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PLANNING REPORT NO. 7

LAND USE — TRANSPORTATION STUDY

INVENTORY FINDINGS 1963

volume one

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Southeastern Wisconsin Regional Planning Commission

Land Use-Transportation Study

Old Courthouse
Waukesha, Wisconsin

Planning Report No. 7

in three parts

volume one

INVENTORY FINDINGS

1963

The preparation of this publication was financed in part through a joint planning grant from the State Highway Commission of Wisconsin, the U. S. Department of Commerce, Bureau of Public Roads and the Housing and Home Finance Agency, under the provisions of the Federal Aid Highway Legislation and Section 701 of the Housing Act of 1954, as amended.

May, 1965

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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STATEMENT OF THE CHAIRMAN

With the approval of the seven counties comprising the Region, the SEWRPC on January 1, 1963, began a three and one-half year Regional Land Use-Transportation Study. The ultimate purpose of this study is the preparation of two of the key elements of an advisory plan for the physical development of the Region: a land use plan and a transportation plan. This report—the first of three—presents a summary of the factual findings of the many required inventories completed as a part of the study to date.

These inventories provide the basis for an analysis of the Region's transportation problems in great depth and thereby permit the sound planning, design, construction, operation, and maintenance of highway and transit facilities throughout the Region. The inventories also provide much valuable and heretofore unavailable data needed for solving drainage, flood control, sewerage, water supply, land and water use, and other resource related problems at the local, state, and federal, as well as regional, level. The inventories provide for all time an invaluable bench mark of historic data upon which future programs and studies can be built.

In accordance with the advisory role of the Commission, this report is herewith transmitted to the governmental agencies comprising the Region for their consideration. Careful review and study of this report by all responsible public officials is urged, since out of this report will grow definitive plans and specific recommendations for both public works facilities and land and water development and management policies. These will be set forth in two succeeding reports and will require implementation, not only by local, state, and federal agencies of government, but by private action as well.

The Commission has not come this far alone. It has taken many man-hours, many dollars, and much cooperative effort between state, federal, and local units of government and private enterprise to complete the necessary inventories and bring this volume into being. The assistance of the cooperating and participating agencies is hereby gratefully acknowledged. It is to the continuation of this same spirit of cooperation—so essential to any implementation of the regional advisory plans that will follow—that this report is hopefully dedicated.

Respectfully submitted,

George C. Berteau
Chairman

Acknowledgments

The completion of the regional land use-transportation study inventories and publication of the findings in this report were made possible only through the cooperation and assistance of many individuals, agencies of government, and private businesses within the Region.

The genuine interest shown in the study and the courtesies shown to the Commission staff by the many municipal, county, state, and federal employees, elected governmental officials, business executives, and university faculty, who gave so freely of their time to the study through participation in the work of the Technical Coordinating and Advisory Committee and through individual consultation, were most gratifying. Particular acknowledgment is due the governmental agencies which assigned resident staff to the study, including the City and County of Milwaukee, the State Highway Commission of Wisconsin, the Wisconsin Conservation Commission, the U. S. Bureau of Public Roads, and the U. S. Soil Conservation Service. In addition, the State Committee on Water Pollution, State Board of Health, and U. S. Public Health Service provided valuable assistance in the form of equipment, laboratory services, and technical consultation. Particular acknowledgment is also due the seven county park and planning agencies and the seven county historical societies within the Region, the several planning and engineering consultants, the Milwaukee & Suburban Transport Corp., the Wisconsin Electric Power Company, and the Wisconsin Telephone Company for their invaluable assistance on the inventories.

Completion of the inventories would, of course, have been impossible without the willing and dedicated efforts of the many temporary Commission employees who performed their often difficult and tiring tasks with a devotion that would be a credit to any career profession. Finally, the willing cooperation of the thousands of citizens within the Region who took the time to complete the survey questionnaires in a spirit of good citizenship should be acknowledged.

The assistance, encouragement, and courtesy of all these individuals and agencies are hereby gratefully acknowledged.

Table of Contents

APPENDICES

Table | Chapter III | Page

Chapter IV

Table | Chapter V | Page

Chapter VI

Chapter VII

Chapter VIII

Table Page

Chapter IX

Appendix

List of Figures

Chapter IX

Appendix

List of Maps

Chapter I

INTRODUCTION

The Southeastern Wisconsin Regional Land Use-Transportation Study represents the first major transportation planning effort within this country to be carried out entirely by a legally constituted comprehensive regional planning agency as an integral part of its work program. An understanding of the need for, and objectives of, regional planning and of the manner in which these needs and objectives are being met in southeastern Wisconsin is, therefore, necessary to a proper understanding and appreciation of the regional land use-transportation study and its findings and recommendations.

NEED FOR REGIONAL PLANNING

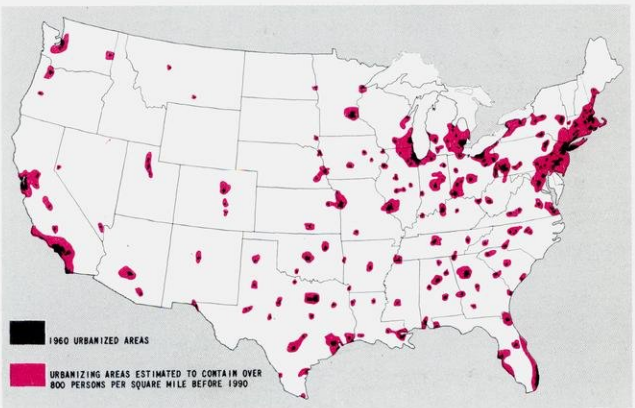
The need for regional planning has been brought about by certain important social and economic changes which, while national phenomena, have far-reaching impacts on the problems facing local government. These changes include: unprecedented population growth and urbanization, much of it in the form of urban sprawl; greatly increased agricultural and industrial productivity; increasing income levels and leisure time; mass recreational needs and pursuits; intensive use and consumption of natural resources; private water supply and sewage disposal systems; far-flung electric power and communication networks; limited access highways; and mass automotive transportation.

