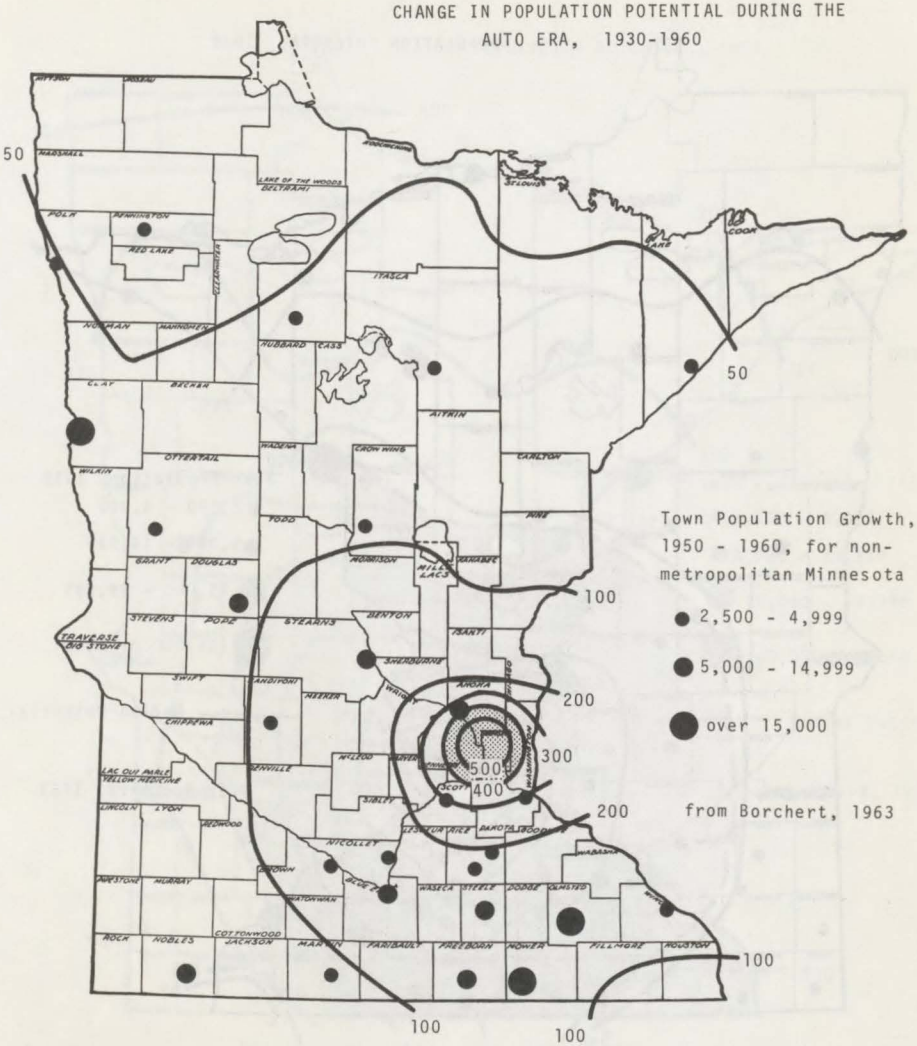

POPULATION POTENTIAL, 1930
Town Population, 1930
2,500 - 4,999
5,000 - 14,999
15,000 - 99,999
100,000 or more
Median Potential
from Borchert, 1963
200
200
200
300
400
500
600
700
600
500
400
300
306
306
300
306
300


POPULATION POTENTIAL, 1960
Town Population, 1960
2,500 - 4,999
5,000 - 14,999
15,000 - 99,999
100,000 or more
Median Potential
from Borchert, 1963
200
200
200
200
300
400
500
600
700
700
600
500
300
375
400

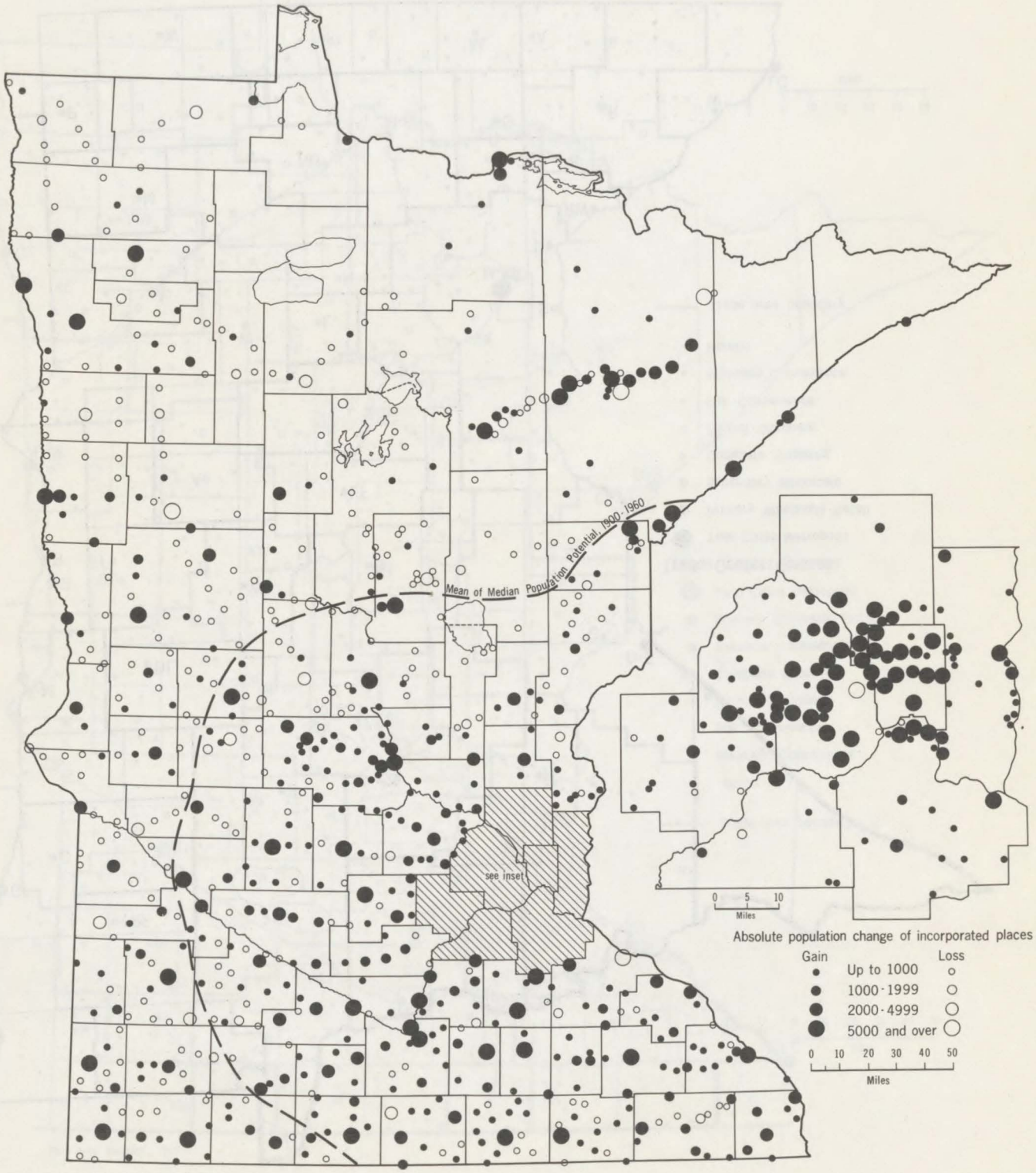
POPULATION POTENTIAL, 1970



CHANGE IN POPULATION POTENTIAL DURING THE AUTO ERA, 1930-1960

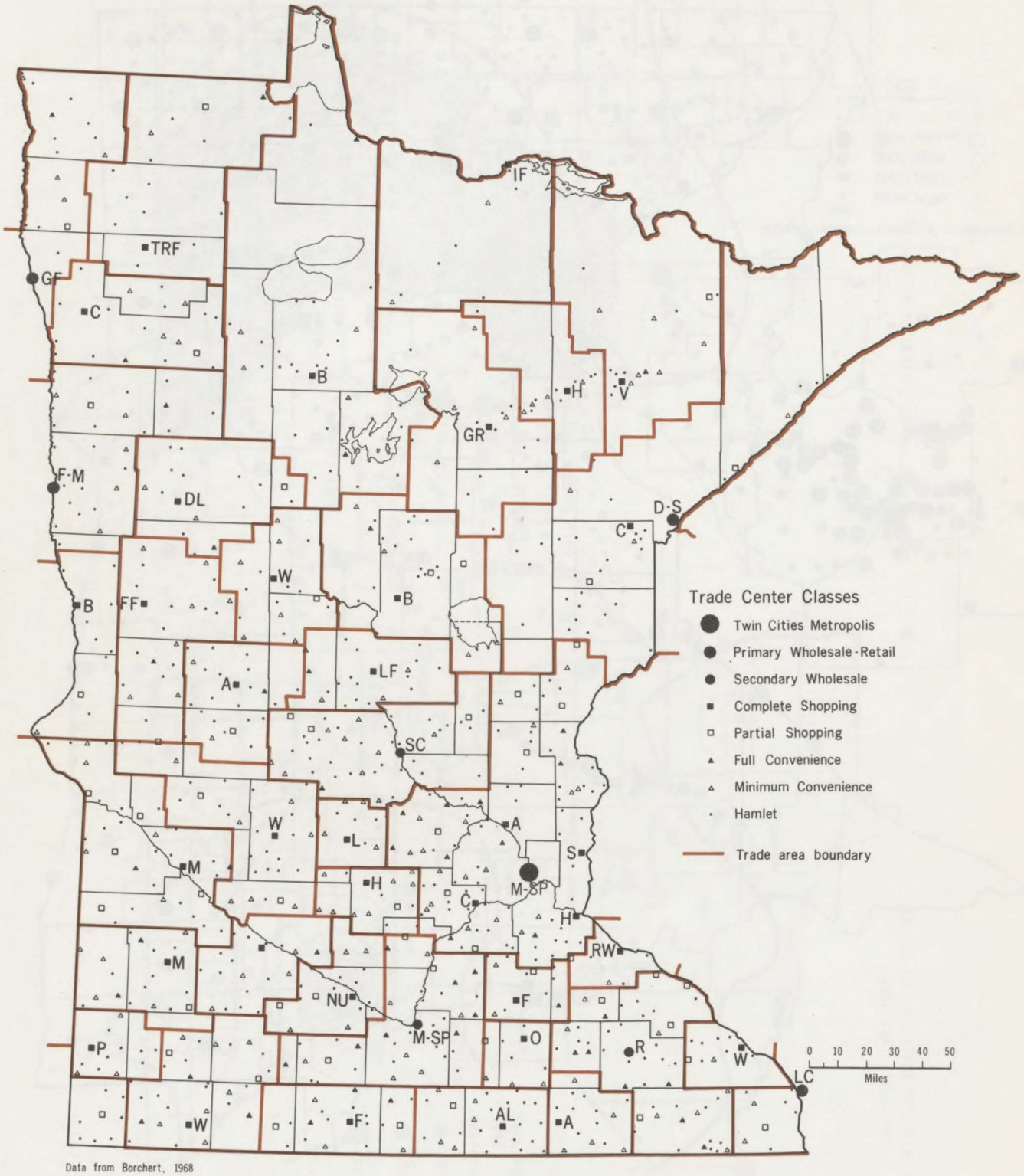


POPULATION CHANGE ZONES, 1950-1960



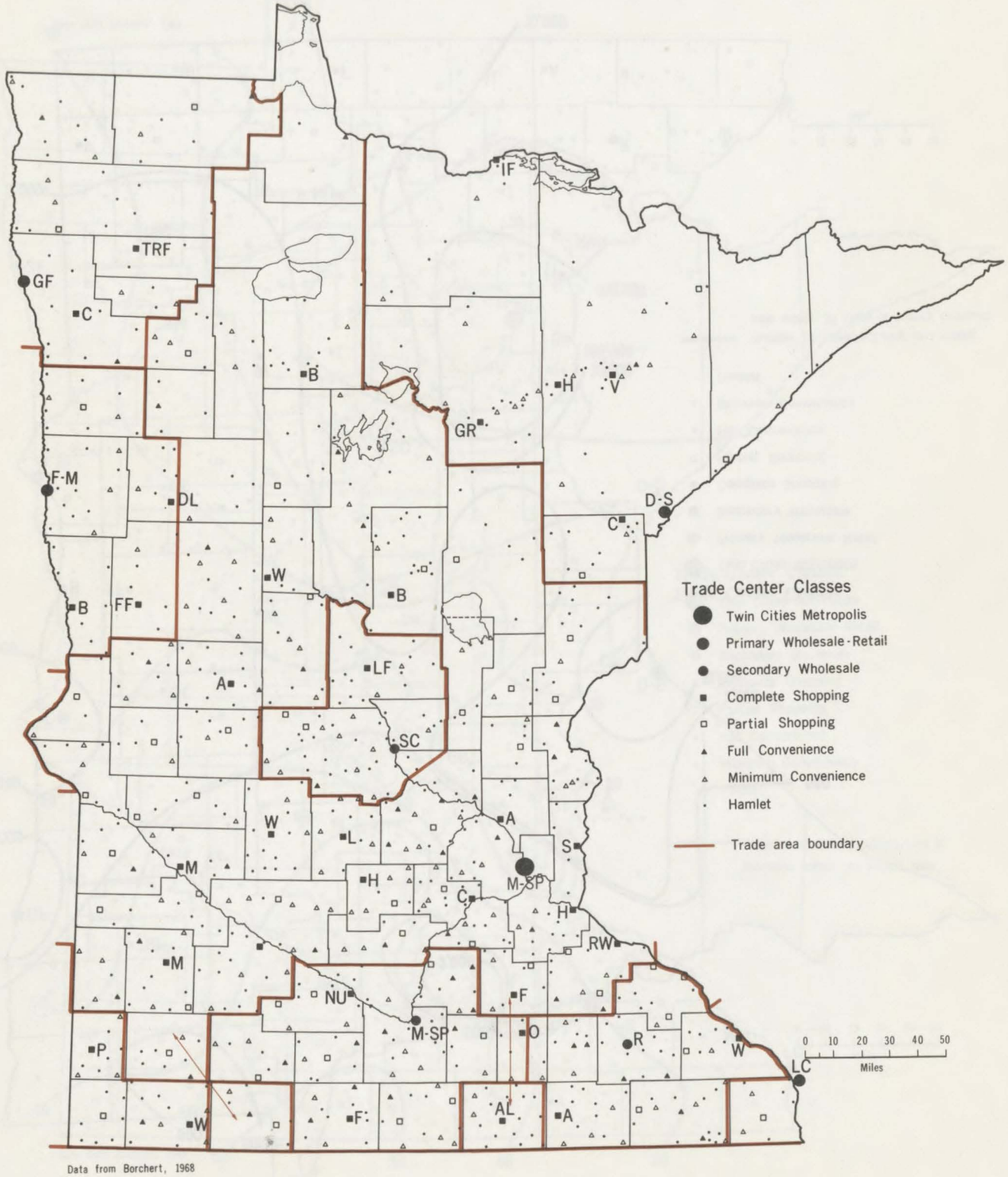
Data from Borchert, 1963

COMPLETE SHOPPING TRADE AREAS



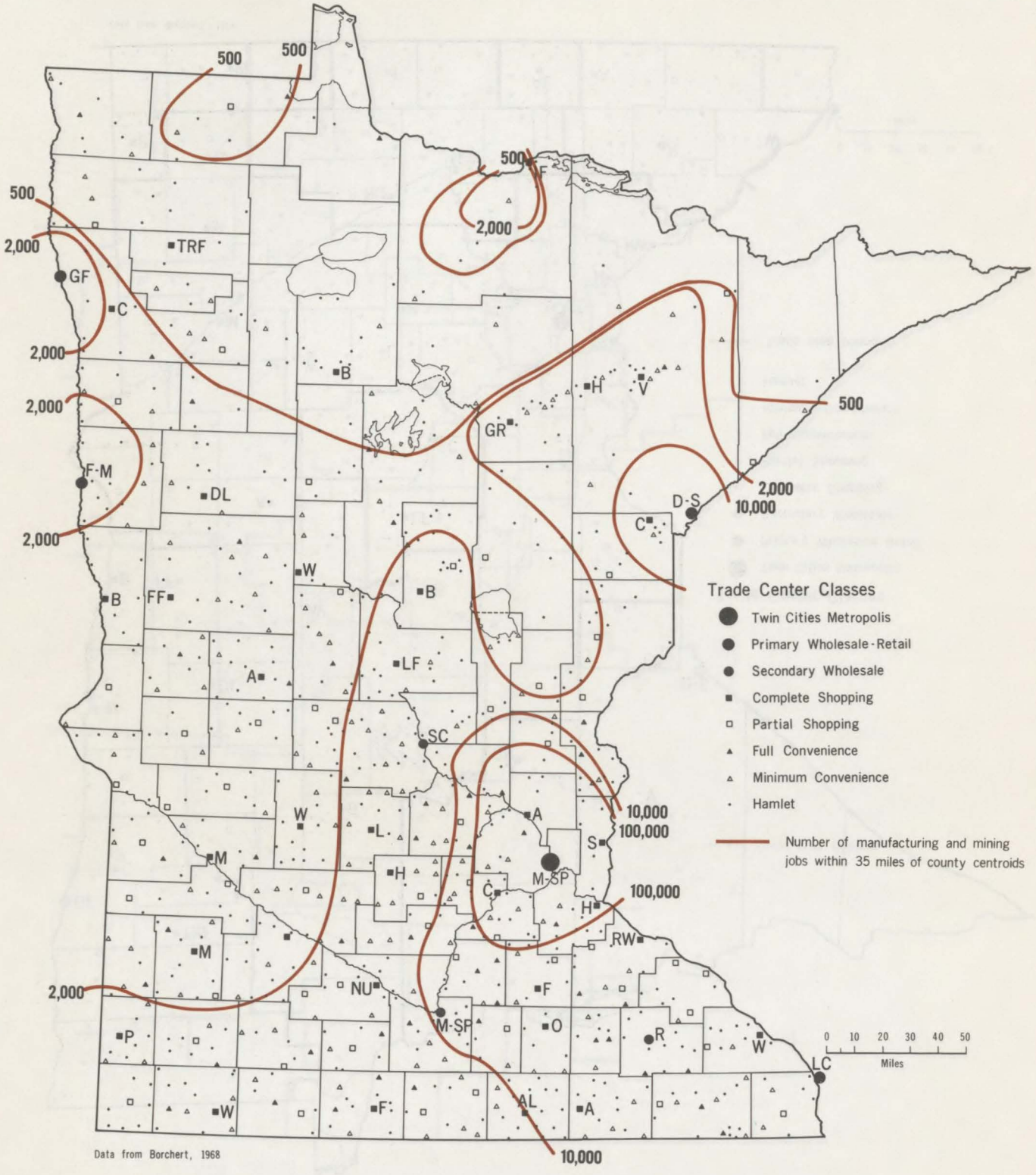
Data from Borchert, 1968

SECONDARY WHOLESALE-RETAIL TRADE AREAS



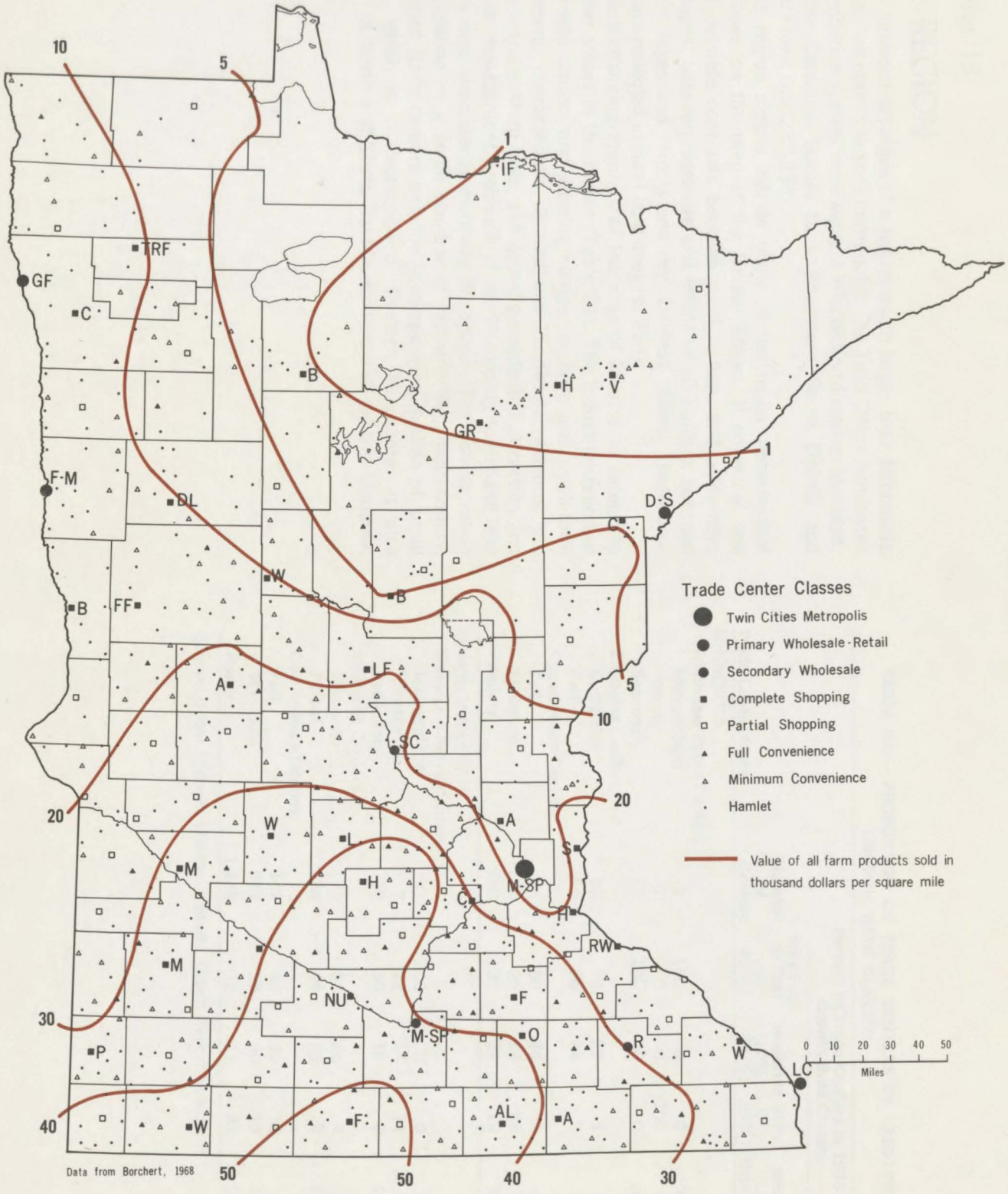
Data from Borchert, 1968

MANUFACTURING AND MINING EMPLOYMENT, 1963



Data from Borchert, 1968

FARM INCOME PER SQUARE MILE, 1964



Chapter 13

THE REGION

Commercial activities of a region much larger than Minnesota focus on the state's largest metropolis. The Twin Cities dominates the circulation system from western Wisconsin to central Montana, from the Canadian border to southeastern South Dakota and northern Iowa (pp. 232-236).

