REGIONAL GROWTH, CENTRAL PLACE DEVELOPMENT, AND FUNCTIONAL CHANGE: RIVER BEND AREA, MINNESOTA

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HERBERT ROGER SMITH

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This is to certify that the

thesis entitled

REGIONAL GROWTH, CENTRAL PLACE DEVELOPMENT AND FUNCTIONAL CHANGE: RIVER BEND AREA, MINNESOTA

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ABSTRACT

REGIONAL GROWTH, CENTRAL PLACE DEVELOPMENT, AND FUNCTIONAL CHANGE: RIVER BEND AREA, MINNESOTA

BY

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The eight county River Bend Area of South Central Minnesota can be analyzed both as a market area for the dominant center of Mankato and as an inter-related set of central places. Historical-geographic research techniques helped trace how technological innovation and adaptation in transportation and agriculture shaped the economic character of the region.

The two most important historical eras of growth and change in the study area were those of rail and highway development. The former was significant because it formed the dominant pattern of central places prior to 1900 and the latter because it dominated in altering the role and function of the central place as well as changing the commercial inter-relationships of centers.

The primary resources for this study were the early gazetteers of Minnesota and the Dun and Bradstreet Books of Commercial Ratings which yielded information regarding

the functional characteristics of all service centers in the study area from the turn of the century to 1960. Through the use of statistical techniques and computer manipulation of the data it was possible to determine the existence of a uniform hierarchy of central places at ten year intervals from 1900 to 1960. Then a profile of each level's expected functional base was derived; it showed the services and goods characteristic of each level of the hierarchy for each decennial interval. The functional profiles also aided in analyzing the changes in consumer demand occurring since the turn of the century. The profiles demonstrated that consumers had reoriented their shopping patterns from smaller local centers toward the larger, more complete service centers primarily as a result of expanded use of the automobile, improved safety equipment, and better roads.

The functional community profiles further revealed that many small towns which may appear to be dead or dying are often still viable elements of the commercial fabric of the area. Though the old "Main Street" business center of many small towns may be almost abandoned, many functions of the community have relocated away from the old commercial core and are non-central types.

The analysis also served to discount the notion of the single regional center. Though in terms of population size there may be only one dominant commercial center in a

region such as the River Bend Area, the functions it performs are no different than those offered by places only half its size.

Many of the ideas developed in this study are related to the concept of comparative advantage which is intimately related to factors of accessibility. Highly accessible places tend to have great comparative advantage for retail sales. A high correlation exists between places with great focality for retail commercial trade and the number of direct road connections these places have to other centers within the region.

Accessibility has been markedly altered over time by increased speeds of transportation available to consumers. The time expenditures involved in the journey to market can be perceived as a constant factor influencing decisions about what a consumer's choice of shopping center will be. As speed has increased through transportation technology, the time necessary to travel to a market has declined, thus lengthening the distance a consumer will travel, which accounts for the decline of many small centers and the growth of other larger places.

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A THESIS

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DOCTOR OF PHILOSOPHY

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To my wife

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The writer also wishes to thank the library staff of Dun and Bradstreet for their assistance in locating the basic data employed in this study as well as providing working space in their offices in New York City.

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CHAPTER I

INTRODUCTION

Geographers, political scientists, sociologists, economists, and other social scientists have been examining for some time the question of "what makes some communities grow while others falter and stagnate?" Each of the disciplines tends to analyze such problems in terms of its own methodology. The geographer sees the problem as one of space, the economist as flows of goods and capital, the sociologist as the movements of people, and the political scientist as communication from centers of control. But most researchers have concluded that accessibility is the key factor in determining how large and/or how fast a community or region will grow. This study will investigate the idea of accessibility and how it affects not only community but regional growth.

The concept of accessibility is usually related to the transportation system available for the movement of goods, people, capital, and ideas over space. Since the turn of the century, the accessibility of central places throughout the world has changed dramatically because the science of transportation innovated and developed new technology. Transportation research for the engineer is

an extremely complex and refined field based in large part upon the calculus of moving vehicles. In this study, however, transportation will be defined as how fast can people, goods, and, in some cases, ideas move within a prescribed area.

This research assumes that for each change in the character of the transportation system within a market area there will be a corresponding change in the spatial, economic, technological, or social character of the region. The nature of the smallest central place can be changed almost immediately by adding or subtracting some factor which influences its accessibility or focality.

Von Thünen, in his study Der isolierte Staat,[1] recognized the importance of transportation on the arrangement of concentric zones of commodity production within the market area of a central place. This concept in economics is termed "comparative advantage." The idea presumes that people attempt to maximize their returns, either real or imagined, by attempting to obtain the greatest utility from their resources or efforts.

Transportation system variations which alter the equality of advantage of Von Thünen markedly affect the characteristics of his conceptualization of concentric rings of production. (See Fig. 1.1.) Von Thünen's theory

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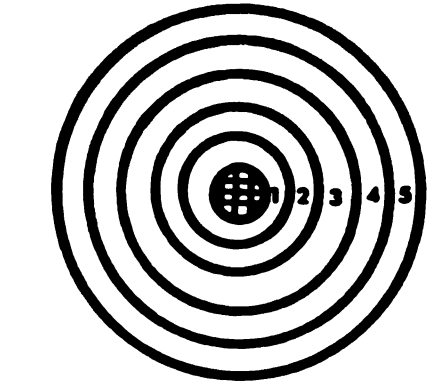
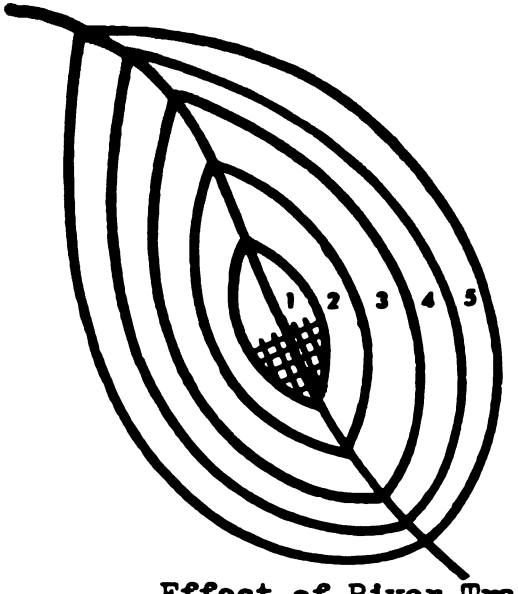
[1] J. H. Von Thünen, Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie (Hamburg, 1826), trans. Carla M. Wartenberg, ed. Peter Hall (New York: Pergamon Press, 1966).



Von Thunen's Original
Concentric Ring Theory



Effect of River Transport
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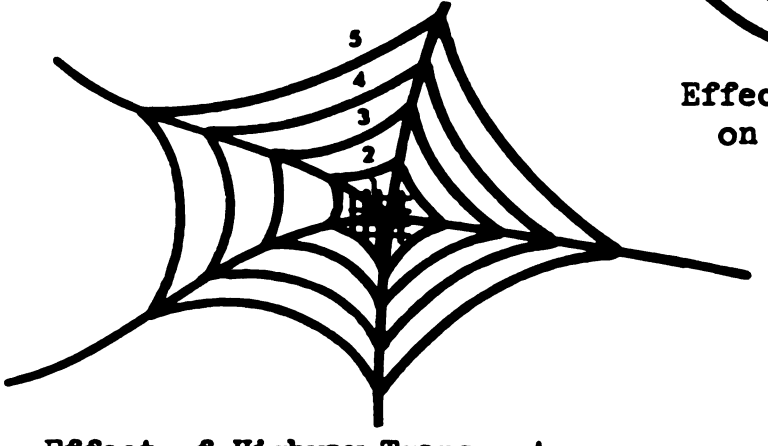

Effect of Highway Transport upon
Concentric Ring Theory

Source: Raleigh Barlow, Land Resource Economics, p. 35

Fig. 1.1

from Der isolierte Staat is recognized as an unrealistic generalization of reality. No place, be it homestead, city, or nation, exists in complete isolation from influences of the economic, social, and political systems which surround it. By its very nature a city is a focal place, and it relates to its tributary or service areas by the connecting paths of communication. These access routes then give producers or consumers living near them a comparative advantage over others living either farther from the city or route of access. The fact that all people within a service area do not have uniform accessibility to the dominant central place forces the development of secondary service centers which provide some goods and services which are not so desirable as to attract people long distances.

In 1933 Walter Christaller attempted to analyze a complete system of central places operating within a complex hierarchy of communities.[2] He explained the organization of communities as hexagonal systems of market places ranging from the largest metropolis down to centers comprising a single function. His theory has been the foundation for much of the research done in central place research and market analysis.

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[2]Carlisle W. Baskin, "Translation of Walter Christaller's 'Diezentralen Orte in Süddeutchland'" (unpublished Ph.D. dissertation, Dept. of Geography, University of Virginia, 1957, Ann Arbor, Michigan: University Microfilms, 1961).

Geographers, because of their concern for determining the orderliness of space, have attempted to apply Christaller's hexagonal theory. Although hexagons allow for the positioning of market boundaries without overlap, they nevertheless do not appear to fit reality. Dickinson,[3] Smailes,[4] Brush,[5] and others,[6] found that there did appear to be some orderliness in settlements when transportation was more primitive and uniform. But our modern transportation system lacks uniformity in speed and has caused considerable alteration and adjustment in the location of market places and their tributary or service areas.

Brush and Bracey in their research on "Rural Service in Southwestern Wisconsin and Southern England" stated:

> The fact that rudimentary centers developed at about six mile intervals in both areas (England and Wisconsin) during the time of primitive transportation leads to the conclusion that the basic distance factor was the time and effort required to get to any center by

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[3]Robert E. Dickinson, "The Distribution and Functions of the Smaller Urban Settlements of East Anglia," Geography, VII (1932), 19-31.

[4]A. E. Smailes, "The Urban Hierarchy in England and Wales," Geography, XXIX (1944), 41-51.

[5]John E. Brush and Howard E. Bracey, "Rural Service Centers in Southwestern Wisconsin and Southern England," Geographical Review, XLV (October, 1955), 559-69.

[6]Jac P. Thijsse, "A Rural Pattern for the Future in the Netherlands," Regional Science Association Papers, X (1962), 133-41; and Gunnar Olsson and Persson Ake, "The Spacing of Central Places in Sweden," Regional Science Association Papers, XII (1964), 87-93. Brian J. L. Berry, Geography of Market Centers and Retail Distribution (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1967). August Lösch, The Economics of Location, trans. W. H. Woglom and W. F. Stolper (New Haven: Yale University Press, 1954).

> cart or foot. The effect of railways was much more significant in Wisconsin than in England because rural settlement and agriculture were still undergoing rapid evolution in the last half of the nineteenth century. The similar effects of automotive vehicles and improved roads in the twentieth century are perhaps unexpected.[7]

Though the impact may have been unexpected, it has nevertheless been most dramatic, not only with respect to market areas served by large urban centers but within the cities themselves. As early as 1915, in his article "Social Anatomy of an Agricultural Community,"[8] Galpin noted the effect of new modes of transportation replacing the horse. Galpin and others, such as Kolb and Polson in their 1933 article "Trends in Town-Country Relations,"[9] observed that higher speeds made it possible for people to travel farther to obtain their needs, thus benefiting from the economies of scale offered by large cities. Gilmore in Transportation and the Growth of Cities observed in 1953 that with new innovations and technology:

> . . . people can travel further at no greater travel cost to perform social or economic functions than they could travel formerly. As a result of this greater ease of travel, there has been a tendency to transfer certain social and economic functions from smaller to larger institutional units and from smaller communities

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[7] Brush and Bracey, op. cit., p. 569.

[8] C. J. Galpin, "Social Anatomy of an Agricultural Community," University of Wisconsin Agricultural Research Station Bulletin, No. 34 (Madison: University of Wisconsin, 1915).

[9] J. H. Kolb and R. A. Polson, "Trends in Town and Country Relations," University of Wisconsin Agricultural Research Station Bulletin, No. 117 (Madison: University of Wisconsin, 1933).

> to larger ones. However . . . the desire for accessibility, plus the cost . . . has prevented this transfer of function from being as nearly complete as many have assumed.[10]

Garrison, et al., in Studies of Highway Development and Geographic Change noted, however, that:

> As transportation is made cheaper, the service areas of the large centers will expand, particularly along the highways and at the expense of the smaller centers. The tendency toward concentrating already owing to increased specialization of services requiring larger service area threshold population will be intensified. . . . On the other hand improved access also appreciably raises urban rents and this contradictory force may encourage decentralization of services to lower rent points. . . .[11]

From the preceding statements one can see that communication invention and innovation have markedly altered the character of life throughout not only the United States but all parts of the world where the new technology has been widely employed and accepted. William F. Ogbun in 1949 observed in his article "The Process of Adjustments to New Inventions":

> If an invention through its use changes one part of our social organization, its influence does not stop there but extends toward the other parts of our social order which are connected with it.[12]

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[10]Harlan W. Gilmore, Transportation and the Growth of Cities (Glencoe, Illinois: The Free Press, 1953), p. 143.

[11]William Garrison, Brian J. L. Berry, Duane F. Marble, John D. Nystuen, and Richard Morrill, Studies of Highway Development and Geographic Change (Seattle: University of Washington Press, 1959), pp. 232-33.

[12]William F. Ogbun, "The Process of Adjustment to New Innovations," Technology and International Relations (Chicago: University of Chicago Press, 1949), p. 21.

The role of transportation technology in reshaping the nature of life is most clearly exemplified in the more recently settled portions of Anglo America where economic development was in its infancy at the time of communication innovations. Likewise, those areas were not as committed to existing economic and social conditions and patterns as they are today. These early conditions in the North American Great Plains and Middle West underwent a series of rapid transitions during the short span of less than seventy years. For the most part, settlement west of the Mississippi and east of the Rocky Mountains occurred during the latter half of the nineteenth century. The economy of these areas at that time was almost totally agrarian, and individuals were usually isolated and self-sufficient. Amos Hawley in his book Human Ecology: A Theory of Community Structure said of those times:

> Isolation makes self-sufficiency mandatory, and once established, self-sufficiency preserves isolation.[13]
>
> Food, because of its bulk, places a particularly heavy burden on transportation facilities. Although transport facilities may be adequate for assembling materials from a local habitat, they rarely are sufficient for the importation of surpluses that might be available in adjacent areas. . . . The maximum scope (of an individual's activities) is measured by the radial distance that may be traversed in a half day's journey from the village site.[14]

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[13]Amos H. Hawley, Human Ecology: A Theory of Community Structure (New York: The Ronald Press, 1950), p. 223.

[14]Ibid., p. 154.

These observations conform to those made by Christaller in Germany, Brush in Wisconsin,[15] Hoover in Michigan,[16] and others, who noted the pattern of settlements in areas with a well developed agricultural base before the arrival of the railroad or automobile.

When the railroad extended into such agricultural areas, the settlement pattern seemed to change markedly. In many cases the railroad meant life or death to an existing community. Many case histories exist of thriving towns which seemed to stagnate and in many cases disappear entirely.

Martin A. Knapp in his 1902 article "Social Effects of Transportation" noted:

> The advent of steam wrought an immediate and radical change in the elemental needs of society. . . . The primary function (of the community) was altered both in extent and relation. . . . The conditions of commercial intercourses were abruptly and completely altered and a suitable new world of energy and opportunity invited the conquest. . . . No other triumph over the forces of nature compares with (the steam engine) in its influence upon the human environment. It has directly and powerfully affected the direction and volume of commercial currents; the location and movement of population; the occupations and pursuits in which the masses of men are engaged, the division of labors, the conditions under which wealth is accumulated, the social and industrial habits of the world and all the surroundings and characteristics of the associated life today.[17]

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[15]Bracey and Brush, op. cit., p. 569.

[16]Edgar M. Hoover, The Location of Economic Activity (New York: McGraw-Hill Book Company, Inc., 1948), p. 125.

[17]Martin A. Knapp, "Social Effects of Transportation," The Annals of the American Academy of Political and Social Science, XX (July-December, 1902), 4-6.

For people who had had to travel at three miles per hour the railroad suddenly opened markets and opportunities which had been unthinkably remote the day before. It made possible the concentration of large numbers of people and created inland centers which could never have existed without the railway. Places which formerly had provided only minimal services to a relatively small area were rapidly transformed into centers which accumulated, processed, and sold the surpluses produced by their tributary areas. These activities, coupled with an expanded market area, produced the capital for the acquisition of goods and services previously unobtainable in remote and inaccessible places. The "multiplier effect" of the focality generated by the railroad's arrival is readily apparent.[18] The advent of the automobile and motor transport accelerated the changes started by the rails.

The motor vehicle was completely independent in its mobility. It provided door-to-door convenience unobtainable from the railway. The automobile driver operated as a free agent not constrained by schedules or the limited alternatives of the rail lines. The range of available goods, services, or other satisfactions was expanded to wherever a passable road existed. Some central places changed their importance and adjusted the functional characteristics of their markets. In many cases the small

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[18] Ibid., p. 8.

service community was bypassed by the motorist in favor of places which offered a greater choice of goods and services.

The motor vehicle not only transformed rural patterns of consumption but also methods of production. With a truck and tractor the farmer could now afford to specialize and take better advantage of his environment. No longer was the farmer self-sufficient; he did not have to be. From specialization came efficiency which yielded greater and greater surpluses of capital. Increased purchasing power permitted the farmer to become still more efficient in production and helped to raise his standard of living. The spiral nature of capital expansion demonstrates the importance of the "multiplier effect" in capital regeneration. Increased agricultural efficiency and increased capital from agriculture also attracted more businesses and services to agricultural communities. These observations are reinforced by Garrison, et al., in their Studies of Highway Development and Geographic Change:

> Almost without exception location patterns are determined by the present network of highway facilities and represent the efficient arrangements of specialization owing to the availability of their transportation. The improvement of the transportation system will introduce further efficiencies into the location system for retail business; this is the impact of continued transportation development.19

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[19]Garrison, Berry, Marble, Nystuen, and Morrill, op. cit., p. 137.

The Premise and Problem

The primary premise of this study is that travel time, not distance, is a primary factor in determining the economic and spatial organization of a region. And it is only when both concepts of time and distance are combined that the utility of space for human activity is seen in its proper perspective.[20] This study will serve as an empirical test of this principle in the River Bend Area of Minnesota.

Arising from this a priori principle are a series of secondary assumptions which form the basis of this study. They are:

1. that the historical patterns of transportation and the relative ease of accessibility of points within and beyond the region determine the economic and spatial organization of that area;
2. that marked changes in transportation technology or routing tend to alter the internal economic and settlement organization as well as change the extra-regional relationships of the area;
3. that as regional consumers are able to travel faster they are also willing to travel farther to obtain more alternatives in order to realize both economic and personal satisfactions, thus causing an alteration in the functions performed by regional market centers;

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[20]The essence of this notion is more fully developed in Lawrence A. Brown's and Frank E. Horton's brief comment on their research notes, entitled "Functional Distance: An Operational Approach" in Geographic Analysis, Vol. II, No. 1, January, 1970, pp. 76-83. In their remarks they note that "Functional Distance" is a measure of the propensity of any set of two nodes to interact. Though their article does not mention the use of time as a possible factor influencing the propensity for interaction, the application is alluded to in their discussion of the potential applications of their research.

4. that as consumers are reoriented and the market functions of a center are altered there will be a corresponding variation in the size and shape of the market area for that place. The parameter of the market area of any place is determined by two factors, one the speed with which consumers can reach a particular center and secondly the attraction qualities of that center.

In order to test these assumptions, several questions had to be answered:

1. Is there really a hierarchy of central places?
2. Can the attraction of any central place be simply analyzed on any other basis than the population of the center?
3. Is there any correlation between community population size and the number of functions performed for its service area?
4. If there is a hierarchy of places as Christaller posited, does it necessarily follow that the largest place in the hierarchy, "the dominant regional center," perform a variety of functions unavailable in places with only one-half to two-thirds its magnitude?

The Study Area

This research will analyze some of the factors influencing the growth and change in a group of rural centers in the present service area of Mankato, Minnesota. Although the sample is a small one, the eight counties included are not atypical of other agriculturally oriented market areas in the Upper Midwest and North American Great Plains.[21] The role of transportation and transportation

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[21]The rational for this is based upon studies by: John R. Borchert, The Urbanization of the Upper Midwest 1930-1960, Urban Report No. 2 (Minneapolis: Upper Midwest Research and Development Council, February, 1963); John R. Borchert and Russell B. Adams, Trade Centers and Trade Areas of the Upper Midwest, Urban Report No. 3 (Minneapolis: Upper Midwest Research and Development Council,

innovation in the reshaping the regional economic development, the settlement patterns, and the functional orientation of service centers will be the primary focus.[22]

Decreasing travel time between places within the modern or present market area around Mankato, Minnesota, is basic to this study. The modern market area of Mankato has been defined by using a composite of the service areas of local retail and wholesale establishments and communications media within or near the community.[23] The

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September, 1963); Edwin N. Thomas, Richard A. Mitchell, and Donald Blome, "The Spatial Behavior of a Dispersed Non-Farm Population," Papers of the Regional Science Association, Vol. IX (1962), pp. 106-33; and Brian J. L. Berry, H. G. Barnum, and R. J. Tennant, "Retail Location and Consumer Behavior," Papers of the Regional Science Association, Vol. IX (1962), pp. 65-106.

[22]The rational for this paper can be attributed in large part to preliminary work done under the guidance of A. K. Philbrick who sparked the curiosity regarding the effects of changing time-space relationships between points in space when speeds are increased. Much of the work done by Garrison and Berry relates to this approach but lacks the historical perspective. When analysis of markets, economics, settlements, or transportation takes place in any dynamic area without the benefit of the historical perspective much of the importance of some of the observations is lost. The impetus for thesis research grew out of Morrill's article on "Towns in Sweden," where he came to this same conclusion on page 2, Annals of the Association of American Geographers, Vol. LIII, No. 1 (March, 1963).

[23]On the basis of this composite and the spatial awareness demonstrated by the political, social, and economic regions focused upon Mankato and the definition of the Mankato service area in C. C. Zimmerman's "Farm Trade Centers in Minnesota," the defined eight county area can be considered valid as the framework of this research. The governor's commission on regional planning also designated all the counties included in the River Bend Area as Region 9 for planning in Minnesota, 1970.

indicated area was deliberately distorted to conform to county lines.

Data Sources

The primary source of data for this research was Dun and Bradstreet's Book of Commercial Ratings. These listings, which are intended primarily for credit analysis by lending institutions and businesses supplying credit, have been published quarterly since 1868. Therefore, any business which has applied for credit with any bank or other business is listed. Under the name of each trade center is included a list of all commercial functions located in that place, alphabetized by the name of the business.

These lists are standard references and are considered by bankers and businessmen to be the best source of information concerning the presence or absence of certain types of enterprise in a center at a given time. The fact that the data were collected by the same firm, using the same criteria and techniques year after year, for the same purposes, helps insure uniformity. In order to maintain continuity, the January volumes of the Dun and Bradstreet's Book of Commercial Ratings for 1900, 1910, 1920, 1930, 1940, 1950, and 1960 were selected for this study. The research value of these resources is

substantiated by C. C. Zimmerman,[24] Paul H. Landis,[25] Douglas Chittick,[26] and Elsie S. Manny.[27]

Limitations of the Data

One of the primary limitations in the use of the Dun and Bradstreet data is the difficulty in obtaining it. The Dun and Bradstreet Company agrees with its subscribers that these books are confidential, and they are destroyed or returned after each new issue is published. Only two reference sets are maintained: one at the Library of Congress in Washington, D.C.; the other in the reference library at Dun and Bradstreet's headquarters at 12 Church Street in New York City. The size of the volumes precludes their being borrowed through interlibrary loan from the Library of Congress, and Dun and Bradstreet will not lend their copies, but they will accommodate a researcher at their facility in New York.

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[24]C. C. Zimmerman, "Farm Trade Centers in Minnesota," Minnesota Agricultural Experiment Station Research Bulletin, No. 269 (Minneapolis: University of Minnesota, 1933).

[25]Paul H. Landis, "South Dakota Town-Country Trade Relations," South Dakota Agricultural Experiment Station Research Bulletin, No. 274 (Brookings: University of South Dakota, 1932).

[26]Douglas Chittick, "Growth and Decline of South Dakota Trade Centers 1901-1951," South Dakota Agricultural Experiment Station Research Bulletin, No. 448 (Brookings: University of South Dakota, 1955).

[27]Elsie S. Manny, "Dun and Bradstreet as a Source of Sociological Data," Rural Sociology, XII, No. 1 (March, 1947), 58-59.

Another problem is that Dun and Bradstreet does not include most forms of personal services such as lawyers, physicians, dentists, veterinarians, barbers, and beauticians in any of their listings. The Martindale-Hubble Law Directory gives data for attorneys for the same decennial intervals employed above. Information concerning physicians was obtained from the American Medical Directory, published annually by the American Medical Association. No uniform information was available for veterinarians, dentists, barbers, and beauticians for the period 1900 through 1960, and they were therefore not included in this study.

Confirmation of the data gathered from these sources was made with early editions of Polk's Gazeteer of Minnesota, North Dakota, South Dakota, and Montana for 1900, 1910, and 1920. The Polk's City Directory for Mankato, Waseca, and New Ulm for the years 1930, 1940, 1950, and 1960 was also useful but was limited to the immediate area of those places.

Dun and Bradstreet was also useful for determination of population of places not enumerated in the U.S. Census. The population data given for places of less than one thousand are the best available estimates. For all other places, state and federal census figures were used.

Information concerning roads, road quality, traffic volumes, and mileage between service centers was obtained from the Minnesota State Highway Department in St. Paul.

County highway maps have been kept by that department since 1920. These maps maintained consistent data relating to the exact routing of all federal, state, county, and township roads in each county of the study area. In addition, they gave the type of surface maintained and the location of certain cultural features. Road maps prior to the 1920's were reconstructed with data supplied by the Minnesota State Highway Department, the Minnesota State Historical Commission, and various county road atlases. Early atlases indicated roads which were major wagon routes at or about the turn of the century.

Traffic volume maps are available for all state subsidized roads. These State Aid Road traffic maps date from 1918 when the highway department was formed.

Definitions of Terms

Throughout this study a number of terms will be used which require definition.

Central function.--Includes only those activities of a retail or service nature discussed in Table 1.1.

Functional unit.--Refers to any individual retail, wholesale, or commercial service enterprise existing at any time in any size trade center.

Functional intensity.--Is the sum total of the functional units found in a community or trade center at any time.

TABLE 1.1.--Classification of central functions used in analysis of service centers in River Bend Area of South Central Minnesota

Sic No.*	Function	Loaded Value **
521	Lumber & Building Materials	2
522	Plumbing & Heating	2
523	Paint, Glass & Wallpaper	4
524	Electrical Supplies	4
5251	Hardware	1
5252	Farm Equipment	1
531	Department Store	7
533	Variety Store	6
539	General Store	1
54	Food Store	1
5511	Automobile Dealer	4
553	Auto Parts	6
554	Service Station	1
5559	Mobile Homes	5
56	Ready to Wear Clothing	2
571	Furniture	3
572	Appliances	4
573	Music, Radio & T.V.	4
5812	Restaurant or Bar	1
591	Drugs	3
592	Liquor	5
593	Second Hand Stores	2
594	Books & Stationary	4
595	Sporting Goods	1
596	Farm & Garden Supply	4
597	Jewelry	5
598	Fuel, Coal & Ice	4
5992	Florist	5
5995	Photo Supply	6
5997	Gifts	3
5999	Misc. Retail Goods	2
60	Banks	4
81	Attorneys	3
801	Physician	3
806	Hospital	5
807	Medical Laboratory	6
719	Hatchery, Stock Yard & Act	3
729	Livery	2
73	Rental Equipment	2
79	Amusements	4
271	Newspaper	3
701	Hotel	4
721	Laundry & Dry Cleaning	4
722	Photo Studio	5

TABLE 1.1.--Continued

Sic No.*	Function	Loaded Value**
725	Shoe & Harness Repair	2
726	Mortuary	5
73	Misc. Business Agents	5
75	Auto Repairs	1
751	Blacksmith	1
76	Misc. Repairs	2
3591	Machine Shop	3
4223	Cold Storage Plant	3
4242	Drayage	3
4832	Radio Station	3
503	Wholesale Notions & Clothing	4
504	Wholesale Groceries & Food	4
505	Wholesale Hides	4
508	Wholesale Machinery & Supply	4
5092	Bulk Oil	2
5094	Wholesale Candy & Tobacco	4
5095	Beverages	6
5098	Wholesale Building Products	1
192	Nursery	4
202	Creamery	2
204	Grain, Feed & Flour	2

*Standard Industrial Classification Number from U.S. Bureau of the Census, Standard Industrial Classification Manual (Washington, D.C.: U.S. Government Printing Office).

**See Appendix, page 223.

Loaded functional value.--Not all functional units have the same size, sales, threshold populations, or relative importance in a community or series of central places. Therefore each functional unit was assigned a loaded value on a scale ranging from one to seven, as shown in Table 1.1, pages 19-20. These values were based upon information obtained from the National Retail Merchants Association and the Chamber of Commerce. Criteria employed for the loadings included: frequency of occurrence, comparative size, estimated volume of sales generated, estimated hierarchical position,[28] and extent of threshold populations.[29] This technique eliminates the disparity between the individual functional units when determining the functional intensity of a series of service centers.

An attempt was made to test the validity of the ranking system and the load totals by running a series of Pearson product moment or Pearson "r" point correlations between the loaded functional values of each community and the population of that place at the same point in time. The analysis reveals a very high degree of validity for the tests which ran as follows:

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[28]Berry, Barnum, and Tennant, op. cit., pp. 74-78.

[29]T. L. Smith, "Farm Trade Centers in Louisiana 1901-1931," Louisiana Agricultural Experiment Station Bulletin, No. 234 (Baton Rouge: University of Louisiana, January, 1933).

Year	Coefficient of Correlation	Sample Standard Deviation	t Ratio*	Degrees of Freedom
1900	.9740	105.875	46.9894	119
1920	.9196	110.907	24.5507	110
1940	.9869	175.353	60.3380	97
1960	.9570	227.027	31.1607	89

*"t" tests indicate significance at 95 per cent confidence limits for all coefficients of correlation.

Service center or central place.--Any place, whether incorporated or not and regardless of the size of its population, is considered a central place or service center if it has or had a name or postal address and possesses some functional unit. This definition does, by intent, exclude any community with no central function, no matter how large its population.

Time-space.--This is a notion best developed by Donald Janelle in his thesis "Spatial Reorganization and Time-Space Convergence." Janelle considers time-space as the prime factor in understanding the organization of man's activities in any areal unit.[30] Janelle also speaks of "time-space convergence," which is the rate at which

[30]Donald G. Janelle, "Spatial Reorganization and Time-Space Convergence" (unpublished Ph.D. dissertation, Dept. of Geography, Michigan State University, East Lansing, 1966), pp. 2-4; "Central Place Development in a Time-Space Framework," The Professional Geographer, XX, No. 1 (January, 1968), 5-10; and "Spatial Reorganization: A Model and Concept," Annals of the Association of American Geographers, LIX, No. 2 (June, 1969), 348-364.

travel time between places has been declining in response to increasing transport efficiency.[31]

Accessibility.--Under conditions of an almost uniform transportation capability such as existed prior to 1900 one would expect the development of a uniform settlement pattern similar to that suggested by Christaller. Then a hierarchy of places would probably have developed with the largest place at the center of the region. But when any element of the landscape is found to have greater utility in terms of site or situation, it may cause a modification in the settlement pattern which would negate the uniformity described by Christaller. Those places which grew the largest and the fastest could be explained by the utility of their site relative to all other places. Centers which have the greatest accessibility tend to be dominant regardless of their situation. The location of this center is not determined simply by the limitation of

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[31]Although other authors have not been so explicit in their discussion as Janelle, consideration should be given to the implications of time-space convergence in the writings of: George K. Zipf, Human Behavior and the Principle of Least Effort (Cambridge, Mass.: Addison Wesley Press, Inc., 1949); Edward Hassinger, "The Relationship of Trade-Center Population Change to Distance from Large Centers in an Agricultural Area," Rural Sociology, XXII, No. 2 (1957), 131-36; P. D. Converse, "The Automobile and the Village Merchant," University of Illinois Bureau of Business Research Bulletin, No. 19 (1928), pp. 27-42; Edward Ulman, "A Theory of Location for Cities," The American Journal of Sociology, LXIII (1957-1958), 853-64; and Duane F. Marble, "Effect of Highway Improvement on Urban Retail Locations," Oregon Business Review, XVIII, No. 10 (October, 1959), 1-4.

distance or space, but when more realistically viewed it is decided by time-space and ease of access to the region's populace.

Convergence.--When viewed in purely spatial terms distance is constant, but when perceived historically as a concept of space and time combined, one can view points in space as converging upon one another. Over the past half century this convergence of points in time-space has been occurring at a very rapid rate. For instance, the trip from Mankato to Judson, Minnesota, covers fourteen miles. In 1900 this trip required four hours and forty minutes; by 1930 the time span needed to travel the same distance had diminished to 43.5 minutes, and by 1960 it had decreased to fifteen minutes. Theoretically these places are 18.66 times closer to one another today than they were some sixty years ago.

The result of the increased accessibility of some places relative to others has been the realization of comparative advantage of the former for economic and, in some cases, political activity. It is assumed that any place which has a greater relative degree of accessibility will logically become a dominant center as a result of its increased focality. Out of this concept arises the notion of market areas and the hierarchical structure of markets

hypothesized by Christaller,[32] Zipf,[33] Lösch,[34] and others.

The inter-relationships which exist between the concepts of accessibility and focality are intertwined. The comparative advantage of a place tends to produce centralization of human activity. Centralization in turn tends to generate focality, simply by the attraction of choice and opportunities offered. As activity is increasingly concentrated and specialized, the numbers of consumers required to sustain the place expand through growth of the areal extent of the service area or increase of the internal population of the region. Thus, any centralization of human activity becomes a focal place and the degree or intensity of its focality is determined by the numbers and activities of people available to sustain it.

With these notions regarding the orderliness of man's organization of space, we will proceed to analyze some of these ideas in terms of the changes which have taken place within the study area. The examination will be historical and geographical in nature and will focus upon the

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[32] Baskin, loc. cit.

[33] Zipf, loc. cit.

[34] Lösch, op. cit., p. 433.

functional[35] and developmental processes[36] which have generated the observed changes in central places within the Mankato market area from 1900 to 1960.

Plan of Presentation

The research design of this study is geared to explain the role of changing transportation systems and the increasing impact of transportation speeds on the spatial organization of a region. The next chapter will discuss the physical factors which influenced the development of the River Bend Area prior to 1900 and explore changes in its social and economic characteristics which occurred as a result of variations in accessibility.

The third chapter analyzes some of the forces operating in the River Bend Area from 1900 to 1960 which caused the changes in the settlement patterns, especially those factors which contribute to the decline or disappearance of communities which existed at the turn of the century. At the same time it will evaluate the changes resulting from technological adaptation, transportation innovation, economic growth and recession, and other elements.

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[35]Functional processes refer to the inter-related factors which influence the changes which occurred in the purpose or function of a central place over time.

[36]Developmental processes relate to the factors which influence the growth or decline of the magnitude of central functions performed by a central place.

Chapter IV discusses the forces influencing the character of the functional base of the service center and attempts to determine the historical trends of growth and change in central places as well as the existence of hierarchical levels of central place activity.[37] The functional differences between a small cluster of houses around a lone general store and a center of thousands of people being served by hundreds of retail, service, and wholesale outlets are those of degree. The differences will be defined in terms of the hierarchical level of services provided by the sum of the respective central place functions.

The fifth chapter introduces the concept of time-space convergence and the function of service centers within the study area. The alterations in the service areas of communities should be related to changes in their relative accessibility which were created by increased speeds of transportation from 1900 to 1960.

One of the basic assumptions of this study is that there is a relationship between the magnitude of a service center's retail and commercial base and the size of its trade area. The size of a trade area is dynamic and reflects the mobility of the population it serves, the

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[37]Brian J. L. Berry and William Garrison, "The Functional Basis of the Central Place Hierarchy," Economic Geography, XXXIV (April, 1958), 145-54; and Berry, Barnum, and Tennant, op. cit., p. 78.

commercial attractiveness of the trade center, and long term economic conditions. These factors determine the number, size, and distribution of trade centers in an area which is predominantly agricultural. The development of an industrial concentration usually modifies the pattern considerably.

Though the primary focus here is upon the interrelationships of transportation and the economics of trade centers, it does not intend to exclude the importance of social, political, or institutional influences. But, these elements will only be discussed where they influence the total study area. Therefore, the analysis of change in the service center-trade area relationship will be limited to changes in population, transportation, commerce, economic trends, and agricultural technology.

CHAPTER II

THE REGIONAL SETTING AND FACTORS RELATING TO THE DEVELOPMENT OF THE RIVER BEND AREA, 1850-1900

Several stages of economic and technological development can easily be identified in the Upper Midwest and Great Plains. The first period is typified by the opening of the prairie for agriculture. In the Upper Midwest between the Mississippi and Missouri Rivers early expansion tended to occur along and back from the rivers as contrasted to the Great Plains where the paths of least resistance were usually old Indian or buffalo trails. Lack of reliable information caused settlement during this period to be spotty. Occasional forts and trading posts served as data sources concerning the availability of space for development.

As settlement increased, a second stage of expansion is clearly discernible. The development of low-draft, steam power vessels opened up formerly sparcely developed areas by providing mass transportation into the areas accessible to the rivers. The role of the steamboat in the settlement of the Mississippi, Minnesota, and Missouri River basins is

well documented.[1] During the mid-nineteenth century the presence of the steamboats on the rivers far in the interior of the Great Plains and the Upper Midwest pushed the wilderness frontier toward the west.