Under the impact of these changes, entire regions, such as southeastern Wisconsin, are becoming mixed rural-urban areas (see Figure 1). This, in turn, is creating new and intensified areawide development problems of an unprecedented scale and complexity. Rural as well as urban people must increasingly concern themselves with these problems or face irreparable damage to their communities and to their land and water resources.

The areawide problems which necessitate a regional planning effort in southeastern Wisconsin have their source in the unprecedented population growth and urbanization occurring in the Region. These areawide problems include among others: drainage and flood control, water supply and pollution, sewerage and sewage disposal, park and open-space reservation, economic development, changing land use, and transportation. These areawide problems transcend the boundaries of any one municipality. Officials and citizens alike who are daily involved in such areawide problems have come to realize that these problems can only be resolved within the context of a comprehensive regional planning effort.

Figure 1

URBANIZING REGIONS OF THE UNITED STATES



The population of the United States is concentrating in approximately 200 large metropolitan regions, the 1960 urbanized areas of which are shown in the figure above. Yet within these metropolitan regions the urban population is decentralizing, spreading out across city, county, and state boundary lines. If existing trends continue, many of these urbanized areas will have merged before 1990 to form huge conurbations. Population densities in rural areas adjacent to these conurbations will have risen to such levels that these adjacent areas will no longer be truly rural, but rather social, economic, and physical urban complexes.

Source: U. S. Bureau of the Census; Map by Dr. Calvin L. Beale, "Population Onslaught," The Furrow, January-February 1965 (Moline: Deere & Company).

Sound regional planning must be relatively long range, looking well beyond the obvious needs of the moment and attendant expedient solutions. It must be comprehensive; that is, it must consider and weigh all aspects of regional development and relate all of these aspects to common unifying objectives. Only in this way can intelligent decisions be made about relative needs and resources applied effectively to the areas of greatest need. Finally, sound regional planning must coordinate all related planning activities within a given geographic area without regard to jurisdictional

boundaries. Regional plans must, therefore, be developed cooperatively with all agencies and levels of government operating within a region and with private enterprise, and must be capable of joint implementation.

THE REGIONAL PLANNING COMMISSION

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) represents an attempt to provide such areawide planning services for one of the large urbanizing regions of the nation. The Commission was created in August 1960, under the provisions of Section 66.945 of the Wisconsin Statutes, to serve and assist the local, state, and federal units of government in planning for the orderly and economic development of southeastern Wisconsin. The role of the Commission is entirely advisory; and participation by local units of government in the work of the Commission is on a voluntary, cooperative basis. The Commission itself is composed of 21 citizen members who serve without pay, three from each county within the Region. The powers, duties, and functions of the Commission and the qualifications of the Commissioners are carefully set forth in the state enabling legislation. The Commission is authorized to employ experts and a staff as necessary for the execution of its responsibilities. Basic funds necessary to support Commission operations are provided by the member counties, the budget being proportioned among the several counties on the basis of relative equalized valuation. The Commission is authorized to request and accept aid in any form from all levels and agencies of government for the purpose of accomplishing its objectives and is authorized to deal directly with the state and federal governments for this purpose. The Commission, its committee structure, and its staff organization, together with its relationship to the constituent counties, are shown in Figure 2, page 8.

THE REGIONAL PLANNING CONCEPT IN SOUTHEASTERN WISCONSIN

Regional planning as conceived by the Commission is not a substitute for, but a supplement to local planning, which necessarily exists to solve local development problems. Its objective is to aid in the solution of areawide development problems which cannot be properly resolved within the framework of a single municipality or a single county.

As such, regional planning has three principal functions:

1. Areawide research; that is, the collection, analysis, and dissemination of basic planning and engineering data on a continuing, uniform, areawide basis so that, in light of such data, the various levels and agencies of government, private enterprise, and interested citizens within the Region can better make decisions concerning community development.

2. Preparation of a framework of long-range plans for the physical development of the Region, these plans being limited to those functional elements having areawide significance. To this end the Commission is charged by law with the function and duty of "making and adopting a master plan for the physical development of the Region." The permissible scope and content of this plan as outlined in the enabling legislation extends to all phases of regional development, implicitly emphasizing, however, the preparation of alternative spatial designs for the use of land and for the supporting transportation and utility facilities.

3. Provision of a center for the coordination of the many planning and plan implementation activities carried on by the various levels and agencies of government operating within the Region.

The work of the Commission is, therefore, visualized as a continuing planning process providing many outputs of use throughout the Region—outputs of great value to the making of development decisions by public and private agencies and to the preparation of plans and plan implementation programs at the local, state, and federal levels. The work of the Commission emphasizes close cooperation between the governmental agencies and private enterprise responsible for the development and maintenance of land uses and for the design, construction, operation, and maintenance of their supporting public works facilities. All of the Commission work programs are intended to be carried out within the context of a continuing planning program which provides for the periodic reevaluation of the plans produced as well as for the extension of planning information and advice necessary to convert the plans into action programs.