The region stands astride many of the major geographical boundaries on the map of the United States. It embraces the widest possible contrasts between rural, urban, and wilderness landscapes; between extensive and intensive agriculture; between northern lakes and forests and dry, treeless plains. These contrasts are reflected in rural land uses (p. 236).

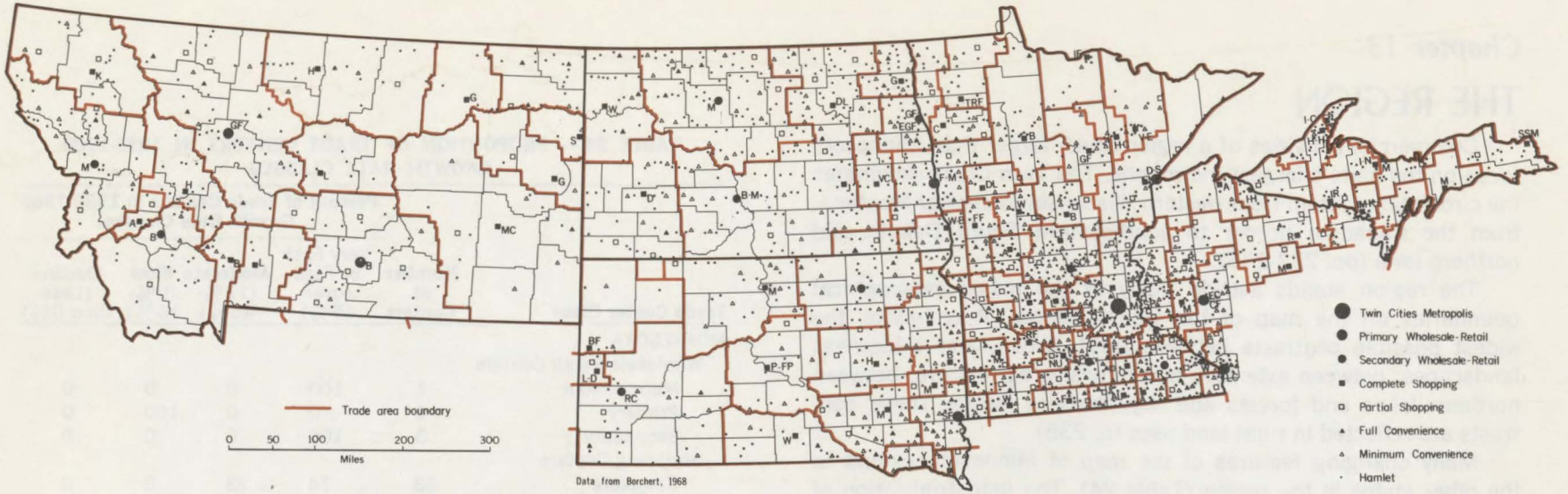
Many changing features of the map of Minnesota extend to the other states in the region (Table 24). The industrialization of farm trade centers and growing number of farm and small-town commuters, characteristic of southern Minnesota, extends into northern and eastern Iowa. The growing residential attraction and resource management problems of the Minnesota forest-and-lake regions also characterize northern Wisconsin. The concentration of population in a small number of fast-growing, multi-county, diversified trade centers and the accompanying decline of small towns, which is characteristic of western Minnesota, is also typical of North and South Dakota, eastern and central Montana.

TABLE 24 — PROPORTION OF TRADE CENTERS IN 1930-1960 GROWTH RATE CLASSES

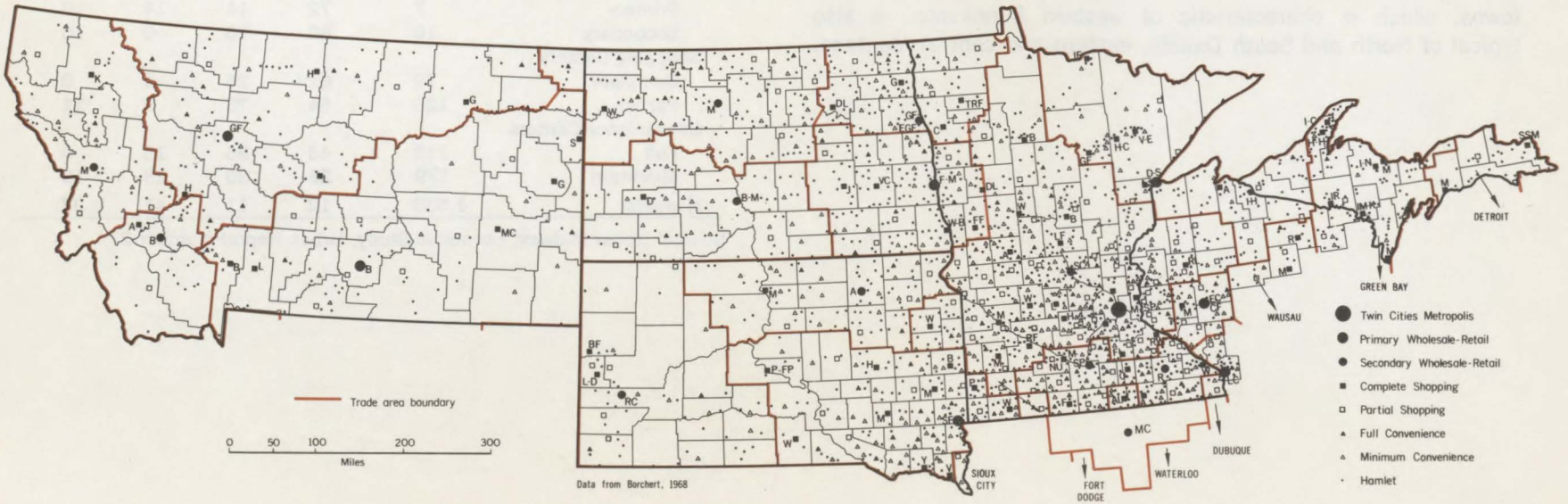
Trade Center Class	Number of Centers	Percent of Trade Centers in 1930-1960 Growth Rate Classes: Very Fast or Fast (over 45%)	Moderate (17%-45%)	Slow (0%-16%)	Decline (Less than 0%)
MINNESOTA					
Wholesale-Retail Centers					
Metropolitan	1	100	0	0	0
Primary	1	0	0	100	0
Secondary	3	100	0	0	0
Shopping Centers					
Complete	33	74	23	3	0
Partial	55	66	24	5	5
Convenience Centers					
Full	52	50	46	4	0
Minimum	170	29	34	28	9
Hamlets	538	22	21	19	38
UPPER MIDWEST					
Wholesale-Retail Centers					
Metropolitan	1	100	0	0	0
Primary	7	72	14	14	0
Secondary	10	80	10	0	10
Shopping Centers					
Complete	79	62	26	4	8
Partial	126	54	26	9	11
Convenience Centers					
Full	112	43	36	15	6
Minimum	379	28	30	23	19
Hamlets	1,539	12	11	41	37

Source: Upper Midwest Economic Study, Urban Report Number 2

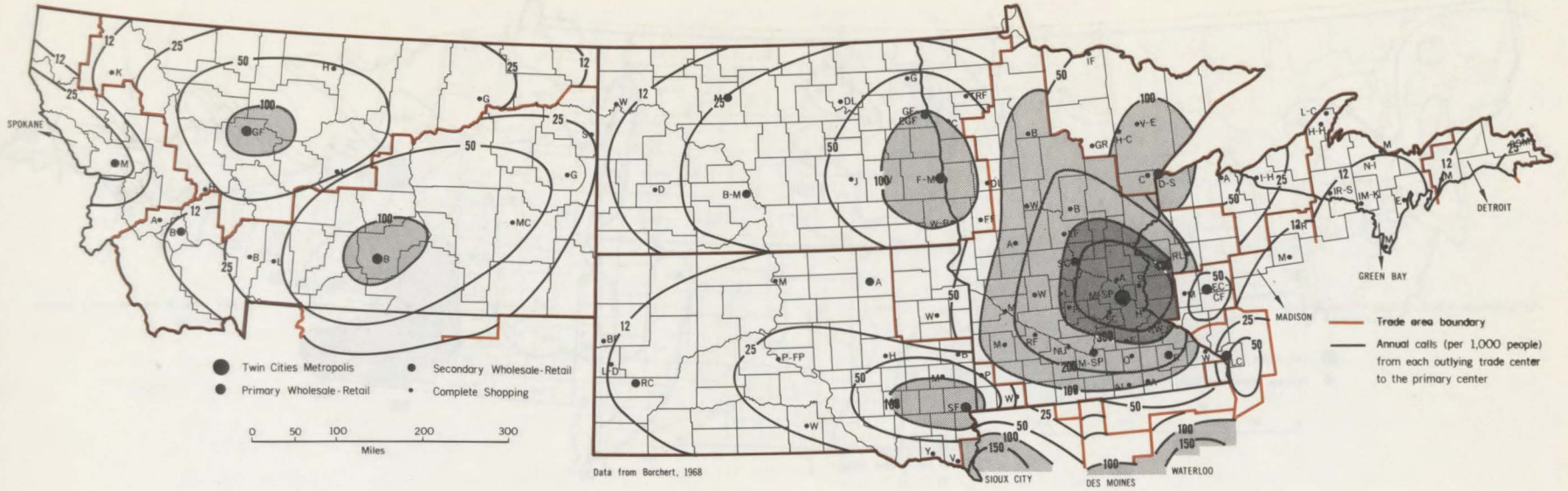
COMPLETE SHOPPING TRADE AREAS



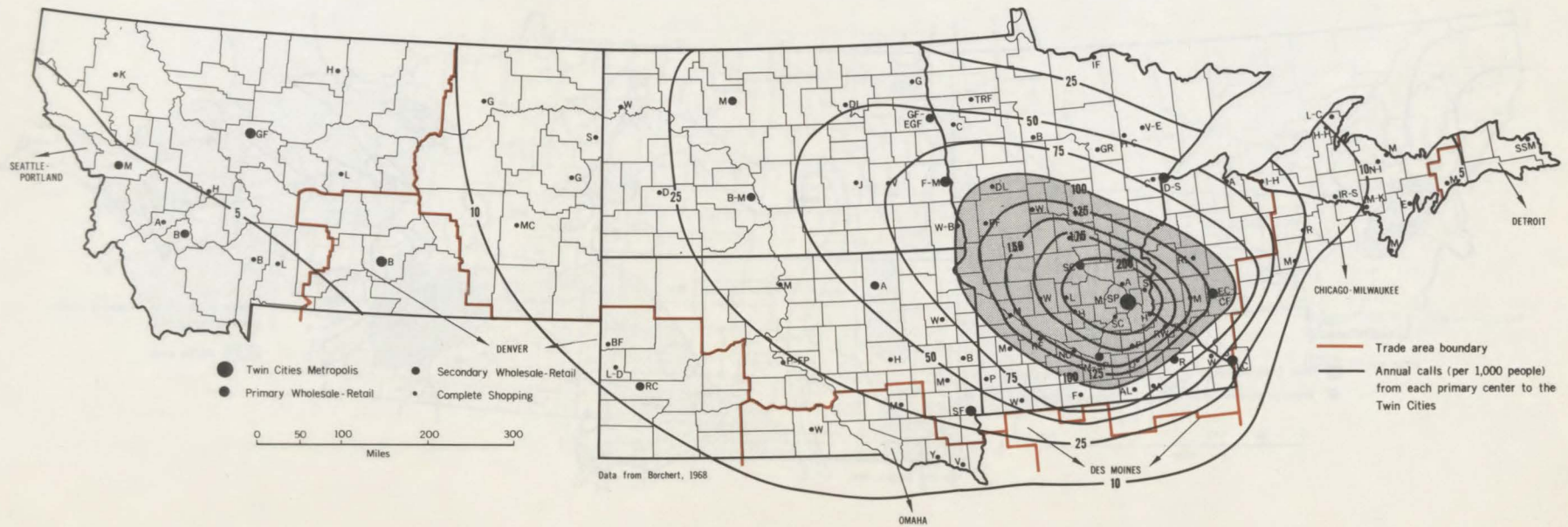
SECONDARY WHOLESALE-RETAIL TRADE AREAS



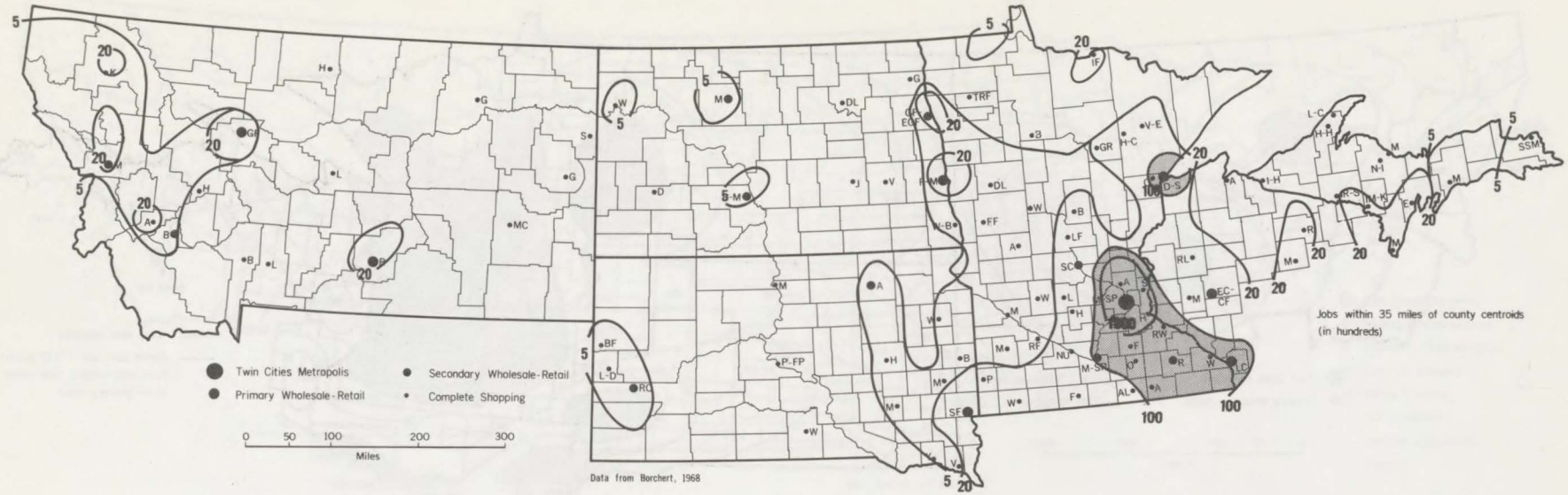
PRIMARY WHOLESALE - RETAIL TRADE AREAS



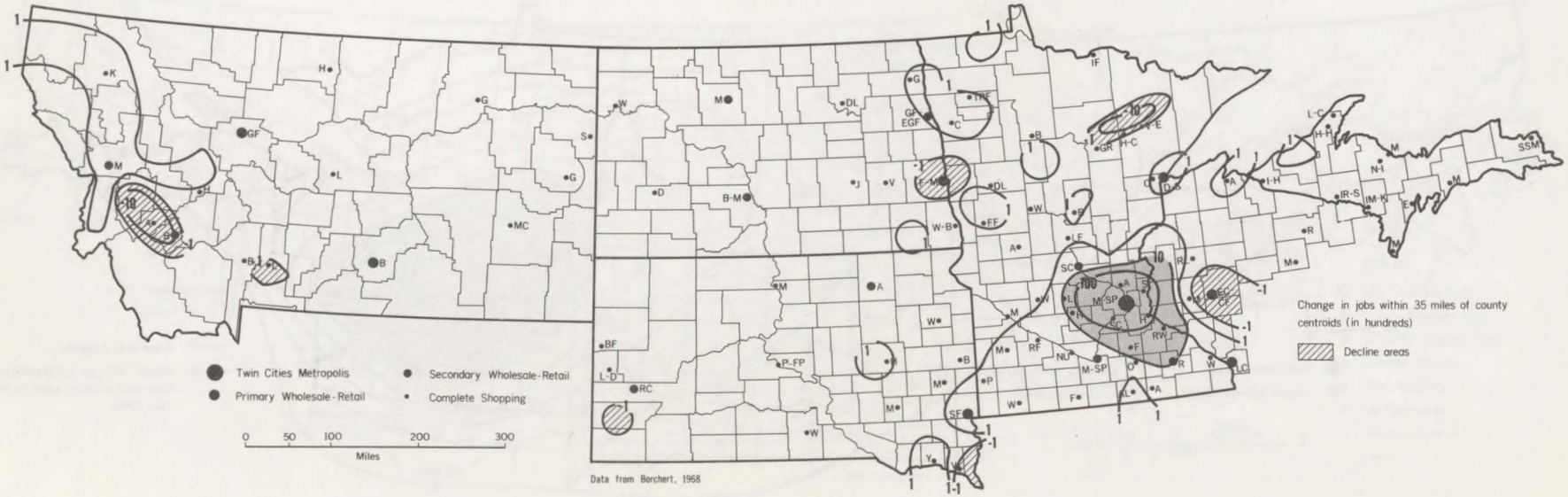
METROPOLITAN TRADE AND SERVICE AREAS



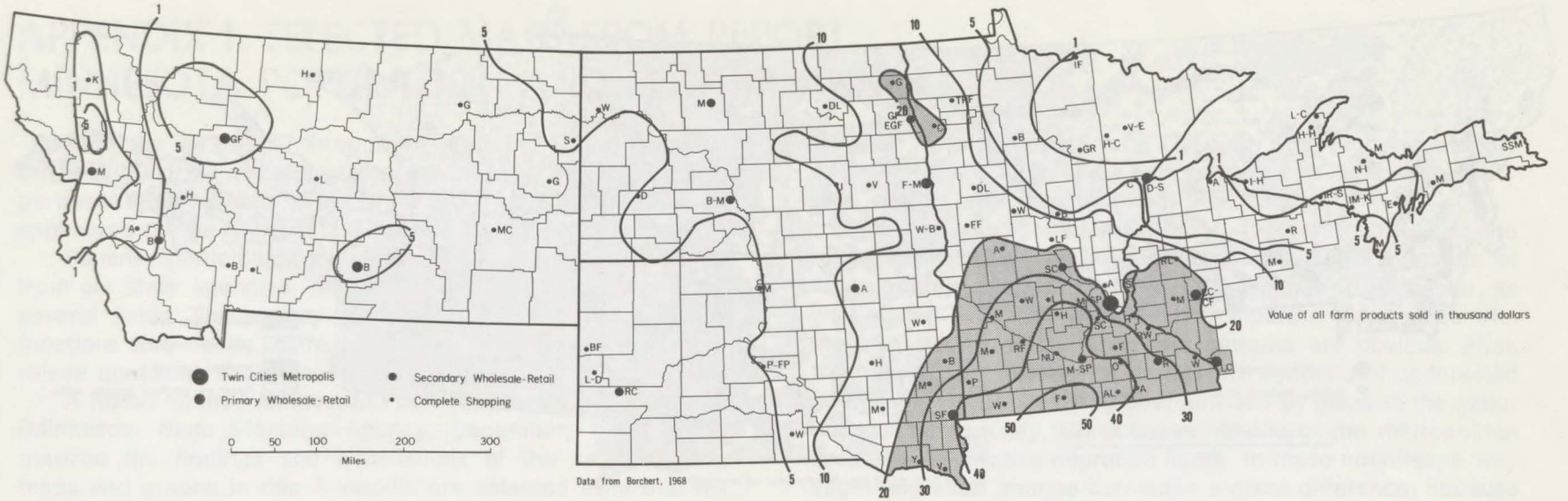
MANUFACTURING AND MINING EMPLOYMENT, 1963



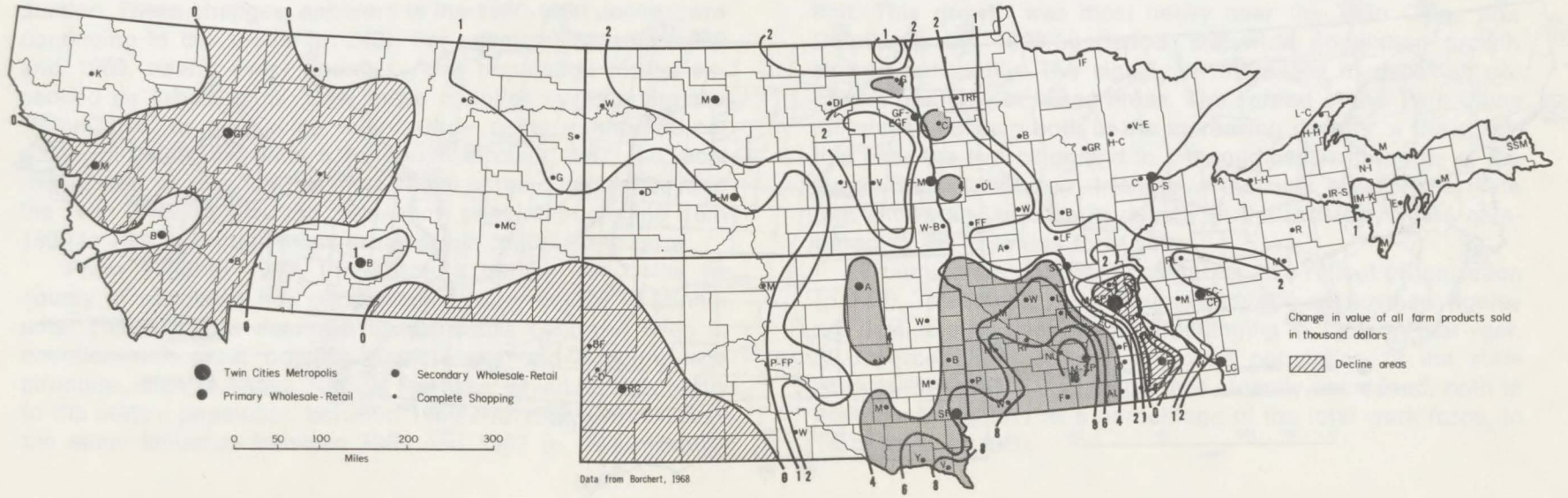
CHANGE IN MANUFACTURING AND MINING EMPLOYMENT, 1958-1963