A third stage of expansion in the Upper Midwest was brought on by the railroads after 1865. Prior to the railroad much of the population and economic growth was concentrated along or near the waterways. Railroads, however, permitted settlement of areas far removed from navigable water, while returning with produce of the region to the market and distribution centers. Previously remote areas became accessible and then integrated as part of the agro-economic systems prevalent at those times.[2]

After the turn of the twentieth century the fourth period of regional growth occurred with the introduction of the automobile and the building of good roads. The automobile and truck further extended the limits of relative accessibility and caused a marked alteration in the character of economic activity and settlement. This research will focus primarily on the impact of the automobile upon the regional character of the study area in South Central Minnesota. In order to do this it is necessary to

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[1]William J. Petersen, "The Early History of Steamboating on the Minnesota River," Minnesota History, XI (June, 1930), 123-44.

[2]Martin A. Knapp, "Social Effects of Transportation," The Annals of the American Academy of Political and Social Science, XX (July-December, 1902), 8.

understand elements of the region's development prior to the automobile.

Because it would be impossible to make any detailed study of the Upper Midwest due to its enormous size, the "River Bend Area" of Minnesota was selected as a sample.

The eight counties in Fig. 2.1 constitute the market area of the city of Mankato, which historically has been the dominant focus of the region. Blue Earth, Le Sueur, Nicollet, Faribault, Brown, Waseca, Watowan, and Martin Counties make up a core region for the Mankato service area.[3]

This region has traditionally emphasized agriculture, and even its industrial activity is related to the processing of agricultural produce such as flour mills, animal feed manufacture, canneries, creameries, and vegetable oil processing. Employment in manufacturing amounted to only 18 per cent of the total labor force in 1958 as compared to over twice that in the state as a whole. The strong emphasis upon agriculture as the economic base coupled with the limited development of industry contributed to the choice of the River Bend Area for this study. In most communities, the lack of manufacturing eliminates many of the problems of discerning how the community developed

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[3]John Borchert and Russell B. Adams, Trade Centers and Trade Areas of the Upper Midwest, Urban Report No. 3 (Minneapolis: Upper Midwest Research and Development Council, September, 1963), pp. 7-23.

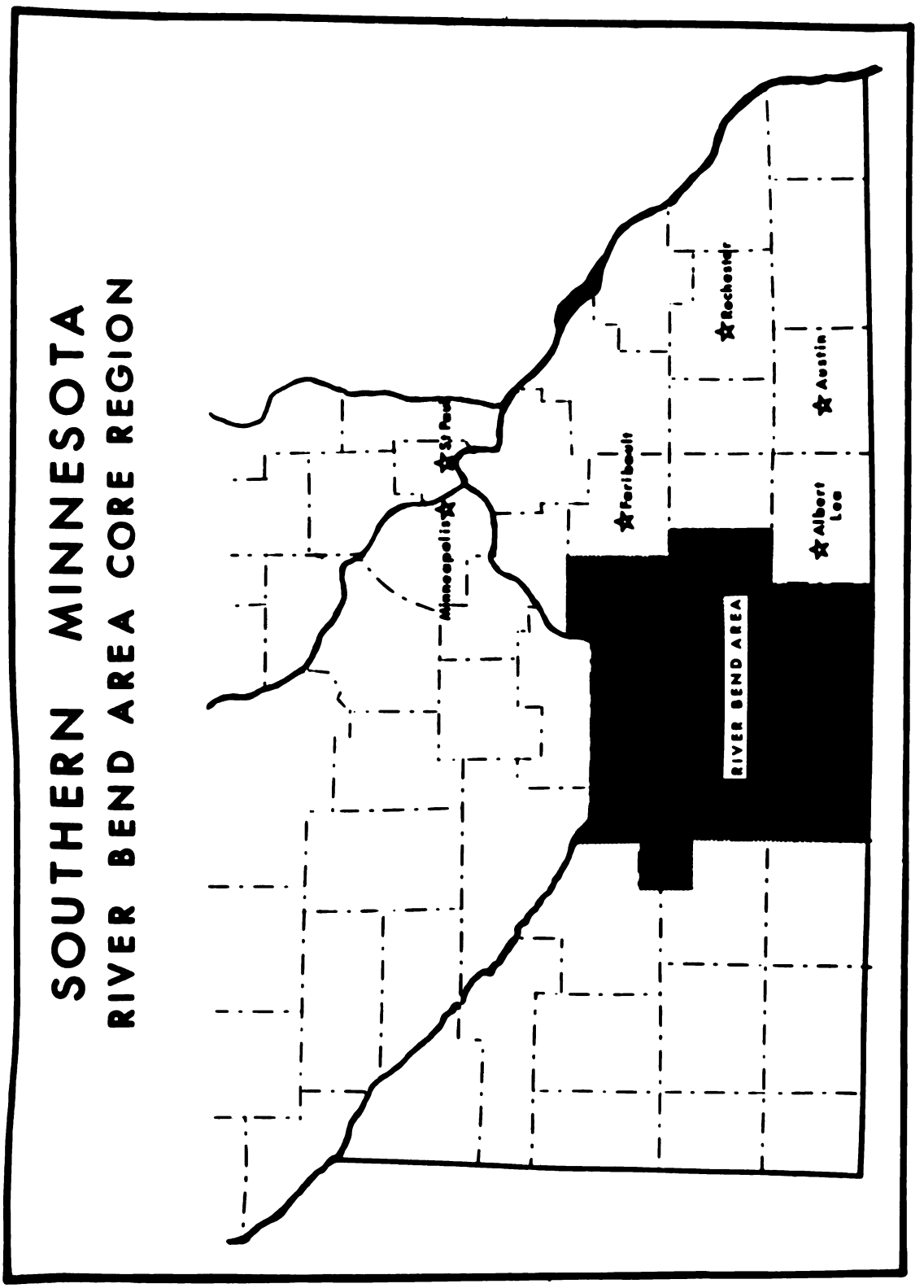
SOUTHERN MINNESOTA
RIVER BEND AREA CORE REGION
St Paul
Minneapolis
Faribault
Rochester
Austin
Albert Lea
RIVER BEND AREA

Fig. 2.1

as a commercial service center. Industrialization tends to generate a market for goods and services which often makes the functional value of the center appear much larger than the expected areal extent of its area. For comparative purposes the industrialized cities and towns of northern Ohio manifest a completely different character in terms of the services and goods they provide for market areas which are only slightly larger than the market areas of many of the small agriculturally oriented towns and villages of southern Minnesota. This relationship is empirically obvious when comparing the size and spacing of communities in the two areas. In northern Ohio it is not unusual to find towns of from 6,000 to 25,000 population within a radius of twelve to fifteen miles of one another. In southern Minnesota, on the other hand, a city of over 10,000 is the exception, and communities with population of from 1,000 to 5,000 population act as primary service centers.

In order to understand the impact of transportation innovation upon the region's economic development and its functional change it is necessary to examine the histo-geographic forces operating prior to 1900.

Early History

In 1700, the Frenchman M. Sieur Le Sueur[4] ascended the Minneaots River to the confluence of the Minnesota and

[4]Thomas Hughes, History of Blue Earth County (Chicago: Middle West Publishing Company, 1901), p. 28.

Blue Earth Rivers, the present site of Mankato. There he established a fort and trading post for the Sioux Indians. He also discovered a deposit of blue colored clay which led him to believe the area was rich in copper, but the clay had no mineral value.

As shown by the map of Indian cessions in Fig. 2.2, in 1851 the Dakota Sioux ceded their rights to much of the River Bend Area in the Treaty of Traverse de Sioux. This opened the area to development some fifty years after the Northwest Territory became a United States possession. Previously, only forts and trading posts had existed.

The first immigrants to the River Bend Area tended to congregate in the forested regions of Le Sueur, Blue Earth, and Waseca Counties where the environment more closely resembled their former homesteads of New England, Ohio, and Pennsylvania. (See Fig. 2.3.) The upland forests consisted of oak, hickory, hard and soft maple, black walnut, butternut, and other familiar varieties.[5] Only the eastern counties of the study area are heavily forested, since beyond the river bluffs the trees thin out, and the open prairie of tall grasses begins.[6] (See Fig. 2.3.)

The rapid rise in the demand for land by immigrants from Germany, Scandinavia, Great Britain, and the eastern

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[5]N. H. Winchell, The Geological and Natural History Survey of Minnesota, I (Minneapolis, Minnesota: Johnson, Smith, and Harrison, 1884), 421-22.

[6]Ibid.

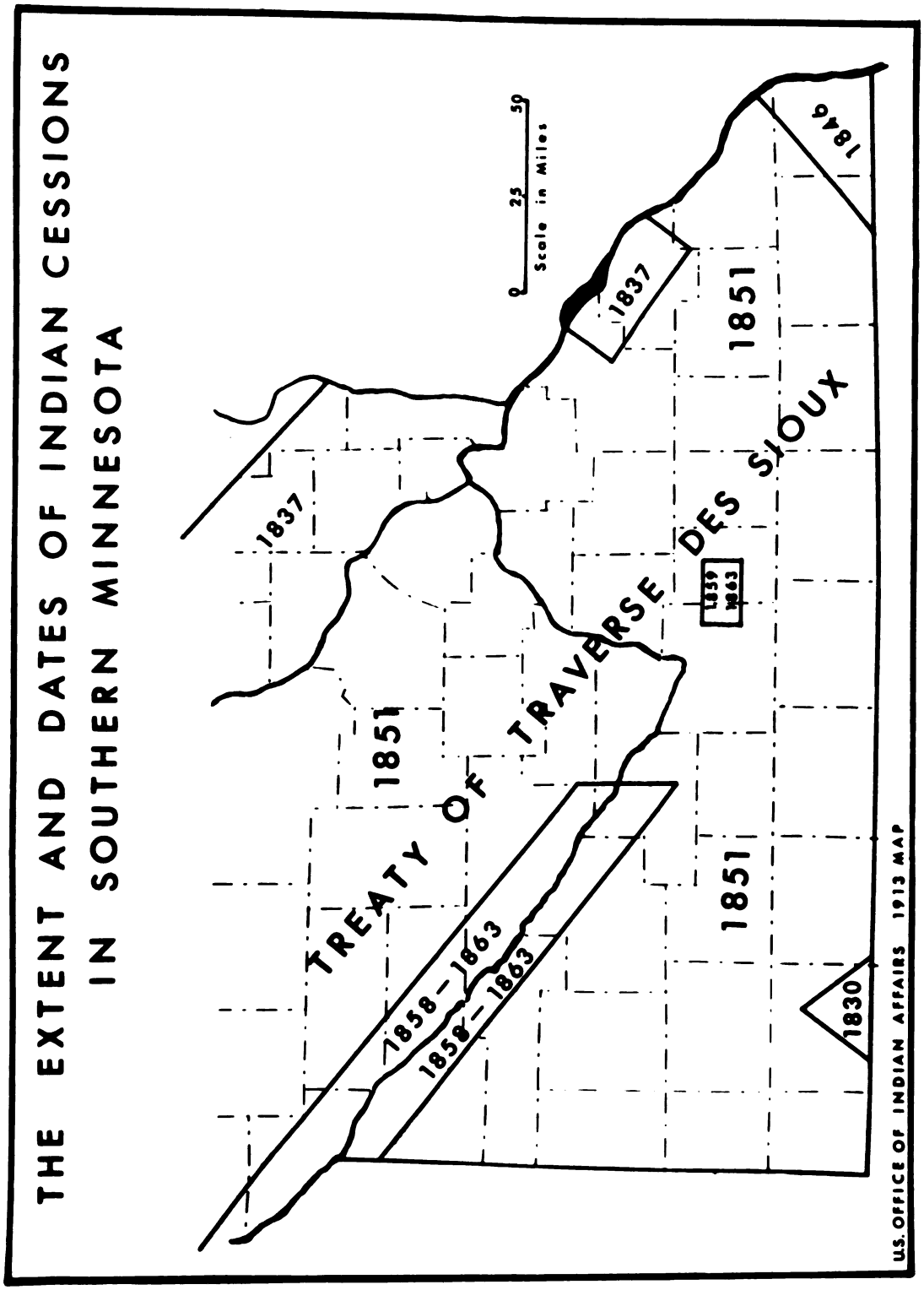
THE EXTENT AND DATES OF INDIAN CESSIONS
IN SOUTHERN MINNESOTA
0 25 50
Scale in Miles
1837
1851
1837
1851
1851
1837
1863
1858-1863
1858-1863
TREATY OF TRAVERSE DES SIOUX
1851
1830
1840
U.S. OFFICE OF INDIAN AFFAIRS 1913 MAP

Fig. 2.2

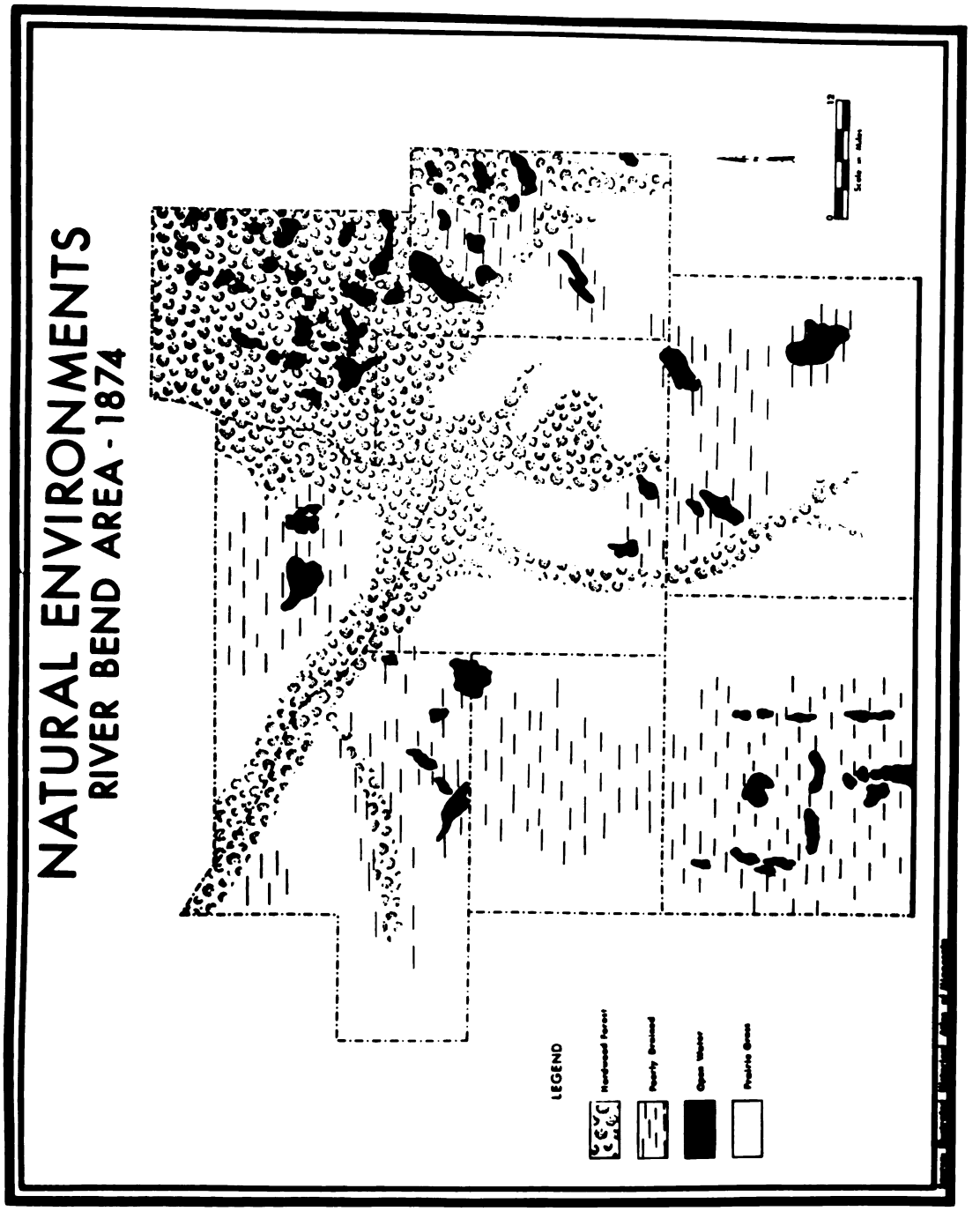
NATURAL ENVIRONMENTS
RIVER BEND AREA - 1874
LEGEND
Hardwood Forest
Prairie Grass

Fig. 2.3

United States quickly pushed pioneer settlement up and out of the wooded ravines and into the open prairie. Though settlement by homesteaders proceeded rapidly from 1850 to 1860, the total population of the area in 1860 was only 20,431. As shown by Fig. 2.4, over half of the people in 1860 were concentrated in Le Sueur, Blue Earth, and Nicollet Counties, with population densities dropping off dramatically towards the south and west. It was not until the 1890's that the area population densities assumed a degree of relative uniformity, as shown in Fig. 2.4 and 2.4a.

The River Bend Area is flat to gently undulating, except along the river valleys and stream courses where the bluffs are heavily eroded and drop off abruptly by as much as several hundred feet.[7] The soils are, for the most part, composed of unconsolidated glacial drift of Wisconsin age with a heavy clay component which tends to retard groundwater movement. The central portion of the study area was once covered by glacial Lake Minnesota which deposited lacustrine clays on the uplands. The peripheral areas in Brown, Martin, Waseca, and Le Sueur Counties are dominated by till plain deposits which are relatively low in relief but somewhat less fertile and more easily eroded than the flatter land of the old lake bed.[8]

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[7] Ibid., pp. 415-18. [8] Ibid., pp. 439-45.

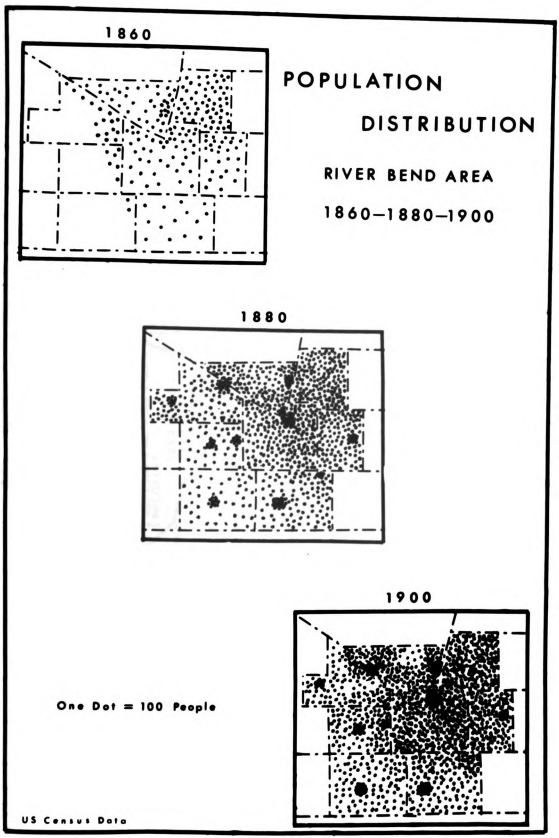
1860
POPULATION
DISTRIBUTION
RIVER BEND AREA
1860–1880–1900
1880
1900
One Dot = 100 People
US Census Data

Fig. 2.4

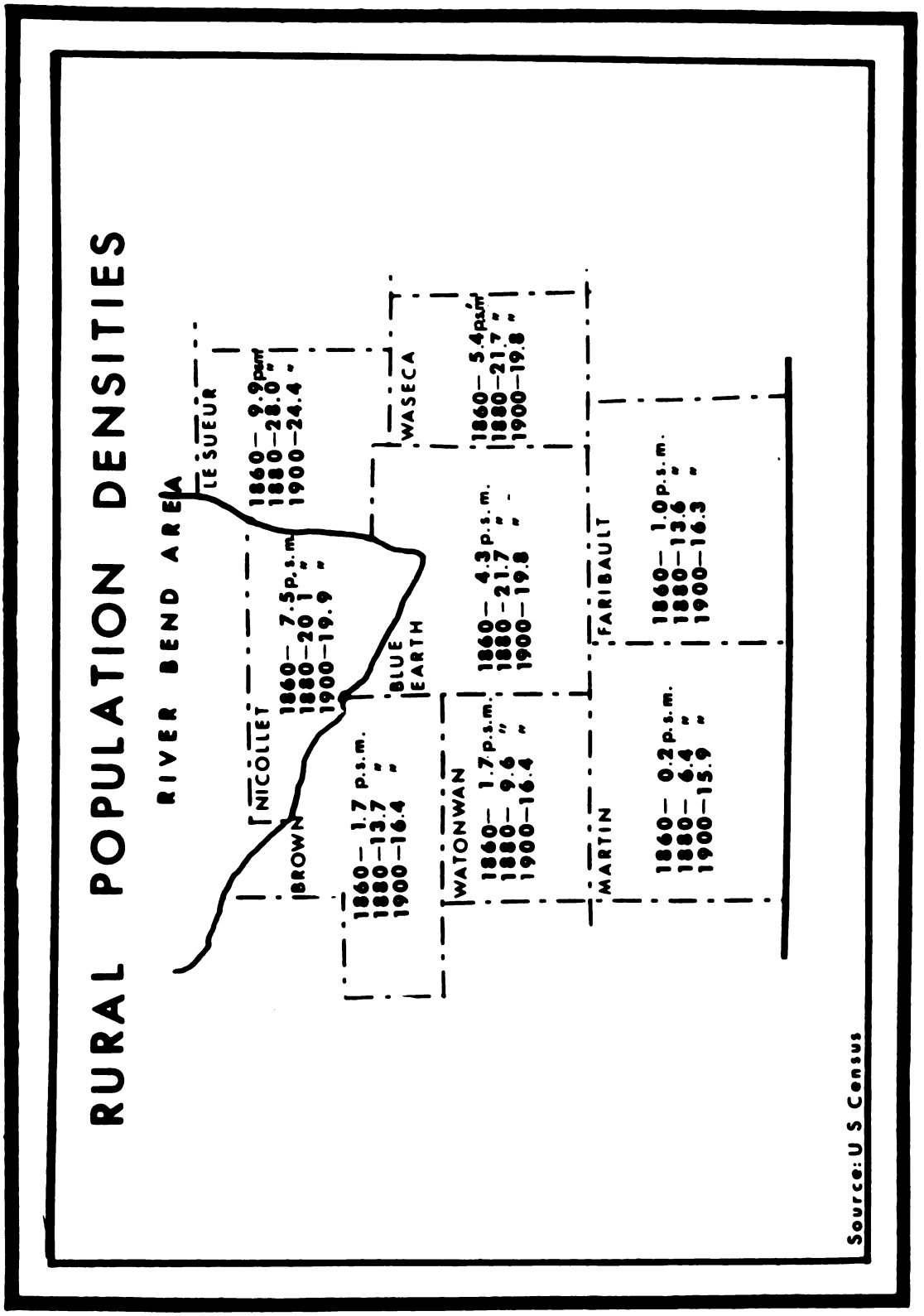
RURAL POPULATION DENSITIES
RIVER BEND AREA
LE SUEUR
NICOLLET
BROWN
BLUE EARTH
WASECA
WATONWAN
FARIBAULT
MARTIN
1860— 9.9 p.s.m.
1880—28.0 "
1900—24.4 "
1860— 7.5 p.s.m.
1880—20.1 "
1900—19.9 "
1860— 1.7 p.s.m.
1880—13.7 "
1900—16.4 "
1860— 4.3 p.s.m.
1880—21.7 "
1900—19.8 "
1860— 5.4 p.s.m.
1880—21.7 "
1900—19.8 "
1860— 1.7 p.s.m.
1880— 9.6 "
1900—16.4 "
1860— 1.0 p.s.m.
1880—13.6 "
1900—16.3 "
1860— 0.2 p.s.m.
1880— 6.4 "
1900—15.9 "
Source: U S Census

Fig. 2.4a

The dominant physical feature is the valley of the Minnesota River and its tributaries, the Le Sueur and Blue Earth Rivers. The Minnesota River meanders through a deeply cut valley flanked on both sides by steep bluffs dropping abruptly at first and then more slowly across wide terraces. The flood plain averages more than three miles in width throughout the River Bend Area. Much of it is tilled but is subject to periodic flooding. A significant portion of the lowland area is dominated by poorly drained land, such as sloughs, abandoned meanders and cut-offs of the river. Many old terraces away from the flood plain provide fertile, well-drained agricultural land.

Climate

The climate of the region is ideal for small grains and other crops adapted to a growing season of less than 130 days.[9] The summers are warm and humid, with average June, July, and August temperatures being above seventy degrees. (See Fig. 2.5.) But the winters on the open prairie are particularly inhospitable and usually include blizzards, heavy snow, long periods of intense cold, and high winds.

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[9]Edward VanDyke Robinson, Early Economic Conditions and the Development of Agriculture in Minnesota (Minneapolis: Bulletin of the University of Minnesota, Studies in the Social Sciences, No. 3, 1915).

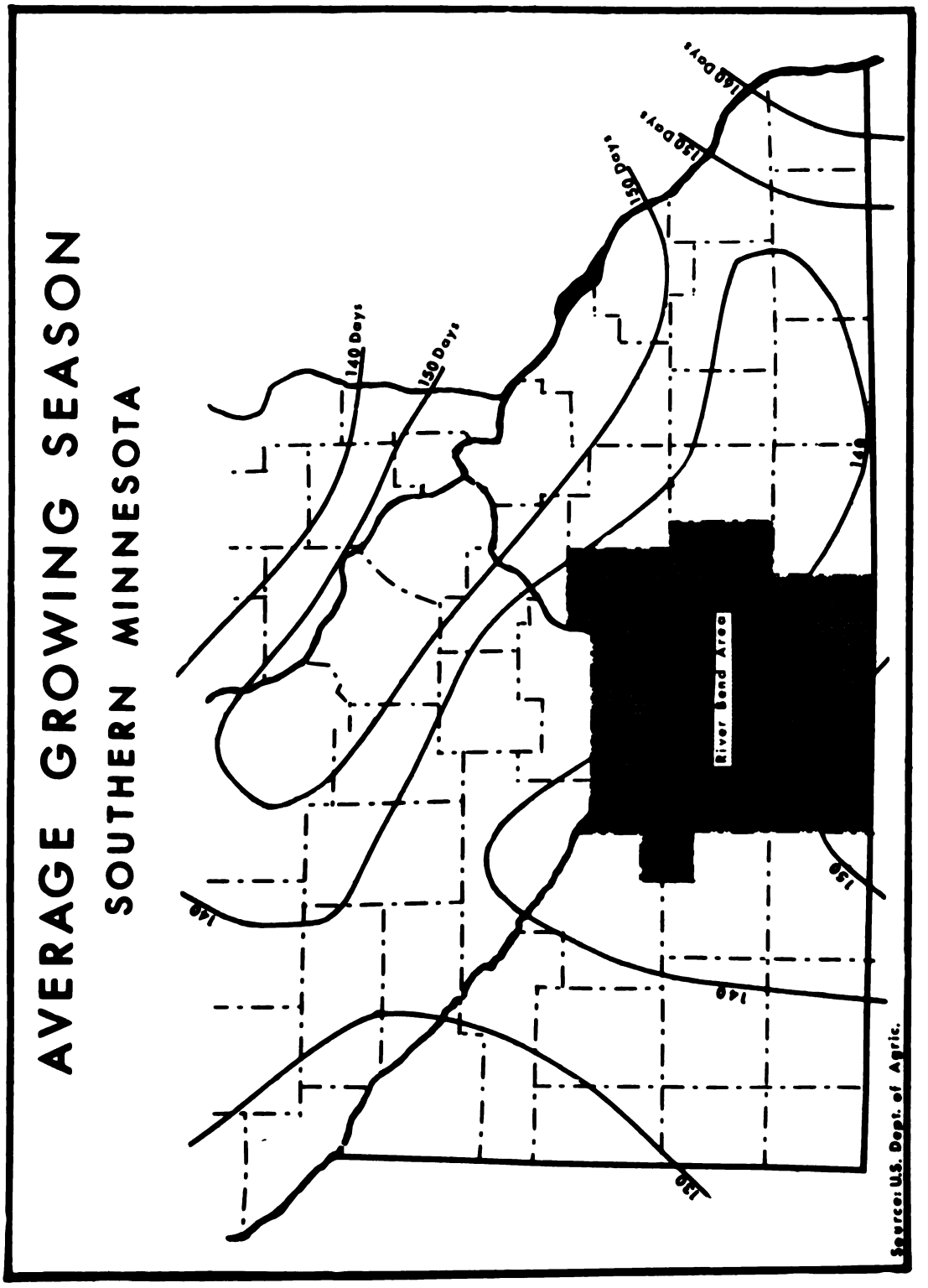
AVERAGE GROWING SEASON
SOUTHERN MINNESOTA
140 Days
150 Days
River Bend Area
Source: U.S. Dept. of Agric.

Fig. 2.5

Indians

The Dakota Sioux, a tribe originally found in the northern Minnesota-Wisconsin forests, had been driven out into the plains by the Chippewa Indians. The Sioux then adopted a very warlike posture in order to exist because they had to displace the Mandan Indian tribes of the Upper Missouri River.[10] The Sioux gained some superiority over their neighbors after they adopted and became adapted to the horse of the white man which gave them increased mobility. These former forest dwellers became highly skilled hunters.[11]

With the coming of the pioneers, the Dakota Sioux once again were threatened, but in 1851 they agreed to cede a large portion of southern Minnesota to the white man for $30,000 according to the Treaty of Traverse de Sioux.[12] As shown by the map of Indian secession, Fig. 2.2, page 35, only a portion of northern Brown County was set aside as an Indian reservation at that time. A

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[10]James W. Lynd, "History of the Dakotas," Minnesota Historical Collections, Vol. II, pp. 143-47.

[11]The essence of this notion comes from Prescott W. Webb, The Great Plains (New York: Grosset & Dunlap, 1931), pp. 115-18, where he discusses the impact of the Spanish horse on the Indian culture of the Apache and Comanche. But it seems to apply equally as well to the Dakota Sioux, who adopted the horse before the Chippewa, but adapted it to plains rather than forest living. This is corroberated by E. E. Edwards, "American Indian Contributions to Civilization," Minnesota History, XV (September, 1934), 252-72.

[12]Robinson, op. cit., p. 43.

smaller section of Blue Earth and Waseca Counties was appropriated by the government in 1855 to establish another Indian reservation for the displaced Winnebago Indians of Wisconsin.

The Sioux uprising of 1862 was a war in which several hundred settlers were murdered in Minnesota and Iowa. This event retarded immigration to the River Bend Area, and only settlements located adjacent to the rivers and military roads managed to survive.[13]

Economic Recession and the Lack of Transportation

The period from 1858 to 1865, a particularly difficult one for the River Bend Area, was due in part to the Indian uprisings but also to the nationally severe financial crisis of 1857 to 1859. Businesses failed, mortgages were foreclosed, land speculation dropped off sharply, immigration stopped, and emigration caused a loss of markets in areas which were, at that time, only marginally productive, as a general economic malaise settled over much of the nation's agricultural interior.

In addition, a further deterent to settlement in southern Minnesota during the early sixties was the Civil War, fought from 1861 to 1865. Few agricultural settlers could move westward to seek cheap land.

Prior to 1865, the lack of roads, railroads, and market towns also retarded the development of the

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[13] Ibid.

agricultural resources of southern Minnesota. As shown by the map of the southern Minnesota road network in 1860 (Fig. 2.6), few towns of any size existed that were not located along navigable rivers or at power sites. In terms of year around usefulness all of the streams of Minnesota, other than the Mississippi below St. Paul, were of marginal value for shipping agricultural products. The peak period for marketing and sale of grains and potatoes was mid-summer to late fall. But steamboats could travel upstream on the Minnesota River more than fifteen miles only from early April to mid July.[14] As shown by Table 2.1, the heyday of steamboating on the Minnesota was from 1855 to 1865. Two considerations must be made in evaluating these data: (1) even though the number of boat trips for some of the years was quite large, the size of these boats was quite small, usually less than thirty tons capacity; and (2) most of the trips were short, often going only as far upstream as Chaska, Minnesota, some twenty-eight miles upstream from St. Paul.[15] (See Fig. 2.7.)

The limitations on year around transportation posed by the variations in flow of the rivers in the central part of the state meant that the average farmer in 1861 had to travel eighty miles to sell his produce at a town on a

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[14]William J. Petersen, "The Early History of Steamboating on the Minnesota River," Minnesota History Magazine, XI, No. 2 (June, 1930), 137-38.

[15]Ibid.

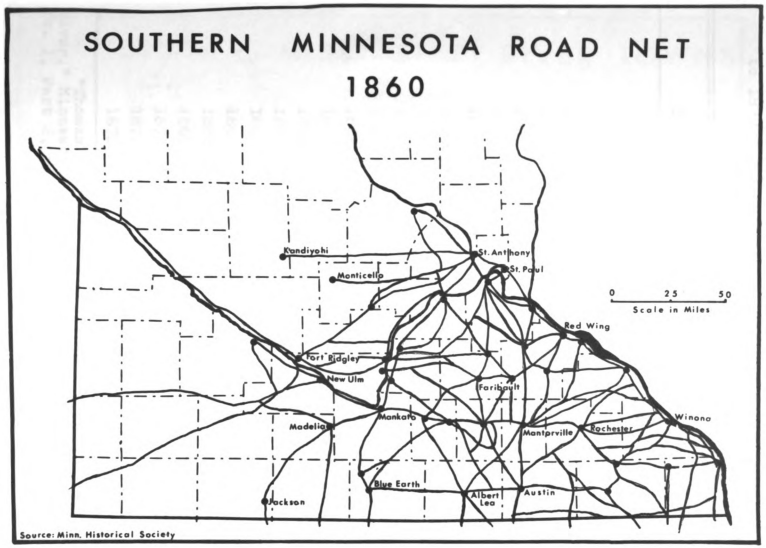
SOUTHERN MINNESOTA ROAD NET
1860
Kandiyohi
Monticello
St. Anthony
St. Paul
0 25 50
Scale in Miles
Red Wing
Fort Ridgley
New Ulm
Faribault
Winona
Madelia
Mankato
Montgomery
Rochester
Blue Earth
Albert Lea
Austin
Jackson
Source: Minn. Historical Society

Fig. 2.6

TABLE 2.1.--Steamboat departures from St. Paul from 1850 to 1872 for destinations on the Minnesota River*

Date	Steamboat Trips (Below Mankato)
1850	4
1851	3
1852	13
1853	49
1854	30
1855	109
1856	207
1857	292
1858	394
1859	300
1860	250
1861	318
1862	413
1863	177
1864	166
1865	195
1866	100
1867	100
1868	80
1869	50
1870	50
1871	20
1872	1

*Thomas Hughes, "Steamboating on the Minnesota River," Minnesota Historical Society Collections, Vol. X, No. 1, Part 2, pp. 158-60.

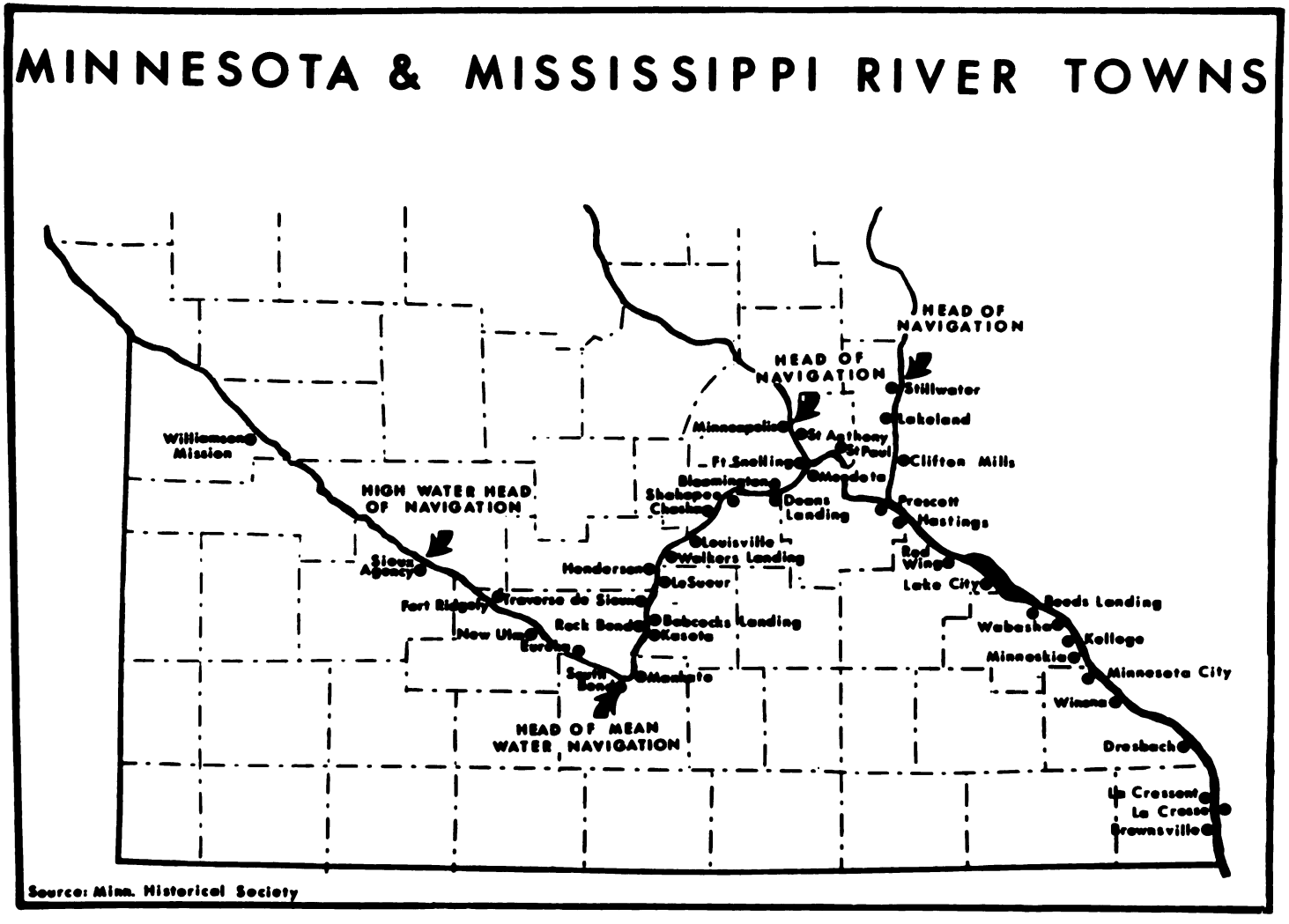
MINNESOTA & MISSISSIPPI RIVER TOWNS
HEAD OF NAVIGATION
HEAD OF NAVIGATION
Stillwater
Lakeland
Minneapolis
St Anthony
St Paul
Clifton Mills
Ft Snelling
Minnesota
Bloomington
Sheboygan
Chaska
Dean's Landing
Prescott
Hastings
Williamson Mission
HIGH WATER HEAD OF NAVIGATION
Louisville
Walthers Landing
Red Wing
Lake City
Henderson
LeSueur
Sioux Agency
Traverse de Sioux
Fort Ridgely
Rock Bend
Babcocks Landing
Kasota
New Ulm
Eureka
Mankato
South Bend
HEAD OF MEAN WATER NAVIGATION
Reeds Landing
Wabasha
Kellogg
Minnesota City
Winona
Dresbach
La Crescent
La Crosse
Brownsville
Source: Minn. Historical Society

Fig. 2.7

navigable stream. This amounted to a trip of some five days travel time compounded often by a wait of two or three days at the market center during periods of peak grain buying.[16] The factors of capital, time, and equipment investment involved in getting the produce to market consumed much of the farmer's profit margin when selling his agricultural goods, which in turn tended to inhibit the attractiveness of developing agricultural land on or near the "no rent" margin for commercial agriculture.