The Region

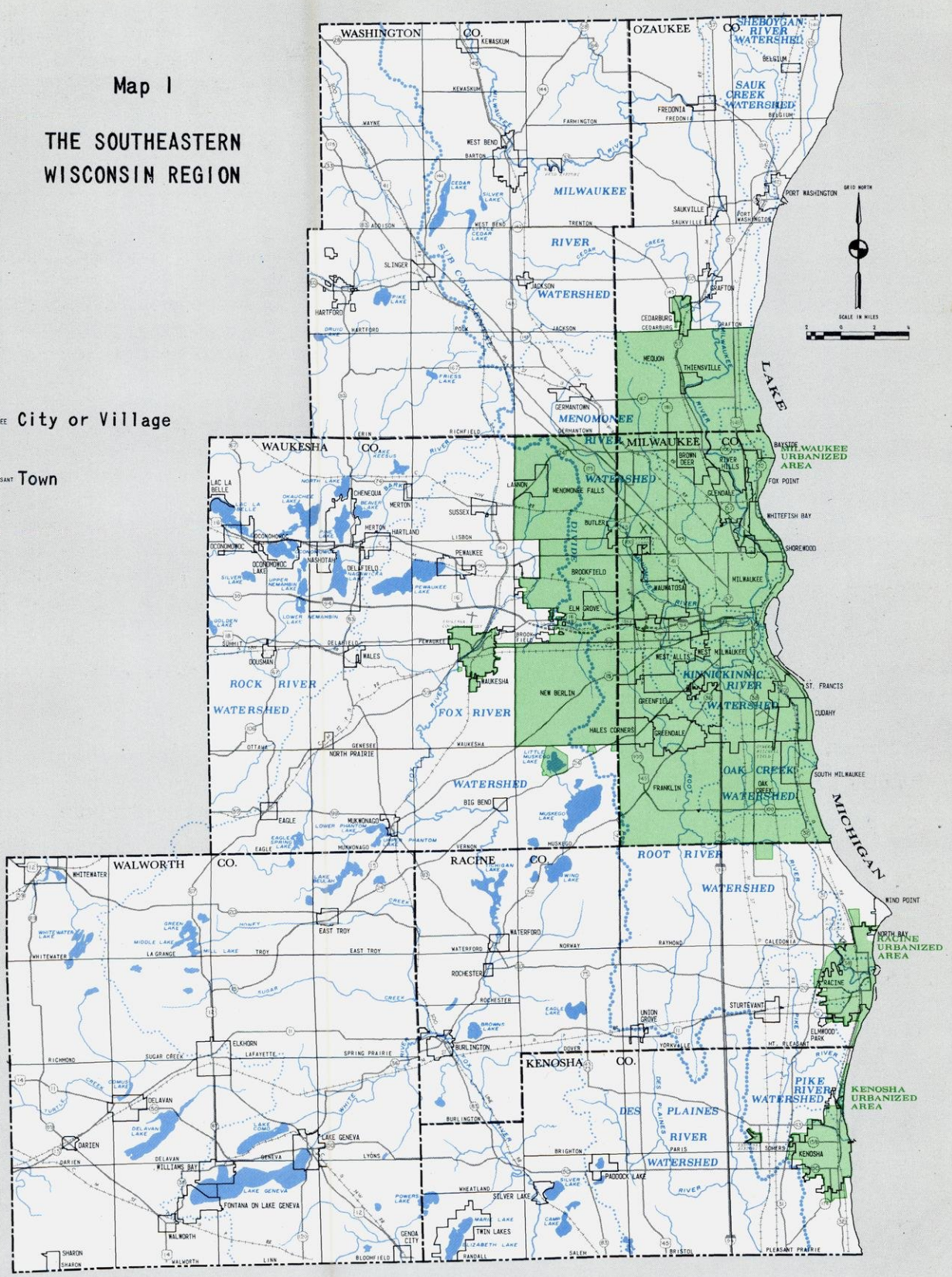
The Southeastern Wisconsin Planning Region, as shown on Map 1, is comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington,

Map 1

THE SOUTHEASTERN WISCONSIN REGION

MILWAUKEE City or Village

MT. PLEASANT Town



The seven-county Southeastern Wisconsin Planning Region comprises only 5 percent of the total area of the state but contains over 40 percent of the state's population and over one-half of all the tangible wealth in the state.

and Waukesha counties in southeastern Wisconsin. Exclusive of Lake Michigan, these seven counties have a total area of 2,689 square miles, and together comprise about 5 percent of the total area of the State of Wisconsin. About 40 percent of the state's population, however, resides within these seven counties, which contain three of the five and one-half standard metropolitan statistical areas in the state. The Region contains approximately one-half of all the tangible wealth in the State of Wisconsin as measured by equalized valuation and represents the greatest wealth producing area of the state, about 42 percent of the state's labor force being employed within the Region. It contributes about twice as much in state taxes than it receives in state aids. The seven-county Region contains 153 local units of government exclusive of school and other special purpose districts and encompasses all or parts of 11 major watersheds. The Region has been subject to rapid population growth and urbanization, and from 1950 to 1960 accounted for 64 percent of the total population increase of the entire state.