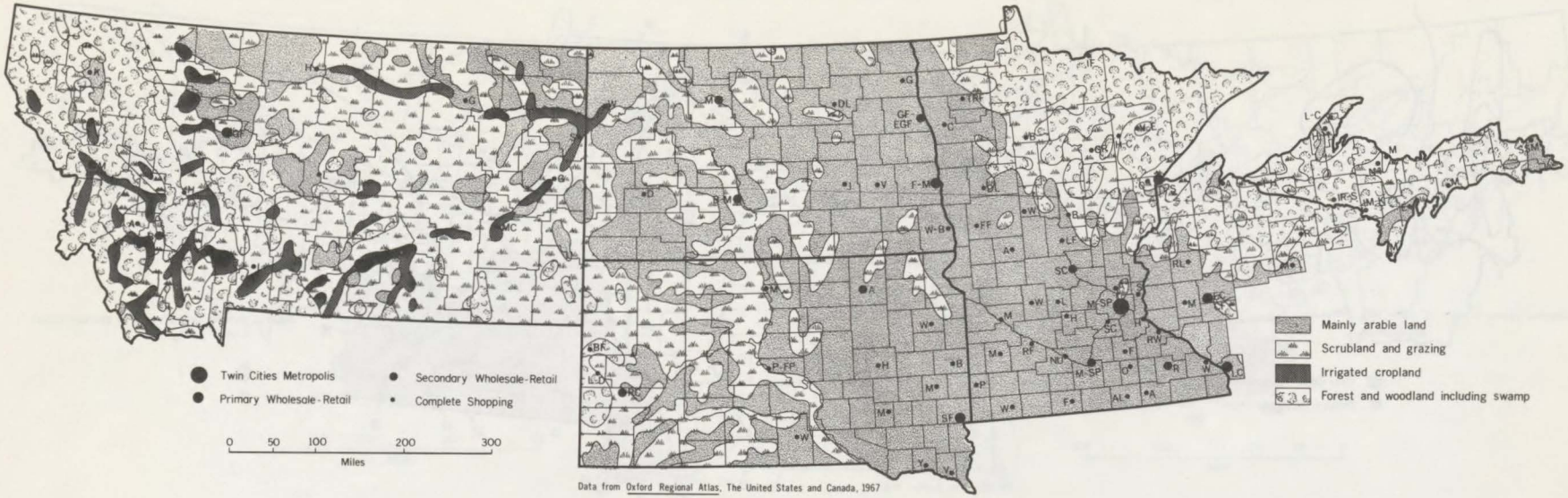
FARM INCOME PER SQUARE MILE, 1964



CHANGE IN FARM INCOME PER SQUARE MILE, 1959-1964

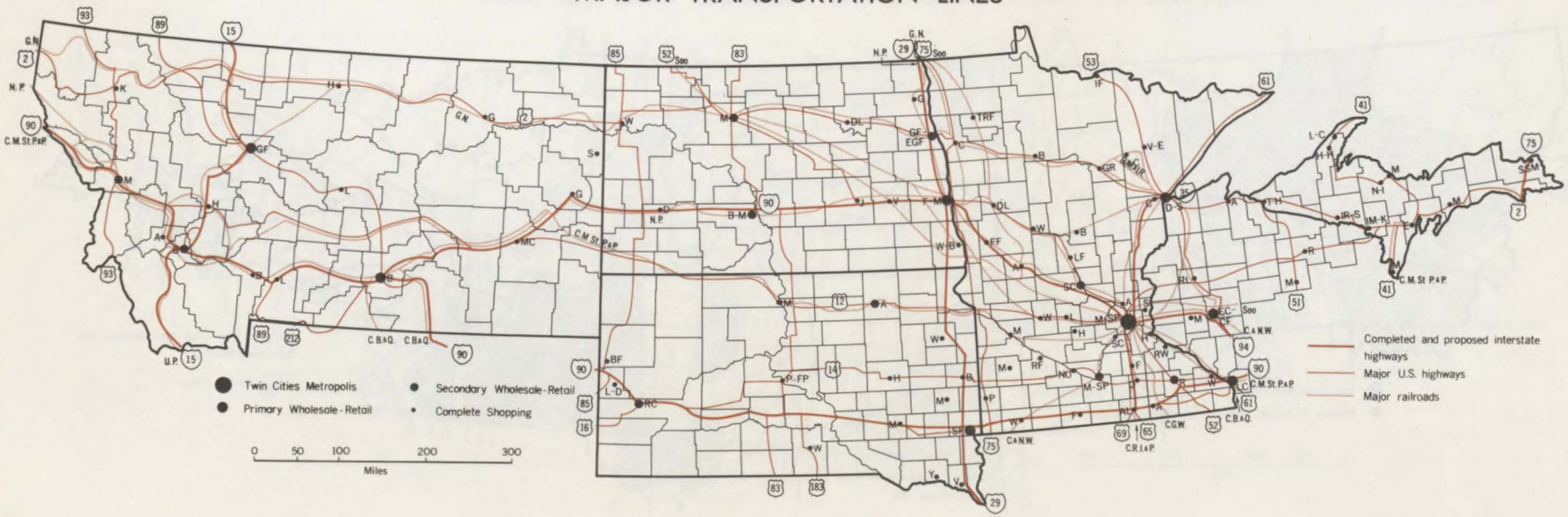


MAJOR LAND USES



Data from Oxford Regional Atlas, The United States and Canada, 1967

MAJOR TRANSPORTATION LINES



APPENDIX I: SELECTED MAPS FROM REPORT MINNESOTA POPULATION AND STATE PLANNING

From the fall of 1967 through the spring of 1968, a seminar on population estimates and projections was held in the Department of Geography at the University of Minnesota and was sponsored by the Minnesota State Planning Agency.

Seminar participants included planning or research staffs from six state agencies, faculty, and graduate students from several fields. The agency participants outlined the planning functions and needs in their organizations and discussed or raised questions about use of population data.

A report entitled ***Minnesota Population and State Planning*** (Minnesota State Planning Agency, December, 1968), summarized the findings and conclusions of the seminar. The maps and graphs in this Appendix are selected from that report. They provide an important supplement to Chapter 5 of the Atlas (pp. 27-42).

Minnesota's current population changes reflect nationwide trends. These trends include continuing growth and dispersal of urban and metropolitan centers (pp. 36-37), the rapidly declining birth rate (p. 239), an increase in numbers of people 65 and older, and declining numbers of workers engaged in farm production. These changes, apparent in the 1950-1960 decade, are continuing in the 1960's (p. 240). For example, between 1950 and 1960, nearly every county's rural population losses exceeded its urban gains. Only those counties surrounding the Twin Cities, or embracing major trade centers, showed net gains (p. 240). This pattern continued through 1967, the most recent year included in this study. Most of the counties, beyond the Twin Cities commuting zone, show population decline from 1960 to 1967, although many urban areas continued to grow.

From 1960 to 1967, the absolute number of births by county of residence has decreased in every county in Minnesota. This absolute decrease in births has occurred even in counties with great population increases and a young age structure, such as Anoka. Natural increase, which added greatly to the state's population between 1950 and 1960, did not have the same influence between 1960 and 1967 (p. 241). Natural increase rates by county vary. The birth rate, though generally declining, is still affected by factors such as income, age structure, custom and religion within the counties.

The net migration rates between 1950 and 1960 show the reasons for population losses outstate and the influence of urban centers such as Moorhead, Owatonna, or Rochester, as well as the Twin Cities (p. 242). Comparing these rates with the 1960-67 migration rates, two patterns are obvious. First, the total population loss in the heavily agricultural or forested counties is no longer being counteracted by gains in the major outstate cities. Only two counties outside of the metropolitan area show a positive migration figure. In these counties, a very slight migration change can make a great difference, because the total population is so small. The second pattern is the growth in drawing power of the counties surrounding Hennepin and Ramsey. The stability of the two inner counties and the spread of their influence is obvious.

The long-term population trends can best be illustrated in the density change maps (pp. 243-245). Between 1860 and 1920, nearly every county showed increasingly dense population. This growth was most heavy near the Twin Cities and Duluth. In the 1920-60 period, statewide population growth slowed noticeably. The significant increases in densities occurred primarily in urban areas. The spread of the Twin Cities influence is shown both in the increasing density of the counties near the two cities and in the southeastern triangle of the state. The southeastern triangle is the only area of the state that shows an increase in density in the last forty years compared to the previous forty years.

Changing occupational categories also reflect urbanization (p. 246). Total employment figures and farm employment figures are available for every decade beginning in 1930. In that year, 30.6 percent of the total employed population of the state worked on farms. This number has steadily decreased, both in absolute terms and as a percentage of the total work force, to 14 percent in 1960.

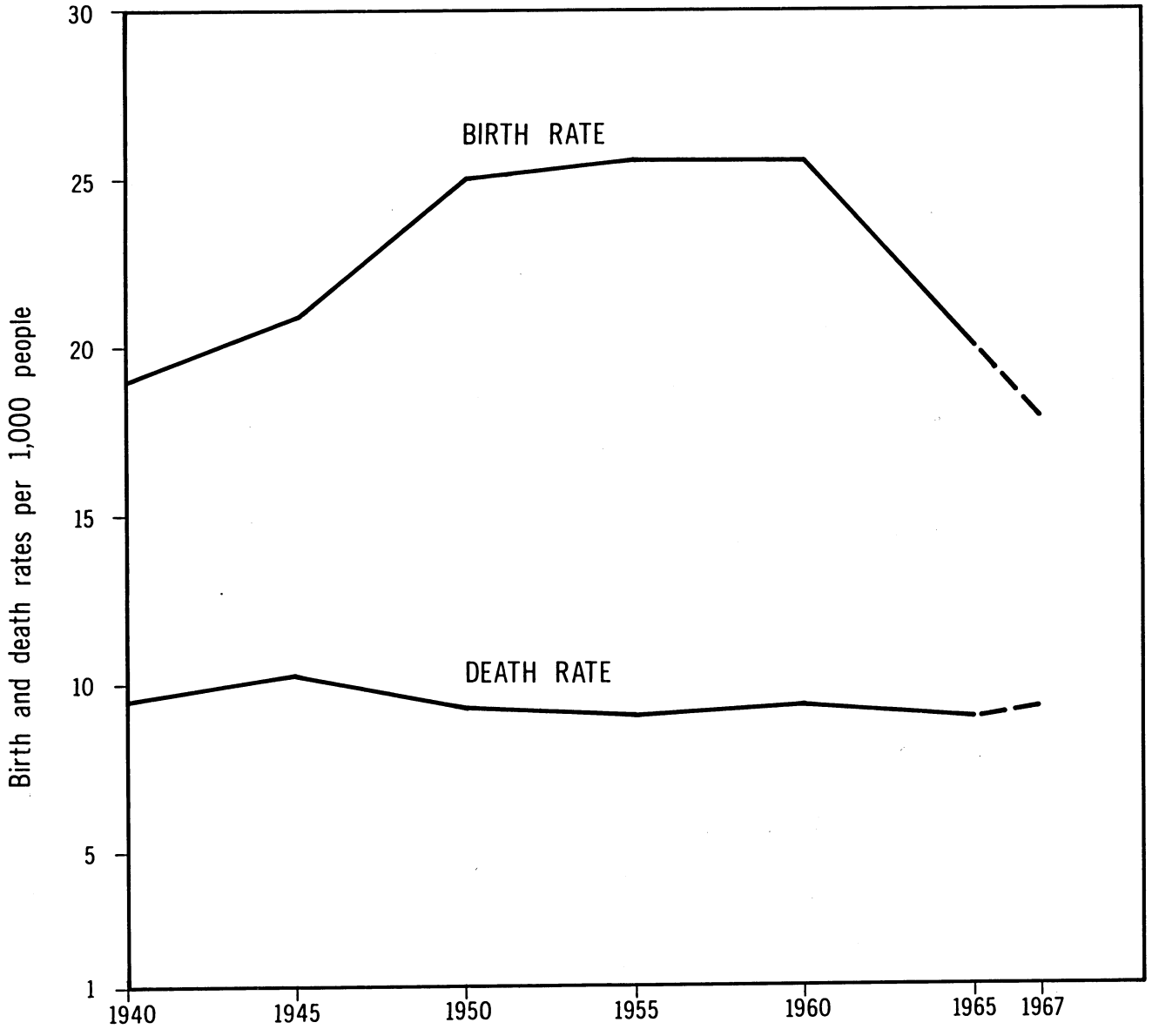
Beginning in 1940, non-farm employment was broken into blue collar and white collar (both clerical and professional). Blue collar employees have increased from 29 percent of the employed in 1940 to 41.1 percent of the total in 1960. White collar employment has shown a comparable increase, from 26.9 percent in 1940 to 40.9 percent in 1960. Within this category, the relative percentage of clerical and professional employment has remained about the same, although the professional category is increasing slightly faster.

Trends within the state's age structure can also be charted; data for each decade since 1870 is available (pp. 247-248). Citizens in the over-65 age category have increased 67 percent in the period between 1940 and 1960. The shift in location of those over 65 shows an interesting pattern between 1940 and 1960 (p. 248). The Twin Cities area, spreading throughout the southeastern triangle of the state, demonstrates a drawing power for this age group. The effect of decreased birth rates in the depression years is reflected in the drop in the 20-44 age group in 1960. The war baby-boom is apparent in the 1960 increase in the 0-19 year range. These age-range fluctuations are important to state government in its planning.

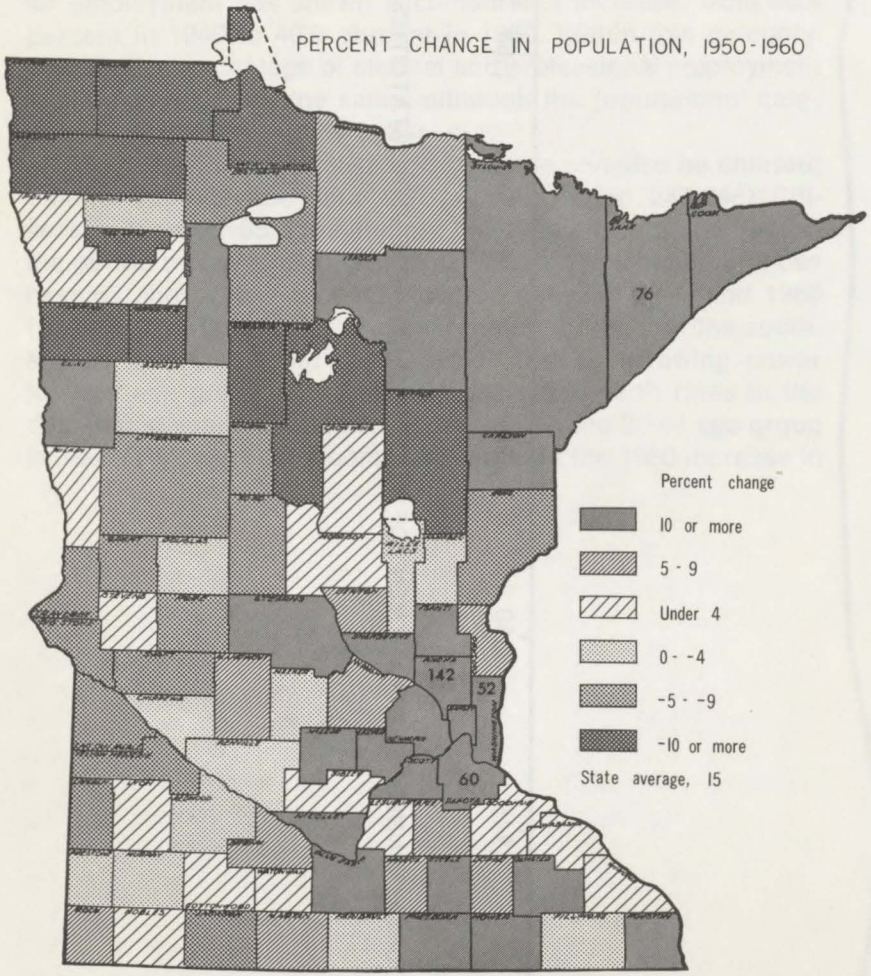
The geographic pattern of population in Minnesota today represents the latest stage in a process of continuing evolution. Past changes in the pattern have reflected technological innovations such as the railroad, the automobile, and the tractor; the economic impact of war and depression; and changes in social values — for example, the desire for small families or the demand for formal higher education. If technologic, economic, and social change continues, changes in the patterns of population may be expected to continue, also.

The present pattern shows a wide variation in not only the numbers of people but also their wealth, occupations, and ages. Hence, within the state there are widely different rates at which a given population generates the need for different services and the revenue to pay for them. Pages 249-258 illustrate the variation of these generation rates in relation to some selected state services: higher education, hospitals, welfare, unemployment, and general taxation.

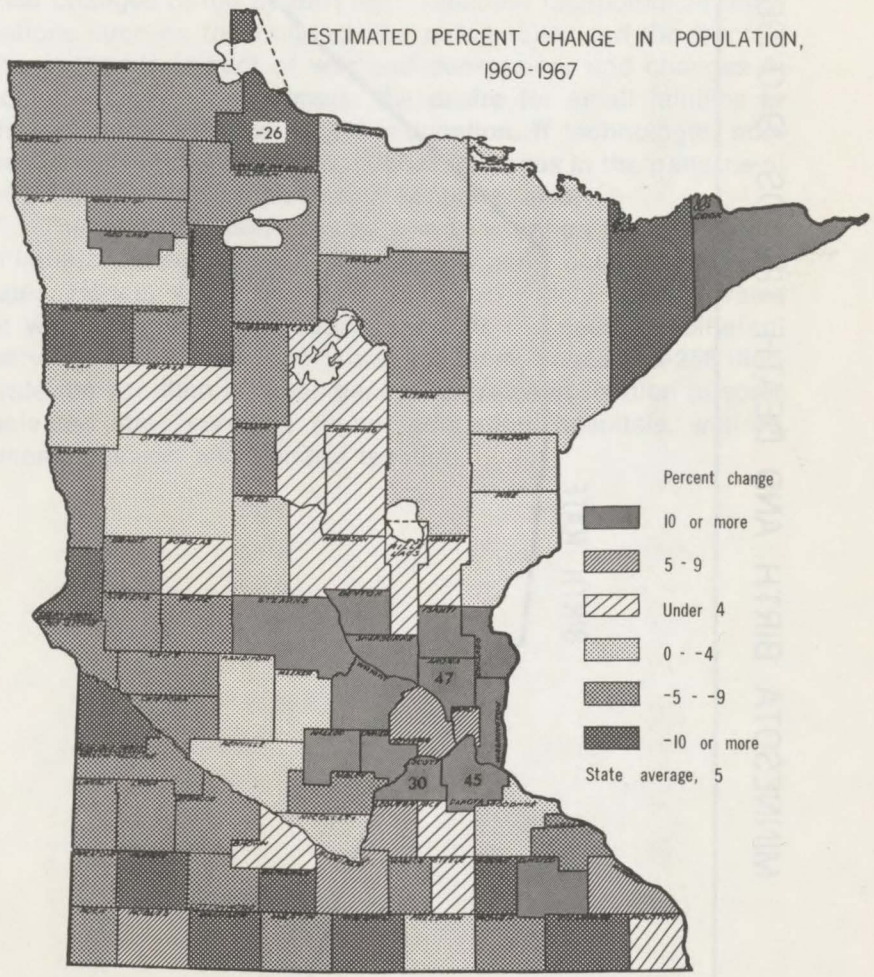
MINNESOTA BIRTH AND DEATH TRENDS, 1940-1967



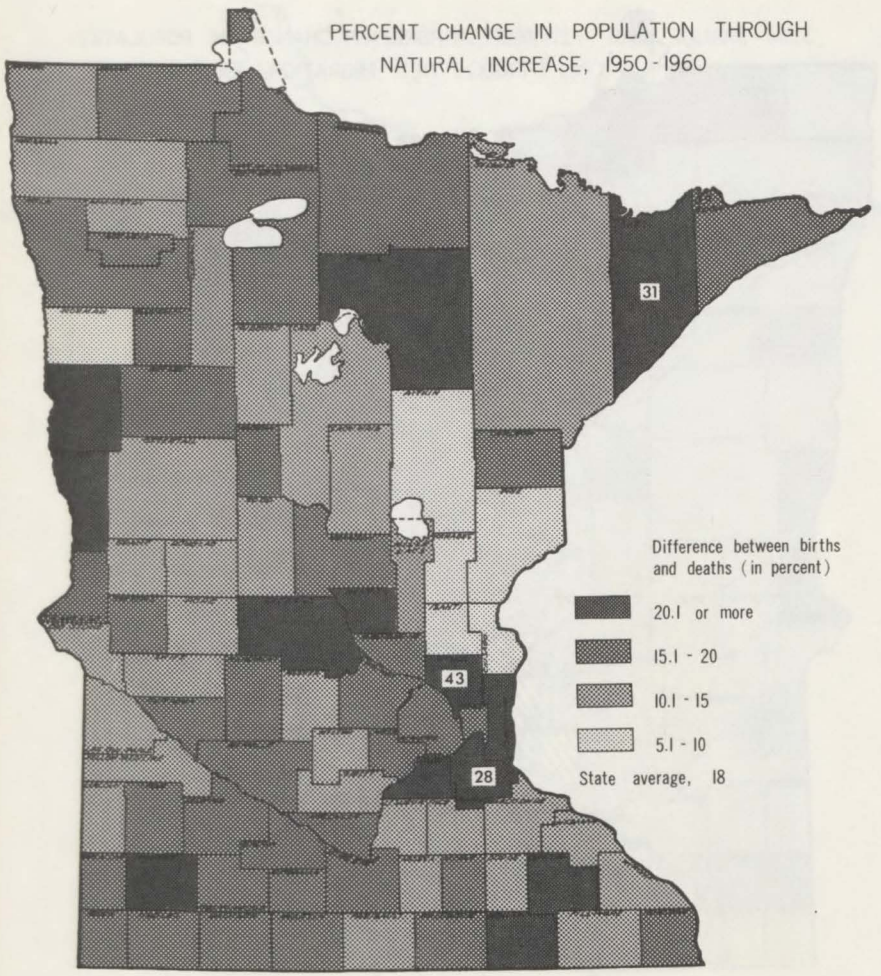
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, SECTION OF VITAL STATISTICS