But for those settlers already involved in agriculture, the need for cash and the commitment of homesteading were so great that the farmers were forced to sell their produce even at a loss.

During the immediate post Civil War years the River Bend Area saw a rebirth of development and settlement. Immigrants once again started to move into the area, but population density continued to drop off rapidly away from the rivers and the few wagon roads. As late as 1870 only a very small portion of the state could be considered truly agricultural.[17]

The Railroad

The railroad made the most dramatic changes in the region since the first pioneers arrived in the early

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[16]Henrietta M. Larson, The Wheat Market and the Farmer in Minnesota 1858-1900 (New York: Columbia University Press, 1926), pp. 18-25.

[17]John R. Borchert and Neil E. Salisbury, A Reconnaissance Atlas of Minnesota Agriculture (Minneapolis: University of Minnesota, 1955), p. 15.

1850's. Railroad towns and service centers literally grew out of the prairie where nothing had previously existed.

Analysis of platting information in the River Bend Area reveals (1) the date of platting and the date of the railroad's arrival correspond very closely in many cases, and (2) that the railroad companies had originally platted a sizeable portion along their right of way in these communities. To encourage the expansion of the railroads the federal government gave right of way land grants which often extended seven miles either side of the tracks.[18] The sale of this land at values scaled to the distance from the tracks and town sites was used to help defray the cost of developing land where the existing markets were relatively small but the market potential was considered to be great.

The railroad played a very important role in developing the River Bend Area. Places which had been just a post office in a general store suddenly grew into service centers with a greatly expanded functional base. Paradoxically, other places which had been considered important service centers declined and often disappeared after being bypassed by the rail lines.

The effect of the railroad on the rural areas was, in many respects, even more dramatic than its effect upon

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[18]Rasmus S. Saby, "Railroad Legislation in Minnesota," Collections of the Minnesota Historical Society, Vol. XV, pp. 58-59.

the central places. After the railroad's extension throughout the eight county area, in 1880 more than 94 per cent of the area population was within three hours drive by wagon and team from the rail lines. (See Fig. 2.8.) As shown by the histogram in Fig. 2.9, the rural population took a most decided jump during the period of greatest railroad expansion from 1870 to 1890. Correlated with this growth was a marked rise in the number of farm units, the value of the land, and the amount of land in cultivation. By 1890 the area had matured to the point where it had become an integral element of the agricultural economy of the state.

No longer was it necessary to expend great amounts of time and capital to sell agricultural surpluses. The average distance from production point to market place had dropped from eighty miles to less than one-tenth that amount in the course of some fifteen years. Profits were greater with the decreased transportation costs and, in addition, the production costs were decreasing as new agricultural innovations were adopted.

Agricultural Shifts--Subsistence to Specialization

Thus, with the railroad's arrival, agriculture in the River Bend Area began to change from subsistence to a more specialized type. And this shift in orientation plays a particularly important role in the development of central place functions. The early settler of the region

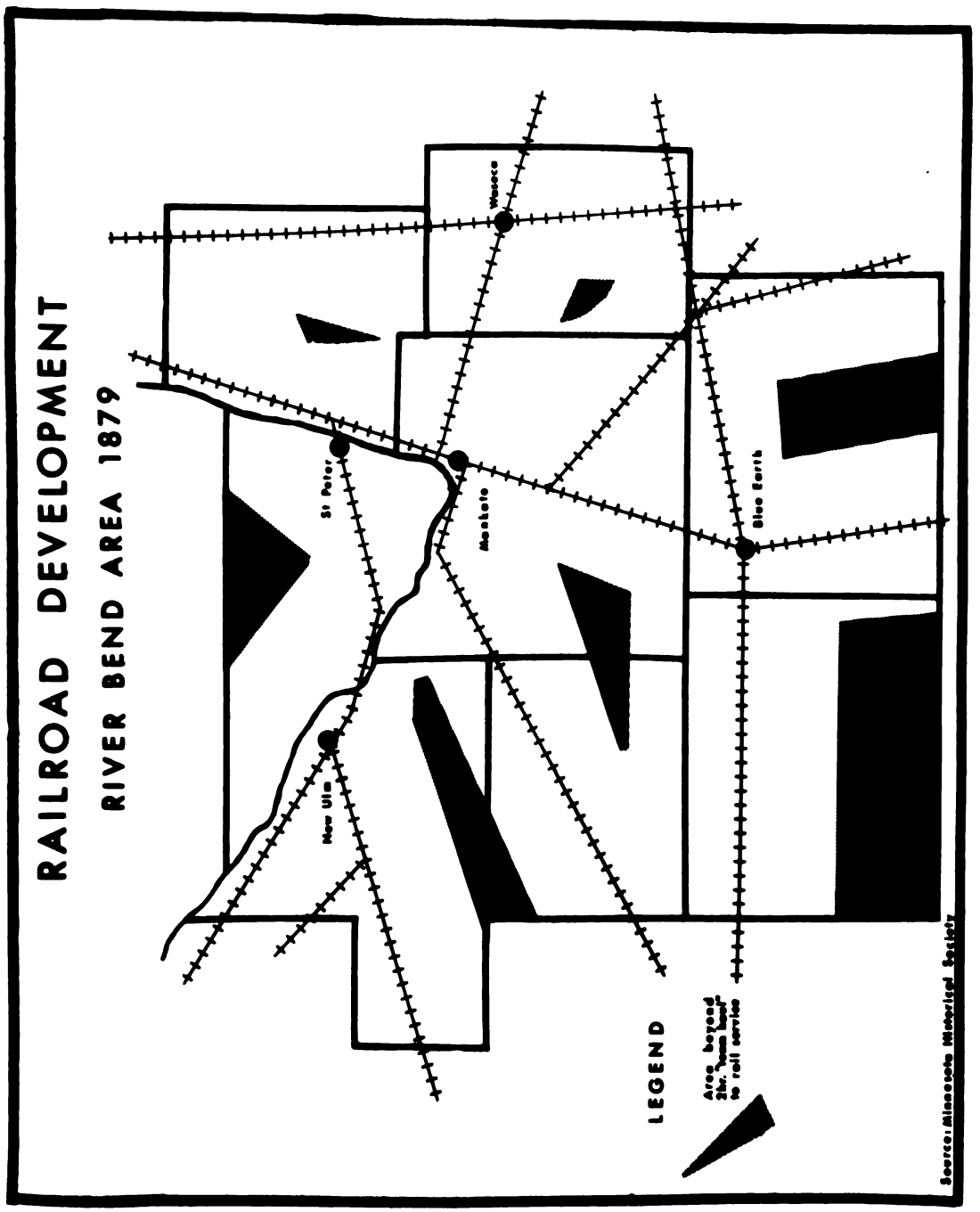
RAILROAD DEVELOPMENT
RIVER BEND AREA 1879
St Peter
Mankato
Waseca
New Ulm
Blue Earth
LEGEND

Fig. 2.8

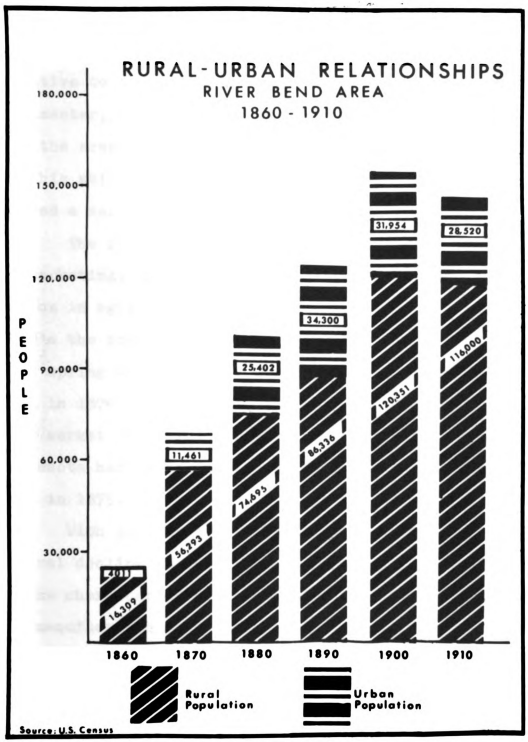
RURAL-URBAN RELATIONSHIPS
RIVER BEND AREA
1860 - 1910
PEOPLE
180,000
150,000
120,000
90,000
60,000
30,000
16,309
56,393
74,695
86,236
120,351
116,000
11,461
25,402
34,300
31,954
28,520
1860
1870
1880
1890
1900
1910
Rural Population
Urban Population
Source: U.S. Census

Fig. 2.9

was essentially self-sufficient with only minimal dependence upon others. The few needs not met by the farm or its neighbors were purchased from the general store, but selections were limited and prices tended to be high, relative to the present. The storekeeper was often the postmaster, harnessmaker, blacksmith, druggist, and miller for the area. The demand for these services being limited and his skills being minimal, the general store often served a market of several hundred square miles.

The railroads tended to revolutionize this pattern of marketing; and with access to distant markets, specialization in agriculture was a logical result. By the late 1860's the trend in southern Minnesota was toward producing hard spring wheat.[19] Two-thirds of the tilled land in the area in 1874 was in wheat,[20] and the percentage of the New York market price for wheat received by farmers in southern Minnesota had risen from 55.6 per cent in 1869 to 69.7 per cent in 1875.[21]

With increasing specialization in wheat and the general decline of subsistence farming came a marked change in the character of the economy of the region. The demand for manufactured goods and specialty items began to increase. Specialization produces a surplus which generates

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[19] Ibid; and Larson, op. cit., pp. 55-73.

[20] Robinson, op. cit., pp. 260-61.

[21] Larson, op. cit., p. 94.

capital, assuming demand is maintained, which can be converted into goods and services formerly provided only by the farm or not sought. The demand for imported groceries, guns, hardware, clothing, and all other forms of consumer goods produced specialized stores and shops. Thus emerged the "Main Street" type of commercial development.

Increased agricultural output and efficiency also contributed to a surplus of disposable income. This surplus also enhanced the centrality of many places by creating the demand for luxury goods, medical services, and hotels. By the turn of the century it was not unusual to find a community of several hundred people with a millinery shop, a hotel, several general stores, a bank, a hardware store, an implement dealer, several bars and restaurants, physicians, a ladies' dress shop, a harness shop, a blacksmith, a creamery, and several grain elevators.

The growth of population in non-rural places increased by 3.5 times in the period 1870 to 1890, and population in places larger than 2,500 expanded by almost five times its 1870 figure in twenty years. A growing rural population coupled with a rapidly expanding urban population tended to develop service centers with a wide range of sizes and magnitudes. They ranged from the smallest center with only a general store through a continuum of places to the largest center (Mankato) which offered a wide variety of stores, shops, offices, and yards.

This change is best demonstrated by the theoretical representations of changing rank-size relationships of central places shown in Figs. 2.10a and 2.10b below.

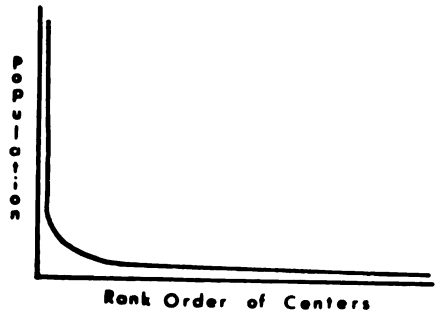

Fig. 2.10a

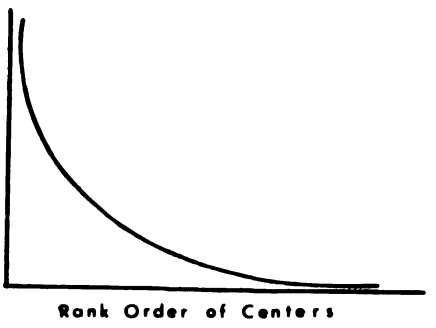

Fig. 2.10b

Fig. 2.10a and Fig. 2.10b.--Rank size distributions of central places in the River Bend Area in the pre-railroad and the post-railroad eras of development.

Obviously, service centers changed dramatically from the pre-railroad era to the post-railroad era. Rapid expansion of central places along the railroads also created a labor deficit within the region. Personnel in the shops, stores, and yards of those communities was no longer supplied by the family. These businesses often required the services of people trained in a vocation. The developing communities attracted people to work as employees of the commercial establishments. Likewise, churches, schools, and other institutions were also increasing in these communities, further enhancing their attraction. Significant numbers of people added to the non-agricultural labor force tended to attract still more services and functions

to the community to meet the demand of the expanded population.

The focality of the railroad community was very strong. As previously mentioned, many of these places grew fantastically in only a few months after the completion of the railroads. One example of this development explosion took place at Lake Crystal in 1869. In less than four months this community grew from nothing to a population of over two hundred with forty permanent structures. At the end of that period the community had a grain elevator, hotel, two-story school, two general stores, hardware store, two-story general merchandise and dry goods store, a harness shop, a cooperage, implement dealership, doctor's office, and a post office.[22]

Agricultural Diversification

During the period of agricultural specialization, primary foci within the community were the grain elevators and flour mills. Almost all economic activity was dependent upon the grain market. At that time sales were concentrated during the few short months in the late summer and early fall. Good grain years, such as 1877 through 1880, brought boom periods, but yields had dipped by a 25 per cent average in the state by the mid-to-late

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[22]Thomas Hughes, History of Blue Earth County (Chicago: Middle West Publishing Company, 1901), p. 169.

1880's, and prices on the exchange were dropping as well, which resulted in a poor return in local investments.

Low grain yields, the uncertainties of the climate, and low prices influenced another shift in the production patterns of the region during the 1880's and 1890's. The region changed from raising only wheat and the hazards of a one-crop economy to a more diverse agriculture with a heavy base of dairy production. The shift away from wheat was caused by a number of other factors besides yields and prices. During the period from 1874 to 1878 the entire River Bend Area, as well as most of southern Minnesota, was devastated by a series of locust invasions which destroyed many of the crops.[23] From the early to mid 1880's agricultural production was again retarded, this time by the chinch bugs. The appearance of the verticilium stem rust which damaged spring wheat throughout the Great Plains made diversified farming a necessity.[24]

The emphasis upon dairying added the creamery to further enhance the focality of many service centers. In 1885 there were eighteen creameries and cheese factories in the area. As shown by the 1885 map of creamery and cheese factories in Fig. 2.11, two-thirds of the creameries in the River Bend Area were concentrated in Waseca and

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[23] Ibid.

[24] Robinson, op. cit., pp. 108-9.

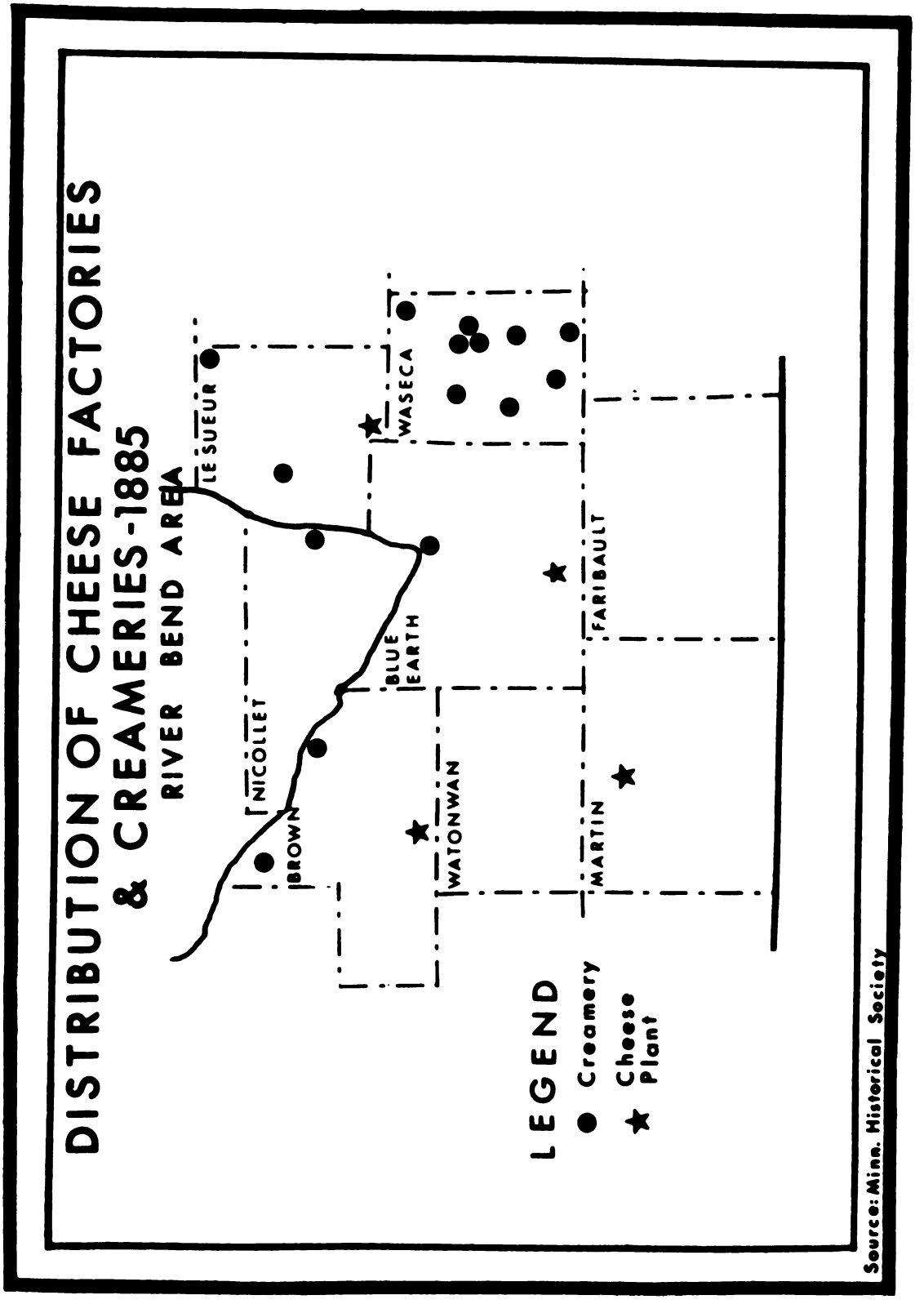
DISTRIBUTION OF CHEESE FACTORIES
& CREAMERIES-1885
RIVER BEND AREA
LE SUEUR
WASECA
NICOLLET
BLUE EARTH
BROWN
WATONWAN
MARTIN
FARIBAULT
LEGEND
Creamery
Cheese Plant
Source: Minn. Historical Society

Fig. 2.11

Le Sueur Counties.[25] By 1901 almost every community within the study area had a creamery or cheese factory either within it or near by. Fig. 2.12 shows that by 1901 dairy products processing was no longer confined to the eastern sections of the study area but had spread into the former grass prairies to the west and south of the Minnesota River Valley.

The growth of dairying in southern Minnesota and the River Bend Area cannot be attributed to any single event, but was the result of a series of technological developments and improvements. Those of note are: the invention of the centrifugal cream separator, improve dairy breeds, the invention of the silo for preservation of green fodder, and the introduction of mechanical refrigeration. In addition, the poorly drained areas produced abundant natural forage or hay which could be harvested in the fall or used as pasture during much of the year. Much of this land was useless for planting crops such as wheat or corn.

The shift away from dependence upon grain as the major element of the local economy also served to even out the economic lulls which occurred in the "off season" when crops were not being marketed. The sale of dairy products in the late winter, early spring, and summer, coupled with receipts from sales of produce during the remainder of the

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[25] Ibid., p. 112.

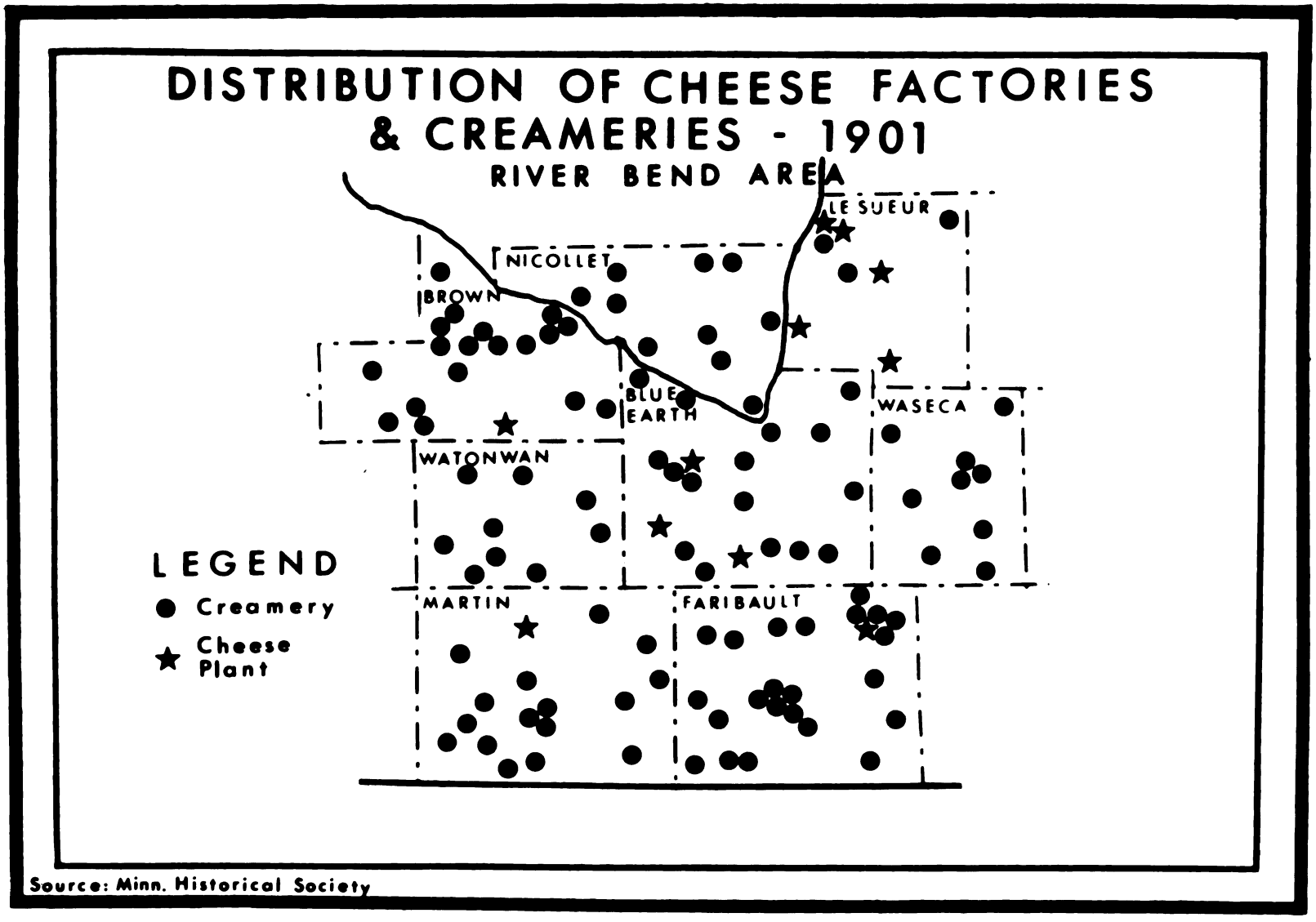
DISTRIBUTION OF CHEESE FACTORIES
& CREAMERIES - 1901
RIVER BEND AREA
LE SUEUR
NICOLLET
BROWN
BLUE EARTH
WASECA
WATONWAN
MARTIN
FARIBAULT
LEGEND
Creamery
Cheese Plant
Source: Minn. Historical Society

Fig. 2.12

year, generated year around flows of cash. The flow of disposable income grew, thus raising the year around demand for goods and services, which increased employment and eliminated layoffs and seasonal help, thereby enhancing the flow of capital which created more demand, and so on.

Conclusions

The simple feedback model of regional economic development in Fig. 2.13 is simply a reflection of the processes discussed above. The model also tends to conform closely with the concepts developed by Harvey S. Perloff in How a Region Grows. He describes the forces which determine the growth of regions as being related to the four sets of variables which are all interrelated through the workings of the market mechanism or price system.[26] It becomes apparent that the factors which initiate change and development conform to the following:

1. Income distribution, technology or institutional policy.

2. Locational and production decisions relating to the requirements of industry.

3. Employment and consumption decisions relating to the pattern of regional economic activity but made independently by individuals.

4. The perception of the relative comparative advantages of the region and the institution or

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[26]Harvey S. Perloff, How a Region Grows (New York: Committee for Economic Development, Supplementary Paper No. 17, 1963), p. 21.

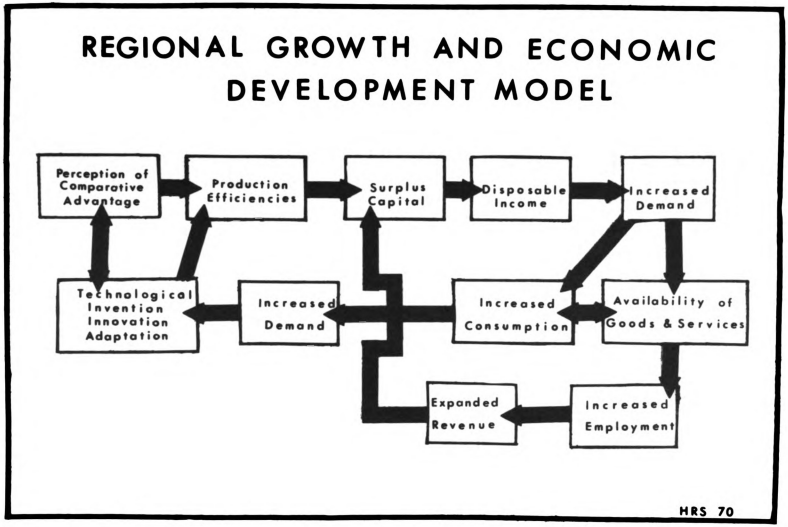
REGIONAL GROWTH AND ECONOMIC DEVELOPMENT MODEL
Perception of Comparative Advantage
Production Efficiencies
Surplus Capital
Disposable Income
Increased Demand
Technological Invention Innovation Adaptation
Increased Demand
Increased Consumption
Availability of Goods & Services
Expanded Revenue
Increased Employment
HRS 70

Fig. 2.13

> programs to take the maximum advantage of the opportunities. These are again individual decisions as opposed to formal governmental policy decisions.[27]

The importance of the above principles is readily apparent from the discussion in this chapter. The following chapters will serve to further demonstrate the role of technology and income distribution in changing the relative comparative advantage of central places throughout the River Bend Area.

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[27] Ibid.

CHAPTER III

FACTORS INFLUENCING REGIONAL GROWTH AND TRADE CENTER ALTERATION IN THE RIVER BEND AREA 1900-1960

The period of population and trade growth in the River Bend Area was essentially over by the turn of the century. As in any frontier area there had been over-development, largely due to developers who came to "seek their fortunes." But after the initial "filling in," the area needed to adjust and adapt to its place in the economic, political, and social fabric of the nation.

Any histo-geographical analysis of the most obvious economic changes in the upper midwest since the turn of the century indicates that three developments overshadow all others. First, agriculture intensified; second, market and shopping patterns were reoriented; and, third, there was rapid mechanization. The first expanded the economic base of the region, thus generating enough surplus income to create a demand for a greater number and variety of functions in the service centers throughout the region. The second caused a marked decline in the number of service centers serving the region. The last is inextricably linked with both the former. Greater affluence made

possible efficiencies in agricultural production and in transportation. Consumption patterns then shifted from local service centers with limited functions to larger and more diversified places. These trends can be attributed to technological innovations which have increased operating efficiency thus permitting economies of scale. This has altered the relative comparative advantage of both the region and the central places within it. This chapter will focus upon some of the factors which have contributed to these changes and place them in their proper historical and spatial perspective.

Decline or Disappearance of Service Centers

Since the turn of the century, the number of service centers serving the nation has been declining steadily. The River Bend Area represents a microcosm of this trend. The forces at work within the nation are in most ways the same ones which reduced the number of River Bend service centers from 132, shortly before the turn of the century, to 99 places in 1960. From 1905 to 1920, the number of centers declined from 132 to 115. During this period the greatest number of community disappearances occurred. Between 1900 and 1920, fifteen new centers emerged while thirty-three functionally disappeared.[1] Analysis of the

[1]The notion of functional disappearance relates to the loss of all central function activity. The place may have continued to exist as a population center but lost all of its economic functions.

Dun and Bradstreet data indicates that these centers fell into one of three classes: (1) a community based on a depleted resource, such as hardwood logging, (2) a place which lost its transportation advantage, or (3) a center which lost much of its focality when its post office closed under the provisions of the 1905 Rural Free Delivery Act.

It should be noted that the centers which disappeared between 1900 and 1920 had a very low level of functional attraction.[2] The average disappearing center was, therefore, very small and possessed only minimal functions such as a creamery or a general store. Of the three larger places, one had been a relatively important stage stop and simply died out after stage coach service was discontinued; another was a resort center bypassed by the railroad; and the third was physically moved and united with another community to make way for the building of a power dam. All three centers had also been bypassed by the railroad.

The importance of the railroad in determining the future of a community is dramatically shown by the fact that in 1900 there were fifty-seven places without railroad service in the River Bend Area. Of these fifty-seven, only

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[2]Functional attraction is the total of all the loaded values for the particular types of activities located within the center. It is not an indicator of how many functions or businesses are in operation within the community.

thirty-nine remained in 1910, and another thirteen functionally disappeared by 1920. In the span of twenty years 54 per cent of the places bypassed by rail service had declined so far that their focality as service centers had vanished.

As previously mentioned, fifteen new commercial centers emerged at the same time the thirty-three centers discussed above were disappearing. The importance of technology is unmistakable in determining the new locations. Only one new community was not located on a railroad.

It is also important to note the influence of the rail transportation upon existing centers. At the turn of the century there were eight communities previously without rail service which had been reached as a result of further expansion of the railroads by 1910. Six of these centers expanded their functional base after being reached by the rail lines but two did not show any measurable growth.

After 1920, the importance of the railroad to the small agricultural service center declined. After 1911, railroad facilities were not expanded, and the rail lines were not extended to new centers. During the 1930's, many small towns lost their passenger service. Railroads then adopted a policy of accepting no "less than car load lots." By 1957, all passenger service in the area had been discontinued and freight service had decreased so that the

rails were being torn up as service was discontinued even more.

Closely correlated with the loss of function in small service centers was the disappearance of the local post office. Prior to the Rural Free Delivery Act of 1905, mail was funneled through the local post office. No provision for mail delivery to home or business was available except by private arrangement. Any place which had a post office was assured of some trade simply by the fact that those residents had to come to the local post office to pick up their mail. The post office was often located in the general store; it served as a captive market for the merchant, produced some small revenue for the postmaster, and often acted as an important social institution for exchanging news and ideas.

By 1910, forty-five fourth class post offices had been discontinued in the River Bend Area. In 67 per cent of the cases the town which had no railroad and which lost its post office franchise had functionally disappeared by 1920. The towns without both railroad service and post offices showed no growth during the period from 1900 to 1920. Only three centers showed no functional decline. Of the remainder, two declined by at least a third in their attraction, while the remaining ten functionally declined by more than one-half.

Another factor influencing the disappearance of some trade centers was the loss of a resource such as the

hardwood forests of Waseca and Le Sueur Counties. Two towns in that area had formerly been logging centers built upon the market created by the sawmills. They literally disappeared overnight after the sawmills were moved away.

After 1920, no service centers were started in the River Bend Area. The steady decline in their numbers from 115 in 1920 to 99 in 1960 can usually be attributed to the market reorientation which accompanied automobile and agricultural specialization. New and re-routed highways bypassed many small centers. New technology in automobile and road design allowed the shopper to go farther and faster with less effort so that many very small service centers simply lost their service area to larger centers. (See Table 3.1.)

TABLE 3.1.--Expected vehicular speeds under varying road conditions for period 1910 to 1960

Date	Dirt Road m.p.h.	Gravel Road m.p.h.	Paved Road m.p.h.
1910	3.0	3.0	3.0
1920	14.0	19.5	33.0
1930	18.0	26.0	39.0
1940	23.0	31.0	43.0
1950	30.0	40.0	50.0
1960	39.0	47.0	57.0

Agricultural specialization became characteristic of the River Bend Area after 1910. More and more the farmer depended upon grain and livestock raising and less and less upon general farming and dairying. Thus, the

creamery, one of the mainstays of the economic structure of many communities in 1900, was gradually forced out of business. As the creamery declined in importance, many small centers lost their service functions, e.g., general stores, blacksmiths, service stations, etc., which had lived off the traffic and money generated by the creamery.

Increased use of the truck had a similar effect upon the small town grain elevator. As shown in Table 3.2, increasing numbers of trucks were in general use after the 1930's by both farmers and merchants. During the 1940's truck design radically improved the carrying capacity of these vehicles and lowered their price by about 40 per cent. Though the cost of operating a more powerful, larger vehicle was commensurately greater, the per mile operating costs were markedly reduced. These factors, coupled with the truck's increased speed, permitted the operator to sell his produce in larger centers; in turn, he gained economies of operation from the variety of goods and services he had available to him. No longer was he forced to sell his goods at the local elevator simply because his effective range of alternatives was limited by the slow speed of the tractor and wagon.

TABLE 3.2.--Trucks in use on farms in the River Bend Area 1930-1960

1930	1940	1950	1960
4,052	4,119	7,775	11,682

Source: U. S. Census of Agriculture.

Similarly, the automobile effected a definite reduction in the role of the small agricultural service center. As demonstrated in the fourth chapter, the rising use of the automobile and declining importance of both the horse and the railroad caused a significant loss of function in many small agricultural service centers. The number of livery stables, harness repair shops, hotels, and blacksmith shops dropped during the period from 1910 through 1930. There was a corresponding rise in the number of auto dealers, service stations, auto repair shops, and other auto-oriented functions. But the growth of these activities was at first confined to the largest centers and only after 1930 did they begin to appear in smaller places. As some functions died out completely and others dwindled in number, the focality of the small center diminished, and in the smallest places, i.e., those with only one or two functions, the loss of market caused their disappearance.

Analysis of the Dun and Bradstreet Book of Commercial Ratings reveals that prior to 1930, decline in the functional attraction of commercial centers was confined to small places with limited service. Other centers tended to grow. But between 1930 and 1940 even places with populations of up to five hundred which had previously exhibited commercial growth and development began to show signs of stagnation and even decline in their importance. There were eighty-five of these places in the River Bend Area in

1930 and only thirteen showed any expansion by 1940. The remaining seventy-two tended to remain either static or decline. Some of this can be attributed to the economic depression of the 1930's, but analysis reveals that of the remaining twenty-seven places in the area, 82 per cent of those with a population over five hundred and loaded functional bases over seventy showed growth during the ensuing decades. This pattern is repeated through 1960.[3]

Much of this pattern of central place growth, decline, or stagnation can be linked to the ubiquitous automobile. By 1930 the way the farmer spent his money was overwhelmingly influenced by his accessibility to larger, more distant places. No longer was he limited to the nearby general store for his needs. Rather, he could travel to a larger center and take advantage of the lower prices and wider choices available there. Because the consumer changed his buying habits, those centers with over five hundred people expanded, but at the expense of the smaller places. Not only did the market area of these centers change, but the threshold population necessary to sustain them was altered. Larger centers expanded their effective market areas, thus increasing the numbers of people they served; this increased their attraction for new business enterprises which further enhanced their

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[3]Growth is defined as being an increase of at least 10 per cent over the preceding decade's loaded function.

focality. At the same time the smaller centers were losing their potential customers as their market areas shrank, reducing their functional base and decreasing their focality.

In several instances a small center retained its viability up to the 1950's because it was isolated from the main trunk highways and paved roads. As a result, these centers retained a sufficient market to maintain themselves by offering very basic goods or services. They presented an intervening opportunity to the consumer who was not seeking the full service amenities of the large center and who was unwilling to make a long trip over poor roads. But as the county road systems were completed, and paving or straightening of the highways brought these once remote centers closer to the larger communities, both in terms of travel time and convenience, they too began to disappear and die out.

Although a new highway caused some centers to disappear, the loss of an existing highway could sometimes create the same effect for another center. Since the 1950's the trend has been to bypass small towns by rerouting the highway around rather than through the center. During the decade 1950 to 1960 four centers disappeared while no new places emerged in the River Bend Area. In three of the four instances the highway bypass brought about the center's functional demise. These communities were totally oriented to the automobile and included a

service station, auto repair, and a small general store, but they lost such a large proportion of their business after the route change that they were forced out of business. The very marginal nature of these centers was such that either a new road or loss of a road was such a shock that they were unable to adapt to the new economic situation.