Geographically the Region is located in a relatively good position with regard to continued growth and development. It is bounded on the east by Lake Michigan, which provides an ample supply of fresh water for both domestic and industrial use as well as being an integral part of a major international transportation network. It is bounded on the south by the rapidly expanding northeastern Illinois metropolitan region and on the west and north by the fertile agricultural lands and desirable recreational areas of the rest of the State of Wisconsin. As shown on Map 2, many of the most important industrial areas and heaviest population concentrations in the midwest are within 250 miles of the Region; and over 31 million people reside within this radius.

Initial Work Program

The initial work program of the Commission was directed entirely toward basic data collection. It included six basic regional planning studies initiated in July 1961 and completed in July 1963: a statistical program and data processing study, a base mapping program, an economic base and structure study, a population study, a natural resources inventory, and a public utilities study.

All of these initial studies were directed toward providing a basic foundation of planning and engineering data for regional planning and were documented in six published planning reports.[1] None of these studies involved the preparation of plans. Their findings, however, provided a valuable point of departure for all subsequent Commission work.

Also as a part of its initial work program, the Commission adopted a policy of community planning assistance wherein functional guidance and advice on planning problems are extended to local units of government and through which regional planning studies are interpreted locally and regional plans may be integrated with local plans. Four local planning guides have been prepared to date under this community assistance program to provide municipalities throughout the Region with information helpful in the preparation of sound local codes and ordinances. These guides will aid in implementing regional as well as local plans and will further assist local public officials in carrying out their day-to-day planning functions. The subjects of these four guides are: subdivision control, official mapping, zoning, and organization of local planning agencies. All include model ordinances, and all provide a framework for plan implementation through local land use control measures.

LAND USE-TRANSPORTATION STUDY

The land use-transportation study is the first major work program undertaken by the Commission that is actually directed toward the preparation of long-range development plans.[2]

There were four principal reasons why the Commission chose the transportation problem as the object of its first large scale planning effort. First of all, the Commission was aware of the fact that providing for the movement of people and goods within the rapidly urbanizing Region is one of the most complex and difficult problems facing public officials today. Transportation has an important impact on daily life, providing the freedom to select from a variety of places in which to live, work, shop, and seek recreation. The attendant problems of congestion, accidents, and costs are

[1] For a description of these studies and bibliography of published reports see "Regional Planning in Southeastern Wisconsin," SEWRPC Technical Record, Vol. 1 – No. 1.

[2] The second major work program actually directed toward the preparation of long-range development plans to be undertaken by the Commission is a comprehensive watershed planning program for the Root River basin. This program, the first of a series, was initiated in July 1964 and has as its objective the preparation of a comprehensive watershed plan, including proposals for land use and for water control facilities, which will offer workable solutions to the drainage and flood control, water pollution, land use, and park and open-space reservation problems of that basin.

Many of the most important industrial areas and largest population and employment concentrations in the midwest are located within 250 miles of the Region, and nearly one-sixth of the entire population of the United States lives within this radius.

therefore of wide popular as well as official concern. Because of these factors and because of its tremendous impact on regional development, transportation is, and will increasingly become, one of the principal areas of public policy determination facing public officials, citizen leaders, and technicians within the Region. The magnitude of the transportation problem and its importance to sound regional development required that early consideration be given to this problem.

Secondly, the Commission was aware of many local traffic and transportation problems, some of these very pressing, which could only be resolved properly within the framework of a regional transportation planning effort. The lack of adequate basic transportation planning data for the Region, coupled with important changes in regional development patterns, in the use of the various modes of transportation, and in transportation planning technology, made the need for a regional transportation planning effort in this respect imperative.

Thirdly, the Commission, through close liaison with the State Highway Commission of Wisconsin, anticipated the fact that the Federal Aid Highway Act of 1962 would limit federal aids for new highway construction in large urban areas after July 1, 1965, to those urban areas having established a comprehensive, areawide, continuing, cooperative transportation planning program. The provisions of the Federal Aid Highway Act of 1962 directly affect 32 of the Region's cities and villages which are a part of the Kenosha, Milwaukee, and Racine urbanized areas, as shown on Map 1. The Federal Urban Mass Transportation Act of 1964 contains a similar regional planning prerequisite to the grant of federal funds through the Housing and Home Finance Agency for the development of mass transit facilities in large urban areas. Thus, the Commission would have been remiss in its duties to the local units of government had it not promptly mounted the necessary transportation planning effort.

Finally, the Commission knew that a comprehensive approach to the transportation problem would provide much valuable data for the ultimate solution to drainage and flood control, sewerage, water supply, land and water use, and other resource related planning problems prevalent within the Region. Indeed, comprehensive transportation planning, as envisioned by the Commission, was thought to provide the broadest possible initial approach to any comprehensive regional planning effort.

The Commission, therefore, appointed an interagency technical advisory committee to develop a transportation study prospectus. Such a committee was established and included representatives of the U. S. Bureau of Public Roads, State Highway Commission of Wisconsin, Milwaukee County, and the SEWRPC itself.[3] This committee, meeting from October 1961 to February 1962, prepared a prospectus for a regional land use-transportation study,[4] which was endorsed by the Commission on April 6, 1962, published, and, in accordance with the advisory role of the Commission, transmitted to the governmental agencies comprising the Region for their consideration and action. All seven constituent county boards subsequently formally endorsed the prospectus and agreed to provide the local funds necessary for its implementation. The Bureau of Public Roads, U. S. Department of Commerce; the State Highway Commission of Wisconsin; and the U. S. Housing and Home Finance Agency also endorsed the prospectus and, under coordinated but separate contracts, the latter two agencies agreed to provide the federal and state funds necessary for its implementation.