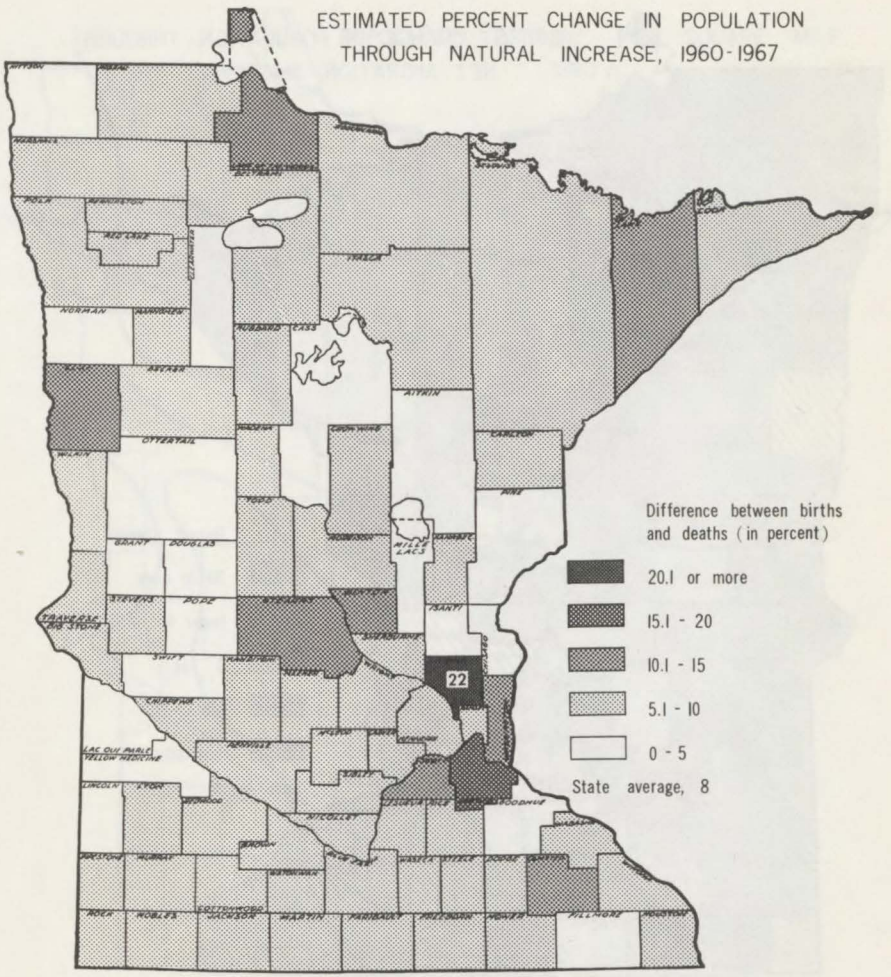
SOURCE: *CITY AND COUNTY DATA BOOK,* 1967, UNITED STATES BUREAU OF THE CENSUS



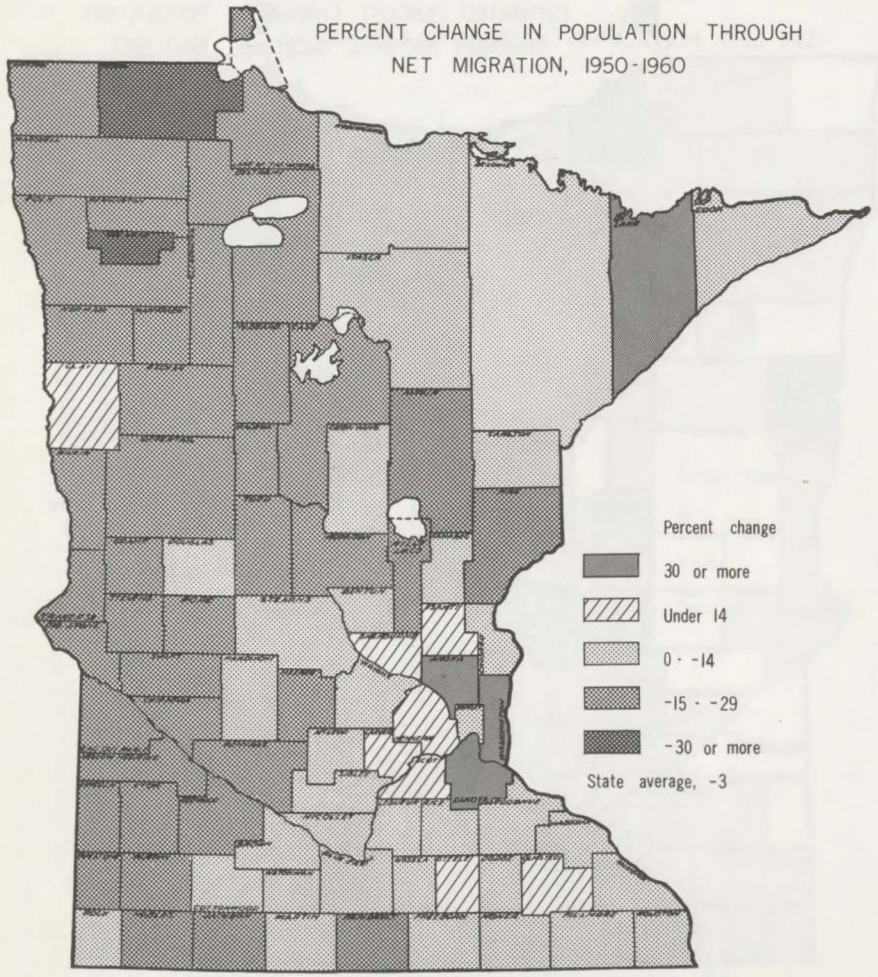
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, SECTION OF VITAL STATISTICS



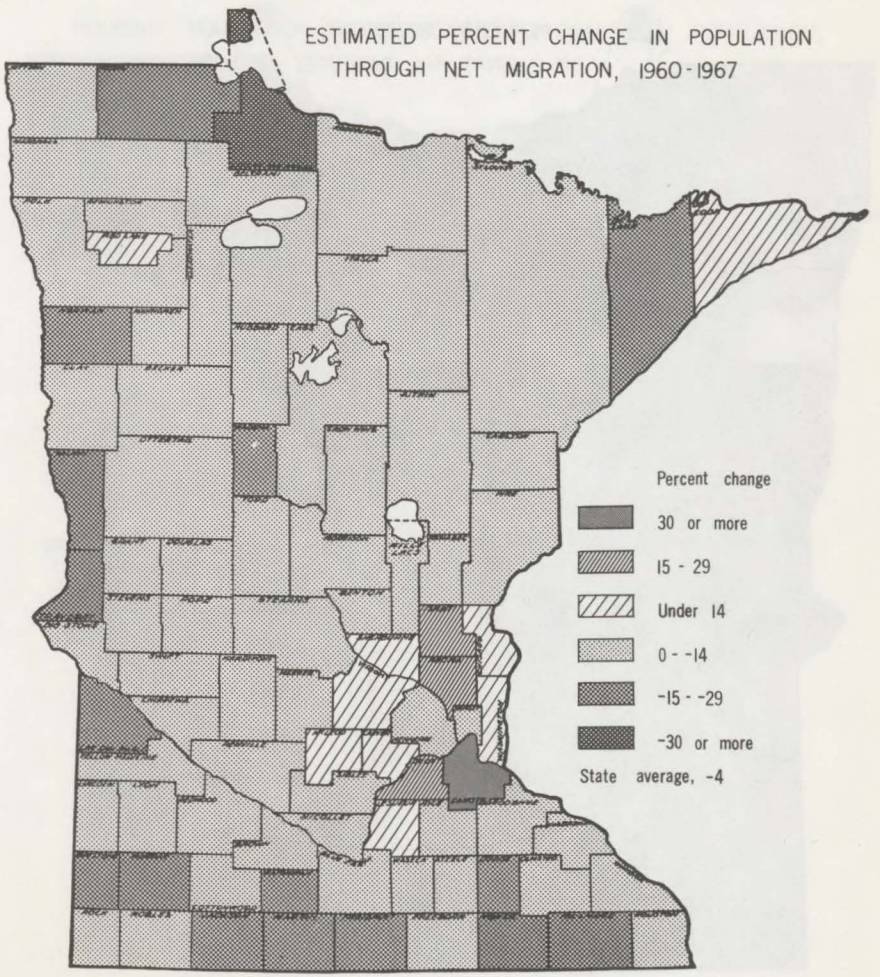
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, SECTION OF VITAL STATISTICS



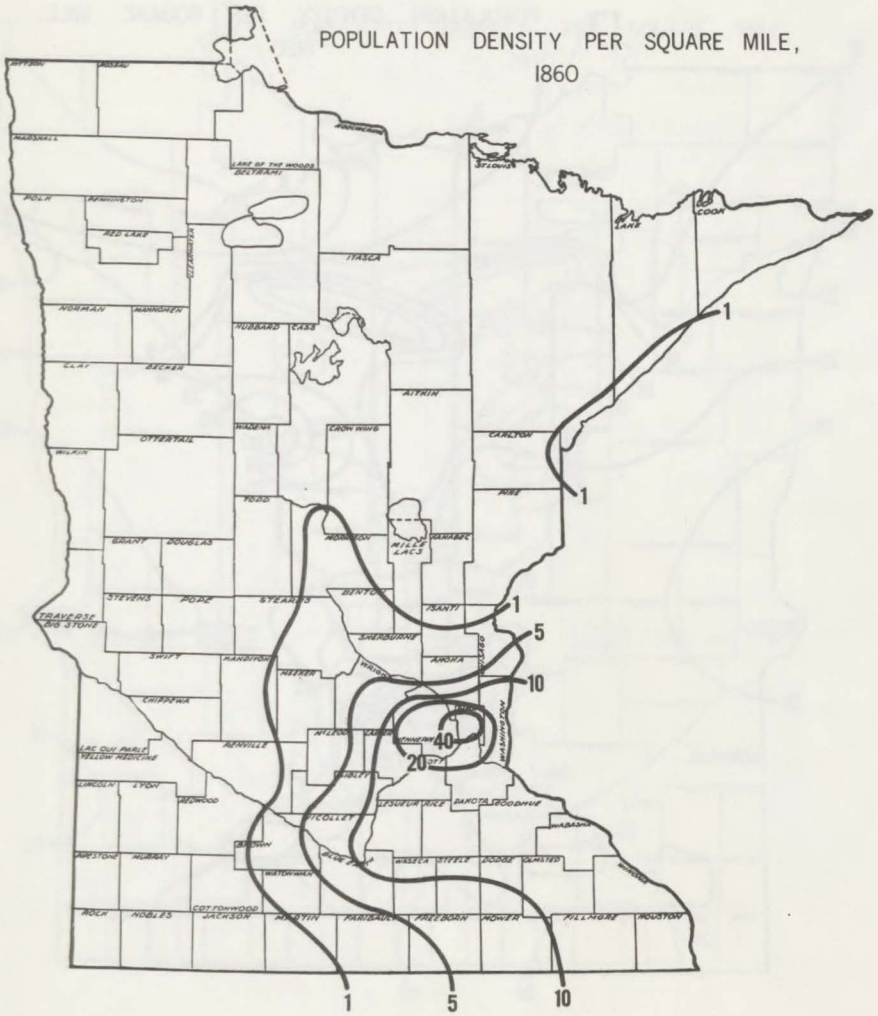
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, SECTION OF VITAL STATISTICS