Trends in Regional Growth

Population and Employment

Contrary to what might be expected in a region where many of the service centers were disappearing and others were growing very slowly, the population of the area was expanding as was the economic base. As shown by Fig. 3.1, both rural and urban populations were increasing. The trend of rural population goes counter to that of the state and the nation between 1910 and 1950. During this period regional, rural population expanded. Most of the increase was created by an expansion of the rural non-farm population living in centers with less than one thousand population. Due to the limitation of the census data for this period, it is impossible to pinpoint precisely the population trends in the rural areas, but based on other census data it appears that the population on farms rose from 1910[4] to

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[4]Regional population at the turn of the century was on the decline, as population densities dropped from 22.1 per square mile in 1890 to 19.6 per square mile in 1910.

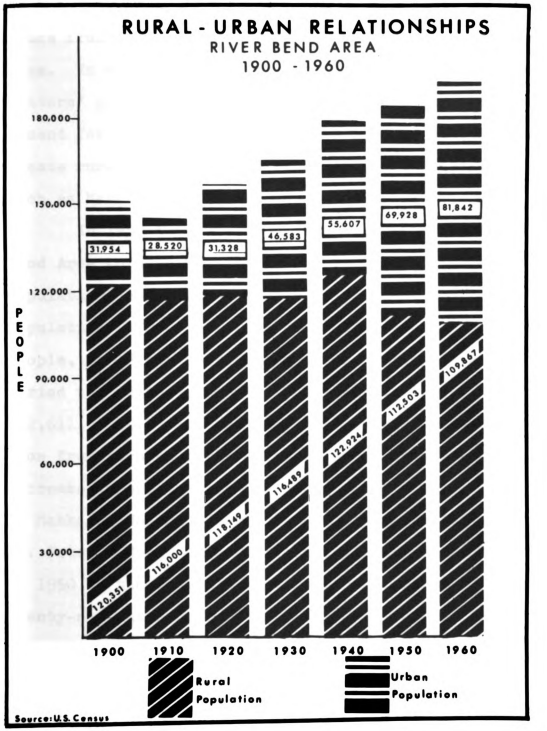
RURAL - URBAN RELATIONSHIPS
RIVER BEND AREA
1900 - 1960
PEOPLE
180,000
150,000
120,000
90,000
60,000
30,000
31,954
28,520
31,328
46,583
55,607
69,928
81,842
120,251
118,000
118,140
116,489
122,824
112,503
109,857
1900
1910
1920
1930
1940
1950
1960
Rural Population
Urban Population
Source: U.S. Census

Fig. 3.1

1940. In 1950 the first marked decline in rural farm populations since the turn of the century appears. Part of the increase in rural populations from 1910 to 1940 comes from the increase in the number of farms within the area. In addition, the very rapid growth of the urban centers' populations during this same period generated a demand for housing beyond the city limits, which tended to create rural non-farm population around the larger centers such as Mankato.

In 1950 the rural non-farm population of the River Bend Area totaled 42,554, or 23 per cent of the area population, as contrasted with 39 per cent for rural farm population. The rural farm population decreased 12,014 people, or 12 per cent, since 1930. During this same period the region's population grew from 136,072 to 182,611, a 12.3 per cent increase. These shifts in population from farm to urban or rural non-farm demonstrate the increased opportunities for employment in the major centers of Mankato, Waseca, Fairmont, New Ulm, Blue Earth, and St. Peter. Total number of manufacturing establishments in 1950 in the region's centers had increased by only twenty-six units over 1930. But employment in manufacturing, as shown in Table 3.3, had grown by 1950 to 6,837, an increase of 2.25 times that of the 1930 figure of 3,006. This growth of employment opportunities attracted people both from within and outside the region. Emigration from the farms to the cities resulted in greater

TABLE 3.3.--Employment in manufacturing for River Bend Area 1919-1958

County	Year				
	1919	1929	1939	1947	1958
Blue Earth					
Establishments	91	61	56	71	71
Employees	826	611	510	1,613	2,311
Payroll	785	707	542	3,848	10,272
Value Added	1,953	2,941	2,390	8,442	21,716
Brown					
Establishments	58	48	47	41	53
Employees	538	478	712	1,381	1,586
Payroll	552	576	600	3,382	5,704
Value Added	2,088	2,756	2,488	7,408	10,339
Faribault					
Establishments	48	33	30	29	34
Employees	156	271	450	833	787
Payroll	186	269	232	1,383	2,731
Value Added	523	1,201	981	3,034	5,936
Le Sueur					
Establishments	67	26	21	30	33
Employees	502	706	777	1,314	889
Payroll	453	965	482	2,525	3,299
Value Added	2,201	2,808	2,540	7,063	8,080
Martin					
Establishments	38	26	30	30	39
Employees	252	500	663	983	1,357
Payroll	227	521	482	2,627	5,183
Value Added	558	2,285	1,444	4,438	14,041
Nicollet					
Establishments	44	21	19	26	25
Employees	182	77	106	247	350
Payroll	161	75	106	517	1,190
Value Added	444	281	410	859	2,593
Waseca					
Establishments	33	26	22	27	24
Employees	266	262	128	696	1,229
Payroll	319	291	118	1,434	4,351
Value Added	955	835	358	2,961	10,405

TABLE 3.3.--Continued

	Year				
	1919	1929	1939	1947	1958
Watonwan					
Establishments	31	21	20	24	22
Employees	131	101	113	370	885
Payroll	164	151	90	811	2,471
Value Added	266	319	222	1,251	2,966
State					
Establishments	6,225	1,258	3,735	4,567	5,317
Employees	115,623	36,731	78,023	179,986	209,187
Payroll	127,107	47,120	96,887	501,355	1,020,211
Value Added	335,040	153,688	306,840	1,022,586	1,594,505

Source: U. S. Census of Manufacturing.

concentrations of rural non-farm population in and around the larger centers while the population density of the outlying agricultural areas decreased generally.

But increased employment opportunities within the region's urban centers was not the primary cause of declining farm population between 1940 and 1960. Rather, it was the result of the consolidation of farm units necessary for the efficient use of the high priced farm machinery becoming available. Steadily increasing use of mechanized equipment eliminated many jobs formerly performed by field hands and/or the farm family, forcing these people to seek employment in the cities rather than on the farms.

Another factor contributing both to the migration from farm to city and the consolidation of farms was the rising age of farm operators. In 1951 the average farmer's age was 50.4 years, with 64 per cent over age 45. This age factor may have been a major reason for some of the former rural farm population relocating in the trade centers. Since 1950 a significant proportion of the population growth of small agricultural service centers comes from elderly farm operators migrating to communities where they retain some elements of their former life style without the responsibilities of farm life.[5]

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[5]Unpublished research by students in a techniques of field research course at Mankato State College, conducted in the communities of St. Clair, Wells, Beauford, and Rapidan, Minnesota, in 1966, 1968, and 1969.

Even though the region's agricultural population and the number of farms began decreasing after 1940 while urban employment and urban and rural non-farm populations rose, the area's economic base remained tied to agriculture. In 1960 the total regional population amounted to 196,335, with rural farm population accounting for 31 per cent of the total. This is contrasted with 17 per cent of the population living on farms in all of Minnesota.

The agricultural orientation of the region has been further enhanced by the increasing industrial employment in the cities of the River Bend Area. In 1939, 50 per cent of the manufacturing in the area was devoted to food and kindred product processing, but only 27 per cent of the labor force was employed in this group of industries. Since 1939 the number of establishments processing agricultural produce had declined by 22 per cent, but employment in the remaining 131 businesses had risen by 1958 to more than 50 per cent of the manufacturing labor force.

Agricultural Growth and Change

Agriculture in the River Bend Area has undergone a series of definitive changes as new technology and transportation have appeared. At the turn of the century general farming was the rule; the specialization of the 1870's and 1880's had declined so much that very few farmers relied upon a single crop. The vagaries of the climate, prices, disease, and pestilence made one-crop

agriculture too risky. Oats, hay, wheat, and corn were the staple crops, and most farms also kept a few hogs and dairy cows.

During the "teens" agriculture began to respecialize after five canneries started in the eight county area, creating a demand for sweet corn, early peas, squash, pumpkin, and some beans. Not only did these new industries contribute to specialization, but they also contributed significantly to the industrial trend by attracting new labor and business. Since the end of the First World War the area has attracted several new canneries, and more recently flash freeze operations, for the processing of local vegetables and poultry products. The rise of this type of business can be attributed to the growth of surplus income in the national economy allowing for purchases of convenience foods in cans, waxed boxes, plastic bags, or foil containers.

Coupled with rising national affluence has been a higher demand for fresh meat leading to the increase in beef fattening throughout much of southern Minnesota and northern Iowa. This trend has led to intensive cultivation of corn and soybeans which are used as hog and steer feed. Thus, through the development of pesticides, herbicides, increased plant populations, and highly efficient mechanized farm implements the area has returned to a specialized agricultural base. The comparative advantages the region once held for wheat and other cereal grains

have shifted farther west where techniques of dry farming coupled with new hybrids have given the Dakotas and Montana the least comparative disadvantage for economical production of cereal grains.

The shift in agricultural orientation for the River Bend Area is best exemplified by the changes in the corn-wheat ratio. In 1900 the per acre ratio was 1:2.7; by 1920 it had declined to 1:0.75; and in 1960 it was down to 1:0.18.[6] The changes generated the conditions for a new rural life style. Corn paid a higher return to the farmer than any other form of grain, particularly when converted into pork or beef. Many of the major meat processors of the nation not only maintained buyers and holding pens in the small railroad communities of the area, but several major meat processors opened plants in neighboring Albert Lea, Austin, and St. Paul, Minnesota. In 1939 the average net income for farmers in the River Bend Area was $2,277; by 1960 it had risen to $3,009 after declining from a high of $3,434 in 1958. Similarly, median family incomes rose over the period 1950 to 1960 from an average of $2,760 to $4,921.[7]

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[6]Based upon data derived from information supplied by the Minnesota Department of Agriculture Crop and Livestock Reporting Service and the United States Bureau of the Census.

[7]Minnesota Department of Agriculture, State-Federal Crop and Livestock Reporting Service, 1962 Minnesota Agricultural Statistics, St. Paul, 1962, p. 66.

Periods of economic crisis have noticeably altered the farmer's spending ability, i.e., during the agricultural slump immediately following the First World War and during the depression of the 1930's. During the thirties many of the region's farmers were hit not only by a sharp decline in agricultural prices but also by the closing of many of the small town banks. Between 1920 and 1940 over half the banks in the River Bend Area closed their doors. In 1920 there were 149 banks; in 1930 there were 106; by 1940 their numbers had decreased to 73. Of the seventy-six bank closings during this twenty year period, only seven were consolidations; the remaining sixty-nine were forced closings. With the bank failures went the financial reserves of many farmers who were often forced either into bankruptcy or very curtailed production. In many cases they had to sell their basic livestock herds to buy feed and seed, meet mortgage payments, and pay operating expenses and taxes. Lack of a demand for animal feeds, curtailed grain production, and a period of severe drought contributed to the decline of feed, grain, and flour mills in the area. Between 1920 and 1940 the number of feed and grain elevators declined 32 per cent, from 188 to 127.

During the late thirties and World War II farm prices underwent an almost unprecedented rise. Along with increased economic returns came rural electrification and more mechanization. The demand for food and kindred

products during the war, coupled with an even greater demand for meat, milk, and poultry products, and the aid shipments abroad after the war greatly increased the farmer's economic surpluses. He could easily purchase the trucks, tractors, self propelled corn pickers, shellers, and combines to make his operation more efficient and profitable. In addition, he also had sufficient resources to create a new rural life style which had formerly been available only to the urban dweller, i.e., gas and electric appliances, automobiles, and modern home facilities.

Increased efficiencies in agricultural production and marketing, coupled with greater mobility, effected another change in the region's agricultural character during the 1950's. Increasing numbers of jobs in industry and commerce and more leisure time, particularly during the winter, enabled many farmers to pursue two occupations, independent farmer and paid employee. By 1960 almost 20 per cent of the region's farmers were employed in either full or part-time positions away from the farm. The additional income generated by these arrangements further enhanced rural purchasing power, thus increasing retail sales in the urban centers.

The agro-economic expansion of the region was further enhanced from 1910 to 1940 as the number of farms grew and the size of farms decreased. (See Fig. 3.2.) This trend is contrary to national trends which showed a general decline in numbers and an increase in size for the

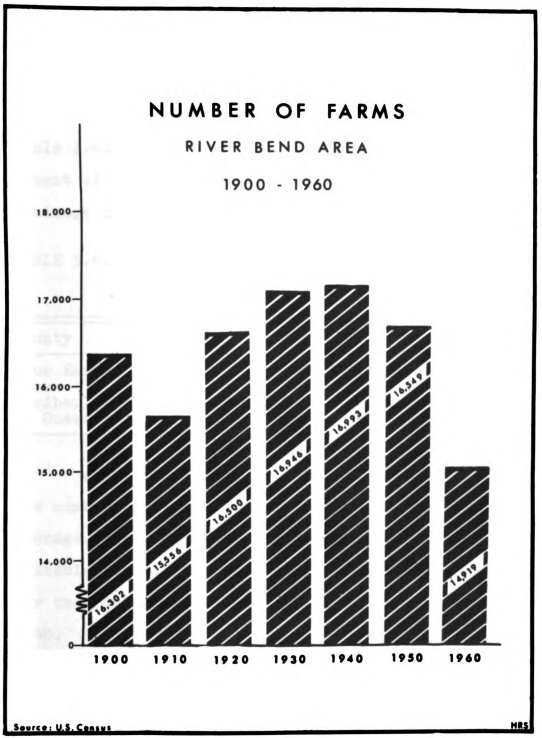
NUMBER OF FARMS
RIVER BEND AREA
1900 - 1960
18,000
17,000
16,000
15,000
14,000
0
16,392
15,554
16,500
16,948
16,993
16,349
14,919
1900
1910
1920
1930
1940
1950
1960
Source: U.S. Census
HRS

Fig. 3.2

same period.[8] Though the trend in land development and farm size seems irrational, it becomes understandable when the vast acreage opened for cultivation by artificial drainage is considered. As noted in the prceding chapter, much of the area was previously unsuitable for cultivation because of excessive slope or poor drainage. As shown in Table 3.4, the 1950 Census of Agriculture indicates the extent of land made available for cultivation by artificial drainage projects installed after the turn of the century.

TABLE 3.4.--Per cent of county area developed through public drainage projects

County	Per Cent	County	Per Cent
Blue Earth	38	Martin	60
Brown	23	Nicollet	34
Faribault	56	Waseca	15
Le Sueur	23	Watonwan	23

As more and more land was opened for cultivation, the number of farms increased; and even though their average size decreased, the percentage of each farm unit suitable for tilling was higher. These two factors account for the rising rural farm population of the area through 1940.

The earliest drainage program in the area was begun in 1898. Private drainage programs had been

[8]Howard L. Hill and Frank H. Maier, "The Family Farm in Transition," A Place to Live, The Yearbook of Agriculture, 1963, United States Department of Agriculture (Washington: Government Printing Office, 1963), p. 170.

instituted by individuals prior to that date by those possessing riparian rights, but these projects amounted to less than 1 per cent of the total cultivated area at that time.[9]

During the first third of the twentieth century, artificial drainage projects rapidly expanded in the River Bend Area. The ditching and tiling projects were provided under laws relating to county or judicial ditch and drainage legislation.[10] After the early thirties there was a marked decline in drainage programs because of a lack of available capital for financing and the marginal utility of land still awaiting drainage.

As the area increased its production and marketing capacity, the value of land and buildings showed a continuous rise in value except for the Depression years between 1930 and 1940. Between 1900 and 1960 agricultural land values in the eight counties rose 7.7 times. (See Fig. 3.3.). The increased value of rural land and buildings indicates the growing economic productivity of the region.

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[9]Bert E. Burns, "Artificial Drainage in Blue Earth County, Minnesota" (unpublished Ph.D. dissertation, University of Nebraska, Department of Geography, Lincoln, 1954).

[10]Prior to 1898 the law of the land was based upon riparian rights. Enabling legislation passed at the time made it possible for district courts to obtain easements along and away from water courses and property lines to allow for the artificial drainage of swamps and sloughs not adjacent to natural drainage systems.

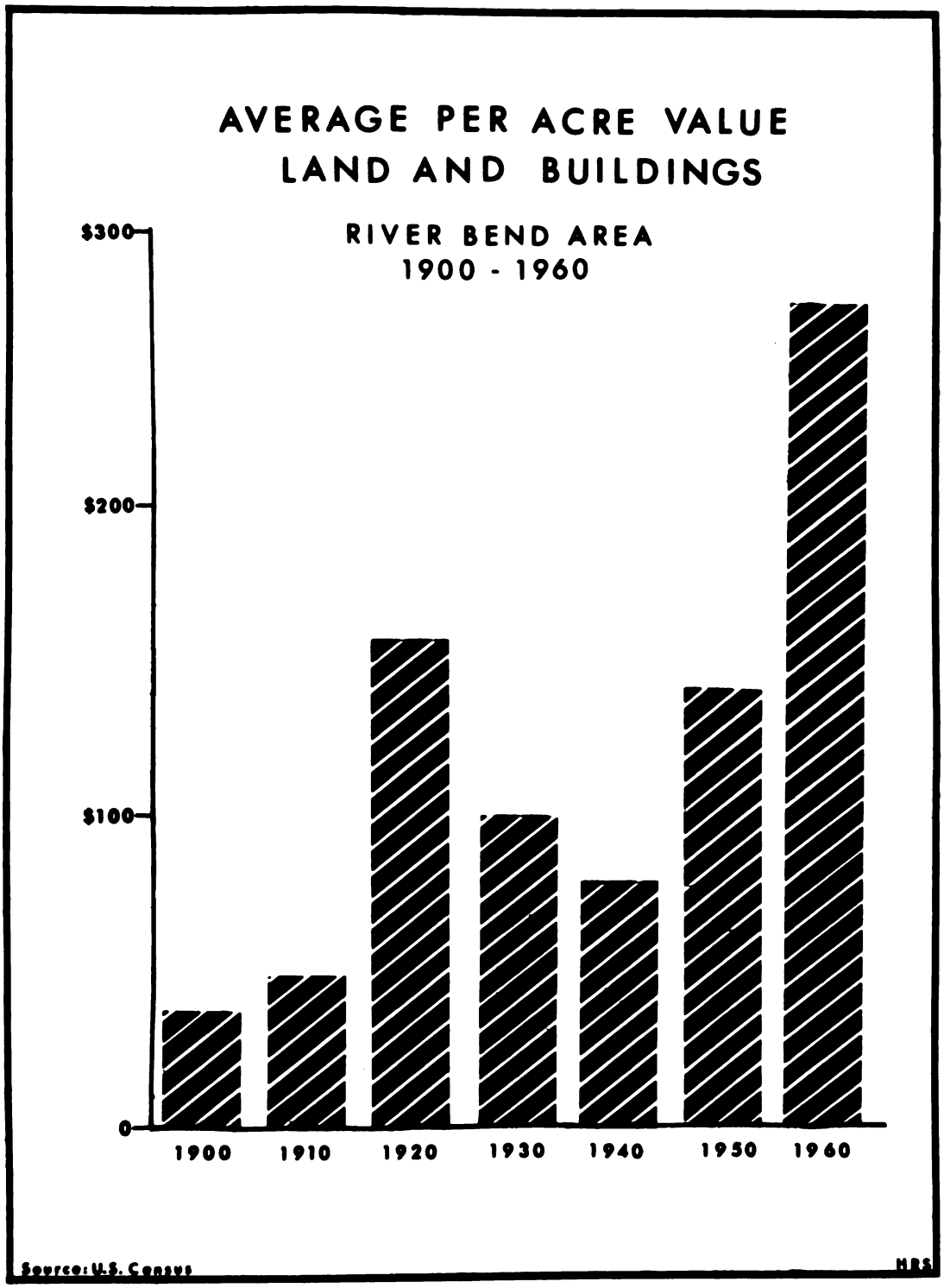
AVERAGE PER ACRE VALUE
LAND AND BUILDINGS
RIVER BEND AREA
1900 - 1960
$300
$200
$100
0
1900
1910
1920
1930
1940
1950
1960
Source: U.S. Census
HRS

Fig. 3.3

Expanding Mechanization

The growth of the region and its changes in population, agriculture, commercial centers, and general economics can generally be traced to rapidly mechanizing production and transportation coupled with expanding and improving of the local road network. In 1910 there were 131 automobiles but no trucks or gasoline tractors in the River Bend Area, though there were six auto dealerships.[11] By 1920 automobile ownership had risen considerably, demonstrated by the fifty-four auto dealerships in the area. At this time the first service stations appear in the Dun and Bradstreet Book of Commercial Ratings. In 1920 there were two service stations, but by 1930 their number had grown to seventy-one.

By 1932, the date of the first county automobile registrations, the automobile could be considered to be ubiquitous. The area averaged 3.1 people per vehicle. As shown in the table of county automobile registrations, the number of vehicles in the region continued to grow until in 1960 it was almost double the number in 1932. (See Table 3.5.) Vehicle ownership in 1960 was the equivalent of one vehicle for every 1.9 residents in the River Bend Area.

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[11]From information contributed by the Blue Earth County Historical Society, Mankato, Minnesota, November, 1967.

TABLE 3.5.--Automobile registrations by county for the River Bend Area 1932-1968*

County	Year				
	1932	1940	1950	1960	1968
Blue Earth	10,856	15,286	18,582	24,600	32,953
Brown	7,902	10,200	12,758	15,693	20,090
Faribault	7,180	9,807	12,117	13,988	16,730
Le Sueur	5,868	7,830	8,760	11,653	14,691
Martin	7,731	10,895	13,376	16,250	18,570
Nicollet	4,644	6,199	8,045	9,761	12,936
Waseca	4,579	6,197	7,183	8,801	11,245
Watonwan	4,250	5,633	6,994	8,585	10,551
River Bend Total	53,010	72,047	87,815	101,331	137,766

*From information supplied by the Director of Motor Vehicles, Minnesota Department of State, St. Paul, Minnesota. The earliest records available for county auto registrations commence in 1932. No earlier data from reliable sources are available.

The widespread acceptance of the automobile and the growth of the road network both contributed to altering regional markets and consumer shopping patterns. Although auto design and technology raised the average paved road speed from 33 mph in 1920 to 57 mph in 1960, it was only after the 1940's that much of this speed capability could be used. Prior to that date, most of the road net of the area was either unimproved dirt or gravel roads. In 1930 there were only twenty-two miles of paving in the entire eight county area outside the cities; 10,218 miles, or 61 per cent of roads were improved gravel, the remaining 6,659 miles being dirt. By 1940 it had grown to 1,163 miles, largely through the efforts of the Works Project

Administration in conjunction with the State Highway Department. In 1960 paved roads in the region amounted to only 29 per cent of the road miles, or 2,941 miles, but less than 1 per cent of the road system of the area could be classed as either improved or unimproved dirt road.

The increased acceptance of the automobile after 1920 started a steady decline in the number of draft animals used in the area. As transportation speeds rose, the need declined for horses for traveling and motorized farm implements were faster and more efficient than the formerly ubiquitous draft animal. The loss of importance of the horse is shown by the drastic drop in the number of harness, shoe, and leather repair shops.[12] In 1910 almost every town had such a shop. But between 1910 and 1930 their number declined from 110 to 89. This is not to say that the draft animal was no longer important to production functions after 1930. As late as 1930 there were still over 91,000 draft animals in the area.[13] This represents an average of six animals per farm at that time.

The climate of the region demanded that the draft animal be retained on the farm in southern Minnesota even as late as 1950. Though self propelled machinery could be

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[12]Due to a lack of computer capacity in the original analysis, harness, shoe, and leather repair shops were lumped together.

[13]United States Bureau of the Census, 1930 Census of Agriculture (Washington: U.S. Government Printing Office, 1933).

substituted for the draft animal during ideal conditions, it was often worthless in extreme cold, deep snow, or mud. The draft animal could always be depended upon, even in the coldest of weather; though slowed by mud or snow the horse or mule was seldom stalled or mired. Most automobiles in use into the mid 1930's were ill equipped for use under adverse conditions. Mud and snow tires were almost unknown, and chains were the only answer for vehicular use on snow or ice or in mud. Steel wheels with iron lugs were the norm on tractors into the mid thirties. Such machines were easily mired by mud, unsuited for use on public roads, and almost impossible to start in freezing temperatures. Tractors did not usually have self starters until the 1940's when high compression engines became more common.

Even though the tractor was less than perfect, there was an average of one tractor for every four farm units in the River Bend Area in 1930. By 1960 their numbers had grown to almost three tractors per farm unit. These figures do not include the numbers of self propelled corn pickers and grain combines in use, not to mention the balers, silage choppers, and other motorized machinery common on farms today. As previously noted, increased use of the auto and truck has resulted in a steady growth of auto dealerships, service stations, and auto parts sales. Similarly, as agriculture has mechanized more, farm implement sales and service has also increased. Secondarily,

farm cooperatives supplying gas and oil to farms and parts and tire distributors serving the agriculturalist in the field have also expanded.

Conclusions

The factors influencing change are not constants; rather, the variables assume differing degrees of importance at different times. Today, the lack of a railroad or the loss of a post office would affect the development of most trade centers only slightly. The dependence of people on commerce and travel has shifted from the railroad to the highway and from the post office to the mail carrier.

Technological development and innovation, particularly in transportation and production, can and do alter the settlement pattern of a region and determine the economic character of an area. Price and demand changes influence consumer tastes by emphasizing certain commodities at the expense of others. Economies of scale and time created by new production and transportation technology further enhance these changes. These factors generate increased disposable income and, when coupled with a more effective and efficient road system, cause the decline or disappearance of some service centers while enhancing others. Increased production and increasing demand for manufactured or processed goods boost opportunities for manufacturing employment, resulting in

increased urban populations. Regional urbanization grows more rapidly as demand for labor in agriculture decreases and transportation efficiencies permit rural dwellers to work in the cities.

The following chapters will study the ways in which new transportation and higher speeds alter the role and function of the agriculturally oriented service center. They will demonstrate the existence of a central place hierarchy while showing the changes which take place within the community functional structure over several decades. Finally, they will graphically demonstrate the dynamics of market areas which result from diminishing time-space relationships and/or functional growth or decline.

CHAPTER IV

THE CHANGING ROLE OF CENTRAL PLACES IN THE RIVER BEND AREA, 1900-1960

In a histo-geographic central place analysis, it is important to examine not only the factors influencing the change in the center's role but also the functional trends which emerge over time. Most of the work dealing with central places has neglected to examine trends. This perspective yields little insight into the changes in, or past functions of, central places studied.

Hassinger, Kolb, Zimmerman, and others attempted some analysis of the changes in central places of Minnesota, Wisconsin, Nebraska, and South Dakota in the late 1920's and early 1930's. But their research did not show that some communities were disappearing while others were growing in their relative importance and still others were remaining static in population and functions performed. During the late twenties, P. D. Converse attempted to interpret how the automobile altered the functions performed by villages in central Illinois.[1] His study, however,

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[1]P. D. Converse, "The Automobile and the Village Merchant," University of Illinois Bureau of Business Research Bulletin, No. 19 (Champaign, Illinois: 1928).

only describes the various types of businesses characteristic of the towns he considered, and does not consider the changes in these enterprises.

This research will examine the central places of the River Bend Area from 1900 to 1960, and will analyze the changes which they underwent. This chapter will consider, as Berry, Barnum, and Tennant did in their article on west central Iowa,[2] the tendency of hierarchical or group class arrangement of central places. At the same time it will question how the functional role of each hierarchical group class changes in response to the demands of economics and accessibility. Further, an attempt will be made to show that hierarchical levels of central places within the study area have remained essentially static since the turn of the century.

Finally, the types of functional changes and the relative importance of individual functions from 1900 to 1960 will be considered. For each decade, a series of profiles of community central functions will be constructed in order to explore the changes in central place structure and the differences between each hierarchical level.

The use of a system of weighted values for each central function studied is an essential technique employed

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[2]Brian J. L. Berry, Gardner Barnum, and Robert J. Tennant, "Retail Location and Consumer Behavior," Papers and Proceedings of the Regional Science Association, IX (1962), 65-106.

in this analysis.[3] This technique is analogous to that employed by Berry and others in their study of central places in Iowa. In their research, however, they used a weighted value which was based upon the number of functions an individual establishment performed. The historical foundation of this research precludes field work; therefore, a specific value was assigned each function. This technique, though arbitrary, avoids the confusion of equating different functions. Obviously, it is impossible to account for individual variations in size, sales volume, employment, or inventory due to a lack of uniform data for all decades. (See Appendix, page 223.)

The validity of weighting each function does need to be verified as a device for determining the focality of a place. Therefore, the loaded values and community population were correlated, as were the loaded values and the number of central functions in each center. The technique employed was the Pearson Product Moment, or Pearson "r" test. The correlations derived between loaded functional values and the population of each place is shown in Table 4.1. On the basis of the findings from this analysis, the loaded functional value of each community will henceforth be considered as an index of each community's attraction as a service center.

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[3] A detailed discussion of the assigned loadings and the rational for them appears in Chapter I.

TABLE 4.1.--Correlation coefficients between loaded values and populations

	Year						
	1900	1910	1920	1930	1940	1950	1960
Coefficient	.9740	.9812	.9198	.9857	.9871	.9858	.9577
Population*	123	123	115	111	105	103	99

*Population = number of centers in 100 per cent sample.

The Hierarchy

The concept of the hierarchy of central places is a primary element of this research. Regression analysis was used to avoid arbitrarily determining the hierarchical levels as Brush, Bracey, Christaller, and others have done. As shown in Fig. 4.1, the arrangement of places along a continuum describes a curvilinear function. This function, when constructed as a graph, shows the relationship of the number of functions in each center relative to the log of the loaded functional value of that place. But the asymptotic curve in Fig. 4.1, when plotted on the x-y axis as dual logarithms or as discrete numbers as shown in Fig. 4.2, assumes the form of a straight line with no discernible breaks or hierarchical steps. Analysis of the curves for each of the decennial periods from 1900 to 1960 revealed that a hierarchy can be determined by fitting a series of regression lines, each with a unique vector, to a series of empirical regions within each curve. (See Figs. 4.3 through 4.9, pages 102 to 108)

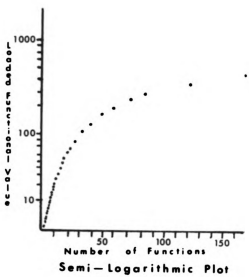

Fig. 4.1

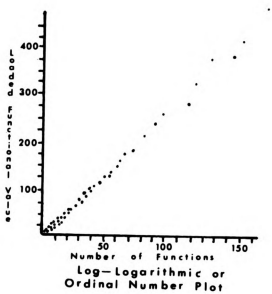

Fig. 4.2

The levels of the hierarchy, which are identified as group classes, are described by regression lines fitted to each area within the curve by the least squares method of analysis. Empirical analysis of each curve from 1900 to 1960 determined the range or extent of each line of best fit. Through a series of tests and adjustments it was determined that no less than five and no more than seven groupings could be found within any curve. Comparison and analysis revealed that by adjusting "the lines of best fit" uniformity in the group classes could be derived which yielded high correlations between all the seven curves. The correlations are shown in Table 4.2.

It must be noted that each group-class within each decade is not represented. This is the result of the

TABLE 4.2.--Correlation of loaded functions with the number of functions within each hierarchical group-class of the River Bend Area, 1900-1960

Group-Class	Year						
	1900	1910	1920	1930	1940	1950	1960
I	.8859	.9077	.9130	.8611	.8868	.8841	.8843
II	.9628	.9598	.9618	.7745	.9173	.8959	.9220
III	.9726	.9555	.9646	.9722	.9656	.9759	.9679
IV	.9584	.9758	.9508	.9531	.9545	.9782	.9503
V*	----	----	1.0000	1.0000	----	1.0000	1.0000
VI	1.0000	1.0000	1.0000	----	1.0000	1.0000	1.0000
VII	----	----	----	1.0000	1.0000	1.0000	1.0000

*High correlations in group-classes V, VI, and VII are accounted for by the low number of observations in each group-class.

All correlations have significance at the 95 per cent confidence level.

exceptional size or focality of Mankato, the dominant regional center, relative to other large centers such as New Ulm, St. Peter, Faribault, and Waseca, whose growth was slower throughout the period.[4]

Analysis of the curves shown in Figs. 4.3 through 4.9 indicates the consistency of the correlations shown in Table 4.2, page 100, and the uniformity of relationship of the regression lines for each decade. The solid line plotted on each curve represents the "line of best fit" for that particular decade, while the dashed line represents the mean line for that particular group for all the decades. The close correlation between the average lines and the regression line for each decade indicates the relatively small change which has taken place with each group-class over time. The relative focal nature of class I places in 1900 has remained essentially the same up to 1960. The same is true in each class of central place for the seven decennial intervals.

The importance of the relative stability of the focal nature of each class of place is further demonstrated by the data in Table 4.3. Analysis of the average number of functions in each group-class indicates that the

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[4]The extremely high correlations in groups V, VI, and VII are of little significance since the size of the sample in these groups was always less than three. But in groups I, II, III, and IV the size of the number was sufficiently large to give a valid t test of correlation to each value.