The prospectus, as prepared, was not a finished study design. It was a preliminary design prepared with the objective of obtaining support and financing for the necessary study. This objective it fully attained. The prospectus, however, set forth certain basic principles to be recognized in the execution of the study; outlined a staff organization; specified major work elements; established a time schedule; and, of course, provided cost estimates for the necessary work.

Study Objectives

The primary objective of the regional land use-transportation study, as set forth in the prospec-

[3] The committee members were: D. F. Haist, Chairman, Chief of Urban and Advance Planning, State Highway Commission of Wisconsin, Madison, Wisconsin; K. W. Bauer, Secretary, Executive Director, Southeastern Wisconsin Regional Planning Commission; T. R. Clark, District Urban Planning Supervisor, District 2, State Highway Commission of Wisconsin; J. H. Groenier, Division Planning and Research Engineer, U. S. Bureau of Public Roads, Madison, Wisconsin; R. H. Paddock, Division Engineer, U. S. Bureau of Public Roads, Madison, Wisconsin; H. Shebesta, Urban Planning and Traffic Engineer, District 60, State Highway Commission of Wisconsin; and H. B. Wildschut, County Highway Commissioner and Director of Public Works, Milwaukee County. In addition, G. E. Marple, Chief, Urban Planning Division, Washington, D. C., and A. J. Medford, Regional Planning and Research Engineer, Region 4, U. S. Bureau of Public Roads, provided valuable guidance and advice to the committee in the preparation of the prospectus.

[4] SEWRPC Regional Planning Program Prospectus, April 1962.

tus, is to produce two of the key elements of a comprehensive plan for the physical development of the Region—a land use plan and a transportation plan. These plans, to be effective, must be amenable to cooperative adoption and joint implementation by all levels and agencies of government within the Region. Through such implementation the major land use and transportation problems of the Region may be abated.

Ancillary objectives of the regional land use-transportation study include:

1. Establishment of the complete pattern of movement of people and goods within the Region by highway and transit.

2. Quantitative analysis of the existing and the probable future transportation supply and demand on both a local and regional basis and the quantitative assignment of future traffic to the developing regional freeway and major arterial street and highway and transit systems of the Region.

3. Establishment of a coordinated and uniform data collection and analysis system that will readily provide on a continuing basis summary data on population, employment, motor vehicle ownership, land use, soil and water capabilities, travel origins and destinations, transportation facilities, public utilities, and financial resources for the Region. These data are to be available in a form suitable to assist federal, state, and local agencies of government and private investors in making development decisions.

4. Promotion of better understanding by public officials, planners, and engineers of the interrelationships existing between land use and transportation and of the factors influencing residential, industrial, and commercial land development within the Region, thereby providing a better insight into local and regional growth patterns.

5. Establishment of an increased awareness of the effect of each local community's plans on surrounding communities and on the Region and promotion of the coordination of the land use and transportation planning efforts of all levels of government within the Region.

6. Collection and analysis of data that will permit forecasts and recommendations to be made regarding future patterns of economic activity, population distribution, land use development and long-term impacts of alternative transportation system arrangements; costs and benefits of alternative generalized transportation systems and specific transportation facility improvements; and programs for the best utilization of existing transportation facilities and for the construction of new transportation facilities as may be dictated by needs.

Study Staff and Committee Structure

The basic organizational structure for the study was outlined in the study prospectus and, as shown in Figure 2, consists of six functionally organized divisions reporting to the Study Director who, in turn, reports to the Executive Director of the Commission.[5]

The Commission very early in its existence recognized that any comprehensive regional planning program covers such a broad spectrum of related governmental and private development programs that no agency, whatever its function or authority, can "go it alone." The basic Commission organization, therefore, provides for the attainment of the necessary interagency coordination through both the establishment of advisory committees and through an interagency exchange of technical staff.