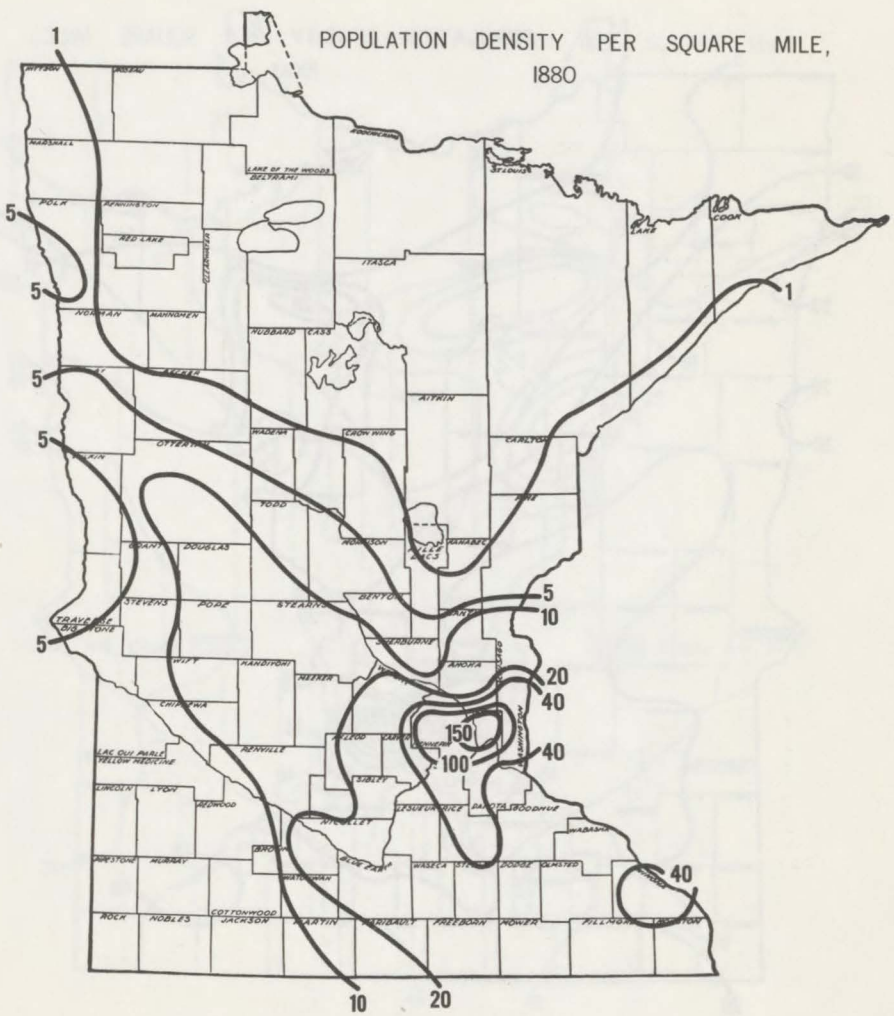


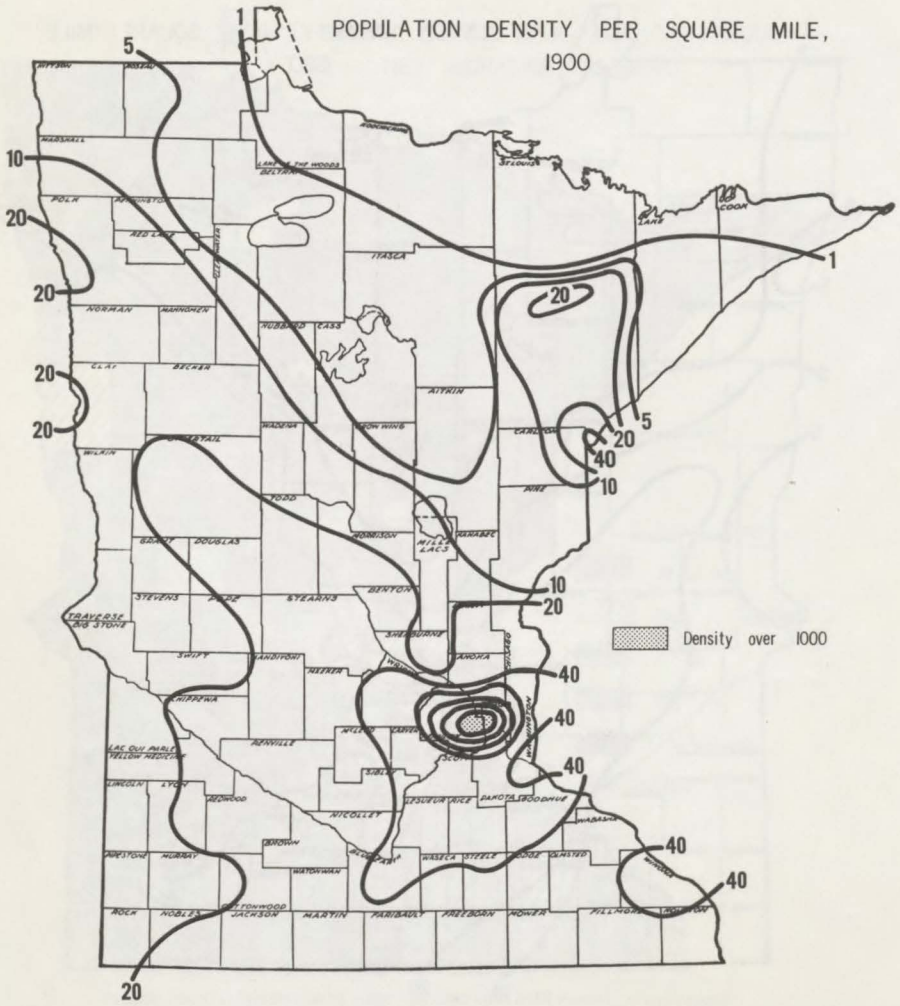
SOURCE: *COUNTY AND CITY DATA BOOK*, 1967, UNITED STATES BUREAU OF THE CENSUS

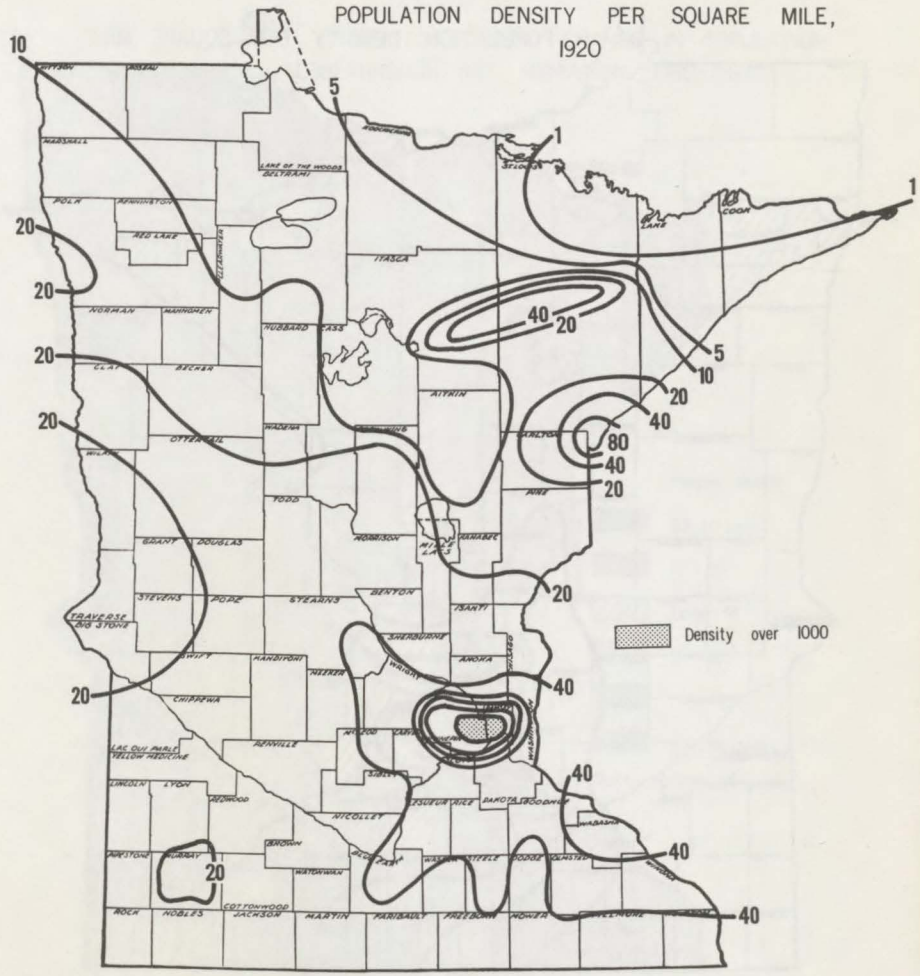


SOURCE: MINNESOTA DEPARTMENT OF HEALTH, SECTION OF VITAL STATISTICS

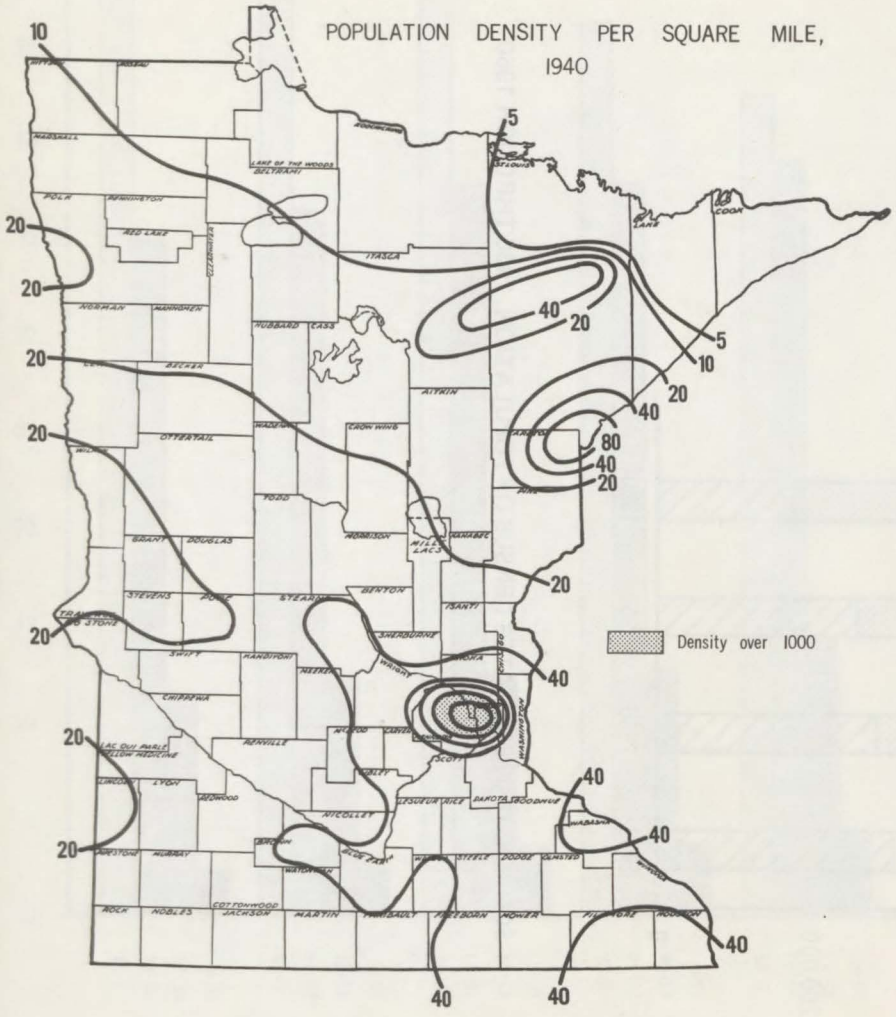

POPULATION DENSITY PER SQUARE MILE,
1860
1
5
10
40
20
1
5
10


POPULATION DENSITY PER SQUARE MILE,
1880
1
5
5
5
5
1
5
10
20
40
150
100
40
40
10
20

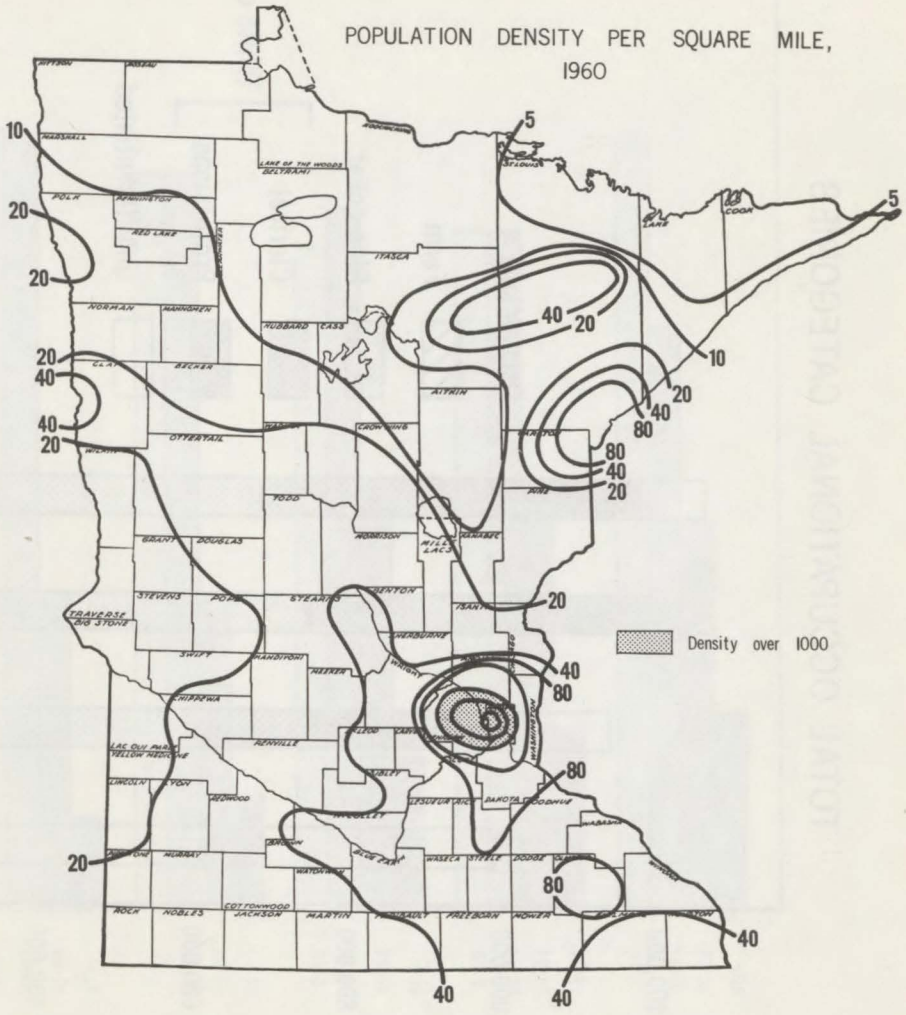

POPULATION DENSITY PER SQUARE MILE,
1900
Density over 1000


POPULATION DENSITY PER SQUARE MILE,
1920
Density over 1000

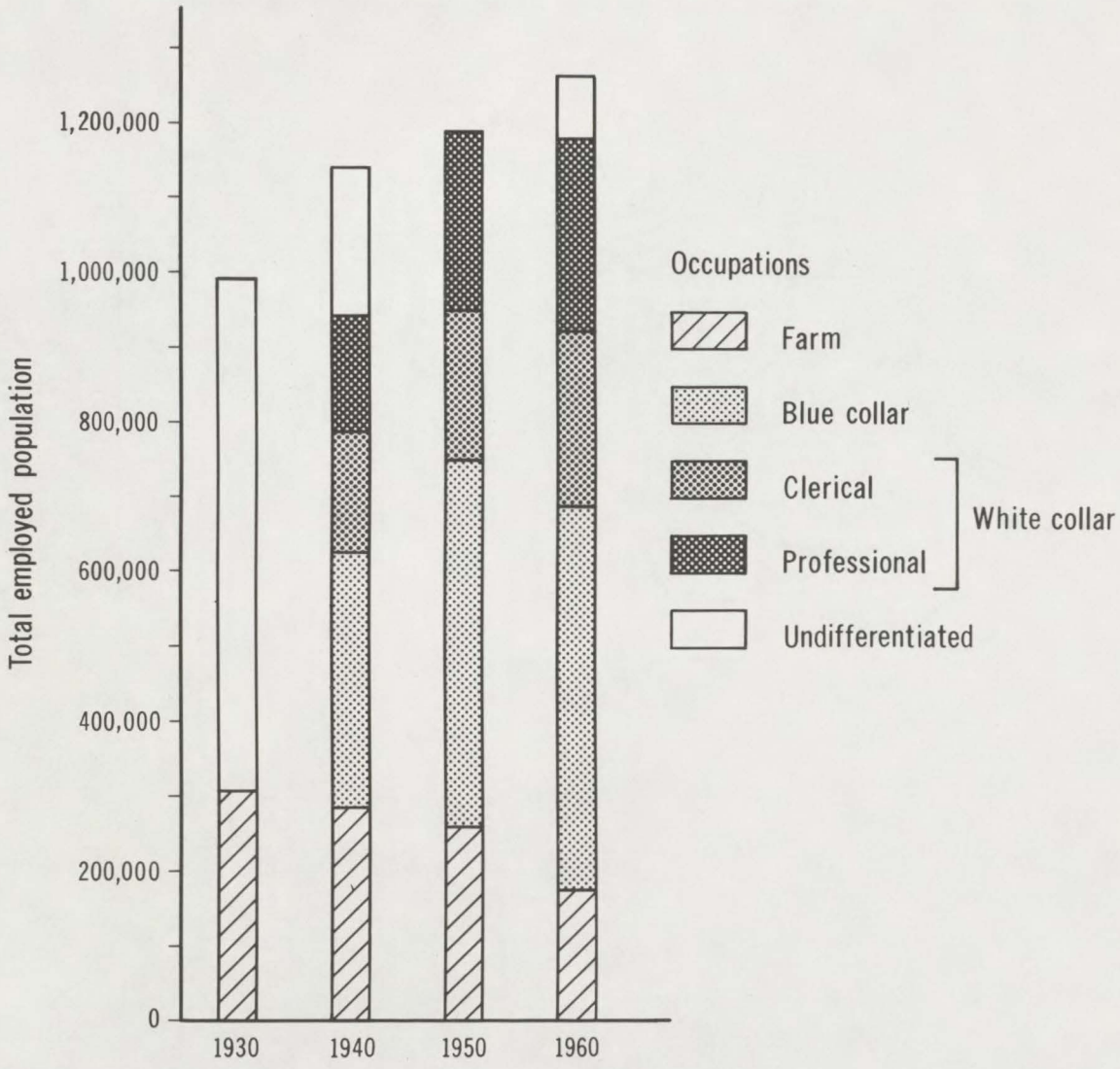
POPULATION DENSITY PER SQUARE MILE, 1940



POPULATION DENSITY PER SQUARE MILE, 1960



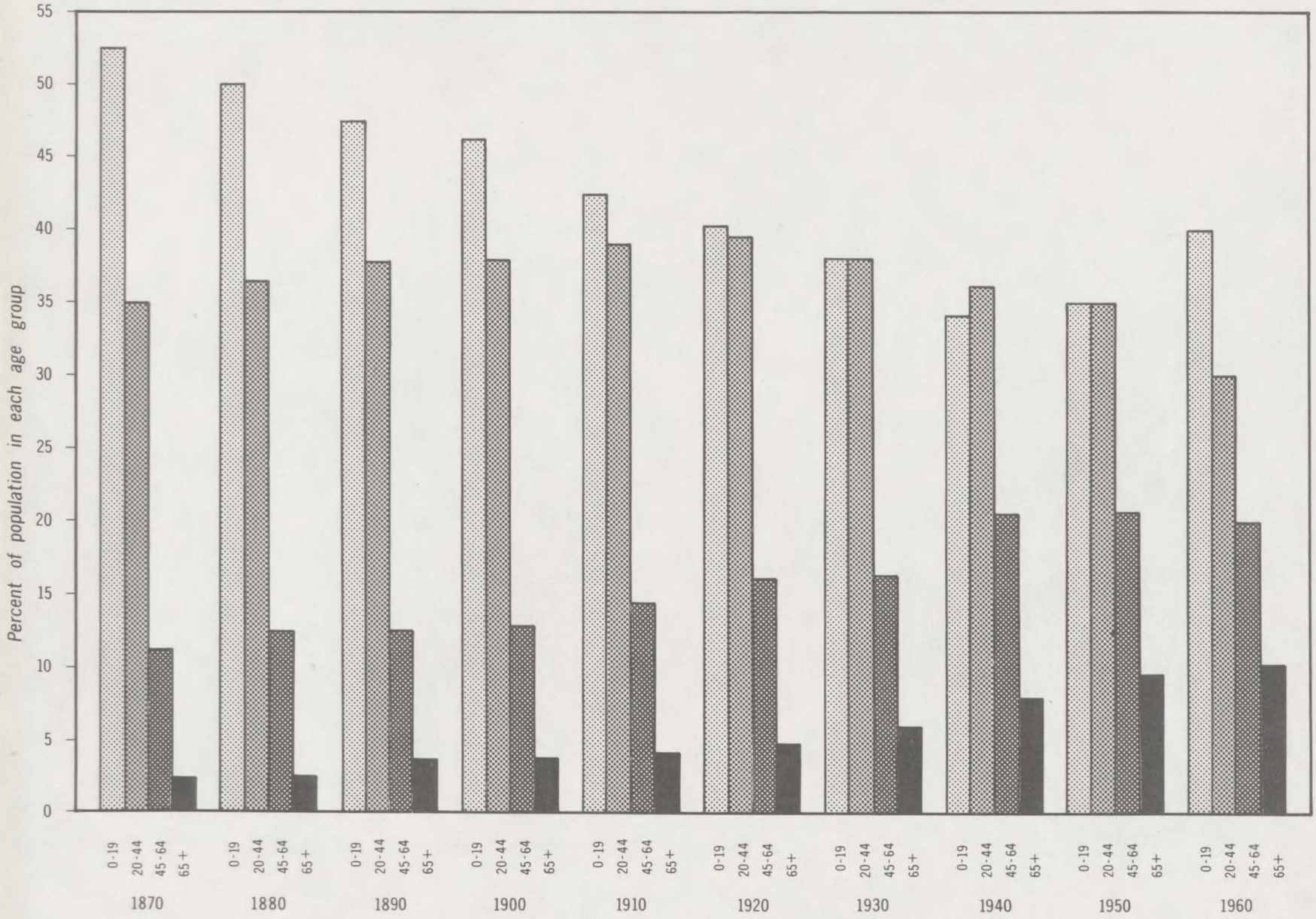
TOTAL OCCUPATIONAL CATEGORIES



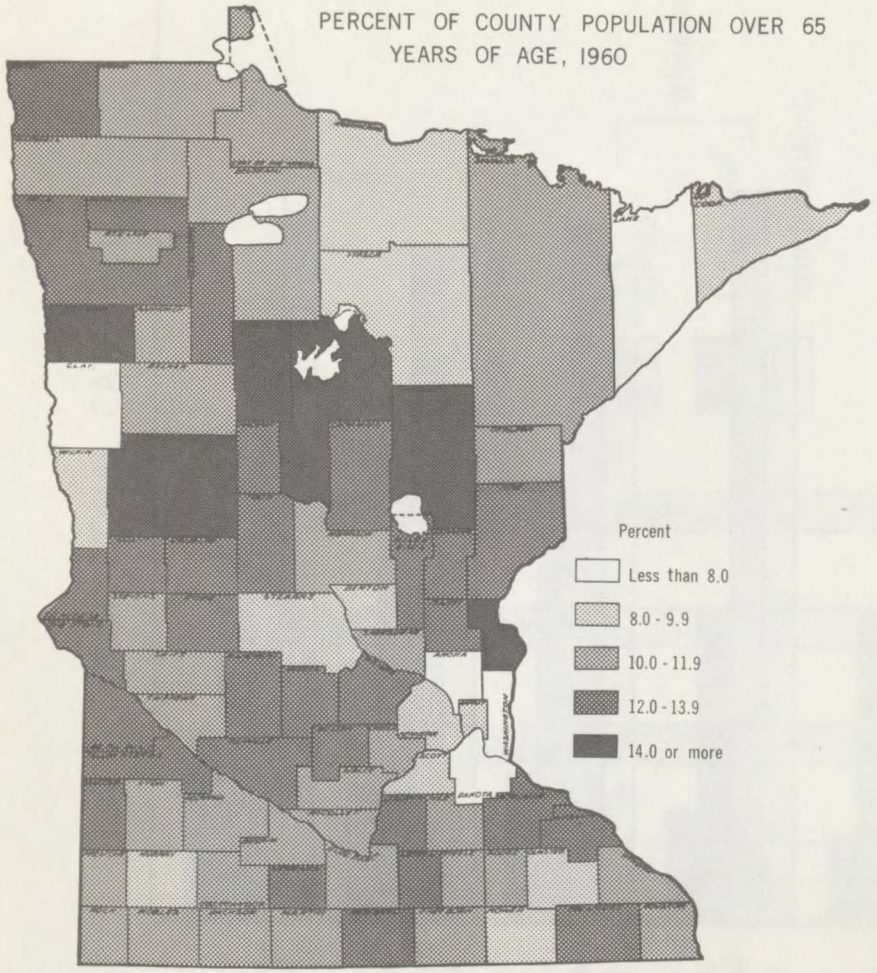
SOURCE: UNITED STATES CENSUS OF POPULATION, 1930 THROUGH 1960

Percent of population in each age group

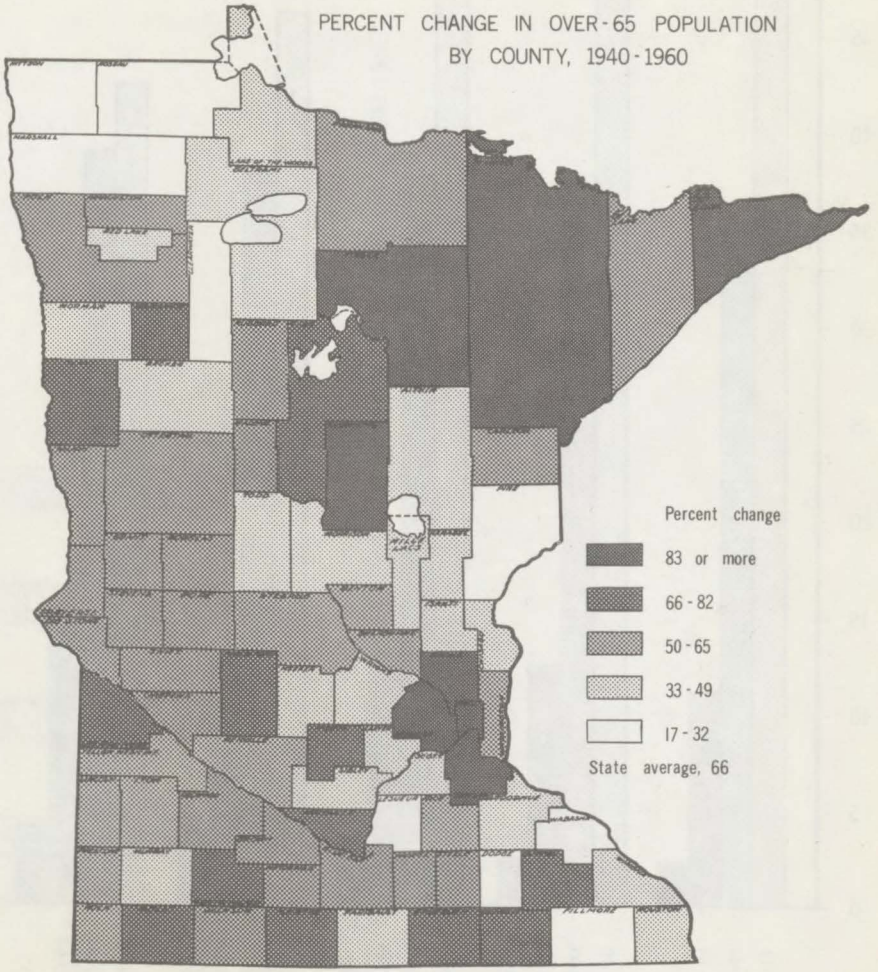
MINNESOTA AGE STRUCTURE, 1870 - 1960



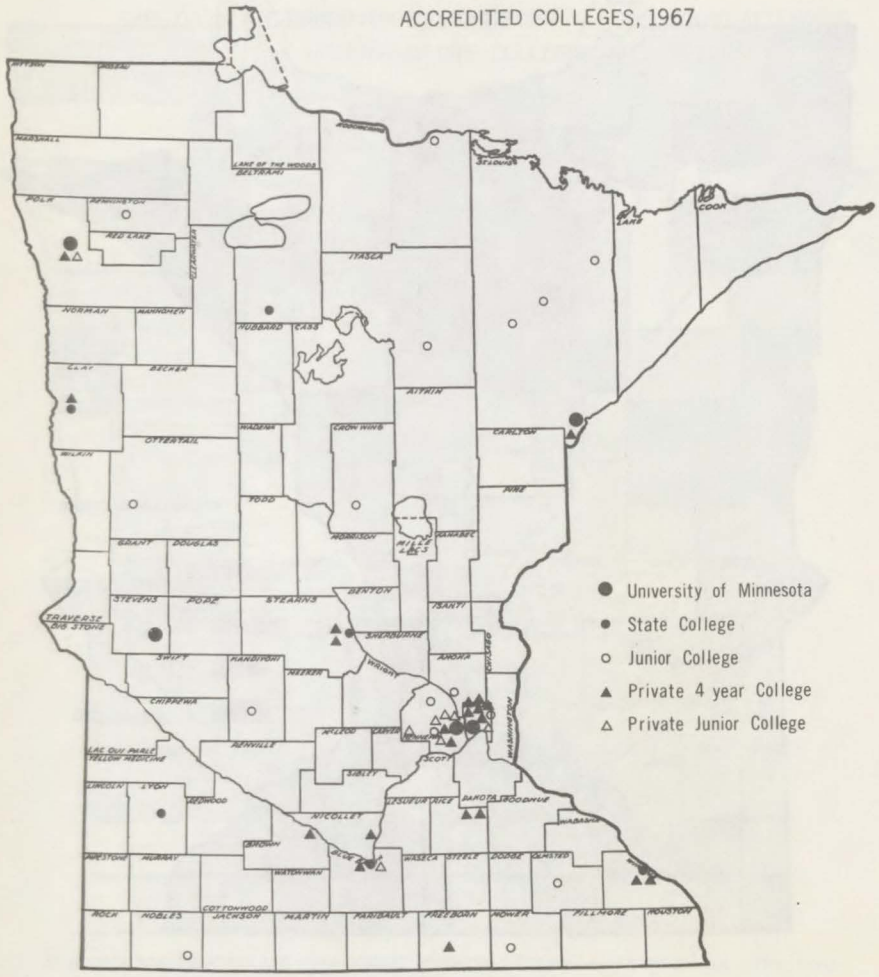
SOURCE: *CENSUS OF POPULATION: 1960,* VOL. 1. CHARACTERISTICS OF POPULATION, PART 25, MINNESOTA, AND *16th CENSUS OF UNITED STATES: 1940,* VOL. II, CHARACTERISTICS OF POPULATION, PART 4, MINNESOTA