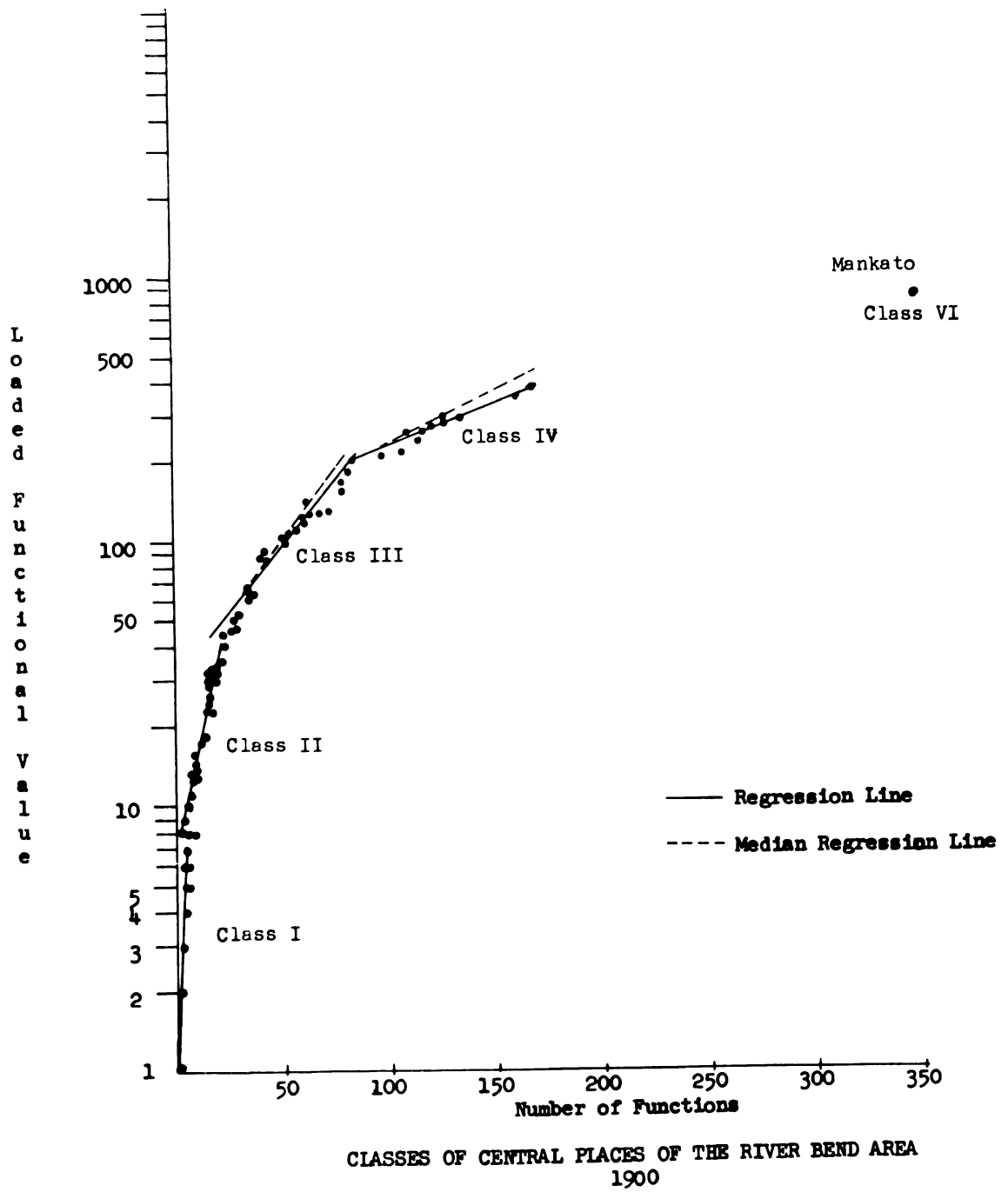
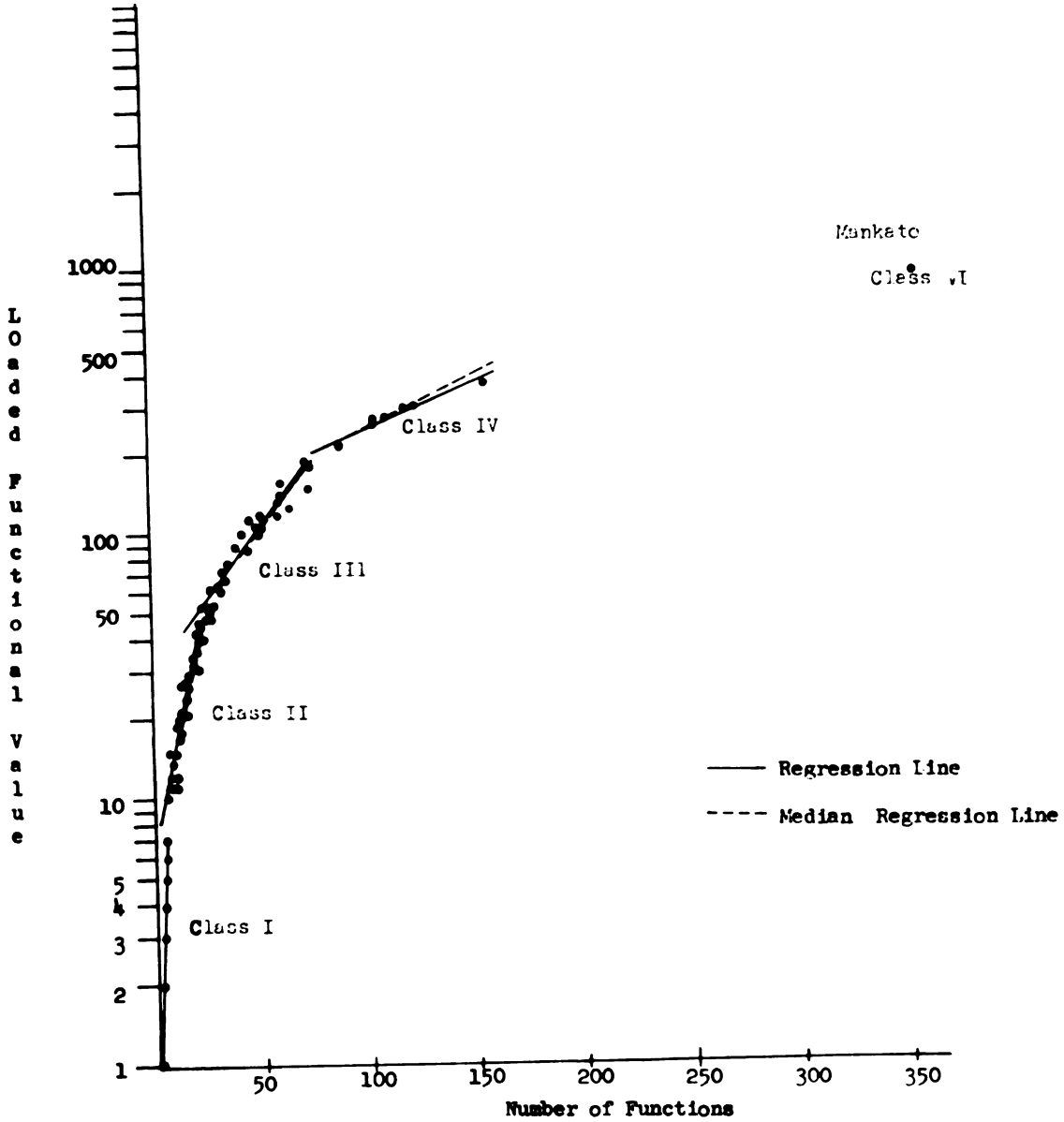
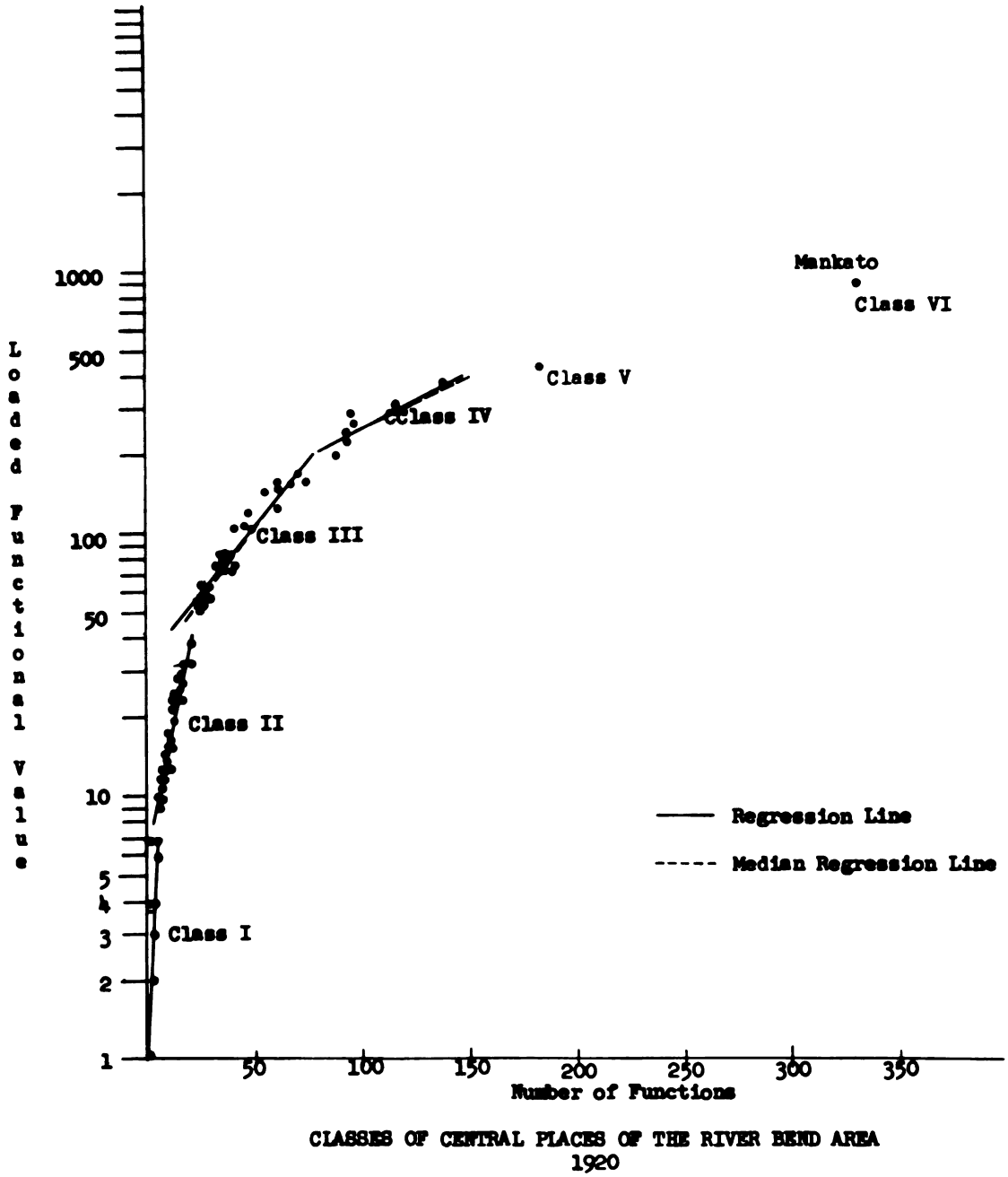

Loaded Functional Value
1000
500
100
50
10
5
4
3
2
1
Mankato
Class VI
Class IV
Class III
Class II
Class I
Regression Line
Median Regression Line
50
100
150
200
250
300
350
Number of Functions
CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1900

Fig. 4.3



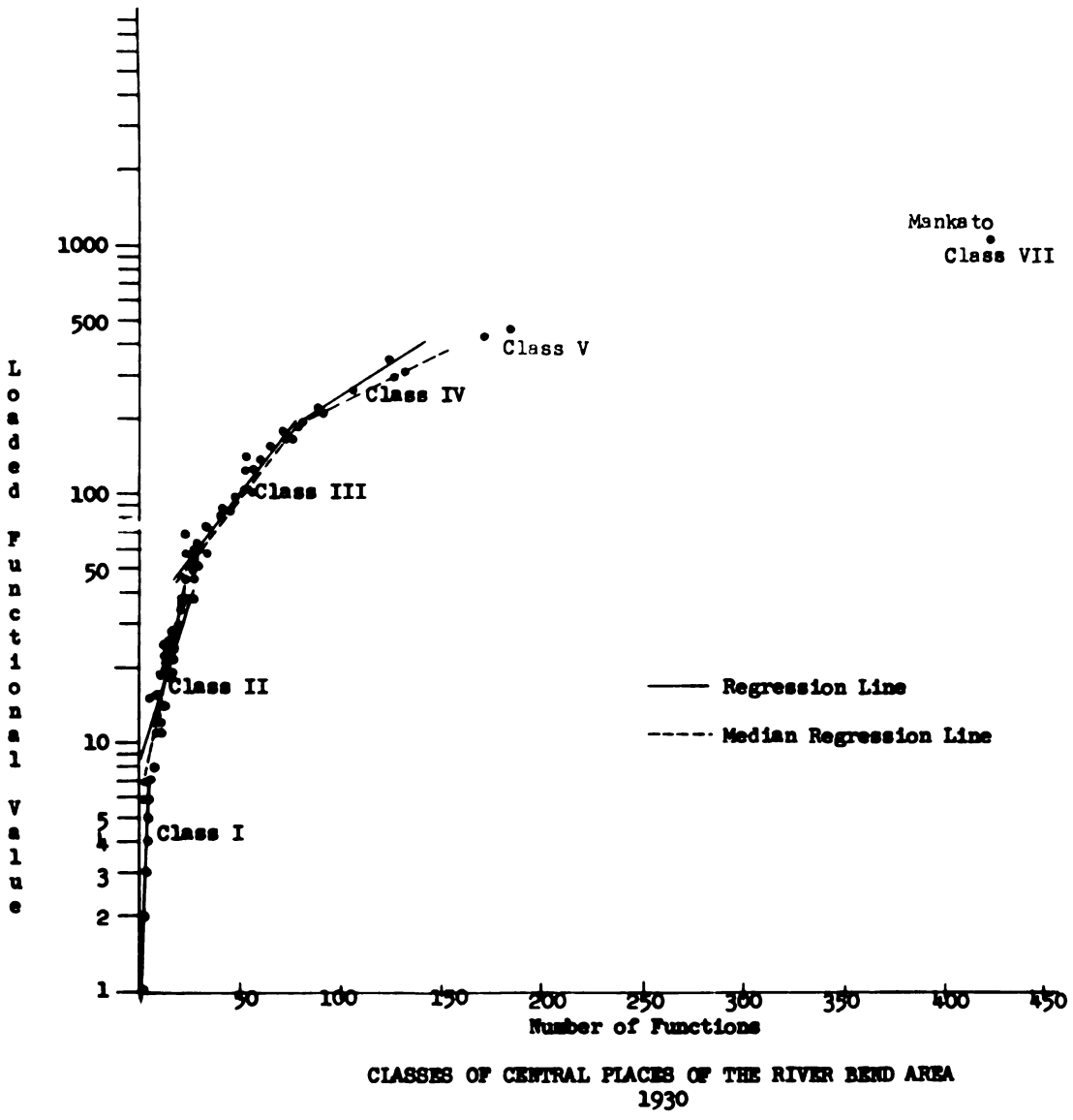
CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1910

Fig. 4.4



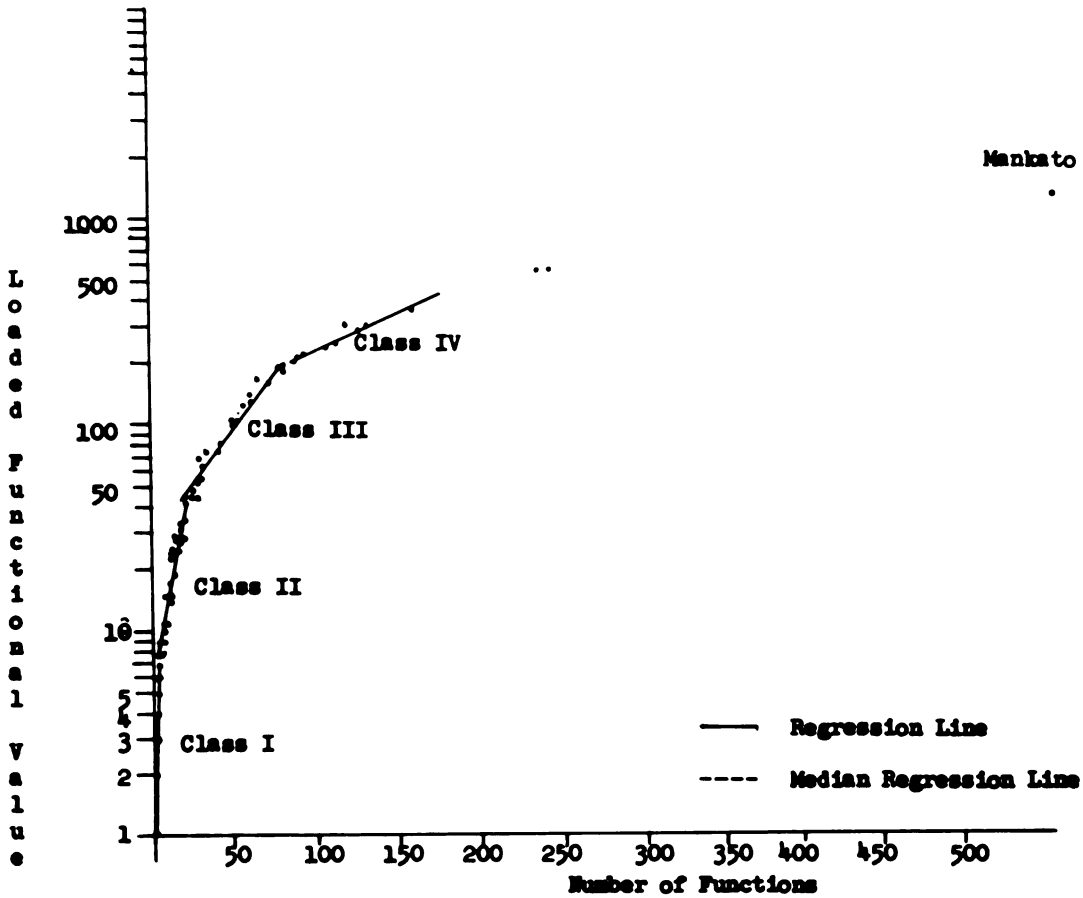
CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1920

Fig. 4.5



CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1930

Fig. 4.6



CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1940

Fig. 4.7

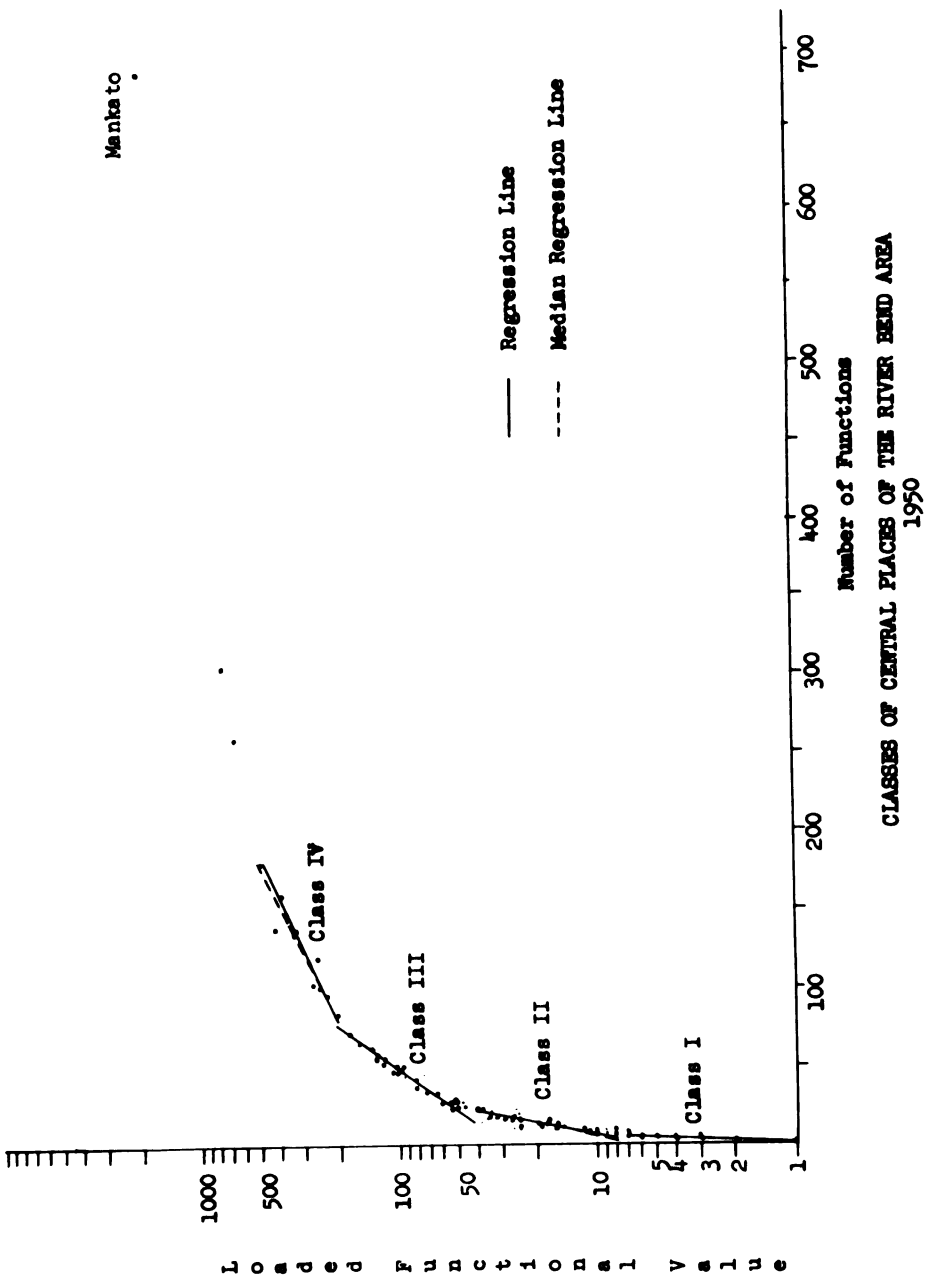

Mankato
Regression Line
Median Regression Line
Class IV
Class III
Class II
Class I
Loaded Functional Value
1000
500
100
50
10
5
4
3
2
1
100
200
300
400
500
600
700
Number of Functions
CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1950

Fig. 4.8

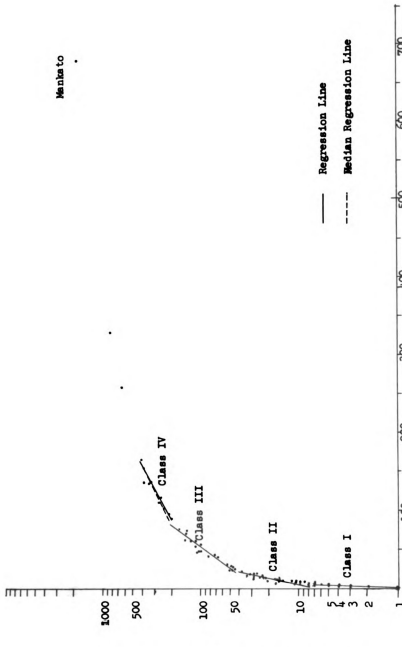

Weighted Value
1000
500
100
50
10
5
4
3
2
1
100
200
300
400
500
600
700
Number of Functions
CLASSES OF CENTRAL PLACES OF THE RIVER BEND AREA
1960
Regression Line
Median Regression Line
Class I
Class II
Class III
Class IV

Fig. 4.9

TABLE 4.3.--Average number of functions in each group-class of the River Bend Area, 1900-1960

Group-Class	Year						
	1900	1910	1920	1930	1940	1950	1960
I	2.81	2.29	1.92	1.92	2.20	2.55	2.26
II	11.27	11.45	11.74	12.58	12.37	13.06	12.03
III	48.42	41.31	42.50	41.96	45.11	43.79	43.56
IV	115.78	108.71	110.50	98.40	110.75	112.33	112.87
V	--	--	184.00	179.52	--	176.00	166.00
VI	354.00	358.00	334.00	--	236.00	284.00	294.00
VII	--	--	--	424.00	567.00	648.00	676.00

change in the number of functions performed by groups I through IV centers was very small. The relative consistency in the number of functions is yet a further indication of the validity of the hierarchy and the stability of each level within the ranking.[5]

The variations in the number of functions found in the fifth, sixth, and seventh groups become more extensive as the size of the groups becomes smaller and the growth of communities causes shifts within and between classes over time. As indicated in Table 4.4, the decreasing numbers of centers in groups V and VI can be attributed to the increase in focality acquired by secondary centers such as New Ulm, St. Peter, and Fairmont and the marked growth of Mankato which is the only center in group VI through 1920 and group VII thereafter.

All too often geographers, economists, and others concerned with market or central place analysis tend to overlook the fact that central places are dynamic and changing, rather than static and fossilized elements of the settlement or market pattern. This is implicit in Berry, Barnum, and Tennant's article "Retail Location and

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[5]A comparison of the data in Tables 4.2 and 4.3 and the loaded function curve for 1930 indicates some variation from the mean data of the entire study period. Class II centers in particular show variation from the mean which was the result of the build-up of high loaded value service and retail sales functions in these centers without a significant change in the number of establishments. Much of this change can be attributed to the increased affluence of the 1920's and the mobility of consumers as a result of increased use of the automobile.

TABLE 4.4.--Number of centers in the River Bend Area and the percentage of the total by group-class, 1900-1960

Group-Class	1900		1910		1920		1930		1940		1950		1960	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
I	54	43	47	38	36	31	36	32	30	28	31	30	34	34
II	33	27	33	27	40	34	35	31	35	34	34	34	30	30
III	26	21	35	28	32	28	32	29	29	27	24	23	23	24
IV	9	07	7	06	5	05	5	05	8	08	9	08	8	08
V	-	-	-	-	1	01	2	02	-	-	2	02	1	01
VI	1	01	1	01	1	01	-	-	2	02	2	02	2	02
VII	-	-	-	-	-	-	1	01	1	01	1	01	1	01
Totals	123	99	123	100	115	100	111	100	105	100	103	100	99	100

Consumer Behavior," as they state that the smallest centers " . . . are the hamlets, once the basic element in the American settlement fabric, but now in the final stages of decline."[6] Yet, on the basis of the data in Table 4.4, page 111, it is apparent the number of hamlets in 1960, or class I centers, had declined by only two centers, or 1/18th the total number of central places in this group in 1920. Similarly, class II centers only declined by three from 1900 to 1960, while class III communities declined by two and class IV by one during the same interval.

Changing accessibility and varying economic conditions altered the number of central places necessary to supply various functions for a region, but the changes in total have been relatively small. To dismiss the class I center as a dying element of the "central place fabric" is unobservant. As comparative advantage changes some centers disappear, while places of larger size tend to lose some of their focality and diminish in size sufficiently to take their place. The next section of this study will discuss more fully the impact of diminishing time-space upon market areas, range of community goods, and community size. But it should be noted here that as the travel time decreases, the sphere of influence of some centers will be extended as market orientation shifts from small places to larger centers with more goods and services and greater

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[6]Berry, Barnum, and Tennant, op. cit., p. 70; and John Fraser Hart, Neil E. Salisbury, and Everett G. Smith, Jr., "The Dying Village and some Notions About Urban Growth," Economic Geography, XLIV, No. 4 (October, 1968), 343-49.

accessibility. These events generate a comparative advantage for some centers while producing a comparative disadvantage for others. Some lower order centers may lose sufficient consumers and reduce the threshold population for some of their functions. The loss of these functions may cause the center to decline to another class, or perhaps disappear.

The trend toward market expansion coupled with community growth or decline becomes apparent in Table 4.4, page 111. Since 1900 the number of central places in the River Bend Area has declined by 18.7 per cent. With the changes in the patterns of accessibility created by the automobile after 1920 there was a 24 per cent decrease in the number of centers in class II and class III. During this same period only a small number of class I centers disappeared, largely because class II and class III places decreased so drastically. At the same time larger centers in classes IV through VII grew from seven in 1920 to fourteen in 1950, then regressed to twelve centers by 1960. These changes in number and magnitude usually can be attributed to alterations in River Bend time-space relationships.

The Changing Role of the Central Place

Since 1900 there has been a significant change in the role of the central place and the functions it provides for its markets. In the early part of the century the

dominant commercial functions were: general stores, groceries, clothing stores, and hardware stores. At the same time, primary services were: bars and restaurants, blacksmiths, grain elevators, hotels, and shoe and harness repair shops. These functions were basic to almost all class I and class II centers.

By 1930 the general store had dropped to second place, and the grocery store had become the most ubiquitous retail function. The major change occurred in services. Where the blacksmith had been most important, auto repair had logically taken the lead. Prohibition caused bars and restaurants to decline in number. Physicians and banks rose in number, while hotels and shoe and harness repair shops declined. At the same time new functions were emerging. Most of these were related to greater affluence and to increased numbers of automobiles, service stations, auto dealerships, appliance stores, laundries, dry cleaners, and bulk oil distributorships.

By 1960 the general merchandise store had dropped to less than one-half its number in 1900, while the grocery store, the service station, the hardware store, and the farm implement dealership were the most common retail activities. Bars and restaurants had risen to become the most common service function in the area again. Other services at this time, in terms of their relative numerical importance, were gasoline stations, grain elevators, auto repairs, physicians, and attorneys. Each of

these types developed because the level of disposable income of area consumers rose steadily with increased dependence on the automobile.

Functional Changes in Central Places

Two factors, namely, increased accessibility created by the automobile and the expanded economic activity created by greater consumer purchasing power, have almost completely changed central places throughout Anglo America. Not only has there been a marked decrease in horse-and-buggy-oriented functions and a change in merchandising methods, but there has been a concomitant alteration in the role of central places since the turn of the century. No community is completely static at any time. Changes may occur so slowly that they are imperceptible or they may be quite dramatic. The social and economic role of any center in 1900 was markedly different from the same place in 1960. The demands, the extent of the market area, and the number of centers serving various markets have been significantly altered. But as indicated in Table 4.2, page 100, and Table 4.3, page 109, the functional attraction and relative importance of class I through class IV communities have remained essentially the same for over sixty years.

To test further the hypothesis that the functional attraction of hierarchical levels of central places remains stable it was necessary to analyze the functional

data for all central places for each of the seven decennial periods. A tabular listing of the frequency of occurrence of each type of function was constructed for each level and each decade. From these tables functions were arranged from most frequent occurrence through least frequent. A mean occurrence for each activity was derived, which indicates the ratio or per cent of times each type could be expected to occur in any class center. (See Appendix, Tables A.1 through A.6.)

Due to the size of the sample and the magnitude variations within the class intervals of the hierarchy, it was impossible to identify a real or existing center which was exemplary of a particular class center at any moment in time. This becomes particularly obvious in class III centers having more than forty-two functions. The range in group III places is from forty-three to two hundred functions, and the size of the group varies from twenty-four in 1960 to thirty-five in 1910. Therefore, it was impossible to identify a specific place as being representative of a particular group. But on the basis of the data relating to the mean number of functions characteristic of each class and the information derived from the tables of average frequency of occurrence, it was possible to construct a set of hypothetical centers. Though these would not necessarily be characteristic of any particular community, they do provide a chronological profile of each

class and allow for analysis of change within and between groups.

The hypothetical centers shown in Tables 4.5 through 4.9 were constructed by using the ratios of occurrence, as described above. The types of functions expected in each group were identified by using the ratios in rank order until the means in Table 4.3, page 109, were reached. The ratios of occurrence also yielded a value of expected magnitude for each function which determined not only that a particular function was characteristic of a given class but also how many identical functions would be expected in the average center at that time. The sum of these ratios, rounded to the nearest real number, was used to determine the functional profile for each of the hypothetical centers.

Analysis of the data in the Appendix, Tables A.1 through A.6, shows how the structure of merchandising and services in central places is changing throughout the River Bend Area. Many of these changes are probably indicative of centers throughout the United States. The general store, once the mainstay of retailing in rural America, has obviously declined in importance in all classes of central places. Even in the class I center the place of the general store has declined to the point where it is found in less than one-half of the centers in 1960. Yet it remains as the most common retail activity in the class I centers.

TABLE 4.5.--Functional profile of average class I central place of the River Bend Area, 1900-1960

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
General Store	1	1	1	1	1	1	1
Creamery	1	1	1	1	1	1	
Blacksmith	1						
Grain Elevator							1*
Service Station							1*
Grocery						1	

*Equal likelihood of occurrence.

TABLE 4.6.--Functional profile of average class II central place of the River Bend Area, 1900-1960

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
General Store	2	2	2	2	1	1	1
Blacksmith	2	1	1	1	1		
Grain Elevator	1	2	1	1	1	1	1
Creamery	1	1	1	1	1	1	1
Hotel	1	1					
Restaurant or Bar	1	1	1	1	2	2	1
Grocery	1		1	1	1	2	1
Hardware	1	1	1	1	1	1	1
Harness & Shoe Repair	1						
Lumberyard		1	1	1		1	1
Bank		1	1	1	1	1	1
Auto Repairs			1	1	1	1	1
Farm Machinery			1	1	1	1	1
Service Station				1	1	1	1
Bulk Oil						1	1

TABLE 4.7.--Functional profile of average class III central place of the River Bend Area, 1900-1960

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
Grocery	3	3	4	4	5	5	4
Restaurant & Bars	5	4	3	2	4	4	3
Grain Elevator	4	3	3	2	2	2	3
Drugs	2	1	1	2	2	2	2
Furniture	1	1	1	1	1		
Bank	1	2	2	2	1	1	1
General Store	5	4	3	3	2	2	1
Bulk Oil					1	1	1
Hardware	2	2	2	2	2	3	2
Farm Machinery	2	1	1	2	2	2	2
Physician	2	2	2	2	1	1	1
Creamery	1	1	1	1	1	1	1
Clothing	2	2	2	2	1	1	1
Blacksmith	4	3	2	2	1	1	1
Lumber & Bldg Mtls	2	1	1	1	1	1	
Shoe & Harness Repair	2	2	2	1	1	1*	1
Hotel	2	2	1	1	1		
Lawyer	1	1	1	1	1	1*	1
Livery	1	1	1				
Newspaper	1	1	1	1	1	1	1
Jewelry	1	1	1	1	1	1*	1
Amusements	1	1	1	1	1	1	1
Photo Studio	1	1	1	1			
Mortuary	1	1	1	1	1		1
Laundry & Dry Cleaning			1			1	1
Auto Repair			2	3	2	3	3
Auto Dealer			1	1	1	1	1
Ice, Fuel & Coal			1				
Service Station				1	5	4	4
Auto Parts				1	1	1	
Hatchery, Stock Yards, Auction					1	1	1
Variety Store					1	1*	1
Plumbing & Heating						1	1
Misc Repairs							1
Cold Storage							1
Drayage		1					

*Equal likelihood of occurrence.

TABLE 4.8.--Functional profile of average class IV central place of the River Bend Area, 1900-1960

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
Restaurant	12	11	9	5	10	10	8
General Store	8	6	6	4	2	2	2
Grocery	8	8	11	11	13	10	10
Blacksmith	7	6	4	3	2	1	1
Clothing	7	7	8	6	5	5	4
Lawyer	6	6	5	4	4	4	4
Physician	6	5	6	5	4	4	5
Hotel	5	5	4	2	2	1	2
Elevator	5	3	5	3	3	3	5
Shoe & Harness Repair	5	4	4	2	2	1	1
Drugs	3	4	4	2	2	2	2
Furniture	3	2	2	2	3	4	5
Hardware	4	3	4	2	4	5	6
Farm Machinery	3	2	2	2	3	4	5
Newspaper	3	3	3	2	1	1	2
Livery	3	3	2				
Lumber	3	2	3	2	1	2	2
Banks	2	3	4	3	2	2	2
Jewelry	2	2	3	2	2	2	1
Brewery	2	2					1
Laundry & Dry Cleaning	2	3	3	3	2	2	2
Amusements	2	2	2	2	2	2	1
Creamery	2	3	3	2	4	3	2
Mortuary	1	1	2	1	2	2	2
Misc Repairs	1				1	1	2
Ice, Coal & Fuel	1	2		1	1		1
Drayage	1	1					1
Whls Beverages	1				1		1
Music, Radio & TV	1	1	1	2	1		1
Nursery	1	1					1
Bulk Oil	1	1		1	2	2	3
Misc Retail	1	1		1			
Machine Shop	1	1					1
Books & Stationary	1	1					
Florist	1						
Plumbing & Htg		1		1	1	1	1
Specialty Equip						1	1
Auto Dealer		1	3	2	4	5	3
Variety Store			1	1	2	2	2

TABLE 4.8.--Continued

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
Paint, Glass & Wallpaper				2	2	3	3
Auto Repairs			5	7	4	5	4
Auto Parts				2		1	
Service Station				2	11	7	8
Electrical Supply				1	2	1	
Hospital				1	1		
Whls Grocery				1	1		
Department Store				1			
Hatchery, Stock Yard & Auction					1	4	1
Appliances					1	2	2
News Dealer						1	1
Farm & Garden Store							1
Florist							1
Cold Storage							1

TABLE 4.9.--Functional profile of average class V central place of the River Bend Area, 1900-1960

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
Grocery			14	19		14	12
Auto Repairs			9	14		5	5
Clothing			15	11		7	8
Restaurant			26	11		18	10
Drugs			5	4		3	4
Furniture			3	3		3	4
General Store			10	5		2	2
Service Station				5		11	12
Elevator			8	5		5	5
Hotel			6	4		3	2
Mortuary			3	4		2	2
Auto Parts				4		2	3
Creamery			6	4		5	5
Bank			4	4		2	2
Plumbing & Heating			2	4		5	3
Shoe & Harness Repair			3	4		2	2
Amusements			1	4		2	1
Newspaper			6	4		2	2
Photo Studio			4	3		1	2
Hardware			5	3		10	5
Electrical Supply				3		3	3
Laundry & Dry Cleaner			1	3		6	5
Blacksmith			4	3		3	1
Bulk Oil				3		4	2
Auto Dealers			3	3		4	3
Misc Retail			2	3		1	
Fuel, Ice & Coal			1	2		1	1
Farm Implements			1	2		5	6
Music, Radio & TV			2	2		2	1
Brewery			3	2		1	1
Misc Repair				2		4	5
Wholesale Groceries			1	2		2	
Lumber & Bldg Materials			5	2		1	1
Nursery Green House			2				
Variety Store			2			3	2

TABLE 4.9.--Continued

Function	Year						
	1900	1910	1920	1930	1940	1950	1960
Hospital			3				1
Drayage			1			3	1
Physician			9	13		15	20
Lawyer			6	9		8	7
Livery			2				
Appliances						1	2
News Dealer							2
Machine Shop							1
Whls Candy & Tobacco						3	1
Liquor							1
Whls Machinery & Supply						2	
Misc Business Agency							1
Cold Storage						1	
Whls Beverages						1	1
Photo Supply						2	2

The decline of the horse and wagon and the growth of automobile use are both evident in Tables 4.5 through 4.9, pages 118-123, as indicated by the decline of businesses oriented to the former and the increase of automobile oriented services and sales facilities. The decline of the blacksmith, the livery, and the harness repair shops through 1930 indicates the decline in the importance of the horse in both production and transportation. Many of these enterprises were replaced with service stations, auto dealerships, and auto parts stores. In many cases the evidence indicates that the blacksmith did not really disappear but simply assumed the role of a mechanic in an "auto repair shop." This was a natural transition for many other types of activities displaced by technology; the coal and ice distributor often became a bulk oil distributor, the general store became a corner grocery or gas station, while the livery became automobile sales and service.

As the automobile emerged, specialty services and retailing tended to migrate out of the lower order centers to places with greater focality and accessibility. The most striking example of these shifts was the decline in the number of physicians in class II and class III centers. In 1900, as shown in the Appendix, Table A.2, the ratio of physicians per class II center was .21. By 1960 this had dropped to .06. Similarly, during the same period

physicians dropped continuously in class III centers (Appendix, Table A.3) from an index of 1.92 or about two doctors per center to an index of 1.38. But larger class V, VI, and VII centers almost doubled the number of physicians serving their markets (Appendix, Tables A.5 and A.6).

Likewise, the trend was for clothing stores to decline in numbers in classes II, III, and IV centers and migrate to larger centers where greater specialization was possible. The ratio of clothing stores to the number of centers tended to decline at all levels between 1900 and 1960. But the number of clothing stores which handled a general line declined while speciality shops dealing in men's ready-to-wear, women's ready-to-wear, children's clothing, and infants apparel increased in the larger centers such as Mankato, New Ulm, Fairmont, and Waseca. A counter trend was the disappearance between 1900 and 1930 of many tailors, dress makers, milliners, and corset shops.[7] The functions these businesses once performed were assumed by department stores and lady's ready-to-wear shops. The decline in importance of these establishments reduced the dependence of the rural people for clothing from the communities with a low functional attraction, while forcing a greater dependence upon large

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[7]These data are available only from an analysis of the raw Dun and Bradstreet data prior to synthesis.

centers for all clothing other than work garments which were usually available at the general store.

Still another indicator of change was the decline in hotels throughout the River Bend Area. Though the data in Tables 4.5 through 4.9, pages 118-123, reveal that the number of hotels has been continuously declining at all levels since the turn of the century, the sharpest decline is noted between 1920 and 1930. In 1900 there were 139 hotels in the River Bend Area; in 1920 there were 95; by 1930 their number had declined to 53; and in 1960 there were only 38 remaining. This decrease reflects a transportation shift away from not only the horse and buggy, but also the railroad, the primary public carrier prior to 1930. At the turn of the century and until the mid-to-late 1920's the hotel was the major function in town for itinerant salesmen, laborers, and members of specialized professions. The distances traveled to market in some cases were great enough to force the area farmer to use the hotel as a stop on the journey to market. The slow speed of the horse and buggy, the schedules of the trains and their limited facilities, coupled with the fact that only Pullman trains ran at night, made the hotel a primary element of the commercial and service structure of class II centers. But with the emergence of the automobile, better roads, improved auto safety equipment, and day and night trains, the small

town hotel quickly lost much of its importance. Almost 75 per cent of the hotels in 1900 had closed their doors by 1960, and many of the rest became motels or residential apartments.

As shown by the functional profiles in Tables 4.5 through 4.9, pages 118-123, the hotel was a primary element in the profile of the class II center in 1900. By 1920 it had decreased to the point where it was characteristic of the class II center and the exception in smaller places. By 1940 its numbers had declined to the point where it was no longer characteristic of centers smaller than class IV. Even in the larger centers the number of hotels continued to drop until the 1960's, when motels began replacing hotels to serve transients. In all probability, as new highways are pushed through, as the interstate system is expanded and old highways are improved, the number of itinerants through the area will increase and there will be a proportionate increase in motels throughout the area. Should the recreational resources of the River Bend be developed and promoted the number of transient facilities could rise dramatically.