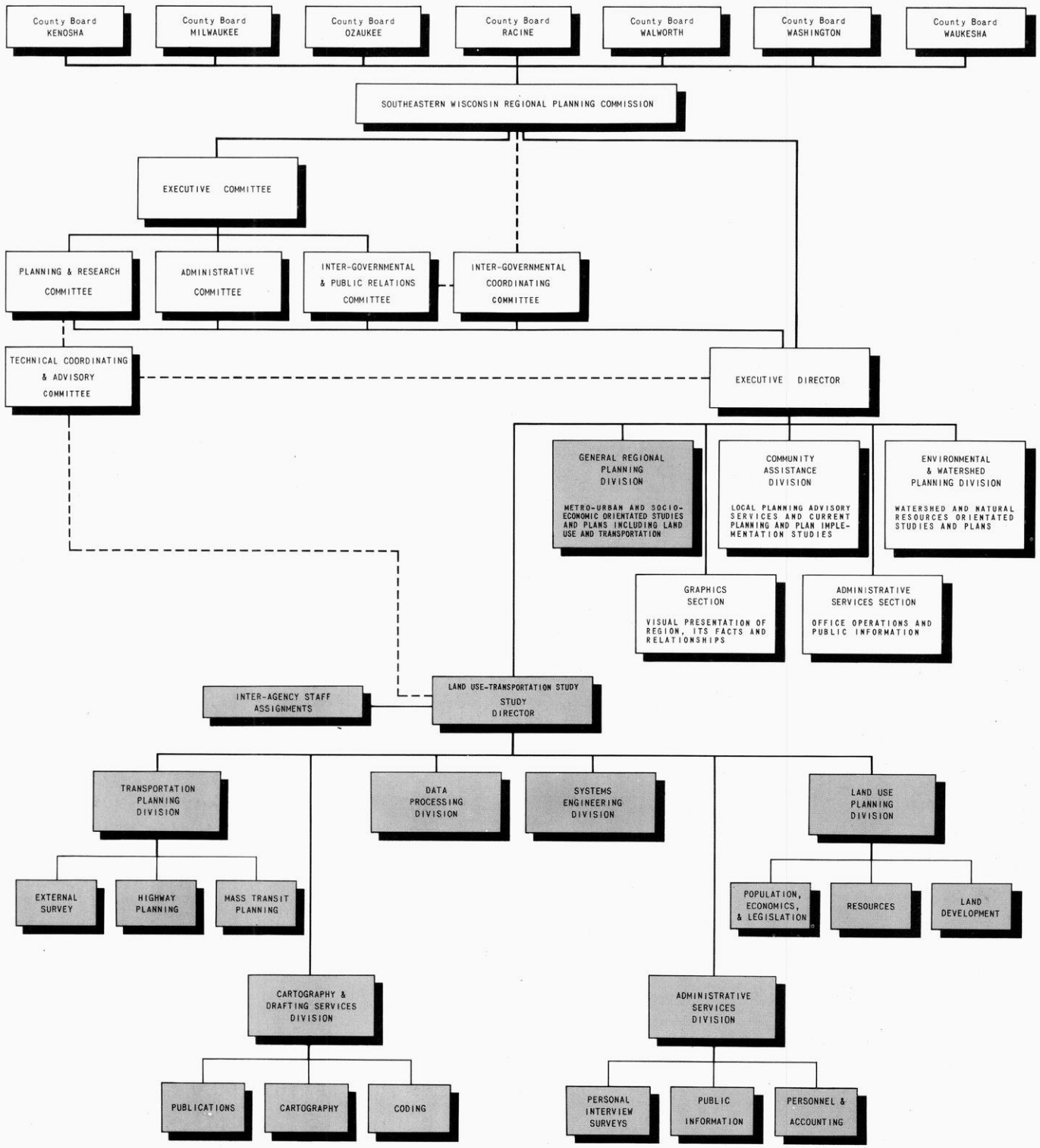
Two types of advisory committees are provided. The first is the technical coordinating and advisory committee which is comprised primarily of technicians in the employ of private enterprise as well as of local, state, and federal agencies of government. The functions of this type of committee are: to assist and advise the Commission staff on technical methods, techniques, and procedures; to serve as a clearinghouse for the assembly and evaluation of planning and engineering data; to recommend technical standards; to exchange ideas for the solutions to technical problems; to coordinate the technical staffs of agencies concerned with development within the Region; and to place, insofar as possible, the experience, knowledge, and resources of the technical staffs of the represented agencies at the disposal of the Commission.

The second type of committee is the intergovernmental coordinating committee, which is comprised primarily of elected and appointed officials

[5] For a description of the functions and staffing of these divisions see "The SEWRPC Land Use-Transportation Study," SEWRPC Technical Record, Vol. 1 – No. 1.

Figure 2

ORGANIZATIONAL STRUCTURE OF THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION AND STAFF



representing local interests. The functions of this type of committee are: to assist and advise the Commission in determining and coordinating basic nontechnical public objectives and policies involved in the conduct of the regional planning studies and in the formulation, adoption, and implementation of regional plans; to familiarize political leadership with the Region's research and planning efforts; and to generate agreement on basic objectives, service levels, standards, and plan implementation procedures among the political units of the Region.

The Technical Coordinating and Advisory Committee on Regional Land Use-Transportation Planning was established on January 14, 1963, in accordance with recommendations in the prospectus, and includes 87 technical representatives from both public and private agencies concerned with regional land use and regional transportation facility development. Membership on the committee includes representatives from the U. S. Department of Commerce, Bureau of Public Roads (USBPR), the U. S. Housing and Home Finance Agency (HHFA), and the U. S. Department of Agriculture, Soil Conservation Service (SCS); from the central and district offices of the State Highway Commission of Wisconsin (SHCW), the Wisconsin Conservation Department, Department of Resource Development, and the University of Wisconsin-Milwaukee; from municipal and county traffic, planning, engineering, highway, and public works departments; from electric, telephone, and gas utilities; and from railroad and transit companies.[6]

The committee has been organized into subcommittees by "subject area." These subject areas include: origin and destination surveys, urban highway planning, rural highway planning, urban land use planning, rural land use planning, natural resources, public utilities, transit and railroad transportation, and socio-economic studies. The committee has proven to be a very active and valuable advisory body to the Commission and its staff. Through this committee federal, state, and local planning and engineering data requirements have to date been effectively recognized and incorporated into the study design.

The Intergovernmental Coordinating Committee on Regional Land Use-Transportation Planning was established in April 1965 and includes 25 key elected legislative and executive officials from throughout the Region.[7]

Advisory committees paralleling these two committees, which were created for the regional land use-transportation study, but dealing with different functional areas have been created by the Commission to assist it in carrying out its other planning programs, particularly its comprehensive watershed planning programs. The basic purpose of all of the advisory committees is to actively involve the various governmental bodies, technical agencies, and private interest groups within the Region in the regional planning process, thereby openly arriving at decisions and action programs which can effectively shape the future physical development of the Region. Such involvement is particularly important to any ultimate implementation of the land use and transportation plans in light of the Commission's advisory role in shaping regional development.