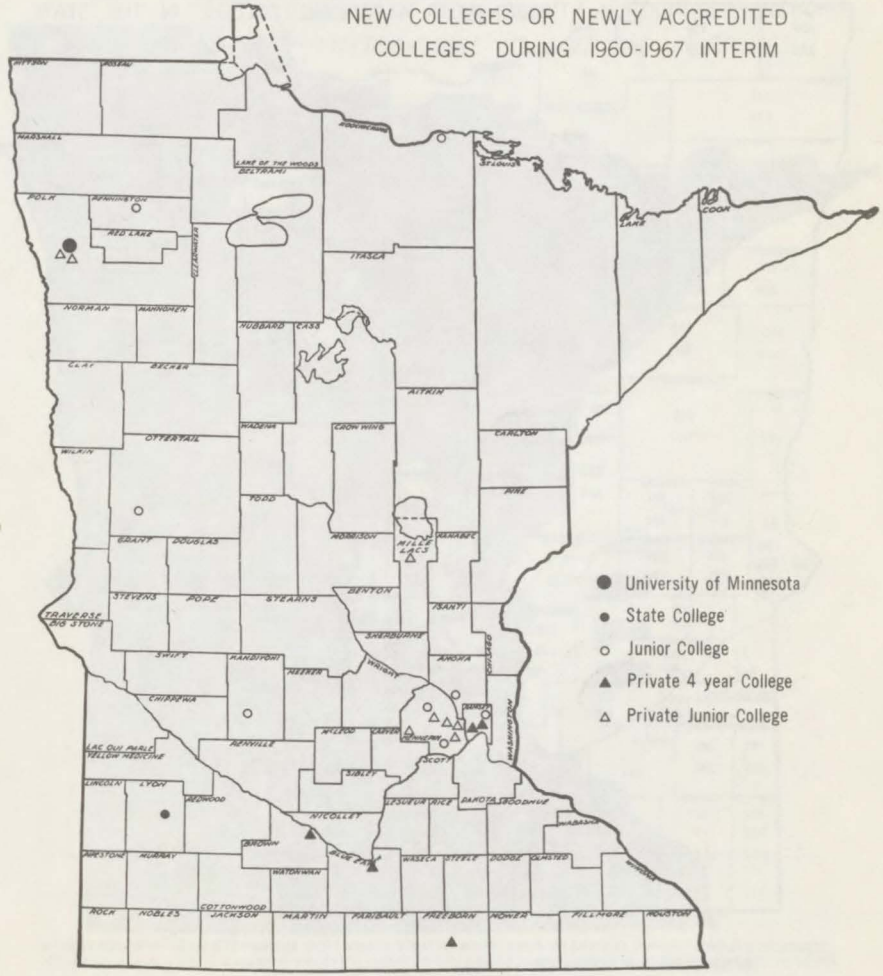
SOURCE: *CITY AND COUNTY DATA BOOK*, 1967, UNITED STATES BUREAU OF THE CENSUS



ACCREDITED COLLEGES, 1967

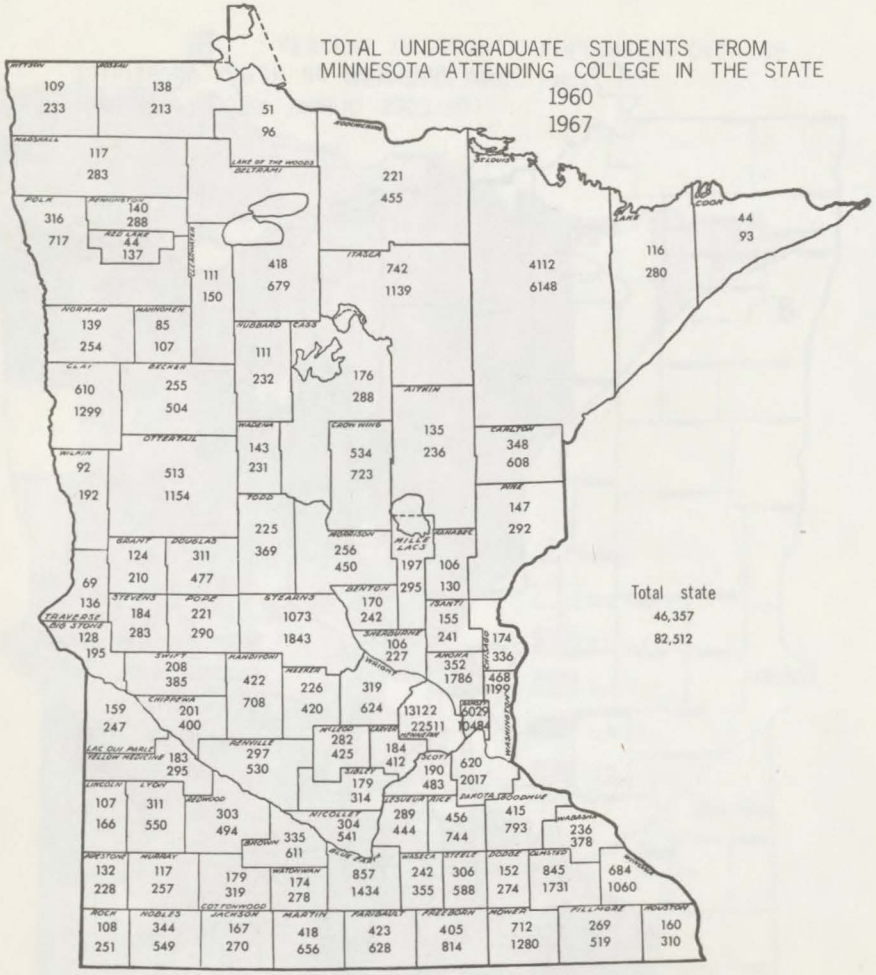


NEW COLLEGES OR NEWLY ACCREDITED COLLEGES DURING 1960-1967 INTERIM



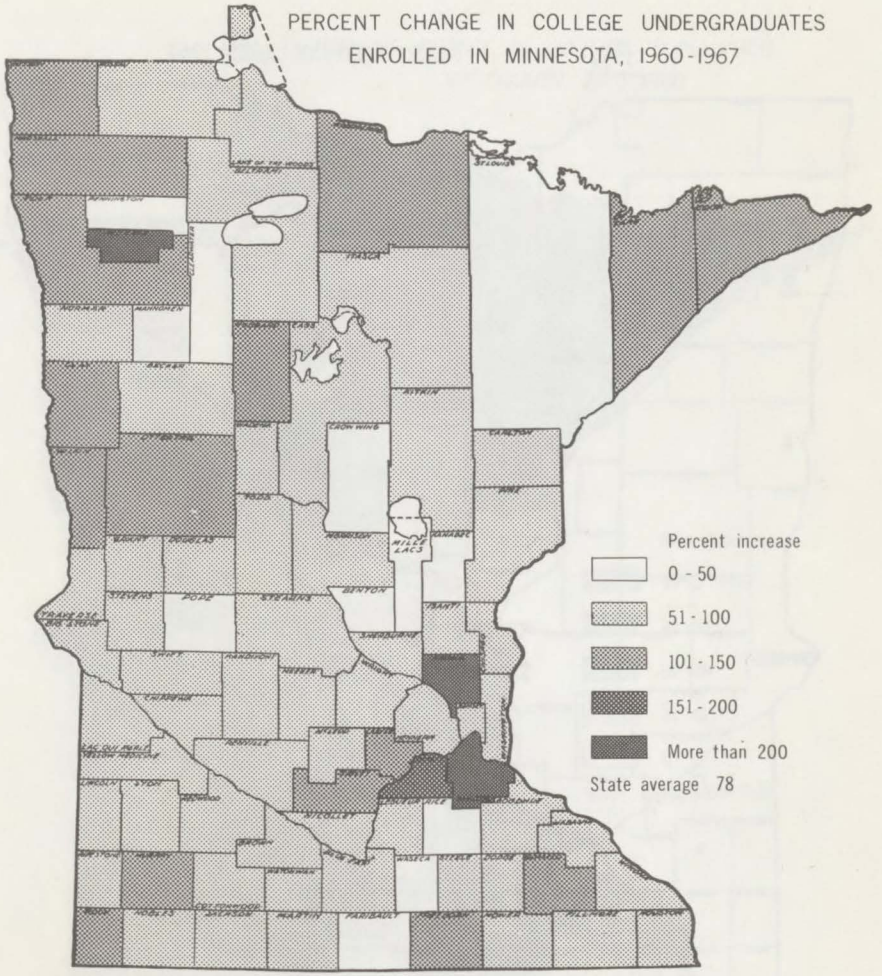
TOTAL UNDERGRADUATE STUDENTS FROM MINNESOTA ATTENDING COLLEGE IN THE STATE

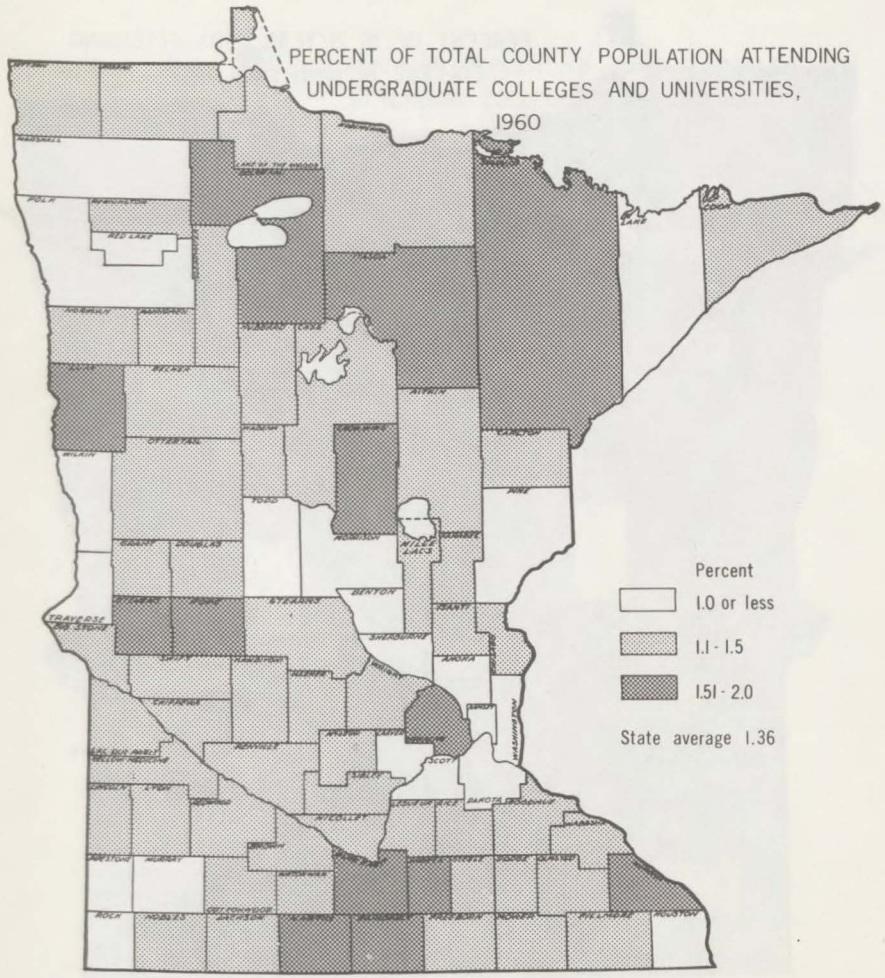
1960
1967



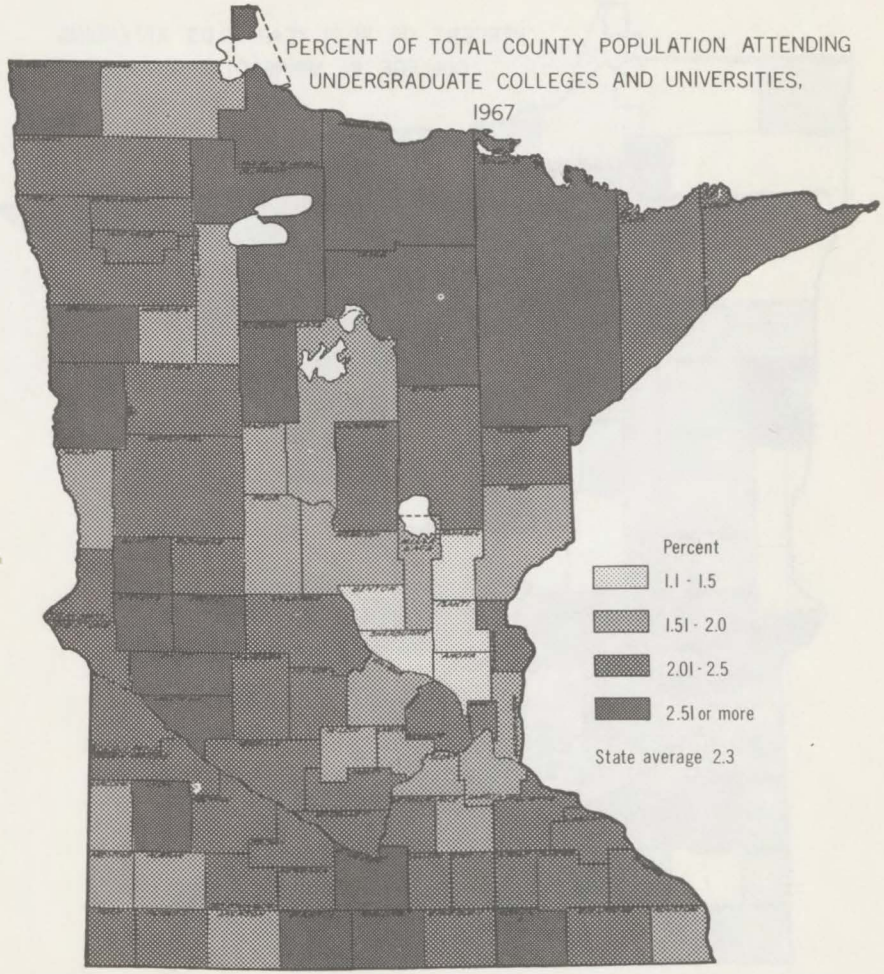
SOURCE: *STUDENT ENROLLMENTS IN MINNESOTA HIGHER EDUCATION,* MINNESOTA HIGHER EDUCATION CO-ORDINATING COMMISSION, 1968

PERCENT CHANGE IN COLLEGE UNDERGRADUATES ENROLLED IN MINNESOTA, 1960-1967





SOURCES: ENROLLMENT FIGURES FROM *STUDENT ENROLLMENTS IN MINNESOTA HIGHER EDUCATION;* POPULATION FIGURES FROM U.S. CENSUS OF POPULATION: 1960



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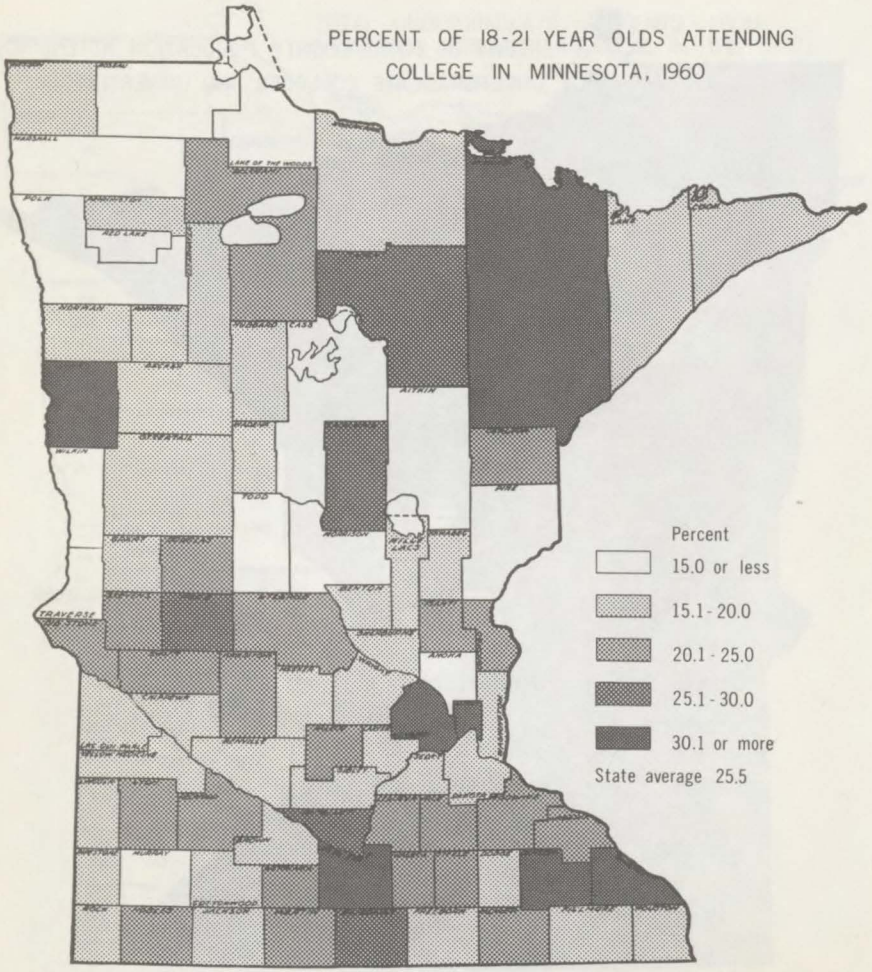
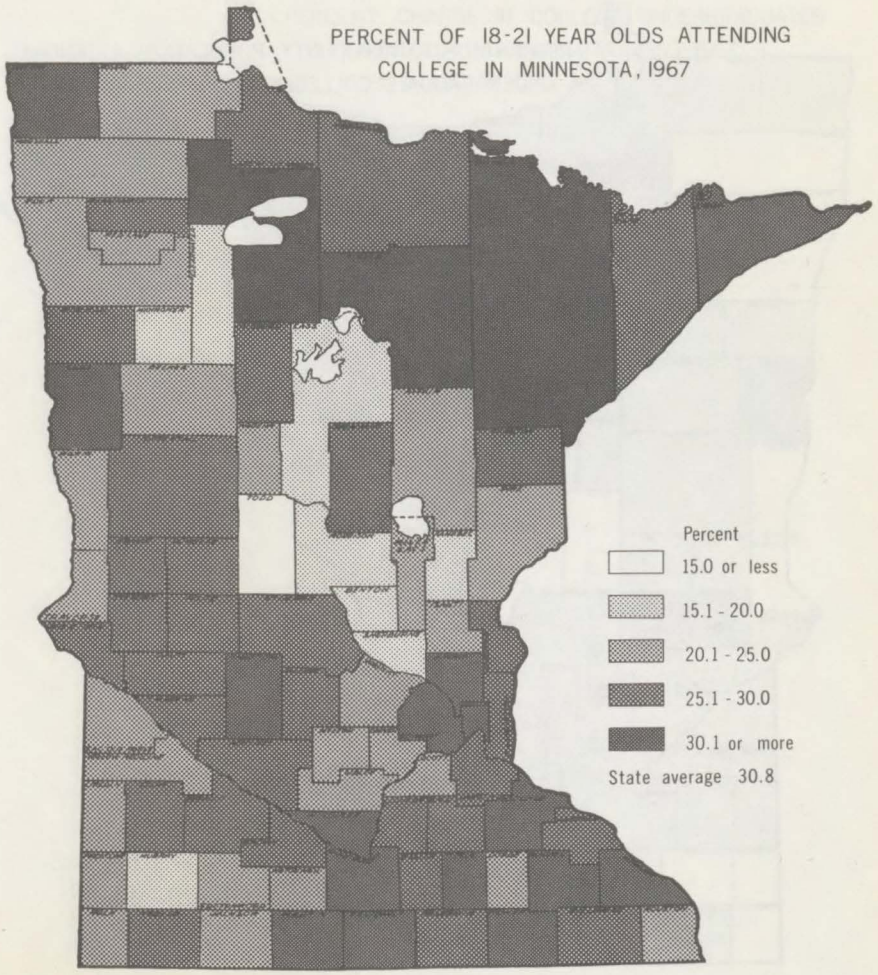
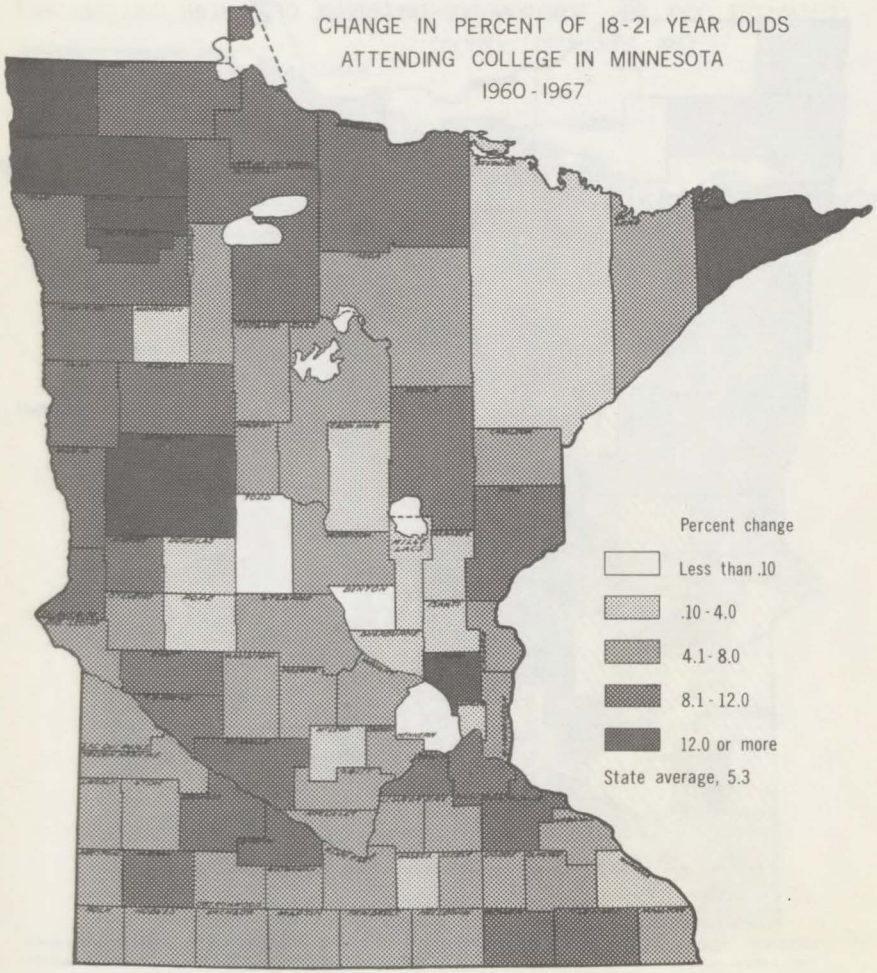