As is indicated by tables of the average number of functions in each class (Appendix, Tables A.1 through A.6), and as confirmed in the functional profiles in Tables 4.5 through 4.9, pages 118-123, the smaller class centers from I through IV have remained essentially the

same over the period 1900 to 1960. As some functions declined in importance, others replaced them. The notion that many small places are dying out seems to be fallacious. Outwardly, the vacant store fronts and empty parking places may indicate a decline of retailing for consumer goods. But closer analysis reveals that as general stores, creameries, clothing stores, blacksmiths, hotels, and other facilities close their doors, new activities become more and more important to the community's economic viability. Gas stations, garages, bulk oil distributors, feed and fertilizer sales, cold storage plants, livestock auction barns, and hatcheries become the only local functions. The smaller communities, i.e., classes I through IV, which often give the impression of slowly dying, are, upon closer analysis, simply orienting more and more to service for the surrounding agricultural area. Moreover, these types of businesses tend to locate in more specialized facilities, often out of the former commercial hub, because of their unique requirements for space and accessibility and lack of need for a location "downtown." Thus, the appearance of commercial decay and decline may be singularly misleading when based solely upon vacancies within the commercial core of the service center.

Greater functional attraction, focality, and accessibility have increased the relative importance of

the larger classes V, VI, and VII centers. Mankato, the dominant center, has grown since 1900 from a place with 354 central functions to a city with 676 in 1960. At the same time, its functional attraction[8] has risen from 869 in 1900 to 1,829 in 1960. As indicated by the graphs in Figs. 4.3 through 4.9, pages 102-108, and the maps in Figs. 4.10 and 4.11, by 1960 the rate of growth for Mankato had outdistanced the rate of growth of the other centers in classes V and VI. Much of the growth in Mankato and the other places comes from expansion and specialization of retail services and goods. Lack of any extensive industrial development in these centers eliminates the problem of accounting for excessive growth. Therefore, the growth of commerce and service activity in these centers results naturally from growing focality and increased accessibility.

It is also important to note how wholesaling has expanded and concentrated in the largest centers of the region. Prior to 1940, wholesaling, for commodities other than foods, was an important element of the commercial structure of only the largest center. But with retail expansion came an increased demand for wholesale commodities and an increase in the number of wholesale distributors. In 1930 there were nine wholesale

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[8]Functional attraction here is based upon the loaded values assigned each type of activity in Table 1.1, page 19.

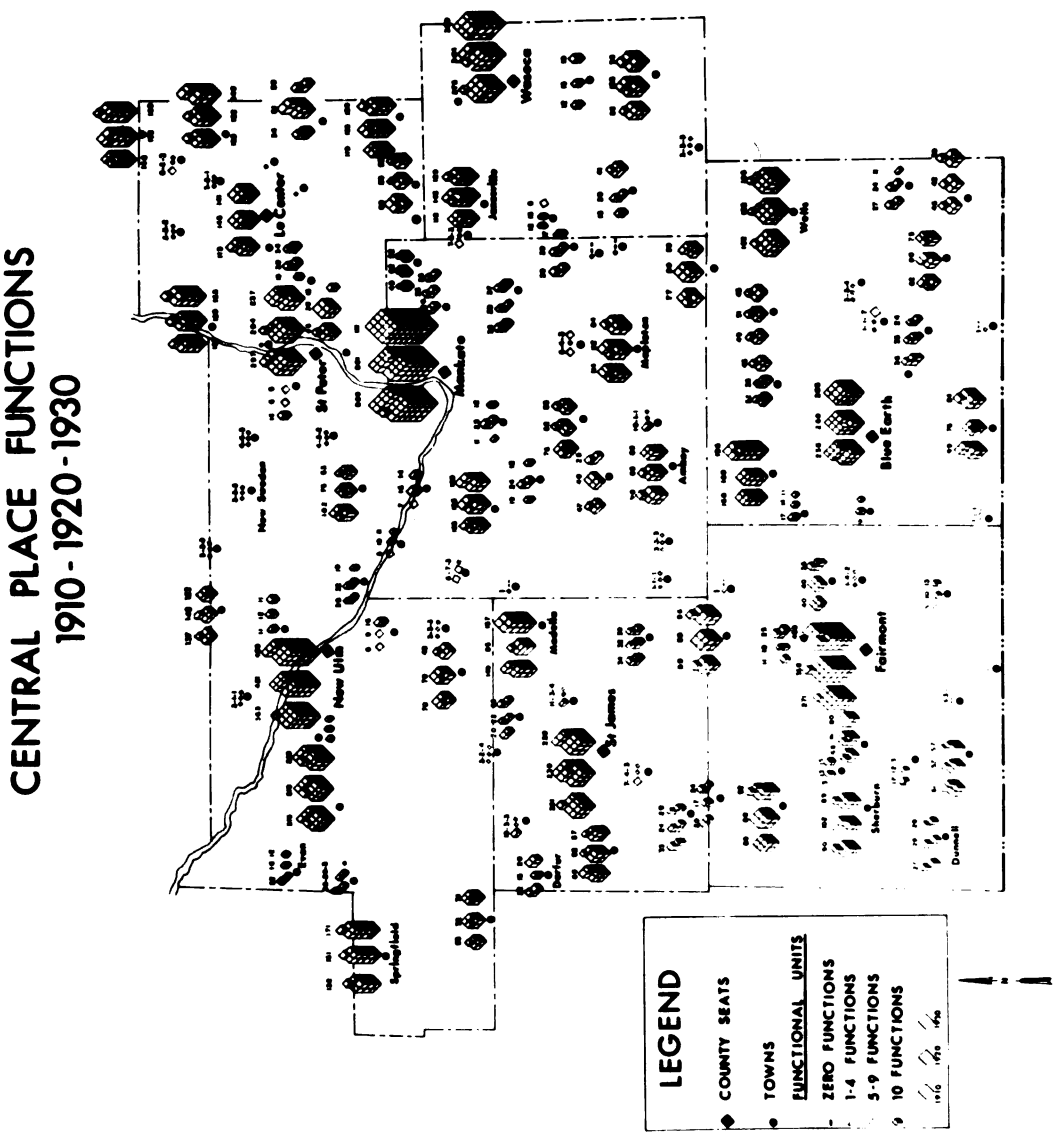
CENTRAL PLACE FUNCTIONS
1910-1920-1930
LEGEND
COUNTY SEATS
TOWNS
FUNCTIONAL UNITS
ZERO FUNCTIONS
1-4 FUNCTIONS
5-9 FUNCTIONS
10 FUNCTIONS

Fig. 4.10

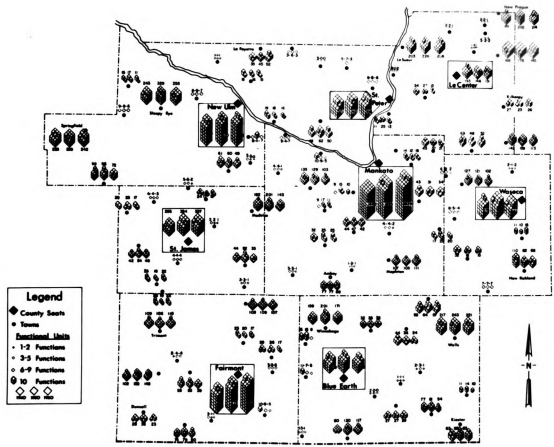
CENTRAL PLACE FUNCTIONS
1940 - 1950 - 1960
Legend
County Seats
Towns
Functional Units
1-2 Functions
3-5 Functions
6-9 Functions
10 Functions
New Ulm
Mankato
St. Peter
Fairmont
Blue Earth
Le Center
Waseca
N

Fig. 4.11

establishments in Mankato, six of which were wholesale grocers. By 1940 their number had grown to twenty-two; in 1950 it had risen to thirty, but had dropped to twenty-one in 1960. The decline between 1950 and 1960 was most noticeable in the wholesaling of food, candy, tobacco, and notions. Two-thirds of the remaining wholesale activity in the region sold beverages or industrial and farm machinery parts and supplies. The other wholesalers migrated from the River Bend Area to Minneapolis and St. Paul in order to capitalize upon the economies of scale created by accessibility to markets and supplies. These economies were enhanced by new techniques of bulk handling and more modern roads. The bulky, hard to ship, low marginal yield commodities, such as grain and beverages, or the close contact goods, such as machinery, machinery parts and supplies, prohibited these dealers from moving. A similar trend is also evident in New Ulm and Fairmont, which have shown gains in wholesale beverages and machinery and supplies while showing declines in wholesale food, groceries, clothing, notions, tobacco, and candy.

The final analysis of central place functional change is based upon the information in Tables 4.10 through 4.16, which are a further condensation of the data in the tables of average frequency of occurrence of functions. These data dramatically illustrate the hierarchical levels at which certain functions appear in

TABLE 4.10.--Occurrence of selected River Bend Area central place functions by class 1900

Class I	Class II	Class III	Class IV	Class V	Class VI
General Store	Elevator	Drugs	Brewery-Bot		Plumb & Htg
Blacksmith	Hotel	Furniture	Laundry & Dry Cleaner		Paint, Glass & Wppr
Creamery	Restaurant	Bank	Misc Spec Repair		Department Store
	Grocery	Farm Machinery	Fuel		Variety Store
	Hardware	Physician	Drayage		Appliance
	Harness Shoe Repair	Clothing	Wholesale Beverage		Liquor
		Lumber	Music		News Dealer
		Attorney	Nursery		Hospital
		Livery	Bulk Oil		Spec Equip
		Newspaper	Misc Retail		Business Serv
		Jewelry	Machine Shop		Wholesale Groc
		Amusements	Books & Stationary		Wholesale Mach & Supply
		Photo Studio	Florist		
		Mortuary			

TABLE 4.11.--Occurrence of selected River Bend Area central place functions by class 1910

Class I	Class II	Class III	Class IV	Class V	Class VI
General Store	Blacksmith	Drugs	Brewery		Paint, Glass & Wppr
Creamery	Elevator	Furniture	Laundry		Department Store
	Hotel	Farm Machinery	Fuel & Ice		Appliance
	Restaurant	Physician	Music		Liquor
	Grocery	Clothing	Nursery		Florist
	Hardware	Shoe & Harness	Bulk Oil		News Dealer
	Lumber	Lawyer	Misc Retail		Hospital
	Bank	Livery	Machine Shop		Hatchery
		Newspaper	Books & Stationary		Bus Serv
		Jewelry	Plumbing & Heating		Misc Repair
		Amusement	Auto Dealer		Drayage
		Photo Studio	Bottler		Whls Cloth
		Mortuary			Whls Groc
					Whls Hides
					Whls Mach & Sup
					Junk Yards
					Whls Bev
					Variety St

TABLE 4.12.--Occurrence of selected River Bend Area central place functions by class 1920

Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII
General Store	Blacksmith	Drugs	Bottler	Plumb & Htg	Elec Sup	
Creamery	Elevator	Furniture	Music	Paint, Glass & Wppr	Dept St	
	Restaurant	Physician	Variety St	Serv Sta	Auto Pts	
	Grocery	Clothing	Bulk Oil	Florist	Appliance	
	Hardware	Sh & Harn		News Dealer	Book & Stationary	
	Lumber Yard	Hotel		Misc Retail	Farm & Garden	
	Bank	Lawyer		Hospital	Photo Supply	
	Auto Repair	Livery		Drayage	Bus Serv	
	Farm Machinery	Newspaper		Junk Yards	Hatchery	
		Jewelry		Nursery	Misc Rep	
		Amusements			Mach Shop	
		Photo Studio			Whls Cloth	
		Mortuary			Whls Groc	
		Laundry & Cleaner			Whls Hides	
		Auto Dealer			Whls Bev	
		Fuel & Ice				

TABLE 4.13.--Occurrence of selected River Bend Area central place functions by class 1930

Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII
General Store	Blacksmith	Drugs	Laundry	Bottler		Appliance
Creamery	Elevator	Furniture	Fuel & Ice	Misc Rep		2nd Hand
	Restaurant	Physician	Music			Book & Stat
	Grocery	Clothing	Bulk Oil			Farm & Garden
	Lumber	Sh & Harn	Misc Retail			Florist
	Bank	Hotel	Plumb & Htg			News Dealer
	Auto Repair	Lawyer	Variety St			Photo Sup
	Farm Machinery	Newspaper	Paint, Glass & Wppr			Med Lab
	Service Station	Jewelry	Elec Supply			Hatchery
	Hardware	Amusements	Hospital			Bus Serv
		Photo Studio	Whls Groc			Mach Shop
		Mortuary	Department Store			Drayage
		Auto Dealer				Whls Cloth
		Auto Parts				Whls Mach Sup
						Junk Yards
						Whls Bev
						Nursery

TABLE 4.14.--Occurrence of selected River Bend Area central place functions by class 1940

Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII
General Store	Blacksmith	Drugs	Photo Studio		Dept Store	Farm & Garden
Creamery	Elevator	Furniture	Laundry & Cleaner		Photo Sup	Florist
	Restaurant	Bulk Oil	Misc Repair		Misc Retail	News Dealer
	Grocery	Physician	Fuel		Bus Serv	Med Lab
	Hardware	Clothing	Whls Bev		2nd Hand	Whls Candy
	Lumber	Sh & Harn Rep	Music		Book & Stationary	Whls Hides
	Bank	Hotel	Appliance		Mach Shop	Junk Yard
	Auto Repair	Lawyer	Plumb & Htg		Cold Storage	
	Farm Mach	Newspaper	Paint, Glass & Wppr		Drayage	
	Serv Sta	Jewelry	Elec Sup		Whls Cloth	
		Amusements	Hospital		Whls Mach & Sup	
		Mortuary	Whols Groc		Nursery	
		Auto Dealer			Brewery	
		Auto Parts			Liquor	
		Hatchery				
		Variety Store				

TABLE 4.15.--Occurrence of selected River Bend Area central place functions by class 1950

Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII
General Store	Elevator	Drugs	Hotel	Photo Sup	Dept Store	2nd Hand
Creamery	Restaurant	Physician	Furniture	Whls Bev	Liquor	Whls Hide
Grocery	Hardware	Clothing	Photo Studio	Cold Stor	Farm & Garden	
	Lumber	Blacksmith	Misc Repair	Book & Stat	Nursery	
	Bank	Shoe Repair	Music Radio	Whls Candy	Hospital	
	Auto Repair	Lawyer	Spec Equip	Florist	Med Lab	
	Farm Mach	Newspaper	Paint, Glass & Wppr	Drayage	Junk Yards	
	Serv Sta	Jewelry	Elec Sup	Whls Groc	Mach Shop	
	Bulk Oil	Amusements	Appliance	Brewery	Whls Cloth	
		Mortuary	News Dealer	Fuel & Ice		
		Laundry		Misc Retail		
		Auto Dealer				
		Auto Parts				
		Hatchery				
		Variety Store				
		Plumb & Htg				

TABLE 4.16.--Occurrence of selected River Bend Area central place functions by class 1960

Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII
General Store	Creamery	Drugs	Hotel	Whls Candy	Department Store	Whls Hide
Service Station	Restaurant	Physician	Furniture	Hospital	2nd Hand Book & Stat	Mobile Homes
Elevator	Grocery	Clothing	Photo Studio	Misc Retail	Med Lab	
	Hardware	Blacksmith	Brewery	Auto Parts	Radio Station	
	Lumber	Shoe Repair	Fule & Ice	Liquor	Whls Cloth	
	Bank	Lawyer	Whls Bev	Elec Sup	Whls Mach & Sup	
	Auto Repair	Newspaper	Music		Junk Yard	
	Farm Mach	Jewelry	Nursery		Whls Groc	
	Bulk Oil	Amusements	Mach Shop			
		Mortuary	Spec Equip			
		Laundry	Paint, Glass & Wppr			
		Auto Dealer	Appliance			
		Drayage	News Dealer			
		Hatchery	Farm & Garden			
		Variety Store	Florist			
		Plumb & Htg	Cold Storage			
		Misc Repair				

various decades. These data further verify the notion expressed by Christaller that places of increasing size serve the same functions of smaller places, while providing functions which require a larger threshold population or a more complex market system.

This increasing complexity of service centers is shown in the tables of the occurrence of selected central place functions (Tables 4.10 through 4.16, pages 133-139), which demonstrate that the higher hierarchical positions have more specialized functions and more intensive land use. Speciality retail establishments, personal and business services, wholesaling, and department and variety stores are characteristic throughout the study period of only the largest center. As the hierarchical level decreases, the services performed and the goods sold become more and more basic, until at the lowest hierarchical level the primary retail function of the center is the general store.

The changes which become apparent from the data in Tables 4.10 through 4.16, pages 133-139, are: (1) the class at which certain functions appear varies from decade to decade, and (2) the changes which occur in the higher order classes as other lower order centers decline and stagnate or grow and prosper.

As has been previously discussed, certain functions tended to disappear from low order centers and appear in progressively higher order centers as transportation

improves and surplus income increases. This trend was particularly obvious in the case of hotels, hatcheries and stock auctions, blacksmiths, book and stationary shops, and breweries. Counter trends can be observed in such functions as plumbing and heating, paint, glass and wallpaper stores, variety stores, appliance sales, florists, business agencies, and bulk oil distributors. These specialized functions require a sizeable market population. With increased transportation capabilities, greater accessibility, and a rising amount of disposable income, more and more consumers were able to afford such luxuries as indoor plumbing, rural electrification, appliances, and oil heat rather than wood or coal-fired systems. The populations necessary to maintain these functions expanded sufficiently to permit their location in smaller centers. Meanwhile, the number of such functions was also expanding in the larger centers, thereby further enhancing their focality.

Similarly, the increased importance of the automobile after 1920 made possible totally new forms of commercial activity. As shown by the data in Tables 4.11 through 4.16, pages 134-139, automobile oriented activities, other than auto dealerships, which often were little more than a store front, were unknown in anything but the largest of centers in 1920. The service station, auto repair shop, and auto parts dealer were confined to the relatively large classes V and VI centers simply by the

lack of consumers to support them in smaller places. Increased numbers of automobiles during the twenties so expanded the market for service, repair, and parts that these functions became indigenous to classes II and III centers respectively by 1930. The growth in numbers and the necessity of having an automobile made the service station in 1960 almost as important to the hamlet or "cross roads" settlements of the Upper Midwest as the general store was at the turn of the century.

Obviously, there have been many other changes in the commercial structure of service centers in the River Bend Area since 1900, such as the decline of the livery stable and the increased numbers of cold storage plants, but to discuss all of these lies beyond the scope of this study.

Further analysis of Tables 4.10 through 4.16, pages 133-139, indicates the relative relationships of classes V, VI, and VII centers. Due to the size of the sample employed in this analysis and the apparent validity of the rank-size relationship,[9] the number of class V or larger centers never exceeds a total of five, while no more than two centers occur at one time in any of the group classes. Because the "n" size of these groups is so small the validity of the data for these groups may be

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[9]George K. Zipf, Human Behavior and the Principle of Least Effort (Cambridge, Massachusetts: Addison Wesley Press, Inc., 1949).

questionable. This is partially mitigated by the fact that at all times Mankato is so much larger than all other places within the study area that it becomes a class by itself. As other centers, such as Waseca, Fairmont, New Ulm, and St. Peter, grew, they tended to assume the rank or position in the hierarchy formerly held by Mankato. As shown by Fig. 4.3, page 102, and Fig. 4.9, page 108, these communities tended to lose, rather than gain, in their relative functional importance, when compared to the growth of Mankato.

Based upon the previously discussed criteria for the determination of the hierarchical groupings in classes I through IV, the extremes of classes V through VI become apparent. But upon closer examination of the data in Tables 4.15 and 4.16, pages 138 and 139, for the decades 1950 and 1960, the existence of the two classes VI and VII can certainly be questioned. By segregating the occurrence of selected functions by classes it is possible to determine, using the data in the Appendix, Tables A.1 through A.6, at what level within the hierarchy certain types of functions are most likely to emerge as characteristic. Yet, the only difference in the data for 1950 and 1960 between class VI and class VII centers was the existence of two functions: wholesale hides and pelts and mobile home sales. Although a greater degree of disparity exists between these same levels of centers in 1940, it seems apparent that the only significant

difference between places with a loaded functional attraction of 501 to 900 and those from 901 to 1,900 is a matter of degree and intensity rather than the real functions the center actually performs.

The question could be raised regarding the variation between class IV and class V in 1930, but no clear differences are evident there. A similar situation becomes evident in 1960 between the same group sets. Therefore, it may be rational to assume that although there are some apparent differences among the class V, class VI, and class VII centers, that these differences are not sufficiently significant, in light of the size of the sample, to warrant three groupings.

Combining groups tends to negate the concept of the "regional center," but without further refining the data into more subdivisions, it is impossible to avoid negating the idea of a functionally superior regional center. It does not deny the existence of the dominant "regional center" as a concept created by the alternatives offered to the consumer relative to all the other centers of the region.

Conclusions

Data analysis in this chapter leads to the following conclusions regarding the River Bend Area:

1. A hierarchy of places can be determined empirically.

2. Service centers are not static, either in the number or type of functions they perform.

3. There is no average or typical community, when defined in terms of the functions it performs.

4. Changes in the functional role of service centers can often be traced to a reorientation in either modes or routes of transportation.

5. When functional profiles of central places are compared for several decades, they indicate some of the changes in consumer demand occurring within a region.

6. In some cases the decline of the functional import of the very small service center is more apparent than real. Often the functions performed are those which are unrelated to a form of commercial core or are of a type requiring less public exposure for their existence.

7. The higher the hierarchical position of a center the more specialized the functions it performs.

8. The concept of a single dominant regional center in the River Bend Area is not necessarily valid when viewed solely in terms of the variety of functions it performs, but exists only when considered in terms of the number of stores and shops available or the size of the population.

Further analysis of the importance of transportation change reveals that alteration in the market areas of the centers within the study area plays an important role in influencing the conclusions reached here. The

following chapter will relate the theoretical concept of diminishing time-space to the size of markets and examine the impact, in the River Bend Area, of market expansion or shrinkage upon the functional role of the service center.

CHAPTER V

DIMINISHING TIME--SPACE, ITS IMPACT UPON THE CENTRAL PLACE, AS REVEALED IN THE RIVER BEND AREA

The concept of time as a spatial factor is common in astronomy where space is described in terms of light years or milliseconds of light. But terrestrial space continues to be analyzed in absolutes as immutable and as constant as light years. With our rapid increases in communication rates linear measures such as the mile have become almost archaic. People today tend to consider space or distance as the time between points, rather than their linear relationships.

The communication medium determines an individual's perception of time. The time distance relationship between New York and Chicago is four hours by jet plane, eighteen hours by automobile, but only seconds by telephone. The communicator chooses a particular medium because of its time-cost benefits to him, not because of distance.

Time as a useful measure of spatial relationship becomes even more meaningful when it is noted that people budget time according to their purposes. Chapin, in

Urban Land Use Planning, observes that time standards for certain functions have been determined; these influence land use development and planning policy in urban areas.[1] Though no absolute generalization can be made, it appears that there are certain broad time limits which influence the location of the home and its relationship to places of employment and shopping. Travel time to employment and shopping is determined in some measure by such psychological satisfactions as prestige or interpersonal relationships, but in large part location is related to the traveler's convenience, time, and cost. Thus in an urban area of 100,000 population people tend to locate within thirty minutes or less from where they work. Likewise, they desire to be within forty-five minutes of the Central Business District and within ten minutes of a major shopping center. Relationship to school and recreation also are considered to be a function of time rather than absolute distance.[2]

At this point it becomes necessary to consider the relationship of time and the elements of the urban morphology as a measure of the focality of these places. The shopping center is a very focal place to the limited number of people who live within a ten minute drive. But the focality of the local shopping is considerably less

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[1]F. Stuart Chapin, Urban Land Use Planning (Champaign: University of Illinois Press, 1965), p. 377.

[2]Ibid.

compared to the service area of the city's commercial core simply because the central shopping area is usually the focal point for the entire metropolitan area. Because of its focality for a larger number of people it is able to offer goods and services more specialized than the local shopping center which is supported by a much smaller threshold population. The diversity and concentration of the Central Business District and its accessibility to the regional populace tends to make it a highly focal place.

Therefore it may be assumed that two factors work together to determine the service area or marketing morphology of a shopping area: (1) accessibility, a function of time and distance and (2) focality or the attraction power to draw consumers from a distance. These factors determine regional consumption patterns as well as urbanized shopping districts.

Application of Social Physics

The interrelationships and influences of foci within either a large city or a region can be viewed in the same way as the gravitational interrelationship and influence of matter in space. This correlation can be described by the formula:

$$\frac{\text{Mass}_1 \cdot \text{Mass}_2}{\text{Distance}}$$

which describes the extent of gravitational attraction between two masses in space. Kingsley Zipf, in his

research in 1946, noted that the number, size, and location of central places were determined by the utility of minimizing "the work of transporting mass over distance." In his research on the intercity movement of goods, capital, or people, Zipf substituted Population (P) for Mass (M) but maintained the distance (D) variable.[3] This simple gravity model substitutes human factors for physical elements as an attempt to explain some human activities.

A similar attempt at using physical laws to explain human activity was employed by W. J. Reilly in 1931. He attempted to determine the proportional exchange of shoppers from a city located between two larger cities. He labeled his formulae "The Laws of Retail Gravitation" (sic),[4] the hypothesis of which is:

> Two centers attract retail trade from any intermediate city or town in the vicinity of the breaking point approximately in direct proportion to the population of the two cities and in inverse proportion to the squares of the distances from these two cities to the intermediate town.[5]

Mathematically, his statement is expressed:

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[3]Kingsley Zipf, "The $\frac{P_1 \cdot P_2}{D}$ Hypothesis on the Intercity Movement of Persons," American Sociological Review, II, No. 6 (1946), 679.

[4]It must be recognized that the use of the word law here is perhaps inappropriate inasmuch as a law is considered indisputable. It might better have been termed the "Theories" of Retail Gravitation since they have not been perfectly proven.

[5]W. J. Reilly, The Law of Retail Gravitation (1st edition; New York: W. J. Reilly Company, 1931; reprint 1953), p. 9.

$$\frac{B_a}{B_b} = \left(\frac{P_a}{P_b}\right)\left(\frac{D_b}{D_a}\right)^2$$

B_a = Proportion of trade from intermediate town attracted to City A
B_b = Proportion attracted to City B
P_a = Population of City A
P_b = Population of City B
D_a = Distance from intermediate center to City A
D_b = Distance from intermediate center to City B

This formula is yet another example of an attempt to duplicate theories of social interaction with laws of physical action.[6] Reilly also uses population as a surrogate for mass and derived his formula from the laws of physical gravitation.

During the early 1940's, Paul D. Converse empirically tested the theories developed by Reilly and found many of his conclusions to be valid.[7] He also made a significant modification of Reilly's "Law" by developing a derivation which made it possible to determine the spatial boundary between two competing markets. The "breaking point" theory assumes, if:[8]

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[6]Two basic reviews of the literature relating the use of theories of social interaction to the laws of physics are: Walter Isard, Methods of Regional Analysis: An Introduction to Regional Science (New York: John Wiley, 1960); and Gunnar Olsson, Distance and Human Interaction (Philadelphia: Regional Science Research Institute, 1965).

[7]P. D. Converse, "The New Laws of Retail Gravitation," Journal of Marketing, XIV, No. 3 (October, 1949), 379-84.

[8]The derivation of this formula is not explicit in the work of Converse, but the calculation has been proven

1. $\frac{B_a}{B_b} = \left(\frac{P_a}{P_b}\right)\left(\frac{D_b}{D_a}\right)^2$

   then at the breaking point $\frac{B_a}{B_b} = 1$.

2. If this is valid then $1 = \left(\frac{P_a}{P_b}\right)\left(\frac{D_b}{D_a}\right)^2$

3. Therefore the distance (D_{ab}) between A and B =

$$D_a + D_b$$

4. Thus $D_a = D_{ab} - D_b$

5. It follows then that $1 = \left(\frac{P_a}{P_b}\right)\left(\frac{D_b}{D_{ab} - D_b}\right)^2$

6. Which implies that $\left(\frac{P_b}{P_a}\right)\left(\frac{D_b}{D_{ab} - D_b}\right)^2$

7. or $\frac{D_b}{D_{ab} - D_b} = \sqrt{\frac{P_b}{P_a}}$

8. $\therefore \quad \frac{D_{ab}}{D_b} - 1 = \sqrt{\frac{P_a}{P_b}}$

9. $\therefore \quad \frac{D_{ab}}{1 + \sqrt{\frac{P_a}{P_b}}} = D_b$

which simply stated says that the breaking point (BP) between two cities A and B can be computed by the following:

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by George Schwartz, Development of Marketing Theory (Cincinnati, Ohio: South-Western Publishing Company, 1963), pp. 12-13; and by David Huff, "Defining and Estimating a Trade Area," Journal of Marketing, XXVIII (July, 1964), 34-38. Also see Brian J. L. Berry, Theories of Urban Location, Commission on College Geography, Resource Paper No. 1 (Washington, D.C.: Association of American Geographers, 1968), pp. 16-20.

$$BP = \frac{\text{Miles between A and B}}{1 + \sqrt{\frac{\text{Population of A}}{\text{Population of B}}}}$$

This formula, when tested in the field by Converse, proved that it was possible to determine the service area of a central place from available data without performing any field work. The criteria employed are less credible when used to analyze the extent of markets and the competition of places for consumers.

It is this writer's contention that substitution of population for mass or attractive power is questionable largely because of the probable variations between the size of population and the retail functions the community may perform. Population's suitability for shopping center analysis would be nil. Previously, it was noted that the use of population as an index was invalid when the researcher tried to show the differences in the functions performed by similar centers, one in a highly industrialized and urbanized area, the other in an essentially agricultural area. Therefore, to substitute population for the retail or commercial attraction of a series of centers in a dispersed pattern would seem irrational. The author believes that the use of the loaded functional total for each center, however, is a viable index of the mass or attraction of a center. For it is not the number of people living in a center which attracts commercial trade, but, rather, the number and type of goods and

services it provides the consumer which generates focality.

Similarly, the author believes it important to reconsider the concept of distance as it is employed by Reilly, Converse, and others. In their analysis, distance was considered for only a given moment in time. But when viewed in an historical perspective the concept of linear distance ceases to be constant as a result of increased speeds.

Much of the discussion regarding spatial analysis has emphasized the concept that time, rather than linear distance, is the important variable. Distance, viewed chronologically, is an immutable measure. But the time-distance relationship between points in space has become greatly exaggerated over the past century as a result of technological innovation and development.

The changing rates of speed which people can travel in the air and over land, or electronically, make it imperative that the concept of changing time-distance also be considered in determining the extent of spatial interaction among points in space. Therefore, the notion of time-distance should be considered as a variable within the framework of Reilly's formula for determining market area. This necessitates the rejection of distance as a measure of the extent of interaction between points in space and substitutes time. The implications of this technique for histo-geographic analysis are readily

apparent. The rates of speed with which it is possible to travel between points have increased rapidly over the past century and have been particularly accelerated in the last half century.

The adoption of loaded functional values as an index of mass and the use of time-distance alter Converse's formula for determining the extent of market areas as follows:

$$BP_{ab} = \frac{TD_{ab}}{1 + \sqrt{\frac{LFV_a}{LFV_b}}}$$

BP_{ab} = Breaking Point of market areas between cities A and B

TD_{ab} = Time-Distance between A and B

LFV_a = Total Loaded Functional Value of A

LFV_b = Total Loaded Functional Value of B

Potentially, this technique allows the analyst to determine the spatial character of markets for moments in time when field work is impossible. He can also evaluate the changes in markets which occur as the relative comparative advantage of a place is altered by innovation or development.

A theoretical construct is developed in Figs. 5.1 and 5.2 which demonstrates the substitutions of the previously discussed values. In both figures the Loaded Functional Value of the community is substituted for population, but time-distance is substituted in Fig. 5.2 for the distance factor employed in Fig. 2.1. The fact

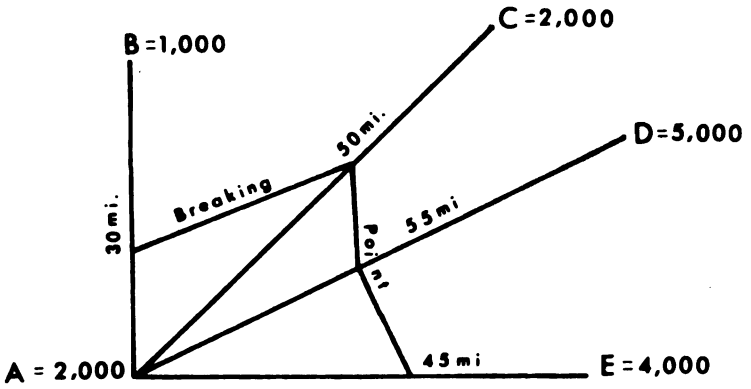

Fig. 5.1.--Converse's Breaking Point determination using linear distance and population.

$$BP_{ab} = \frac{30 \text{ miles}}{1 + \sqrt{\frac{2000}{1000}}} = 12.4 \text{ miles}$$

$$BP_{ac} = \frac{50 \text{ miles}}{1 + \sqrt{\frac{2000}{2000}}} = 25.0 \text{ miles}$$

$$BP_{ad} = \frac{55 \text{ miles}}{1 + \sqrt{\frac{2000}{5000}}} = 33.0 \text{ miles}$$

$$BP_{ae} = \frac{45 \text{ miles}}{1 + \sqrt{\frac{2000}{4000}}} = 26.3 \text{ miles}$$

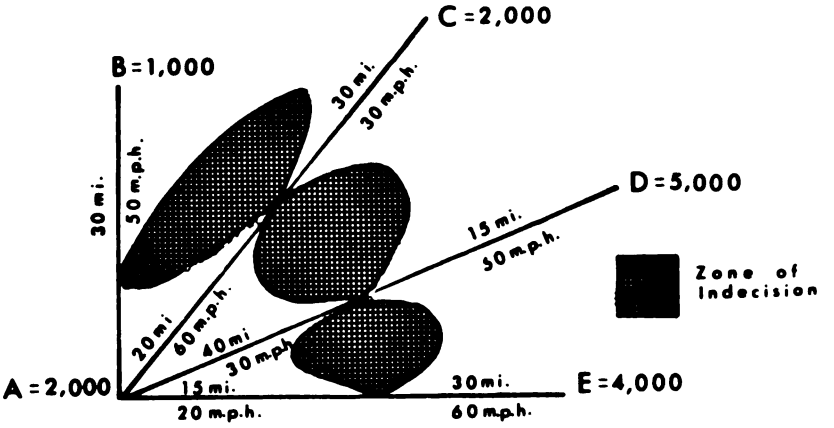

Fig. 5.2.--Modification of Converse's Breaking Point determination using time-distance.

Travel-Time: A to B = 36 min.
A to C = 80 min.
A to D = 95 min.
A to C = 75 min.

$$BP_{ab} = \frac{36 \text{ min.}}{1 + \sqrt{\frac{2000}{1000}}} = \frac{36}{1 + 44.72} = \frac{36}{45.72} = 12.4 \text{ miles}$$

$$BP_{ac} = \frac{80 \text{ min.}}{1 + \sqrt{\frac{2000}{2000}}} = \frac{80}{1 + 1} = 40 \text{ min. or } 30 \text{ miles}$$

$$BP_{ad} = \frac{95 \text{ min.}}{1 + \sqrt{\frac{2000}{5000}}} = \frac{95}{1 + .6325} = 58.19 \text{ min. or } 29.09 \text{ miles}$$

$$BP_{ae} = \frac{75 \text{ min.}}{1 + \sqrt{\frac{2000}{4000}}} + \frac{75}{1 + .7071} = 55.6 \text{ min. or } 30.6 \text{ miles}$$

that not all roads have the same speed capability is given consideration here. An expressway has a much higher average speed capability than either a gravel road or a winding two lane paved road. Therefore, any discussion of markets must consider the speed capability of the connecting roads.

In this analysis the number of right angle turns was also noted as a factor which might reduce the average speed capability of the road. The reduction factor for right angle turns considered two points: (1) the number of right angle turns per mile between two points, and (2) the average speed capability of the road surface.

As shown in a comparison of Figs. 5.1 and 5.2, pages 156 and 157, the speed capabilities of a road will markedly alter the extent of the market along and away from the axis, but linear distance makes no allowance for varying road conditions and time expenditures in the journey to market. This difference can be vitally important in analyzing the spatial character of markets in either a micro or macro area where variations in speed capabilities exist.

A comparison of the conclusions available from Figs. 5.1 and 5.2, pages 156 and 157, demonstrates the obvious value of using time-distance rather than simple distance as a variable. Its value for determining the historical character of markets is even greater when road conditions are improved, highways are re-oriented and

straightened, and their speed capabilities are improved. When speed potentials are combined with alterations in the functional attraction of a region's centers, many of the changes in the roles and functions of its central places can be explained.

Application of Gravity Models to the River Bend Area

The histo-geographic analysis of the River Bend Area necessitates that the region be considered as a series of points which are linked to the dominant center, Mankato, by a series of linear axes. (See Fig. 5.3.) When viewed in a spatial context only, the region would have essentially the same configuration today as the transformation for 1910, as shown by a comparison of Figs. 5.4 and 5.6. At that time all travel was essentially at a uniform speed of three miles per hour and the concept of time-space was irrelevant.