In addition to participating in the regional plan formulation through the advisory committee structure and financial contributions, certain participating agencies of government within the Region have elected to intensify such participation through the direct assignment of technical staff to the regional land use-transportation study. These agencies include the U. S. Bureau of Public Roads, the State Highway Commission of Wisconsin, the Conservation Commission of Wisconsin, the County of Milwaukee, and the City of Milwaukee.[8]

SCHEME OF PRESENTATION

The major findings and recommendations of the regional land use-transportation study are to be presented in three volumes. This, the first volume of the report, sets forth the basic concepts underlying the study and presents in summary form the basic facts pertinent to long-range land use and transportation planning in southeastern Wisconsin. The factual findings are presented so as to describe the total urban Region at a given point in time as an integrated system for land use-transportation planning and thereby to provide the necessary "bench mark" data for the base year 1963. Historical data, where pertinent, are also provided.

The second volume of the report will be concerned with anticipated growth and change in the Region

[6] For a complete membership list, see Appendix A.

[7] For a complete membership list, see Appendix B.

[8] For a complete list of personnel assigned, see Appendix C.

and will present forecasts of economic activity, population, and of land use, transportation, and natural resource demands. The various demands will be scaled against the existing supply of land, transportation services, and the resource base, and generalized alternative plans for future regional land use and transportation development presented, based upon regional development objectives. The second report will provide the basis for selection of the final plan from among the alternative development plans.

The final volume of the report will detail the land use-transportation plan finally recommended for implementation. It will provide for the staging of land use and transportation system development and set forth detailed plans for certain selected major transportation corridors.

These reports can only summarize, in brief fashion, the tremendous volume of information assembled in the extensive data collection, analysis, and forecasting phases of the land use-transportation study. Although the reproduction of these data files in conventional report format is impossible due to the magnitude and complexity of the data collected, data from the files are available to member units and agencies of government and to the public, in general, upon specific request. In fact, information from these files is already being utilized by some planning and public works agencies within the Region for the planning and design of specific public works improvement projects. This first report, therefore, serves the additional purpose of indicating the type of data which is available from the Commission and which may be of value in assisting federal, state, and local units of government and private investors in making better decisions about community development within the Region.

The published planning reports that are being prepared under the land use-transportation study are further supplemented by other Commission reports prepared periodically. These supplementary publications, such as the SEWRPC Technical Record and the various SEWRPC technical reports, deal with certain phases of the work in greater depth and detail than is possible in the final planning reports themselves.

The Technical Record is, generally, a bimonthly publication developed by the Commission to perform three distinct and important functions:

1. To provide a concise, historical record of the technical work accomplished under the regional land use-transportation study.

2. To disseminate technical information on technical methods, techniques, and procedures applied in the land use-transportation study.

3. To encourage an exchange of knowledge, ideas, and concepts between technicians, engineers, and planners engaged in similar endeavors elsewhere.

For a complete and detailed documentation of the technical methods and procedures involved in the land use-transportation study, the reader is referred to the SEWRPC Technical Record.

The SEWRPC technical reports deal with certain major work elements of the land use-transportation study and set forth the procedures and findings of these major work elements on a work progress basis. Major subject areas covered, or to be covered, by the SEWRPC technical reports include the results and findings of the Commission simulation model work, socio-economic inventories and forecasts, financial resource study, potential park and open-space inventory, surface water quality study, and operational soil survey.

Chapter II

BASIC PRINCIPLES AND CONCEPTS

THE LAND USE-TRANSPORTATION PLANNING PROBLEM

Because of its important impacts on daily life and on regional development, transportation is, and will increasingly become, one of the principal areas of public policy determination facing public officials, citizen leaders, and technicians within the Region. Although large amounts of public capital are available for improving transportation facilities and services within the Region, there are never enough funds for all projects proposed and needed. Precisely how this capital should be invested—how much should be allocated to highway facilities and how much to transit facilities and what should be the spatial location and capacities of these facilities—involves many important public policy determinations. These determinations must be made in view of an urbanizing region which is constantly changing and, therefore, should be based upon a comprehensive planning process able to objectively scale the changing travel demand against existing and proposed transportation network capacity. Only within such a planning process can the effect of different development proposals be evaluated, the best course of action intelligently selected, and the available funds most effectively invested.

Most large-scale metropolitan transportation studies completed to date have developed transportation plans without the benefit of land use plans, relying instead upon land use forecasts based largely upon extrapolations of past trends in land use development. Transportation facilities, however, are part of, and have a major effect upon, the physical, social, and economic development of an area; and there can be no effective guidance of desirable regional development patterns without full coordination of transportation plans and policies with overall regional development plans and policies. Transportation planning must, therefore, be an integral part of any comprehensive metropolitan or regional planning effort; and transportation system plans must be based upon long-range, areawide land use plans. Only within the framework of such areawide land use plans can the planning, design, construction, and maintenance of transportation systems be purposefully directed within an urbanizing region.