SOURCES: SCHOOL CENSUS DATA, MINNESOTA DEPARTMENT OF EDUCATION & *STUDENT ENROLLMENTS IN MINNESOTA HIGHER EDUCATION*



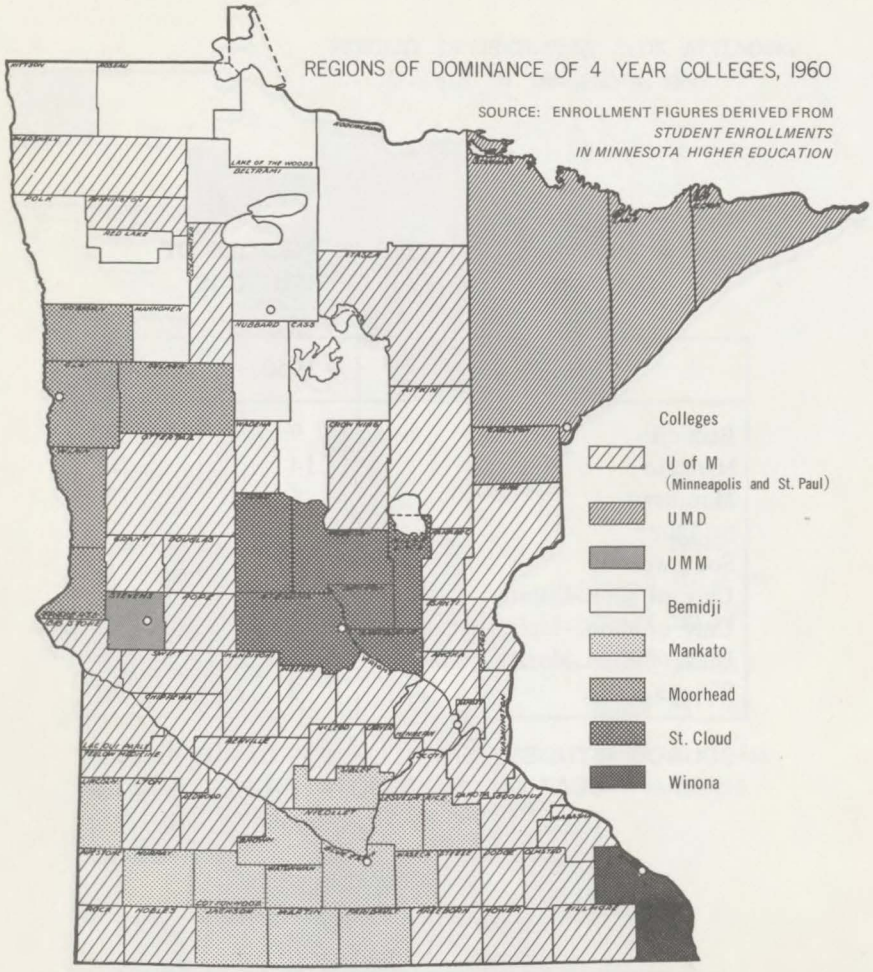
SOURCE: *COLLEGE AGE POPULATION PROJECTIONS,* MINNESOTA STATE DEPARTMENT OF EDUCATION



NUMBER OF COUNTIES IN REGIONS OF DOMINANCE OF 4-YEAR INSTITUTIONS

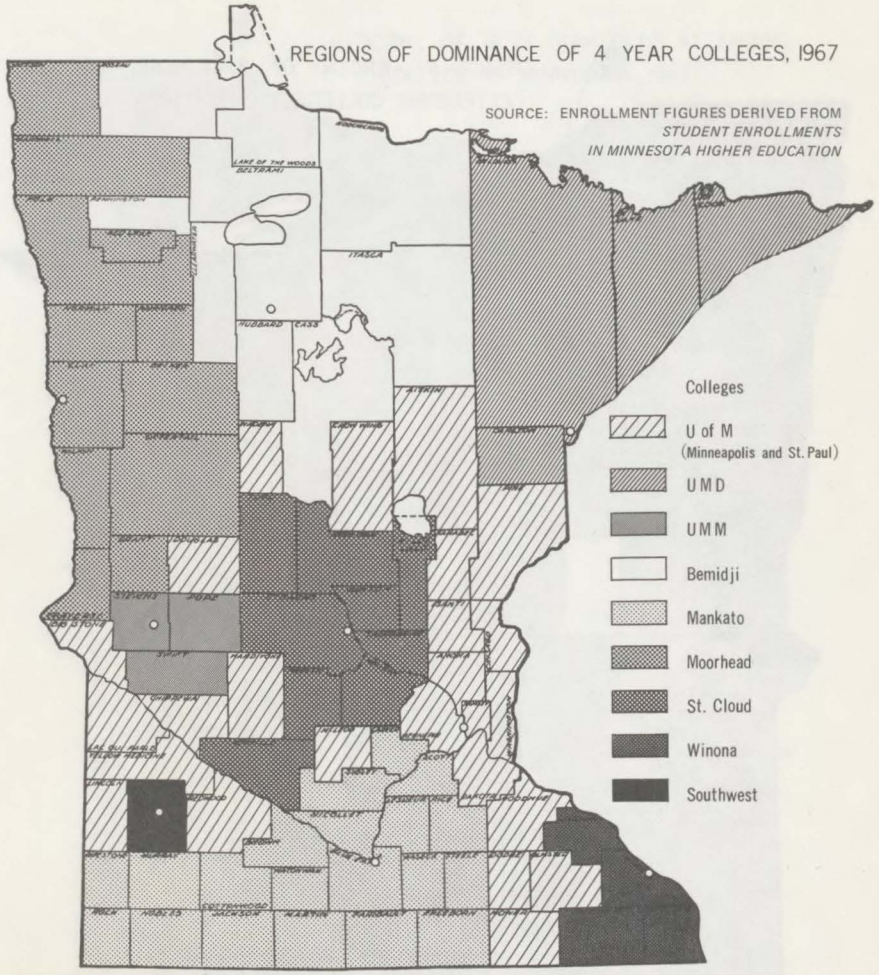
Institution	1960	1967
Bemidji	9.5	9
Mankato	14	20
Moorhead	5	12
St. Cloud	6	9
Southwest	-	1
Univ. of Minn.-Duluth	4	4
Univ. of Minn.–Mpls.-St. Paul	45.5	25
Univ. of Minn.-Morris	1	3
Winona	2	4

SOURCE: STUDENT ENROLLMENTS IN HIGHER EDUCATION, MINNESOTA HIGHER EDUCATION COORDINATING COMMISSION, 1968.



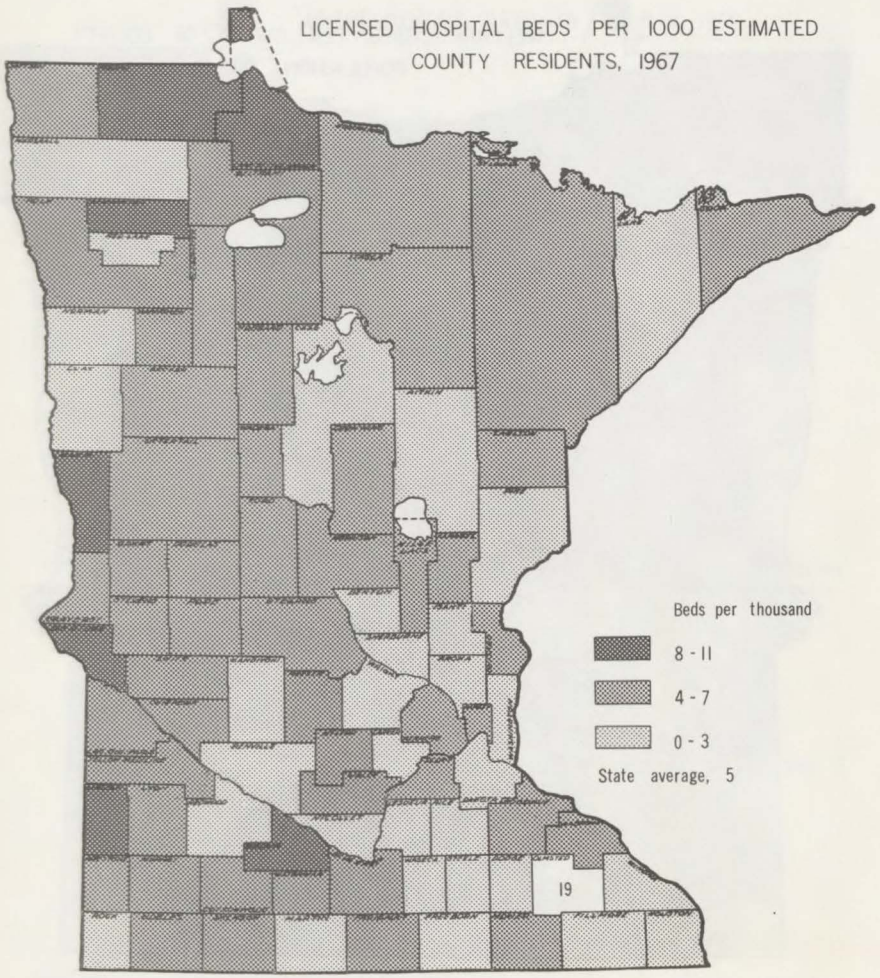
*CROW WING, ITASCA, MOWER, NOBLES AND OLMSTED COUNTIES SENT THE LARGEST NUMBER OF THEIR STUDENTS TO INDIVIDUAL JUNIOR COLLEGES

**KITTSON SENT THE SAME NUMBER OF STUDENTS TO BEMIDJI AS TO THE UNIVERSITY OF MINNESOTA



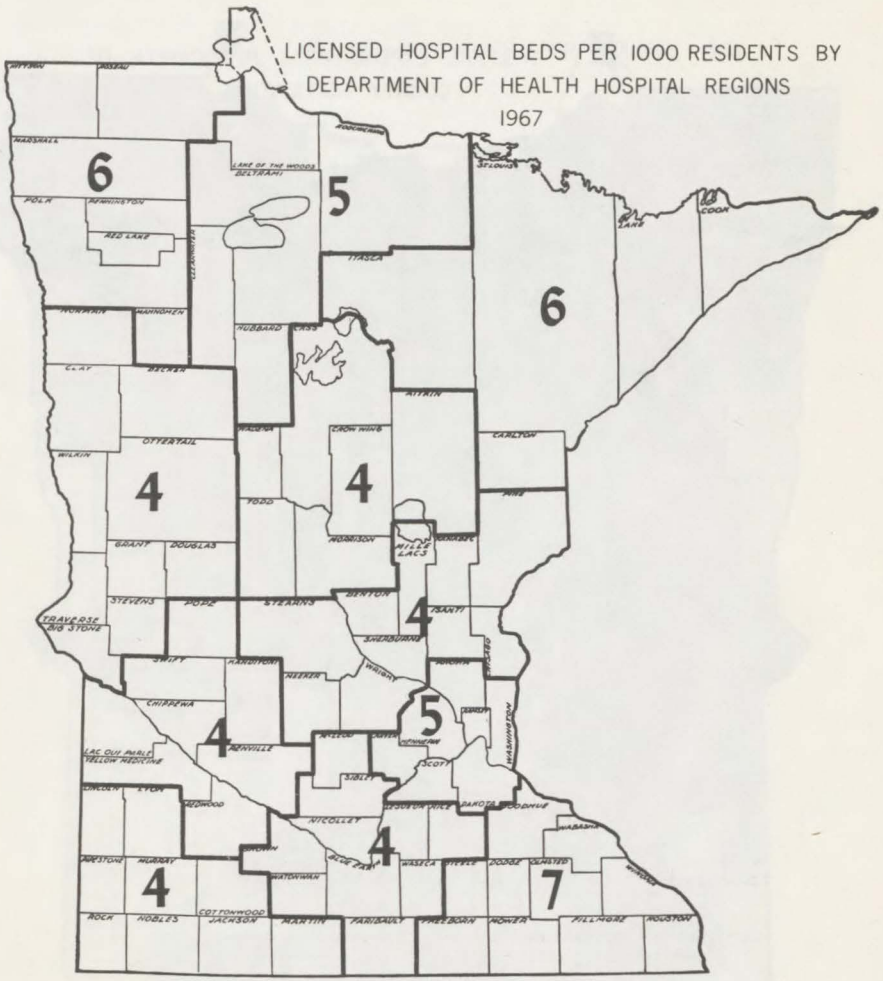
*CROW WING, ITASCA, KANDIYOHI, KOOCHICHING, MOWER, NOBLES, OLMSTED, OTTER TAIL & PENNINGTON COUNTIES SENT THE LARGEST NUMBER OF THEIR STUDENTS TO INDIVIDUAL JUNIOR COLLEGES. RED LAKE COUNTY ALSO SENT 30 STUDENTS TO NORTHLAND JUNIOR COLLEGE AND A SIMILAR NUMBER TO MOORHEAD STATE COLLEGE

LICENSED HOSPITAL BEDS PER 1000 ESTIMATED COUNTY RESIDENTS, 1967



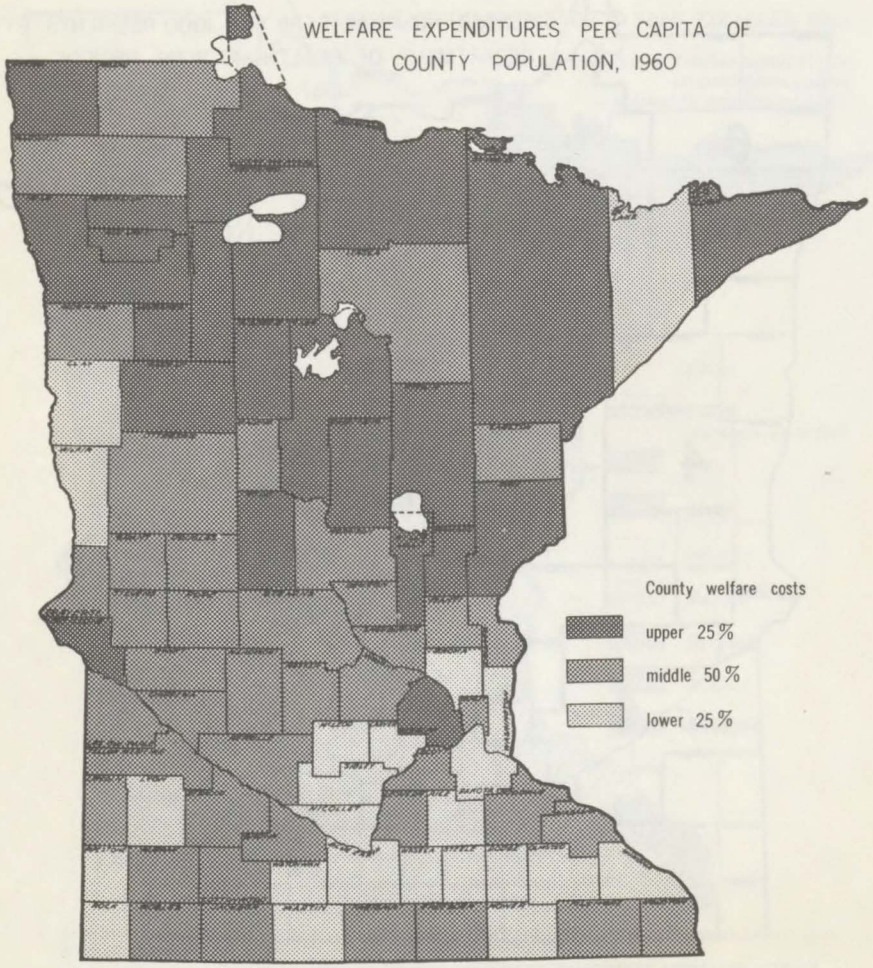
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, DIVISIONS OF HOSPITAL SERVICES AND VITAL STATISTICS

LICENSED HOSPITAL BEDS PER 1000 RESIDENTS BY DEPARTMENT OF HEALTH HOSPITAL REGIONS 1967



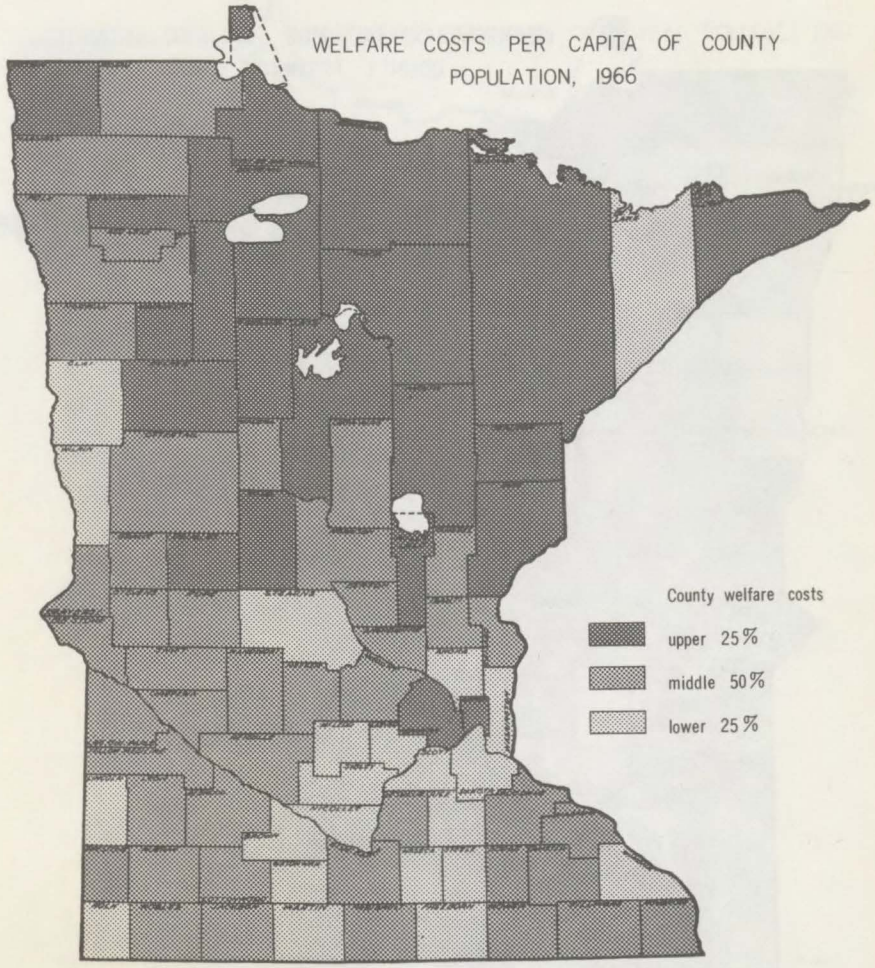
SOURCE: MINNESOTA DEPARTMENT OF HEALTH, DIVISION OF HOSPITAL SERVICES, FEBRUARY, 1968, AND SECTION OF VITAL STATISTICS, JULY, 1968.

WELFARE EXPENDITURES PER CAPITA OF COUNTY POPULATION, 1960

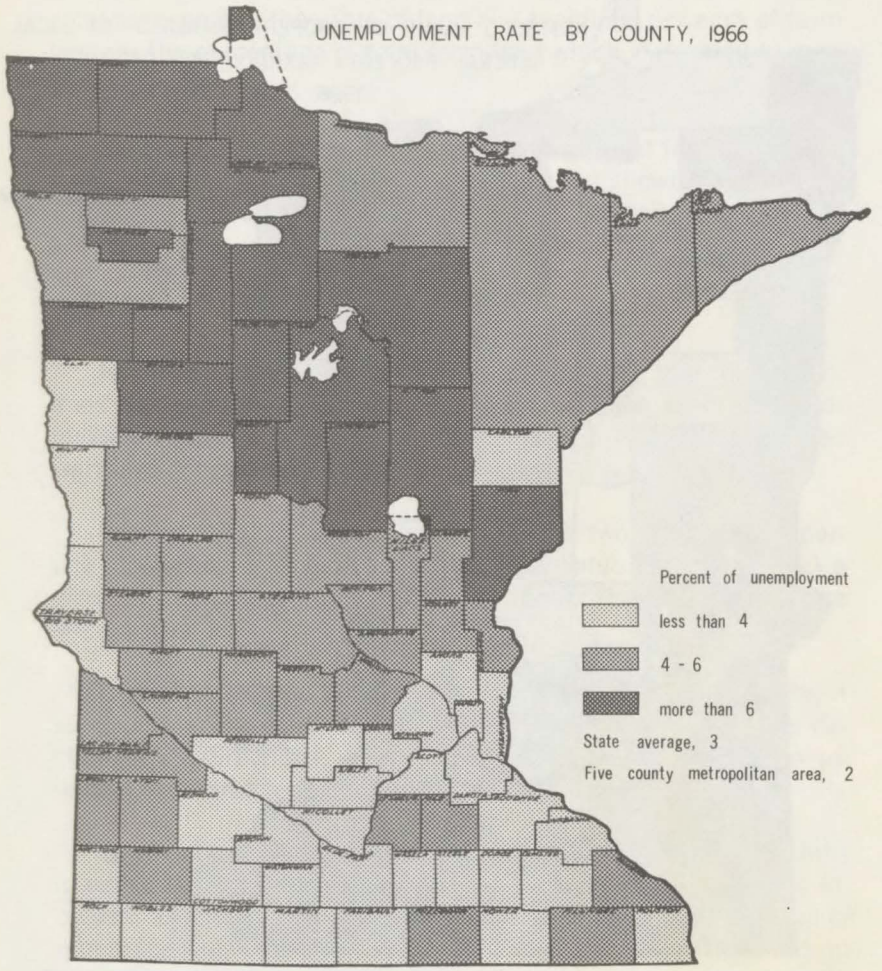


SOURCE: MINNESOTA DEPARTMENT OF PUBLIC WELFARE

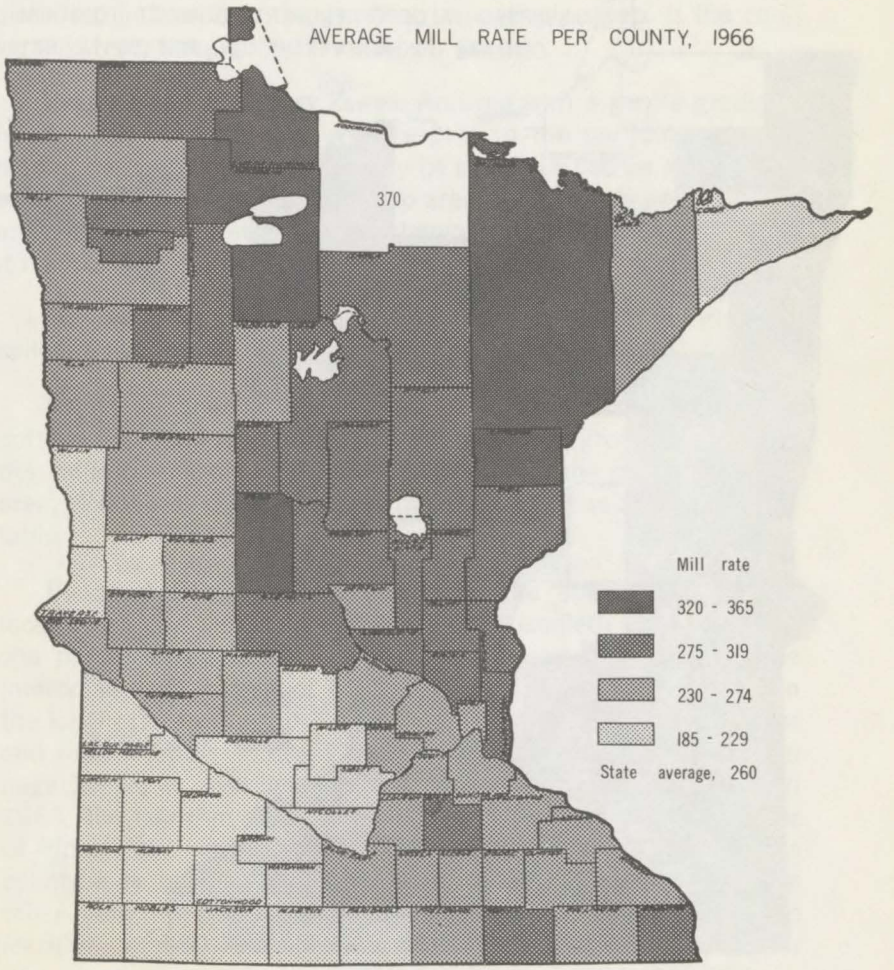
WELFARE COSTS PER CAPITA OF COUNTY POPULATION, 1966