By 1930, as shown in Fig. 5.5, the relative location and relationship of points along the axes had been markedly altered. Time-distance relationships between points varied largely as a result of speed capabilities over gravel, paved, or dirt roads. These factors also account for the uneven rate at which the transformation shrinks and stretches during the three sample decades. The relative similarity of the same distance transformations for the River Bend Area between 1910 and 1960 is a

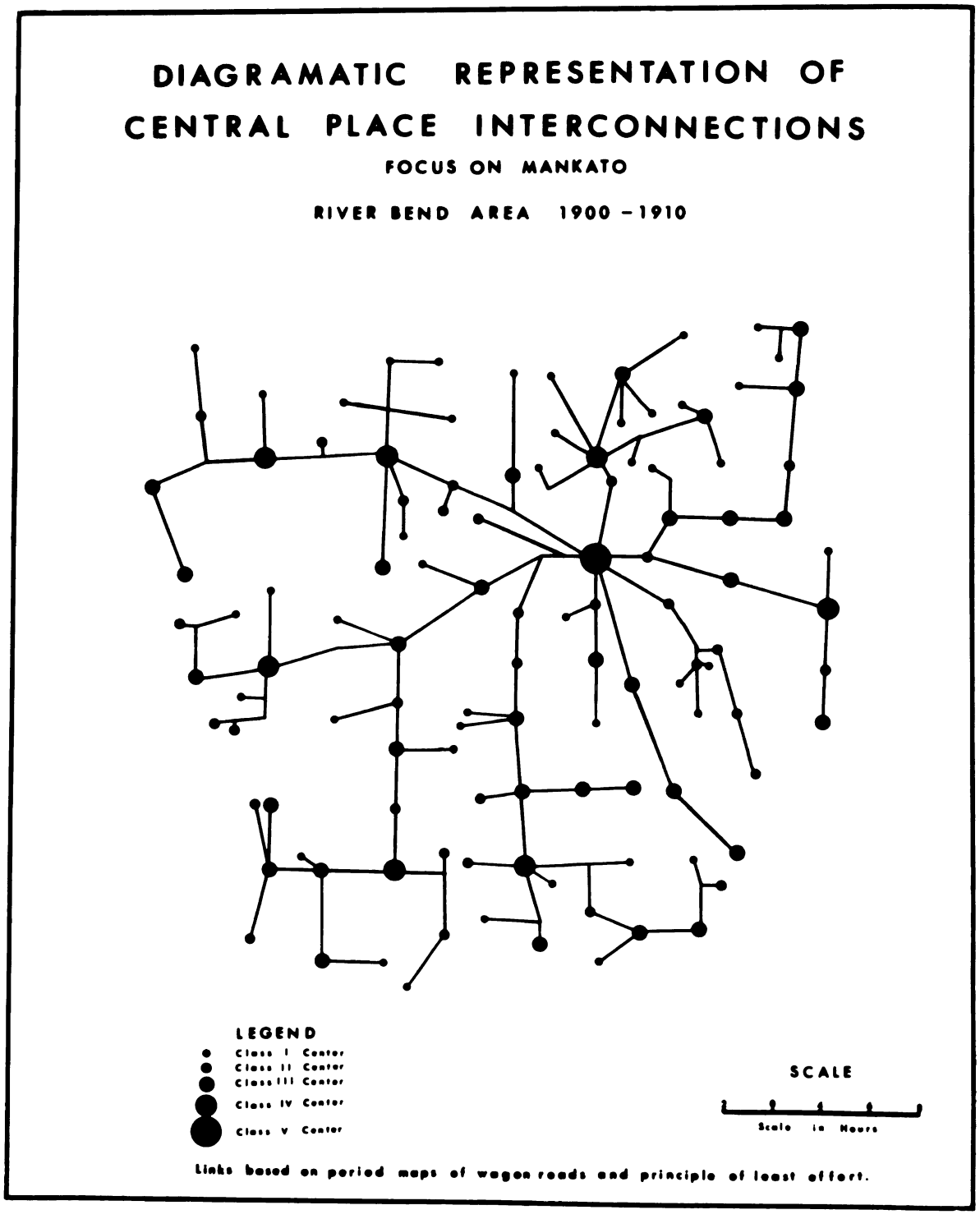
DIAGRAMATIC REPRESENTATION OF
CENTRAL PLACE INTERCONNECTIONS
FOCUS ON MANKATO
RIVER BEND AREA 1900 - 1910
LEGEND
Class I Center
Class II Center
Class III Center
Class IV Center
Class V Center
SCALE
Scale in Hours
Links based on period maps of wagon roads and principle of least effort.

Fig. 5.3

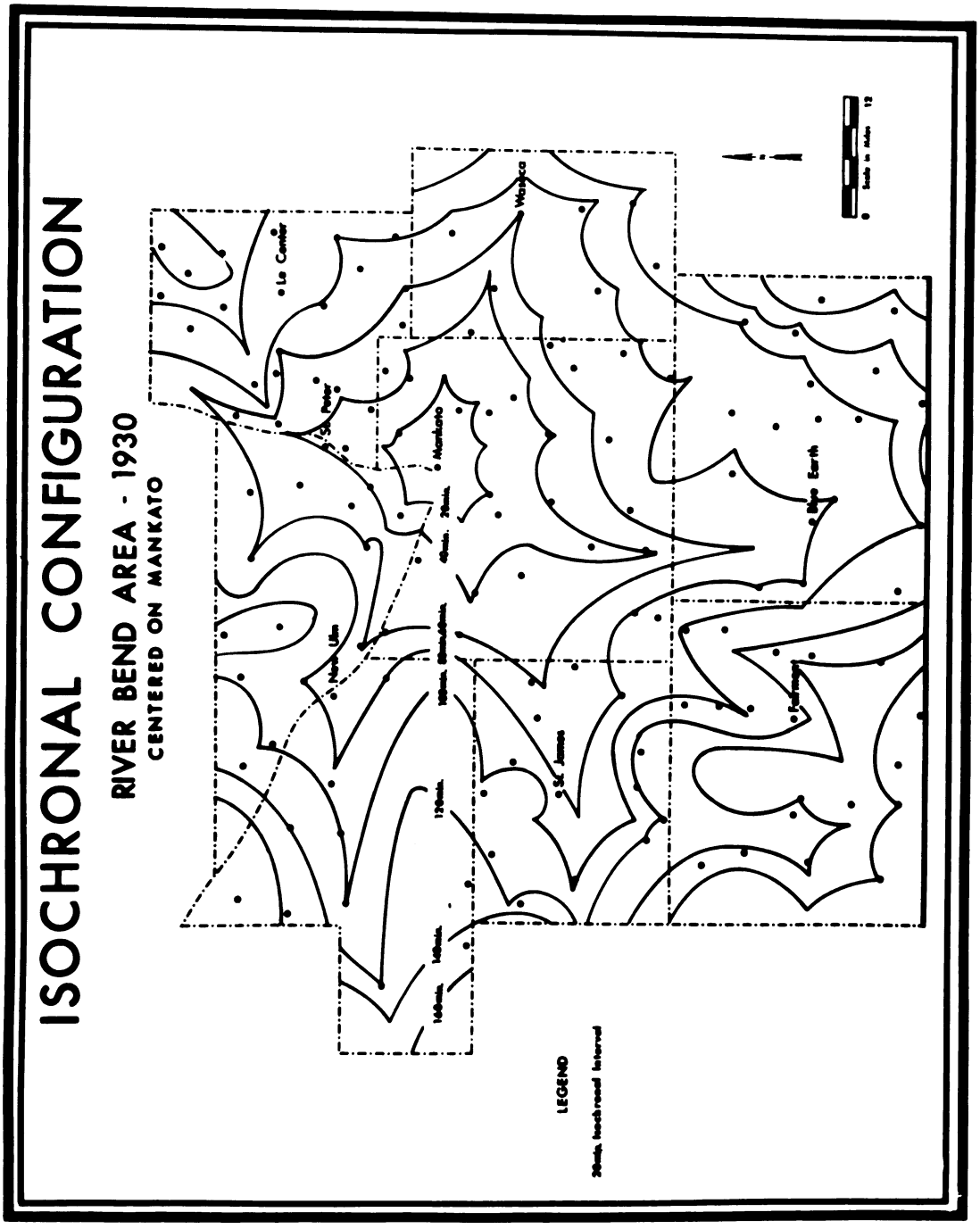
ISOCHRONAL CONFIGURATION
RIVER BEND AREA - 1930
CENTERED ON MANKATO
LEGEND

Fig. 5.5

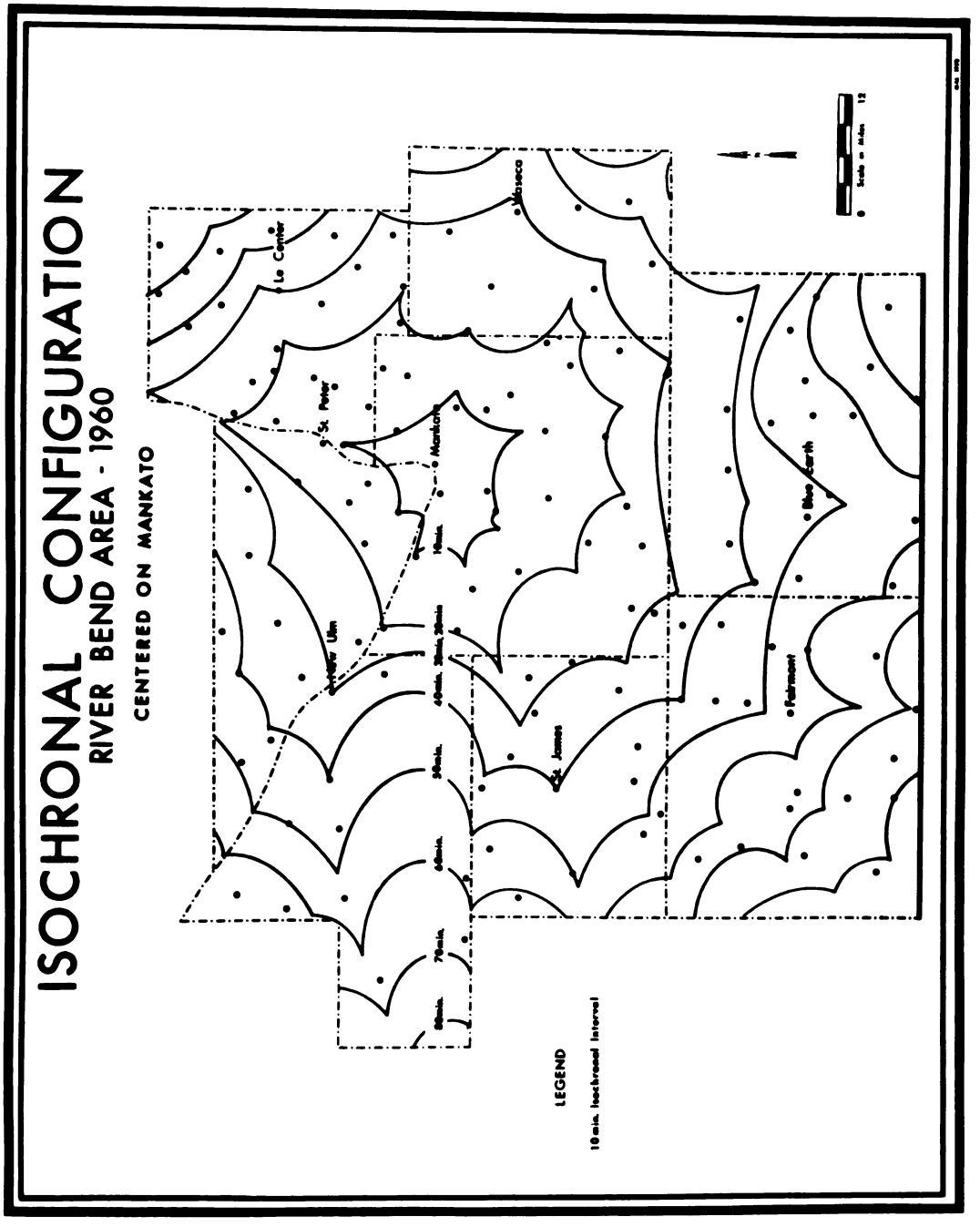
ISOCHRONAL CONFIGURATION
RIVER BEND AREA - 1960
CENTERED ON MANKATO
LEGEND
10min. isochronal interval
Le Center
St. Peter
Mankato
New Ulm
St. James
Blue Earth
Fairmont
Winnebago

Fig. 5.6

result of the development of an almost uniform system of primary paved roads extending away from Mankato.

Assuming that the consumer followed the path of least resistance via centers which offer a series of increasing hierarchical opportunities, the greatest distortion of time-distance occurs in 1930, as shown in Fig. 5.5, page 162. At this time, even though the automobile was more or less ubiquitous, only the main highways were paved. Gravel and dirt roads, with lower speed capabilities, tended to extend the relative time-distance relationships of some places while paved roads made other places more accessible.[9] The marked distortion of the 1930 transformation for the River Bend Area may be an important consideration relating to the lack of a close correlation between group classes of centers for that period. The relative lack of uniformity of travel times between centers, coupled with the economic crisis of the 1930's, may account for this deviation discussed in the preceding chapter.

As indicated by the maps of Blue Earth County's market area in Figs. 5.7 through 5.10, it is clear that

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[9]The technique employed here was developed by Waldo R. Tobler in "Map Transformations of Geographic Space" (unpublished Ph.D. dissertation, Department of Geography, University of Washington, Seattle, 1961). It was applied by Donald A. Blome in A Map Transformation of the Time-Distance Relationships in the Lansing Tri-County Area (East Lansing: Institute for Community Development and Services, Michigan State University, 1963).

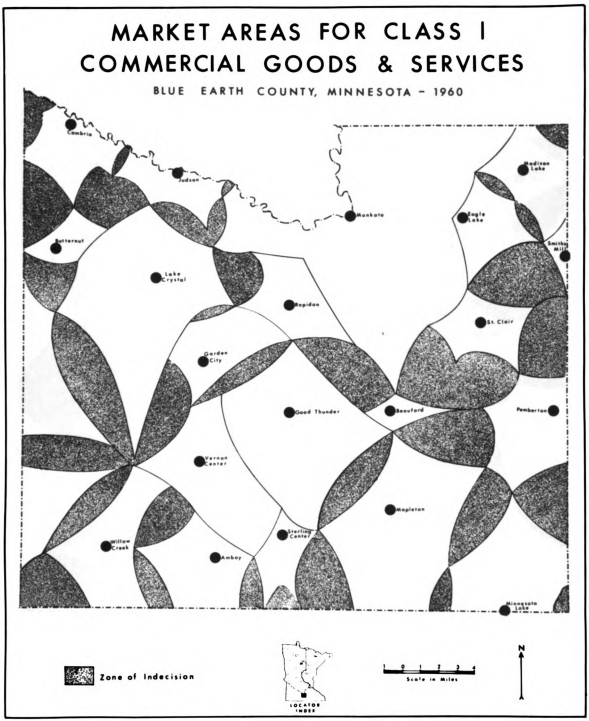
MARKET AREAS FOR CLASS I
COMMERCIAL GOODS & SERVICES
BLUE EARTH COUNTY, MINNESOTA - 1960
Cambria
Judson
Mankato
Eagle Lake
Madison Lake
Smiths Mill
Butternut
Lake Crystal
Rapidan
St. Clair
Garden City
Good Thunder
Beauford
Pemberton
Vernon Center
Mapleton
Willow Creek
Amboy
Sterling Center
Minnesota Lake
Zone of Indecision
LOCATOR INSET
Scale in Miles
N

Fig. 5.7

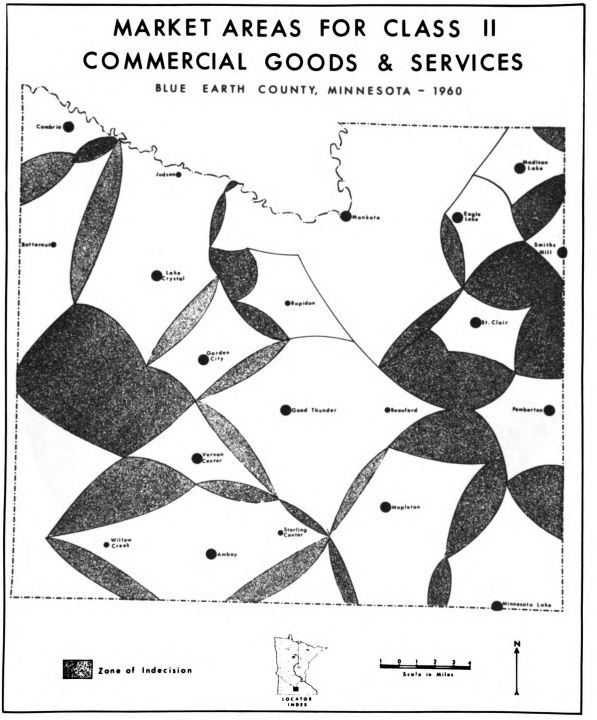
MARKET AREAS FOR CLASS II
COMMERCIAL GOODS & SERVICES
BLUE EARTH COUNTY, MINNESOTA - 1960
Cambria
Judson
Mankato
Madison Lake
Eagle Lake
Smiths Mill
Butterfield
Lake Crystal
Rapidan
St. Clair
Garden City
Good Thunder
Beauford
Pemberton
Vernon Center
Mapleton
Willow Creek
Sterling Center
Amboy
Minnesota Lake
Zone of Indecision
LOCATOR INDEX
Scale in Miles
N

Fig. 5.8

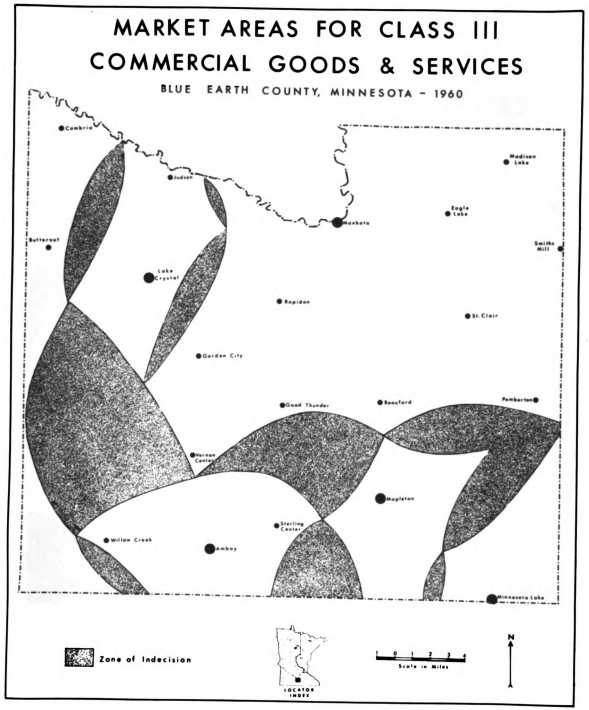
MARKET AREAS FOR CLASS III
COMMERCIAL GOODS & SERVICES
BLUE EARTH COUNTY, MINNESOTA - 1960
Cambria
Judson
Mankato
Madison Lake
Eagle Lake
Butternut
Lake Crystal
Smiths Mill
Rapidan
St. Clair
Garden City
Good Thunder
Beauford
Pemberton
Vernon Center
Mapleton
Sterling Center
Willow Creek
Amboy
Minnesota Lake
Zone of Indecision
LOCATOR INSET
Scale in Miles
N

Fig. 5.9

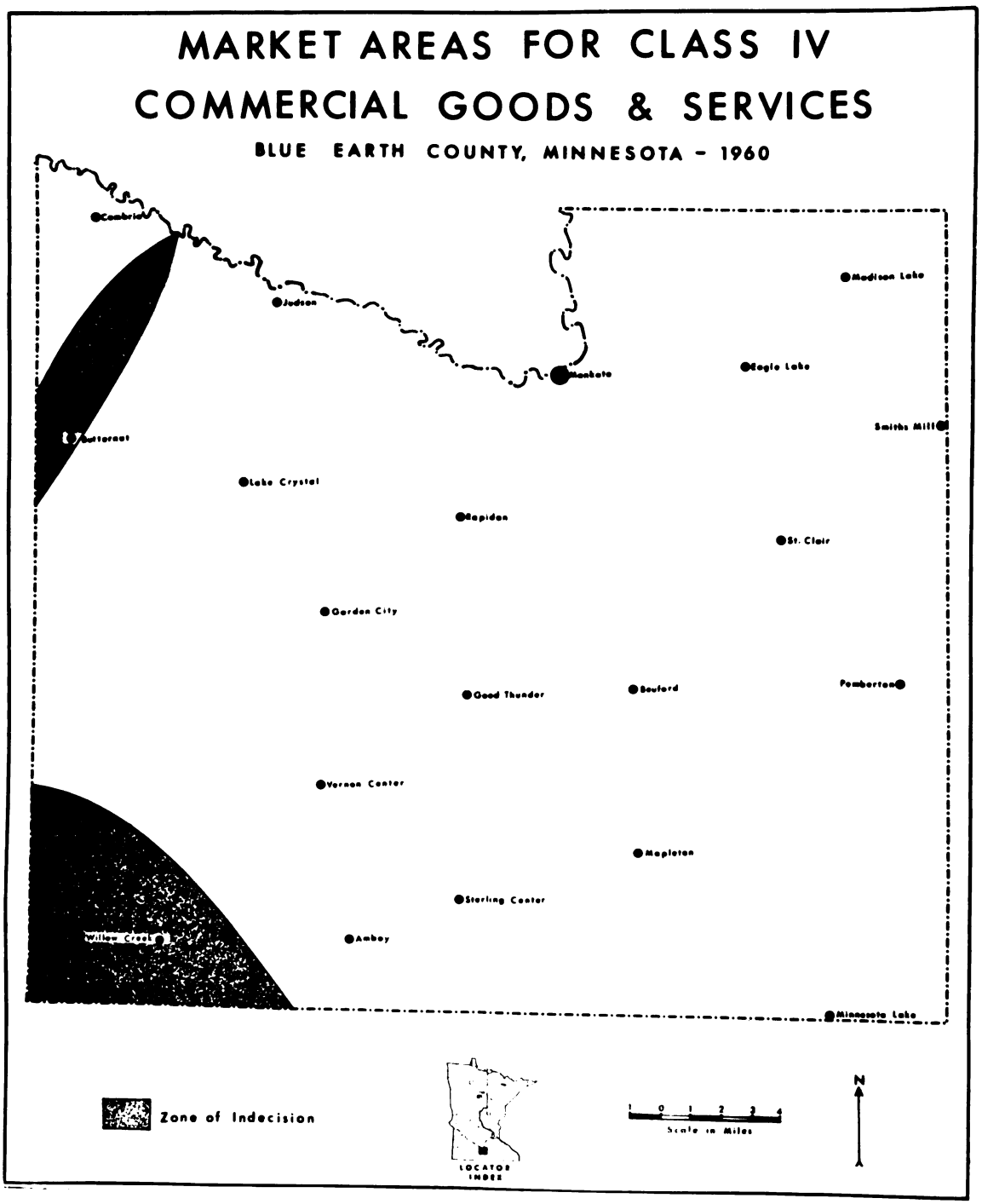
MARKET AREAS FOR CLASS IV
COMMERCIAL GOODS & SERVICES
BLUE EARTH COUNTY, MINNESOTA - 1960
Cambria
Judson
Mankato
Madison Lake
Eagle Lake
Smiths Mill
Lake Crystal
Rapidan
St. Clair
Garden City
Good Thunder
Bauford
Pemberton
Vernon Center
Mapleton
Sterling Center
Amboy
Willow Creek
Minnesota Lake
Zone of Indecision
LOCATOR INDEX
Scale in Miles
N

Fig. 5.10

the use of isochrones for delineation of service areas is more accurate than geometric configurations such as circles or hexagons. As has been demonstrated in numerous studies, market areas are generally determined by competition with other markets and the relative accessibility created by the highway or communications network of the region. Thus market areas do not assume a uniform geometric configuration but tend to be elongated in one direction and shrunken in another with zones of indecision areas existing between centers.

Psychology of Consumption Benefits and Costs

It must also be noted that a group of competing markets do not necessarily encompass the totality of space. Rather, a market is defined as an area where the consumer is presented with a minimum of alternatives. Evidence from market research implies that many consumer shopping decisions are made under conditions of uncertainty.[10] The evidence, related to the psychology of shopper behavior, tends to explain the lack of uniformity in the markets of a region and the presence of zones of indecision which appear in the areas not encompassed by the market of a particular center.

The zones of uncertainty tend to diminish as the consumer increases his variety of requirements. As shown

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[10]David Huff, "Ecological Characteristics of Consumer Behavior," The Regional Science Association Papers, VII (1961), 20.

by the maps in Figs. 5.7, page 165, and 5.10, page 168, the zones which exist for class I type goods and services are often encompassed by the service areas for class III and larger centers. As shown by these maps, the class I communities of Willow Creek and Sterling Center both become incorporated into the service area of Amboy, a class III center. Amboy in turn is incorporated into the sphere of influence of Mankato when the consumer seeks a class IV type of goods or service. The consumer has some knowledge that certain centers will be able to satisfy his requirements. The greater the variety of goods and services required, the larger the center the consumer will select for his shopping destination. His shopping trip may take him through centers which might possibly have some or all the items he seeks, but lack of knowledge or uncertainty will draw him on to the center originally selected. Thus a consumer living south of Amboy might pass through no less than three centers which might offer him satisfaction, yet he goes on to Mankato where he is certain that his needs and desires will be realized. Minimizing his search or maximizing his satisfactions or the use of his time will strongly motivate the shopper to select a particular shopping center. Huff notes that "consumers will show a willingness to travel greater distances for various goods and services as the number of such items available at various locational sources increase."[11]

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[11] Ibid., p. 21.

In his attempt to maximize his satisfactions or minimize his effort the consumer will select a place which meets his needs but will not necessarily select one which exceeds the offerings required. "The consumer finds increased selection to be confusing and dissatisfying because of the difficulty in trying to make a decision with so many choices available."[12] These observations regarding the psychology of shopping patterns tend to explain the hierarchy of a region's service centers. The consumer will select a nearby class I type center as his primary resource if he feels reasonably confident that his demands can be met there. But if doubt exists, he may select a larger but more distant center where he can feel reasonably assured of meeting his demands. Therefore, as mobility increased, after 1920 distance declined as a deterrent to a shopping journey. As a result, service areas and therefore the threshold populations of many smaller communities have literally succumbed to larger order centers. This has contributed to the decline in the numbers of lower order centers throughout the River Bend Area.

Huff, in his article "Ecological Characteristics of Consumer Behavior," acknowledged that cost perception related to travel and indicated it as a curvilinear function dictating the distance a shopper would be willing to travel. Fig. 5.11 shows the relationship of cost to

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[12] Ibid.

distance. It should be pointed out also here that cost can be easily substituted for time. Time-costs in the journey to shop are often more readily perceived than monetary costs incurred for gas, oil, depreciation, insurance, and other operating costs.

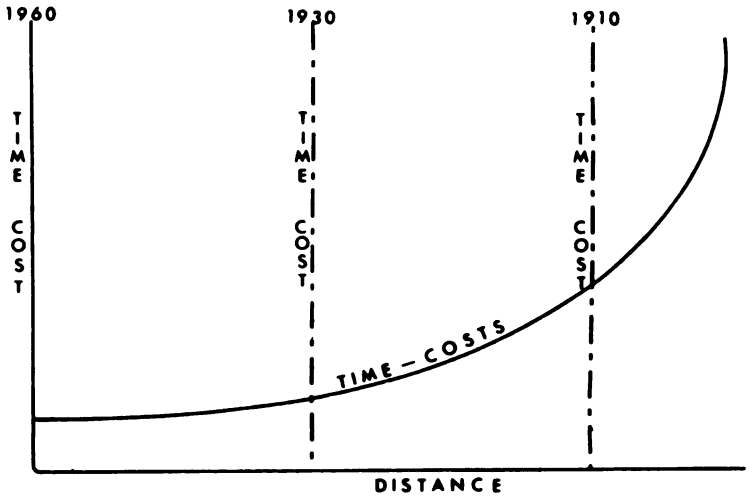

Fig. 5.11.--Chronological relationship of time-costs to distance traveled for consumer goods and services.

Though Huff's original cost distance curve was developed for a single moment in time, it can also be converted to show the cost distance relationships which existed at several time intervals by inserting secondary "y" axis at the appropriate points on the "x" or distance axis of the graph. The time-cost to distance relationship is then determined for the appropriate time interval by assuming that the zero point of the graph begins at the base of the "y" axis at the point it connects with the "x" or distance axis. The use of this technique assists

in demonstrating why slow travel speeds and high time-costs retarded movement in the early part of the century. With increased speed capabilities the consumer cost curve is flattened somewhat and rises gradually with distance. But distance and time are costs which ultimately force a sharp rise in the function so that it ultimately becomes almost perpendicular to its own axis. This condition simply reflects the idea of "opportunity costs." In other words, a consumer has only a given amount of time available for any particular set of activities. Therefore, if he devotes more time than anticipated performing one aspect of the set it will be at the expense of the remainder. Thus the cost of the completed items will rise sufficiently to prevent further time losses. In this way a consumer will attempt to best use his time by going where he can achieve the greatest satisfactions at a minimum of time and money.

The use of time-cost curves in the River Bend Area helps to account for the decline in focality and disappearance of many centers which existed at the turn of the century. As demands increased along with the relative accessibility of all centers, the consumer's consumption patterns were reoriented away from the class I places such as Beauford, Sterling Center, Willow Creek, and others, while shifting toward the higher order centers of Mankato, Waseca, Blue Earth, New Ulm, and Fairmont. Modern automobiles, straight roads, new safety equipment, and paving

were important elements in bringing this about. The cost in time and effort per mile for an automobile are considerably less than for a team and wagon. Because time-costs are a primary consideration in influencing the distances people will travel to seek satisfaction maximization, the impact of these innovations and adaptations becomes apparent on the marketing geography of the River Bend Area.

This notion is furthered by the relationship of distance to that of opportunities. It has already been established that a consumer will travel farther to obtain a variety of goods and services than he will to obtain only a few. But at some point in space the idea of diminishing returns is reached beyond which the shopper will review his desires in relation to the time-cost. Thus arises the concept of the "friction of space."

Huff conceptualizes this relationship of opportunities as a curvilinear function. But this same model could be used to explain the characteristics of consumer shopping patterns during various decades, as shown in Fig. 5.12. In 1910 the River Bend Area shopper had to have a considerable number of needs before he would go off to the "store." There he would find a relatively small number of opportunities or offerings; however, the needs and desires of the times were relatively limited, as was surplus capital. By 1960 the ease and speed of travel, relative to 1910, had increased the consumer's alternatives.

The automobile allowed the shopper to travel a much greater distance in a shorter amount of time to satisfy himself. The fewer or simpler his needs, the shorter the distance he will travel; the more varied or complex his requirements, the farther he will go. Nevertheless, the consumer ultimately decides that regardless of how varied the number of offerings and complex his desires, the friction of space will prevent his traveling.

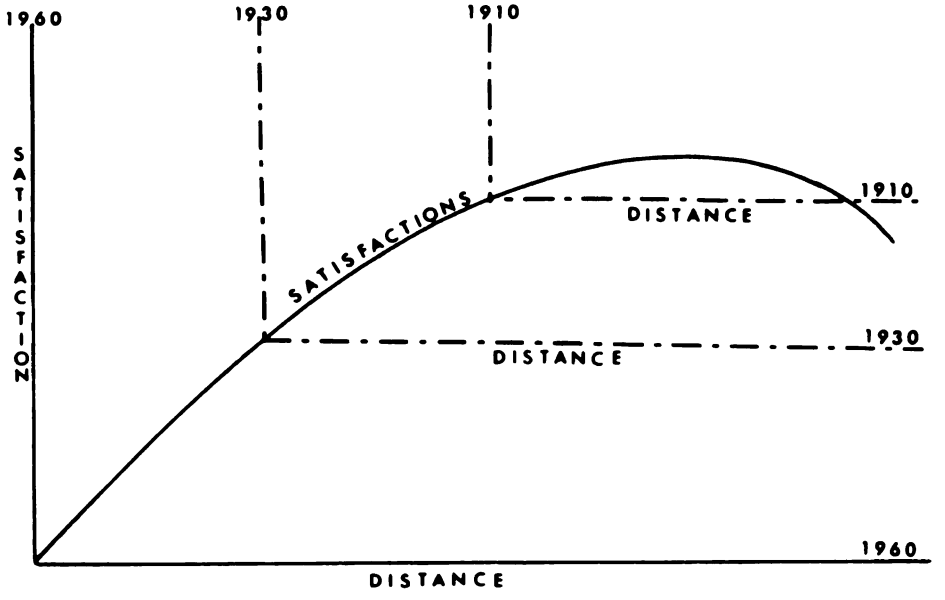

Fig. 5.12.--Chronological relationship of satisfactions and distance in the River Bend Area.

The point of optimum utility becomes obvious when satisfactions and costs are combined, as shown in Fig. 5.13. Where the costs of time and effort are proportionately less than the benefits derived is the point of optimum utility for the consumer. The shopper may not travel to the point at which the costs are lowest but will

go to the point where the greatest satisfaction is realized relative to the time and effort expended.

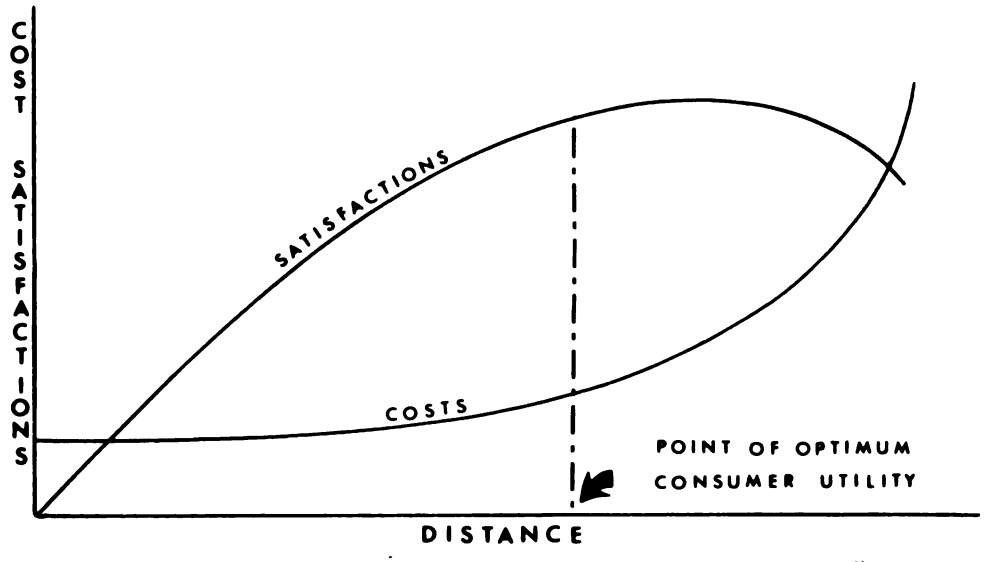

Fig. 3.13.--Determination of optimum consumer utility point.

The perception of benefits versus costs is shown chronologically in Figs. 5.14 through 5.16. The character of consumer's demands have changed in the last sixty years; thus shoppers have altered both the point of optimum utility and the acceptable distance they have established for maximum economy. In 1910 basic consumer satisfactions were realized at relatively short distances; thus the small class I and class II centers of the River Bend Area flourished, largely as a result of the captive nature of their market. As discussed in Chapter IV, the goods and services in these centers were usually diverse enough at least to meet basic needs. By 1930 the point of optimum consumer utility in the River Bend Area had shifted

as time-costs had decreased, transportation speeds had increased and provided more alternatives, while people had increased their disposable income. The point of optimum utility shifted farther away as people were able to realize the maximum satisfaction at larger centers increasingly more distant from their homes, resulting in the decline of the focality of many small rural service centers of the River Bend Area. This trend demonstrated in Figs. 5.14 through 5.16 has been progressing since the turn of the century through 1960, and accounts for the disproportionate growth of the class V through class VII centers, such as Mankato, Fairmont, and New Ulm, and the relative stagnation or decline of the smaller centers discussed previously. (See Fig. 5.17.)

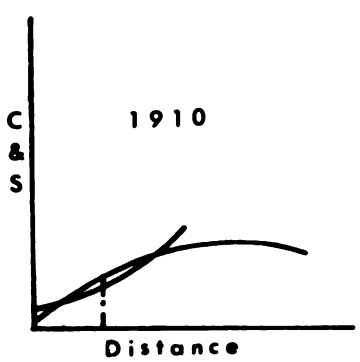

Fig. 5.14.

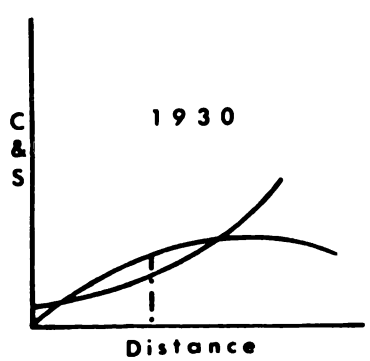

Fig. 5.15

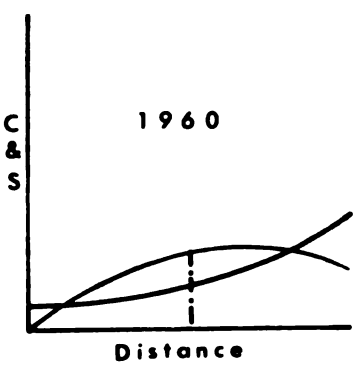

Fig. 5.16

Figs. 5.14, 5.15, and 5.16.--Sequential shift of point of optimum consumer utility resulting from increased speed capabilities and decreasing per mile time-costs.

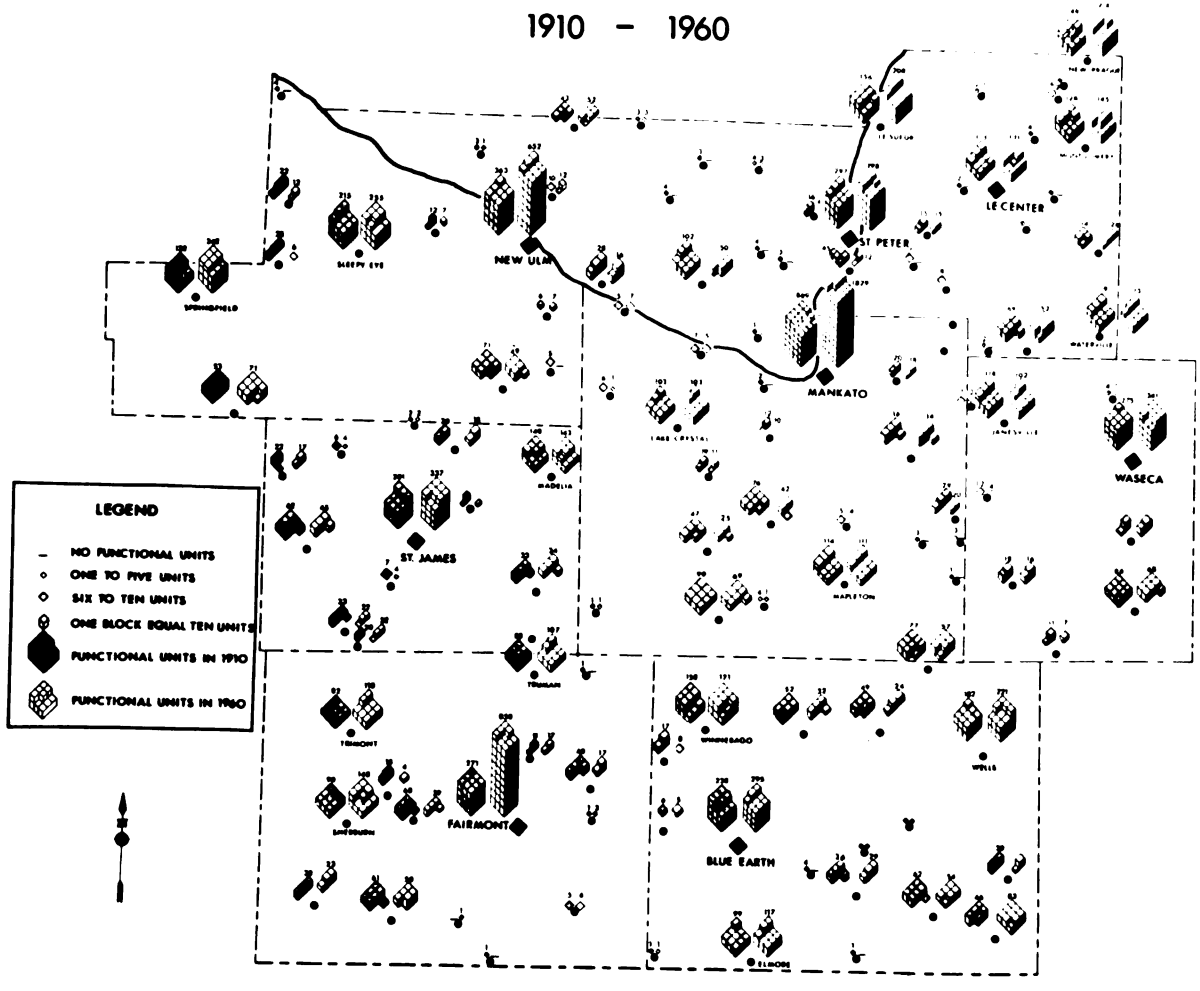
CENTRAL PLACE FUNCTIONS
1910 - 1960
LEGEND
NO FUNCTIONAL UNITS
ONE TO FIVE UNITS
SIX TO TEN UNITS
ONE BLOCK EQUAL TEN UNITS
FUNCTIONAL UNITS IN 1910
FUNCTIONAL UNITS IN 1960
NEW ULM
SPRINGFIELD
SLEEPY EYE
ST PETER
LE CENTER
MANKATO
WASECA
ST. JAMES
MADELIA
FAIRMONT
BLUE EARTH
TRUMAN
TRUMONT
WELLS

Fig. 5.17

Thus when satisfactions and costs to a shopper are placed in a spatial framework, the marketing analyst can explain: (1) the decline in the focality of small centers with a limited number of services, (2) the increase in the focality of large centers, and (3) the changes in the roles and functions these centers perform as their threshold populations change.

Conclusions

As consumers of the River Bend Area have become more mobile with increasing travel rates, market areas have expanded, and cities and towns have literally been converging upon one another. The rate at which the centers have converged has not necessarily been uniform; this has caused marked distortions in their spatial arrangement when distance is diagrammed chronologically rather than in two dimensions. These distortions have altered the accessibility of places and changed the comparative advantages of some centers over others. The impact of time-space convergence upon comparative advantage and allied elements influencing central place growth or decline can be considered as a system or model which can be described schematically as in Fig. 5.18. Those places with the greatest utility or the greatest comparative advantage for consumers have expanded their market areas as the time and effort costs of the shopping journey have declined. These shifts in the spatial character of comparative advantage have also changed consumption patterns. As

shoppers are able to achieve greater satisfactions in less time, they have shifted their orientation from small places to larger ones. The result of this trend has been a decrease in the market area of small centers, i.e., class I and class II, with concurrent expansion of the markets of larger places. The growth and decline of markets have obviously also affected the size of the market population which has determined a center's functions. Those with an expanding threshold population have tended to expand the number and type of functions performed there. Similarly those communities whose thresholds have declined with a loss of comparative advantage have lost some functions while assuming others with a smaller threshold demand; some of those centers whose comparative advantage changed radically disappeared.

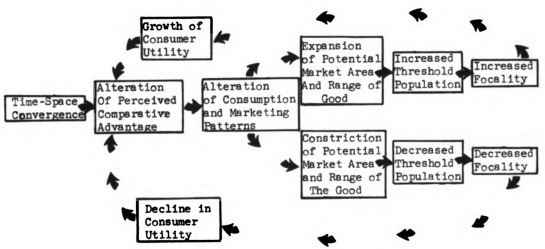

Fig. 5.18.--Model of the impact of time-space convergence upon alteration of perceived comparative advantage.

As some centers have added functions and others have lost them, their consumer utility has changed. When consumer utility has grown, the focality of the center has also grown, thus further increasing that place's relative comparative advantage. For the declining center the converse would be the case. As functions disappear, focality diminishes, causing a decline of consumer utility which alters still further the center's comparative advantage.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND LIMITATIONS

Throughout this study the River Bend Area has been used as a test region for the purposes of applying the notions developed by the author and by others relating to regional growth, central place development, and functional change. Its location within the agricultural interior of the country has had the effect of minimizing the effect of growth and change generated by heavy industry or concentrations of mineral resources. Based upon comparisons with studies of other agricultural regions in the Midwest, the study area appears to have developed in a manner consistent with historical trends of population, retail trade, agricultural production, economic expansion, and transportation. As a result of the consistency of the pattern of development of the region and the lack of extreme exogenous influences upon the area, such as the introduction of large industrial complexes, the River Bend Area has proved to be an excellent location for the testing of the primary premise of this thesis.

The underlying hypothesis of this study has been that time, rather than distance, primarily influences the economic and spatial organization of the River Bend Area

and its central places. Only when the concepts of time and distance are combined can the utility of space for human interaction be perceived in its proper perspective.

The historical-geographic technique illustrates the power of the notion of comparative advantage. In every instance the central places of the River Bend Area developed as a result of a comparative advantage for transportation or access to a basic resource. The perception of a comparative advantage, or the least comparative disadvantage for economic activity tended to begin the process of revenue generation, increased demand, and technological innovation which are primary elements of regional or central place development.

It was also determined that the notion of comparative advantage is not static when viewed historically. One of the primary criticisms this research has made of some contemporary central place research is that it only focuses upon a moment in time rather than using the temporal perspective of change. With new technology and transportation innovation, relative comparative advantage and disadvantage can be significantly altered, resulting in marked changes in the region and its central places.

It has become increasingly apparent in analyzing the River Bend Area that changes in the primary transportation system within and beyond the region have markedly altered not only the economic character of the region but also the roles and functions performed by its market

centers. All too often research on central places has tended to view markets as static elements of an economic landscape. But when viewed in their temporal perspective it becomes obvious that the functions of central places are dynamic and fluid. The regional function of the River Bend Area central place tended to adjust to changes in transportation technology and relative accessibility as well as to such factors as price and demand changes. These factors tend to influence consumer tastes. Rising production efficiency raises disposable income which increases consumption, thus generating new sources of employment, which in turn produces higher demands.

Such factors as demand, surplus capital, etc., influence not only the type of functions a center performs but also the number or variety of services it offers. As markets expand and threshold populations increase, some centers are capable of offering more goods and services. But at the same time as one market grows the potential of other centers declines. Thus the growth and expansion of some market centers often can account for the loss or decline of the focality of others.

Analysis of the functions that River Bend Area commercial centers have performed over the past seven decades has made it apparent that it is possible to develop a ranking system of central places and their functions. This hierarchy is not based upon the population of the center but upon the number and type of

functions it performs. When all the central places of the region are ranked according to size at different times, there is a high correlation among the curvilinear functions that all the centers assumed from decade to decade. By fitting regression lines to portions of the curves the existence of a hierarchy of places within the region was determined. From this data it was possible to classify the functions that each level of center performed.

Certain size centers characteristically performed similar services. Thus, a profile of community functions for each level of the hierarchy in each decade was developed. The changes in these functional profiles provided clues to the changes in consumer demand occurring as the economy and transportation of the region were altered.

Analysis of the community profiles also revealed that many small towns may outwardly appear to be dying or even dead, but their demise is often more apparent than real. Though the old business centers may be almost abandoned, perhaps even more functions are being performed by the community than at other times. Both the form and function of the services have changed. Rather than retail consumer sales of the "main street" variety, the community may have reoriented itself toward providing goods and services located away from the old commercial core, i.e., service stations, fuel, feed, and fertilizer sales, bulk oil and propane gas distribution, machinery repairs, implement sales, etc.

After comparing the community functional profiles, which enumerated the number and type of goods and services available in each place, it became necessary to discard the notion of the existence of the single dominant regional center. Although the largest community in the River Bend Area is almost twice the size, in terms of the number of functions it performs, as the next largest centers, the types of goods and services it offered are essentially the same. The primary advantage of the dominant center lies in the alternatives of choice available to the consumer and the great accessibility this place has for both wholesale and retail operations.

Accessibility is fundamental to the perception of comparative advantage. Highly accessible places also tend to have relatively greater comparative advantage for retail sales. A high correlation exists in the River Bend Area between places with great focality for retail commercial trade and the number of direct road connections these places have to other central places of the region.

As the consumer has been freed from slow, cumbersome forms of transportation, such as the horse and wagon, and has traveled with decreasing time or cash expense, the comparative advantage of the small center has declined while the large center's has grown. Time is a primary concern in the journey to shop. It is often perceived as being equivalent to a cash expenditure or a cost. Thus as the time necessary to travel to market has declined,

through improvements in automobiles and roads, the distances which a consumer will travel to purchase have lengthened. Growth in consumption, greater income surpluses, and changing retail patterns have all contributed to the decline of many of the small towns and hamlets of the study area and the increased focality of larger centers.

Analysis of space in terms of time, rather than linear distance, produces a theoretical convergence of points or central places. Market centers which sixty years ago were hours distant are now only minutes away. When the changing time-distance relationships of central places are coupled with increased mobility, small market centers with limited choices of goods and services have diminishing utility. At the same time the larger, though more distant, center which has a great variety and selection becomes more attractive.

The combination of time and distance is particularly attractive for spatial analysis. Distance is immutable, but the time it takes to overcome space varies with the medium employed. Thus as the automobile has reduced the time-cost of shopping, the market area and population of the small service center have shrunk, resulting in a loss of comparative advantage and focality. On the other hand, the larger center has enhanced its comparative advantage over time while expanding its service area. Increased threshold populations have helped to develop more or new types of businesses which further enhance focality. The

result of this process is the growth and expansion of those places with the greatest relative comparative advantage; those centers with little focality and comparative advantage stagnate, decline, or even disappear.

This research has been intentionally heuristic. It has examined how regional development and central place function relate to economic growth and change. But the research remains ideographic, because it can generalize only about the study area. Since it has not tested any of the relationships in other regions or nationally, it cannot be considered to be all inclusive. Nevertheless, it would be unfair to discount the applicability of the research for other problems in market analysis. The implications of this study may transcend the River Bend Area and find application in the study of other problems. But it must be noted that this dissertation only analyzes the economic, technological, and transportational factors relating to regional and central place growth and change. It tends to neglect many of the socio-cultural or political forces at work that must also be considered as influences in central place reorganization. Many of the ideas presented here may need further refinement in other studies and other areas.

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APPENDICES

TABLE A.1.--Average frequency of occurrence of functions in class I centers, River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
539	General Store	1.02	.81	.88	.90	.80	.52	.41
751	Blacksmith	.57	.28	.22	.08		.03	
202	Creamery	.53	.55	.36	.36	.40	.35	.15
204	Grain Elev	.39	.28	.19	.11	.13	.26	.24
2421	Saw Mill	.20	.09					
521	Lumber	.04	.04			.07	.03	.03
54	Grocery	.04	.04	.03	.05	.10	.29	.15
5251	Hardware	.04						
5252	Farm Machinery	.02			.03	.03		.03
701	Hotel	.02	.02					
725	Shoe & Harness	.02	.04					
5812	Restaurant		.02		.05	.17	.13	.21
60	Bank			.03				
4242	Drayage			.03				
75	Auto Repair			.03	.19	.17	.26	.15
554	Service Station				.03	.13	.26	.24
553	Auto Parts				.03			
1441	Sand & Gravel				.03	.07	.03	.06

TABLE A.1.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
5092	Bulk Oil					.03	.03	.12
4223	Cold Storage						.03	.03
3591	Machine Shop						.03	
594	Books							.03
76	Misc Repair							.03
719	Hatchery-- Stock Yards							.03
	n =	54	47	36	36	30	31	34

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

TABLE A.2.--Average frequency of occurrence of functions in class II centers, River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
554	Service Station				.40	1.44	1.17	1.36
5812	Restaurant	.70	.85	.51	.94	1.50	1.83	1.27
204	Grain Elev	1.18	1.73	1.36	.63	.67	.77	1.23
54	Grocery	.52	.42	.59	1.06	1.22	1.63	1.03
60	Bank	.27	.58	.97	.80	.50	.63	.77
539	General Store	1.94	2.00	1.72	1.69	1.14	1.06	.72
75	Auto Repair			.69	1.20	1.03	1.26	.73
5252	Farm Machinery	.21	.39	.49	.49	.41	.31	.60
5092	Bulk Oil					.25	.40	.57
202	Creamery	.88	.85	.69	.83	.78	.71	.50
5251	Hardware	.48	.52	.62	.51	.47	.60	.43
521	Lumber	.39	.79	.72	.43	.33	.40	.33
751	Blacksmith	1.70	1.12	.82	.80	.61	.23	.30
4223	Cold Storage					.03	.09	.20
719	Hatchery					.14	.20	.13
271	Newspaper	.12	.03	.05	.06	.08	.11	.13
76	Misc Repair	.09	.03	.03			.11	.13
591	Drugs	.27	.30	.41	.34	.19	.17	.13
4242	Drayage	.06	.03	.15		.03	.06	.10
572	Appliances						.03	.10
1441	Sand & Gravel			.03				.06
801	Physician	.21	.09	.15	.09	.11	.06	.06
598	Fuel & Ice	.06	.03	.07	.03			.06
3591	Machine Shop						.06	.06
597	Jewelry	.03	.03					.03

TABLE A.2.--Continued

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
573	Music				.06	.03		.03
524	Electric Supply				.03			.03
5093	Junk					.11		.03
504	Wholesale Grocery						.03	.03
533	Variety Store							.03
553	Auto Parts				.06			.03
726	Mortuary							.03
79	Amusements		.06	.10	.34	.19	.14	
5511	Auto Dealer			.05	.09	.06	.11	
701	Hotel	.85	.61	.46	.20	.08	.09	
522	Plumbing & Heating					.06	.09	
503	Wholesale Clothing & Notions						.06	
725	Harness & Shoe Repair	.42	.33	.43	.31	.22	.06	
5999	Misc Retail					.03		
594	Books & Stationary					.03		
729	Livery	.33	.45	.33				

TABLE A.2.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
56	Clothing	.18	.06	.15				
2421	Saw Mill	.21		.03				
806	Hospital			.03				
192	Nursery		.03	.03				
721	Laundry		.03	.03				
81	Lawyer	.03						
	n =	33	33	39	35	36	34	30

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

TABLE A.3.--Average frequency of occurrence of functions in class III centers, River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
54	Grocery	3.15	3.03	4.16	4.38	4.83	4.54	4.04
554	Service Station				.94	4.93	3.75	3.79
5812	Restaurant	4.65	3.83	2.63	2.47	3.59	4.42	3.29
204	Grain Elev	3.50	3.43	2.69	2.19	1.90	1.88	3.00
75	Auto Repair		.06	2.00	2.88	2.07	3.00	2.71
591	Drugs	1.50	1.09	1.33	1.68	1.54	1.65	1.91
5911	Furniture	1.27	1.00	.70	.45	.29	.25	.22
60	Banks	1.42	1.77	2.16	1.56	1.10	1.04	1.17
539	General Store	5.19	3.74	3.31	2.75	2.03	1.46	1.08
5092	Bulk Oil	.15	.03	.06	.44	.69	.79	1.04
271	Newspaper	1.12	1.00	1.13	1.03	1.00	.92	.92
5251	Hardware	2.15	1.77	2.06	1.59	1.83	2.54	2.33
5252	Farm Machinery	1.77	.89	1.06	1.53	1.69	1.96	2.00
801	Physician	1.92	1.89	1.63	1.56	1.46	1.40	1.38
202	Creamery	1.27	1.31	1.34	1.03	1.13	1.38	1.21
56	Clothing	2.27	1.97	1.75	2.00	1.34	1.16	1.21
726	Mortuary	.58	.46	.63	1.03	1.00	1.00	.75
5511	Auto Dealer			.63	.78	1.38	1.00	.75
751	Blacksmith	3.85	2.77	2.09	1.56	1.21	.54	.75
521	Lumber	1.50	1.33	1.44	.88	.76	.54	.66
522	Plumbing & Heating			.06	.13	.21	.50	.83
76	Misc Repair	.08	.06	.06	.03	.03	.29	.58
533	Variety Store		.06	.22	.38	.41	.42	.54
4223	Cold Storage	.04				.02	.29	.50
725	Harness & Shoe	2.38	1.86	1.53	1.34	1.00	.42	.46
597	Jewelry	.92	.69	.69	.88	.52	.42	.46

TABLE A.3.--Continued

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
719	Hatchery		.03	.03		.62	.92	.46
79	Amusements	.69	.94	1.31	1.31	.72	.71	.46
721	Laundry	.12	.40	.44	.38	.38	.54	.42
4242	Drayage	.35	.36	.31	.15	.10		.42
1441	Sand & Gravel			.03	.03	.14	.13	.25
573	Music	.08	.06	.09	.16	.07		.25
701	Hotel	2.00	1.68	1.31	.72	.48	.38	.25
572	Appliances					.07	.29	.21
192	Nursery	.08	.03	.06	.03		.13	.21
523	Paint & Wallpaper		.11	.22	.25	.21	.29	.18
553	Auto Parts			.06	.72	.90	.54	.18
504	Wholesale Grocery		.03	.09	.06	.07	.13	.13
592	Liquor					.07	.04	.13
5994	News Dealer		.31	.03	.06	.03	.04	.13
531	Department Store	.04						.13
598	Fuel & Ice	.27	.31	.34	.13	.17	.13	.08
5999	Misc Retail	.15	.03	.06	.25	.07		.08
5095	Wholesale Beverage	.23	.20			.07	.08	.08
524	Electrical Supply			.19	.38	.38	.33	.08
722	Photo Studio	.62	.60	.50	.44	.24	.04	.04
81	Lawyer	1.42	1.00	.91	.71	.43	.32	.42
729	Livery	1.27	1.17	.59				
73	Rent Equip			.09		.17	.08	.13
508	Wholesale Machine & Supply				.06	.10		.08
596	Farm & Garden					.03	.13	.08

TABLE A.3.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
3591	Machine Shop	.12	.17	.16	.09	.17		.08
2421	Saw Mill	.12	.11	.13				.08
5093	Junk		.03	.06	.06	.07	.04	.04
5992	Florist				.04		.04	.04
594	Book & Stationary	.04	.06					.04
503	Wholesale Notions & Clothing						.13	
593	2nd Hand					.03	.04	
2482	Brewery	.19	.14	.06	.03	.10		
806	Hospital		.03	.03	.09	.10		
505	Wholesale Hides			.03				
	n =	26	35	32	32	29	24	24

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

TABLE A.4.--Average frequency of occurrence of functions in class IV centers, River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
5812	Restaurant	11.83	10.86	8.86	5.00	10.13	9.56	7.88
539	General Store	8.11	5.86	5.57	4.00	1.63	1.88	1.88
54	Grocery	8.00	7.86	10.71	10.80	12.50	10.11	10.12
751	Blacksmith	7.00	5.71	4.14	2.60	2.38	1.36	1.00
81	Lawyer	5.89	5.86	5.00	4.00	4.00	4.00	4.20
801	Physician	5.78	5.14	5.86	5.20	4.25	4.40	5.00
701	Hotel	5.44	5.00	4.00	2.20	1.76	1.44	1.88
204	Elevator	5.44	3.43	4.71	3.20	3.25	3.11	4.63
725	Shoe & Harness Repair	5.11	3.86	3.71	3.40	2.38	1.00	1.00
591	Drugs	3.25	3.50	1.80	2.20	2.00	2.00	2.25
5911	Furniture	2.50	2.20	3.50	2.20	1.80	2.00	1.80
5251	Hardware	4.22	3.29	4.14	2.20	3.50	5.22	6.13
5252	Farm Machinery	3.44	2.00	1.85	2.00	2.50	4.22	4.63
271	Newspaper	3.22	3.00	3.43	2.40	1.38	1.44	1.75
729	Livery	3.00	2.61	1.57				
521	Lumber	2.89	2.43	2.58	1.80	1.13	2.44	2.00
60	Bank	2.44	3.43	4.00	2.60	1.50	1.78	1.88
597	Jewelry	2.33	2.29	2.71	2.20	1.88	1.78	1.38
722	Photo Studio	2.22	1.57	1.71	1.40	1.00	1.22	1.00
2482	Brewery	2.00	2.00	1.00	.40	.38	.11	.50
721	Laundry	1.89	2.57	2.71	3.00	2.38	1.88	1.50
79	Amusements	1.67	2.86	3.29	1.80	1.63	1.78	.88
202	Creamery	1.67	2.86	3.29	1.80	3.63	2.44	2.38
726	Mortuary	1.33	1.14	1.57	1.40	1.88	1.78	2.00

TABLE A.4.--Continued

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
76	Misc Repair	1.11				.75	1.11	2.13
598	Fuel	1.00	1.57	1.14	1.20	1.00	.78	.50
4242	Drayage	1.00	.49	.57		.25	.67	.75
5095	Beverages	1.00	.29			.50	1.11	.63
573	Music	.89	1.14	1.43	1.60	.75	.67	.63
192	Nursery	.78	.71	.86		.50	.44	.88
5092	Bulk Oil	.67	.74	.83	1.00	1.63	1.67	2.63
5999	Misc Retail	.56	.86	1.17	.80	.38	.53	.26
3591	Machine Shop	.44	.86	.29		.25	.67	.88
594	Books & Stationary	.33	.43				.22	.25
5992	Florist	.33		.50	.40	.38	.11	.50
523	Plumbing & Heating	.22	.71	1.14	1.00	1.00	1.00	.75
73	Equip (Rent)	.22					.89	1.13
2421	Saw Mill	.11	.29	.29			.11	.25
504	Wholesale Grocery	.11		.29	.60	.75	.56	.13
572	Appliances	.11	.14	.17		.50	1.56	1.88
806	Hospital	.11		.86	.80	.50	.56	.25
508	Wholesale Machine Supply	.11			.40	.38		.25
5093	Junk	.11	.14	.67		.13	.11	.25
592	Liquor	.11	.14					.13
533	Variety Store	.11		1.57	1.40	1.50	1.67	1.75
531	Department Store	.11	.14	.29	.60	.38	.11	.25
5994	News Dealer	.11	.29		.40	.13	.78	1.00
5511	Auto Dealer		.43	3.00	1.80	3.88	4.89	3.13
553	Auto Parts		.14	.50	2.00	2.00	1.00	.50

TABLE A.4.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
522	Paint, Glass & Wallpaper		.14	1.00	1.80	1.75	2.89	3.13
524	Electrical Supply			.33	1.40	1.63	1.00	.13
554	Service Station			.17	1.60	10.75	6.56	8.12
505	Wholesale Hides			.17				
719	Hatchery			.17	.40	1.75	3.44	1.38
75	Auto Repairs			5.57	6.80	4.39	5.00	4.25
1441	Sand & Gravel						.56	.25
503	Wholesale Notions & Clothing						.22	.13
5992	Photo Supply						.11	.13
4223	Cold Storage						.11	.50
596	Farm & Garden						.11	.63
5098	Wholesale Bldg Prod						.11	
5999	Mobile Homes							.13
	n =	9	7	5	5	8	9	8

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

TABLE A.5.--Average frequency of occurrence of functions in class V centers, River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
54	Grocery			14.00	19.00		14.00	12.00
75	Auto Repairs			9.00	13.50		5.00	5.00
56	Clothing			15.00	10.50		7.00	8.00
5812	Restaurant			26.00	9.50		17.50	10.00
591	Drugs			5.00	3.50		3.00	4.00
5711	Furniture			3.00	2.50		3.00	4.00
539	General Store			10.00	5.00		1.50	2.00
554	Service Station				5.00		11.00	12.00
204	Grain Elevator			8.00	4.50		5.00	5.00
701	Hotel			6.00	4.00		2.50	2.00
726	Mortuary			3.00	4.00		2.00	2.00
553	Auto Parts				4.00		2.00	3.00
202	Creamery			6.00	4.00		5.00	5.00
60	Bank			4.00	4.00		2.00	2.00
522	Plumbing & Heating			2.00	3.50		4.50	3.00
725	Shoe & Harness Repair			3.00	3.50		2.00	2.00
597	Jewelry			3.00	3.50		2.00	3.00
523	Paint, Glass & Wallpaper			1.00	3.50		1.50	1.00
79	Amusements			1.00	3.50		1.50	1.00
271	Newspaper			6.00	3.50		2.00	2.00
722	Photo Studio			4.00	3.00		1.00	2.00
5251	Hardware			5.00	3.00		10.00	5.00
524	Electrical Supplies				2.50		2.50	3.00
721	Laundry & Dry Cleaners			1.00	2.50		5.50	5.00

TABLE A.5.--Continued

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
751	Blacksmith			4.00	2.50		2.50	1.00
5092	Bulk Oil				2.50		3.50	2.00
5511	Auto Dealer			3.00	2.50		4.00	3.00
5999	Misc Retail			2.00	2.50		1.00	
598	Ice, Fule & Coal			1.00	2.00		1.00	1.00
5252	Farm Implements			1.00	2.00		5.00	6.00
573	Music, Pianos & Records			2.00	2.00		1.50	1.00
2482	Brewery			3.00	2.00		1.00	1.00
76	Misc Repairs				1.50		3.50	5.00
504	Wholesale Groceries			1.00	1.50		1.50	
521	Lumber			5.00	1.50		1.00	1.00
192	Nursery			2.00	1.00		.50	
533	Variety Store			2.00	1.00		3.00	2.00
806	Hospital			3.00	1.00		.50	1.00
4242	Drayage			1.00	.50		2.50	1.00
572	Appliances				.50		1.00	2.00
5992	Florist				.50		1.50	1.00
5994	News Dealer				.50		.50	2.00
531	Department Store				.50			
3591	Machine Shop				.50		.50	1.00
5094	Wholesale Tobacco & Candy				.50			1.00
719	Hatchery, Stock Yards & Auction						2.50	1.00
592	Liquor						.50	1.00
594	Books and Stationary						.50	

TABLE A.5.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
508	Wholesale Machinery & Supplies						.50	
73	Misc Business Agencies						1.50	1.00
4223	Cold Storage						.50	.50
503	Wholesale Notions & Clothing						1.00	
5095	Beverages						.50	1.00
596	Farm & Garden Sup						1.00	
5093	Junk						.50	
5995	Photo Supply						1.50	
801	Physician			9.00	12.82		14.50	20.00
4832	Radio or TV Sta							
5599	Mobile Homes							
81	Lawyer			6.00	8.50		7.50	7.00
729	Livery			2.00				
	n =			1	2		2	1

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

TABLE A.6.--Average frequency of occurrence of functions in class VI centers River Bend Area, 1900-1960

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
5812	Restaurant	26.00	25.00	19.00		20.50	17.50	23.00
554	Service Station			1.00		22.00	18.50	18.50
521	Grocery	57.00	53.00	43.00		23.50	22.00	16.50
801	Physician	20.00	20.00	20.00		16.50	16.50	17.00
75	Auto Repair			15.00		7.50	15.00	14.00
56	Clothing	26.00	30.00	21.00		12.50	15.50	13.00
591	Drugs	7.00	7.00	7.00		6.00	5.00	6.00
571	Furniture	6.00	4.00	5.00		4.50	3.50	5.00
204	Grain Elevator	12.00	10.00	9.00		4.50	5.50	9.50
522	Plumbing & Heating	2.00	1.00	1.00		3.50	7.50	8.00
523	Paint, Glass	2.00	2.00	6.00		1.50	2.50	7.50
5251	Hardware	8.00	10.00	8.00		8.00	9.00	8.00
5252	Farm Machinery					5.00	6.00	7.50
76	Misc Repair	8.00	2.00	4.00		2.50	6.00	7.00
5511	Auto Dealer		3.00	9.00		4.00	8.50	6.00
202	Creamery	4.00	3.00	3.00		3.50	3.00	5.50
521	Lumber	4.00	6.00	5.00			4.00	5.50
553	Auto Parts			7.00		6.50	6.00	5.00
73	Rental Equip					.50	5.50	5.00
573	Music	2.00	5.00	3.00		1.00	3.00	4.50
722	Photo Studio	5.00	7.00	3.00		3.00	2.50	4.50
721	Laundry	7.00	12.00	8.00		4.50	6.50	4.00
5999	Misc Retail			3.00		2.00	1.50	4.00
271	Newspaper	9.00	7.00	6.00		7.00	5.50	4.00
4242	Drayage	1.00	1.00	3.00		2.00	1.50	3.50

TABLE A.6.--Continued

SIC No.*	Function	Year						
		1900	1910	1920	1930	1940	1950	1960
5092	Bulk Oil	1.00	2.00	1.00		5.00	3.50	3.50
597	Jewelry	7.00	7.00	6.00		3.00	3.00	3.50
725	Shoe & Harness Repair	10.00	5.00	8.00		3.50	2.25	3.50
719	Hatchery & Auction	10.00	7.00	3.00			4.50	3.00
60	Bank	6.00	8.00	10.00		3.00	2.00	3.00
539	General Store	9.00	9.00	11.00			3.50	3.00
701	Hotel	9.00	8.00	7.00		3.50	4.50	2.50
772	Appliances	2.00	1.00	1.00		1.50	2.50	2.50
5095	Beverages	4.00	1.00				1.25	2.50
192	Nursery	4.00	2.00	1.00			1.00	2.50
751	Blacksmith	17.00	11.00	7.00		3.50	2.50	2.50
524	Electrical Supply					1.00	3.00	2.50
2482	Brewery	3.00	4.00	2.00		2.50	1.25	2.50
589	Fuel & Ice	7.00	6.00	3.00		1.50	1.50	2.00
726	Mortuary	5.00	3.00	4.00		1.50	3.00	2.00
79	Amusements	1.00	6.00	7.00		2.00	2.00	2.00
5994	News Dealer	1.00	5.00	3.00			3.00	2.00
807	Medical Lab						.50	1.50
594	Book & Stationary	2.00	3.00	2.00		1.00	.50	1.50
4832	Radio Station							1.50
806	Hospital	2.00	2.00	1.00		3.00	1.50	1.50
5093	Junk						1.50	1.50
508	Wholesale Machinery	2.00	1.00			.50	1.00	1.50
531	Department Store	1.00	1.00	1.00		1.00	.50	1.00
5992	Florist	1.00	2.00	1.00			1.50	1.00
5599	Mobile Homes							1.00

TABLE A.6.--Continued

SIC No.*	Function	Year 1900	1910	1920	1930	1940	1950	1960
4223	Cold Storage					.50	1.00	1.00
5995	Photo Supply			1.00			.50	1.00
596	Farm & Garden			2.00			1.50	1.00
592	Liquor	2.00				1.50	3.50	1.00
533	Variety Store	1.00	1.00	1.00		1.00	1.00	1.00
3591	Machine Shop	2.00	1.00	2.00		1.00	2.00	.50
593	2nd Hand							
81	Lawyer	29.00	24.00	20.00		15.00	15.00	17.00
504	Wholesale Groc	4.00	4.00	5.00		2.50	2.00	2.00
503	Notions & Clothing Wholesale		2.00	3.00		.50		2.50
	n =	1	1	1		2	2	2

NOTE: Each of the numbers occurring above serve as an index of average expected frequency of occurrence. They may be considered either as a ratio 1:n or a percentage of the total possible.

*SIC No. refers to the Standard Industrial Classification Number used by the U.S. Census in classifying types of industrial, commercial, and service activity.

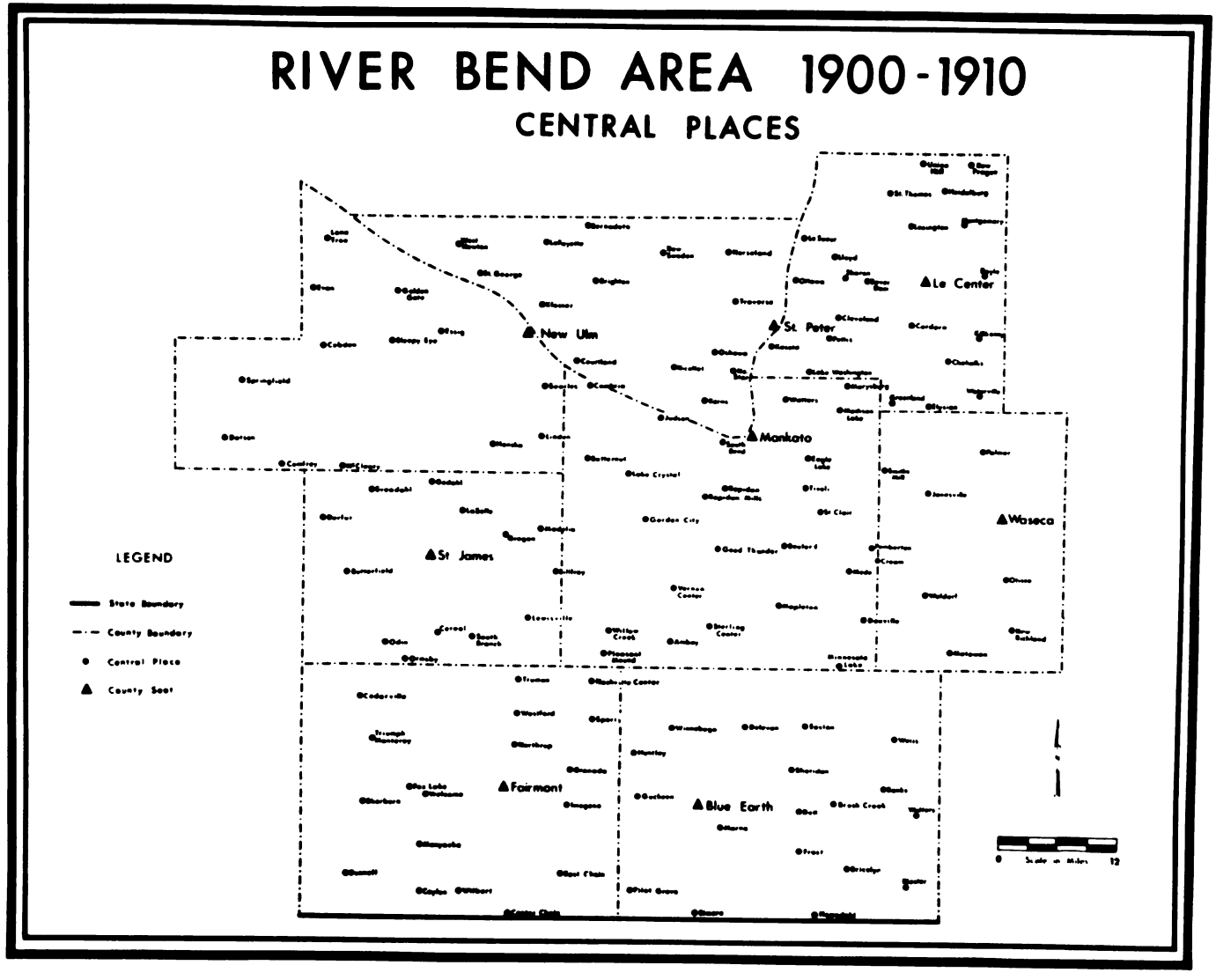
RIVER BEND AREA 1900-1910
CENTRAL PLACES
LEGEND
State Boundary
County Boundary
Central Place
County Seat
New Ulm
St. Peter
Le Center
Mankato
St James
Waseca
Fairmont
Blue Earth

Fig. A.1

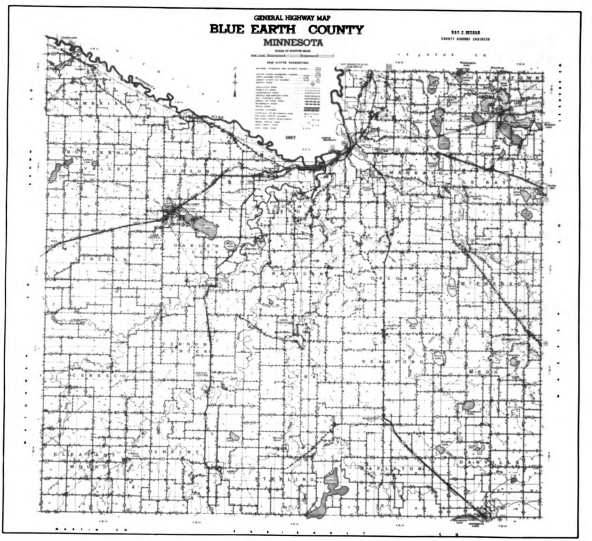

Fig. A.2

APPENDIX

The technique employed in assigning the loaded functional values to each type of functional unit was based upon subjective judgments regarding information obtained from the National Retail Merchants Association and the Chamber of Commerce. The criteria employed for the loaded values included: frequency of occurrence of the function, relative size, i.e., floor space, estimated volume of sales generated, estimated hierarchical position, extent of threshold populations and employment.

Though the author recognizes the subjective character of the decisions relating to the loadings, precedent for this technique was established by Brian J. L. Berry, H. G. Barnum, and R. J. Tennant in their article "Retail Location and Consumer Behavior" in the Papers of the Regional Science Association, IX (1962), 74-78, and by T. L. Smith in his monograph "Farm Trade Centers in Louisiana 1901-1931," appearing in the Louisiana Agricultural Experiment Station Bulletin, No. 234, Baton Rouge: University of Louisiana, January, 1933.