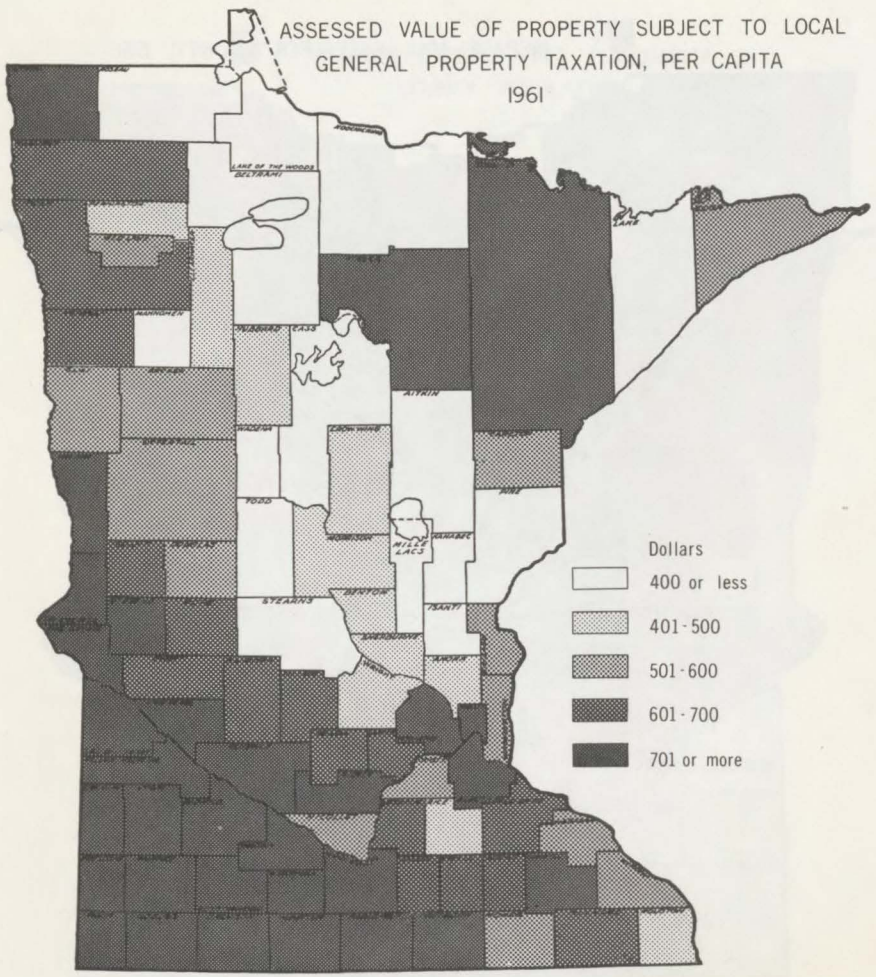
SOURCE: MINNESOTA DEPARTMENT OF PUBLIC WELFARE. (COUNTY POPULATION ESTIMATES FROM MINN. DEPT. OF HEALTH, SECTION OF VITAL STATISTICS.)



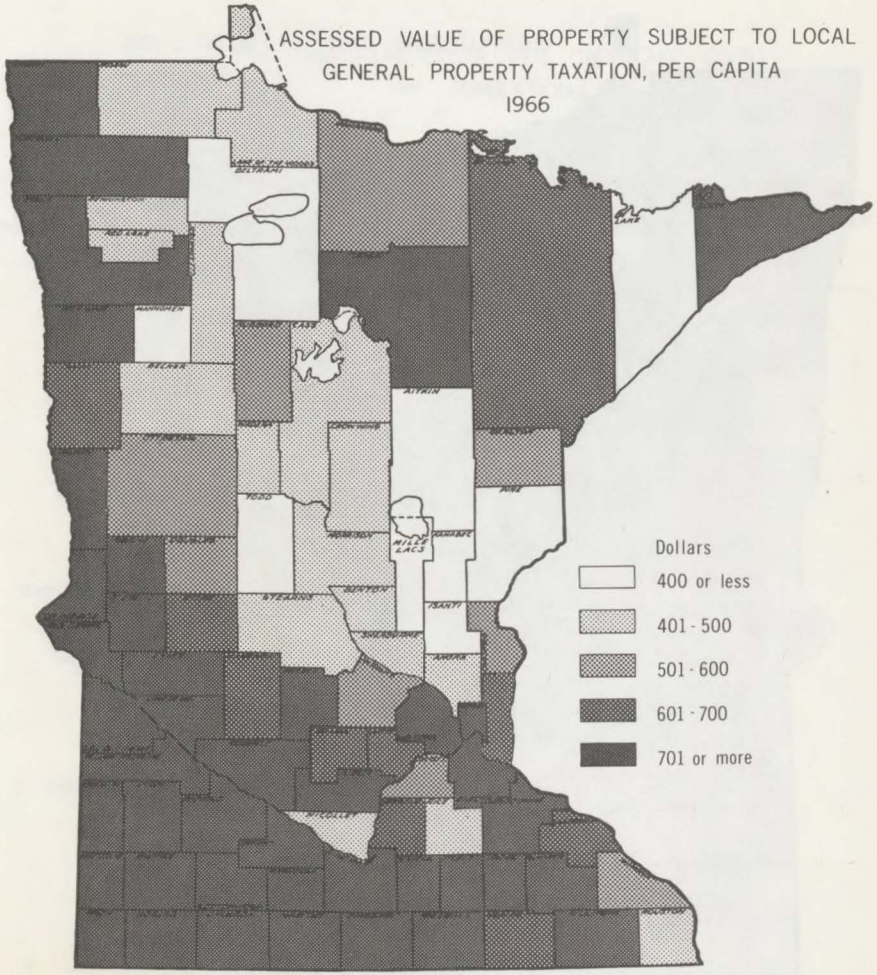
SOURCE: MINNESOTA DEPARTMENT OF EMPLOYMENT SECURITY, DIVISION OF RESEARCH AND PLANNING



SOURCE: STATE AUDITOR OF MINNESOTA



SOURCE: CENSUS OF GOVERNMENTS, TAXABLE PROPERTY VALUES: 1962



SOURCE: *PRELIMINARY REPORT: ASSESSED VALUATIONS FOR GENERAL PROPERTY TAXATION,* CENSUS OF GOVERNMENTS, 1967

APPENDIX II: NOTE ON THE READING OF MAPS

Many maps in this atlas show the distribution of numerical values of some particular phenomenon over the state of Minnesota; for example, the value of land and buildings per acre of farm land, or the percentage of total farm land which is devoted to corn in each county.

Geographic Pattern. The main thing to be read from each map is the geographic pattern of the phenomenon shown. The pattern consists of one or more areas of **maximum intensity,** one or more areas of **minimum intensity,** and **transition belts** of varying width and rapidity of change which separate the centers of high and low intensity.

Isarithms. To make the pattern apparent at a glance, a set of lines has been drawn upon some maps, and the exact value for individual places is not shown. Such lines are commonly called **isarithms** (or **isopleths**).

Properties of Isarithms. Isarithms have two definitive properties (1) a given line represents the same value everywhere; (2) a given line separates values which are higher than the value of the line from values which are lower.

Closed Isarithms. Where an isarithm forms a closed circle, it surrounds an area of maximum intensity, from which values decline in all directions; or it surrounds an area of minimum intensity, from which values increase in all directions.

Gradients. A direction which is at right angles to the isarithms is called the **gradient.** In the direction of the gradient, values increase as one moves across isarithms of progressively higher numerical value or decrease as one moves across isarithms of progressively lower numerical value.

Steep and Gentle Gradients. Where isarithms are relatively close together, values change rapidly as one moves in the gradient direction; in that case the gradient is relatively **steep.** If the converse is true, the gradient is relatively **gentle.**

Regions and Boundary Zones. An area with a gentle gradient is relatively homogeneous with respect to the particular phenomenon the map shows; and it may be distinguished as a **region.** A steep gradient which separates two areas of relatively gentle gradient is a zone of relatively rapid change between two regions, and it may be called a **boundary** or **boundary zone.**

Interval. The difference in value between adjacent isarithms is called the isarithmic **interval** of the map.

Values for Specific Local Areas. In addition to the geographic pattern, a second type of information to be read from each map is the value of the phenomenon it shows for some particular local area. In this way the map serves the same purpose as a numerical table.

Direct Reading and Interpolation. The specific values for local areas can be read directly from an isopleth or isarithm, if one passes through the local area in question; or they can be interpolated by means of comparing the relative distance from the local area in question, along the gradient, to the next lowest and next highest isarithm. For example, the isarithmic map on page 75 shows Average Value of All Products Sold per Farm in 1964, the isarithm of $15,000 passes almost across the center of Pipestone county; therefore, the average value for Pipestone county may be read directly as approximately $15,000. On the other hand, the center of Waseca county lies midway between the isarithms of $10,000 and $15,000; hence the average value for Waseca county can be interpolated as approximately $12,500.

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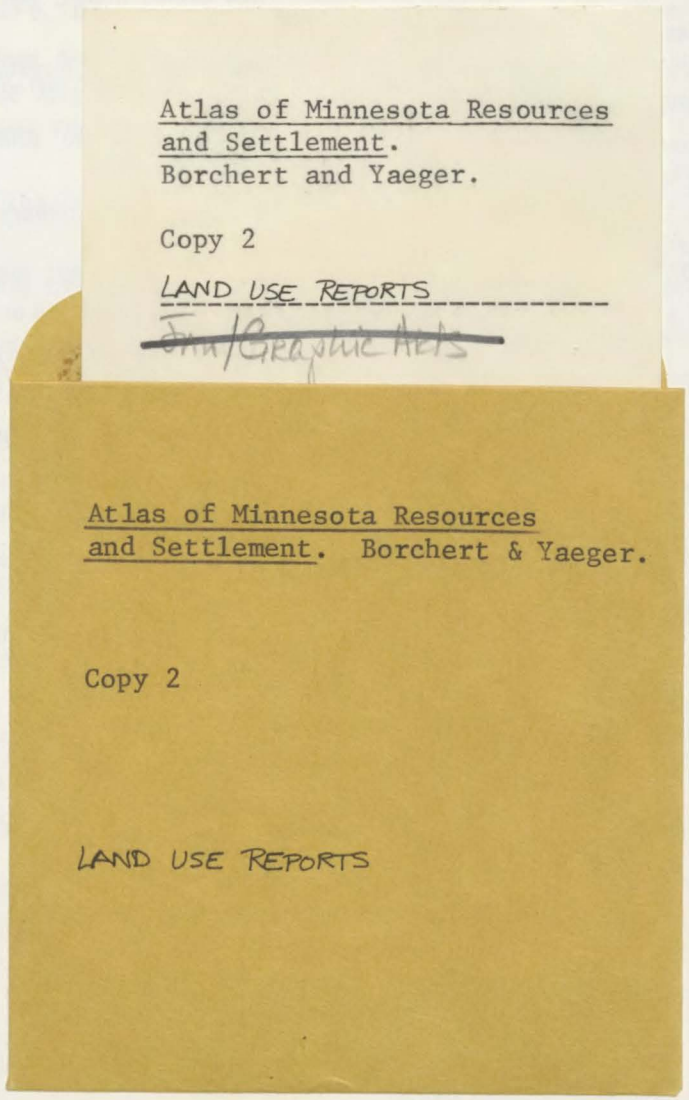
Atlas of Minnesota Resources and Settlement.
Borchert and Yaeger.
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LAND USE REPORTS
Atlas of Minnesota Resources and Settlement. Borchert & Yaeger.
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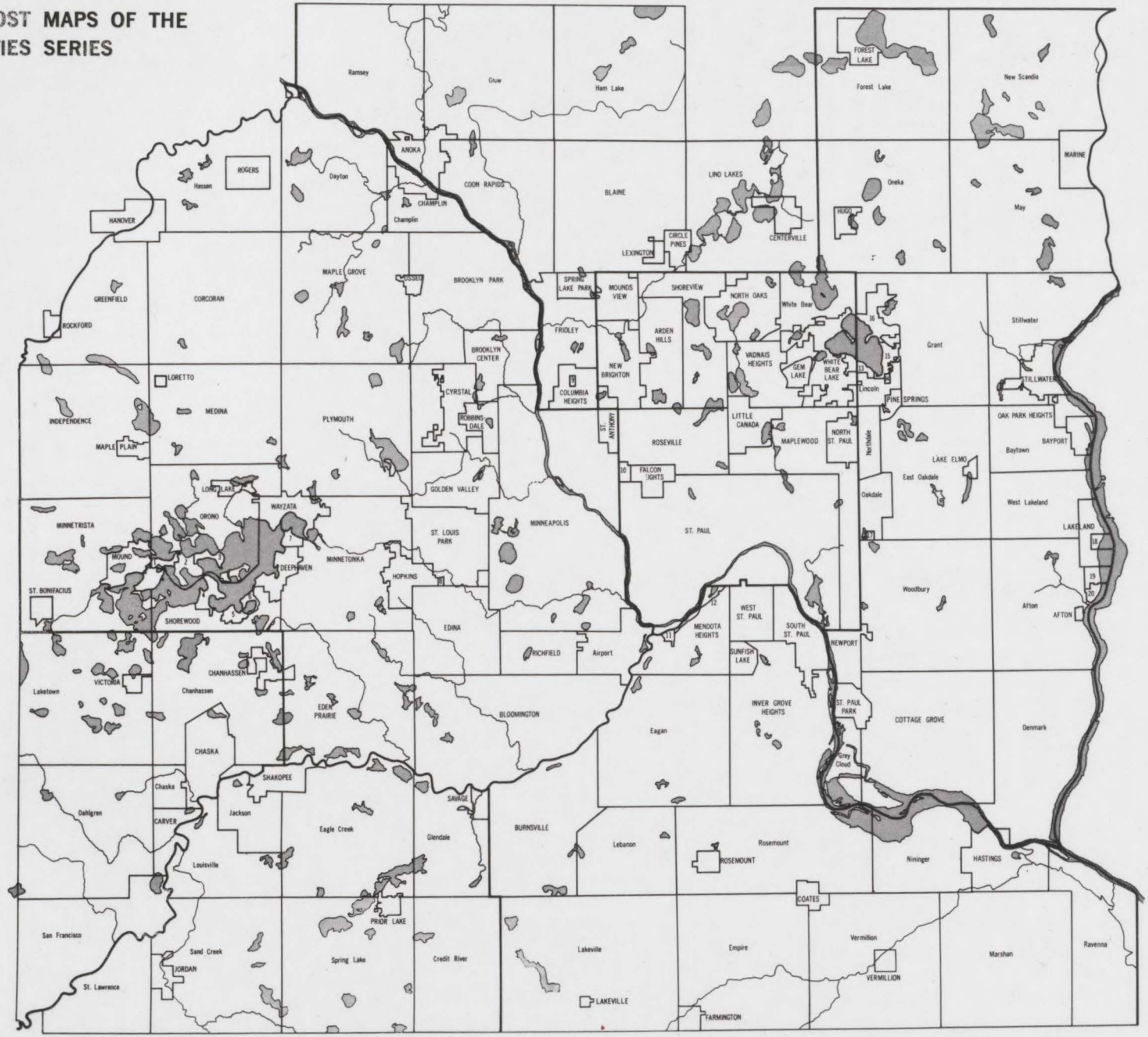
LAND USE REPORTS

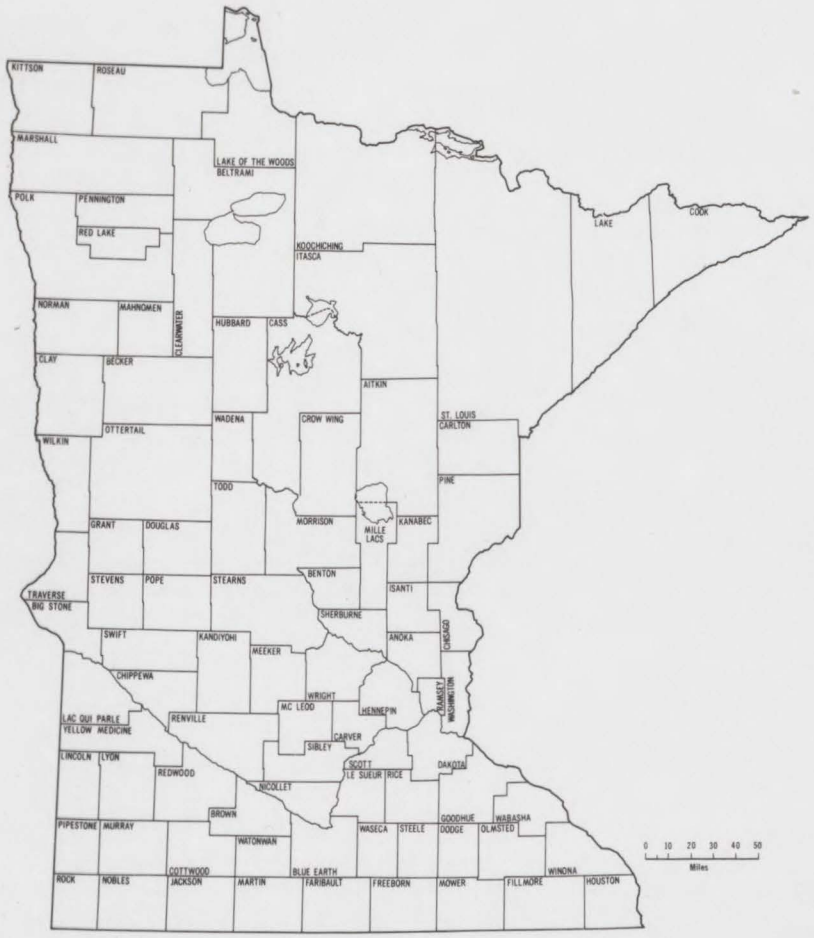
OVERLAY FOR MOST MAPS OF THE TWIN CITIES SERIES

MINOR CIVIL DIVISIONS, 1960

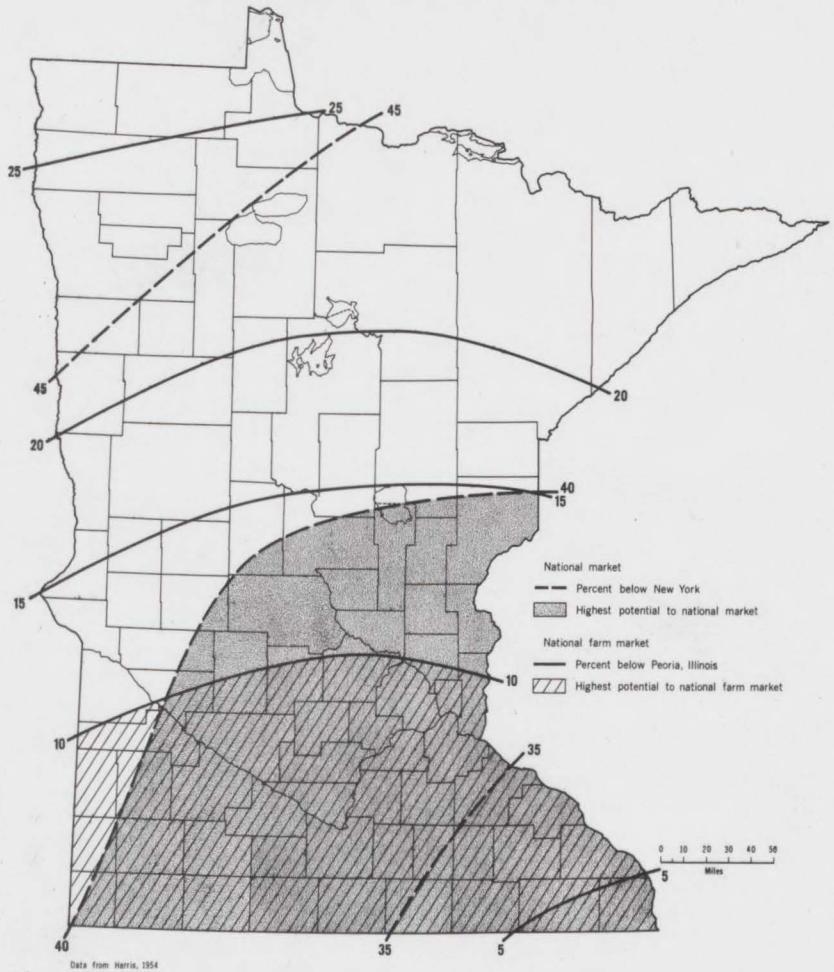


1. SPRING PARK
2. ORONO
3. MINNETONKA BEACH
4. TONKA BAY
5. EXCELSIOR
6. GREENWOOD
7. WOODLAND
8. MINNETONKA
9. HILLTOP
10. LAUDERDALE
11. MENDOTA
12. LILYDALE
13. BIRCHWOOD
14. WILLERNIE
15. MAHTOMEDI
16. DELLWOOD
17. LANDFALL
18. LAKELAND SHORES
19. ST. CROIX BEACH
20. ST. MARY'S POINT

OVERLAY FOR MANUFACTURING PLANTS SERIES



NATIONAL MARKET POTENTIAL



Data from Harris, 1954

Twin Cities Metropolitan Area

(Major urbanizing portion)

GENERALIZED LAND USE 1968

- Single-family Housing
- Mixed Single and Multi-family Housing
- Commerce
- Industry
- Railyard
- Airport
- Institution
- Cemetery
- Public Recreation
- Private Recreation
- Agriculture or Vacant
- Water Body
- Woodland
- Marsh
- Interstate Freeway
- Programmed Interstate Freeway
- Expressway
- Arterial
- County Boundary
- Municipal Boundary
- Township Boundary

Metropolitan Council of the Twin Cities Area

January 1968

The preparation of this map was financially aided through a Federal grant from the Department of Housing and Urban Development, under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended.

MILES 5 15 20 25 30 35 40 45 50