In southeastern Wisconsin the existence of a newly created comprehensive regional planning agency, charged by the State Legislature with the duty and function of making and adopting an advisory "master plan for the physical development of the Region," has provided a most fortuitous situation for the execution of a transportation planning program. The regional planning agency can avoid the shortcoming of excluding land use from the system to be planned and thereby avoid being forced to forecast the amount and spatial distribution of future land uses on the assumption that past development trends will continue. Instead, the regional planning agency can incorporate the preparation of an objectively determined land use plan, capable of cooperative adoption and joint implementation by the units of government concerned, in the planning process. The planning process can thereby produce a purposefully directed transportation system plan which is more meaningful at both the regional and local level.

Land use, like transportation, is one of the principal areas of public policy determination facing public officials, citizen leaders, and technicians within the Region. Although much new land use development is financed by private capital, each new increment of urban growth, whether it be a subdivision, shopping center, or industrial plant, inevitably creates a demand for new public facilities and services and requires the investment of public capital in new or improved transportation facilities, utilities, and community facilities and the expenditure of public funds for their operation and maintenance. Moreover, the unit of government facing these new public investments and increased public expenditures may not always be the same as the unit experiencing the growth. Thus, while detailed land use problems are primarily of

local concern and properly subject to local planning and control, the aggregate effects of changing land use activities are regional in scope and not only interact strongly with the need for regional utility, recreation, and transportation facilities but exert a demand upon a limited natural resource base. The wise and judicious use of this resource base, together with the functional relationships existing between land use and the demand for regional utility, recreation, and transportation facilities, must be the major guidelines for the determination of which land uses are regional in character or influence and, therefore, are to be included in a regional land use plan. These include large land-consuming uses such as agriculture, regional park and open-space reservations, woodlands, and wetlands. Other land uses which are regional in their influence by virtue of the demand which they exert upon public works facilities of a regional nature, such as the major trafficways and major storm water drainage channels, are residential, commercial, industrial, and certain governmental and institutional uses. Still other land uses, such as local commercial and service uses; local institutional and governmental uses including schools, churches, libraries, police and fire stations, and local park and recreation areas, need not receive explicit attention in a regional land use plan but are, instead, implicitly contained in such a plan as integral components of residential neighborhoods.

BASIC PRINCIPLES

The specific planning process applied in the SEWRPC regional land use-transportation study is based upon five basic principles. These are:

1. Transportation planning must be regional in scope. Travel patterns develop over an entire urban region without regard to corporate limit lines. Thus, transportation planning cannot be accomplished successfully within the confines of a single municipality or even a single county if that municipality or county is a part of a larger urban complex. The regional transportation system, which is composed of freeways, expressways, arterial streets and highways, and transit lines, must form a single integrated system over the entire Region, a system which can adequately serve the developing regional travel patterns.

2. Transportation planning must be conducted concurrently with, and cannot be separated from, land use planning. The land use pattern determines the amount and spatial distribution of travel to be accommodated by the transportation system; and, in turn, the transportation system is one of the most important determinants of the land use pattern, forming the basic framework for all urban development today. Although detailed land use patterns are primarily of local concern and properly subject to local planning and control, the aggregate effects of the spatial distribution of land use activities are regional in scope and interact strongly with the need for regional utility, recreation, and transportation facilities.

3. Highway and transit systems must be planned together. Each mode of transportation should be assigned that part of the total travel demand which it is best suited to carry. To be most effective, arterial street and highway systems should function in a coordinated rather than competitive manner with the transit systems.

4. Transportation facilities must be planned as an integrated system. The capacities of each link in the system must be carefully fitted to traffic loads and the effects of each proposed facility on the remainder of the system quantitatively tested.

5. Both land use and transportation planning must recognize the existence of a limited natural resource base to which urban and rural development must be properly adjusted to ensure a pleasant and habitable environment. Land, water, and air resources are limited and subject to grave misuse through improper land use and transportation facility development. Such misuse can lead to serious environmental problems that may be difficult or impossible to correct.

THE LAND USE-TRANSPORTATION PLANNING PROCESS

Based upon the foregoing principles, the Southeastern Wisconsin Regional Land Use-Transportation Study employs a seven-step planning process by which the Region and its principal functional relationships can be accurately described both graphically and numerically, the complex movement of people and vehicles over highway and transit facilities simulated, and the effect of dif-

ferent courses of action with respect to regional land use and transportation system development evaluated. The seven steps involved in this planning process are: 1) study design, 2) formulation of objectives and standards, 3) inventory, 4) analysis and forecast, 5) plan design, 6) plan test and evaluation, and 7) plan selection and adoption. Plan implementation, although necessarily a step beyond the foregoing planning process, must be considered throughout the process if the plans are to be realized.

The end results of the above process are not only regional land use and transportation plans scaled to future land use, travel, and resource demands and consistent with regional development objectives, but the beginning of a continuing planning process that permits modification and adaptation of the plans and the means of implementation to changing conditions. Each step in this planning process includes many individual operations which must be carefully designed, scheduled, and controlled to fit into the overall process. An understanding of this planning process is essential to any appreciation and understanding of the results. Each step in the process, together with its major component operations, is diagrammed in Figure 5, page 16, and described below.

Study Design

Every planning program must embrace a formal structure or study design so that the program can be carried out in a logical and consistent manner. This study design must: specify the content of the fact-gathering operations, define the geographic area for which data will be gathered and plans prepared, outline the manner in which the data collected are to be processed and analyzed, specify requirements for forecast and for forecast accuracy, and define the nature of the plans to be prepared and the criteria for their evaluation and adoption. The study design may be based upon a highly structured series of mathematical models or upon a more traditional framework of analysis, forecast, and plan preparation; but it must be formally established if the planning program is to avoid uncoordinated and wasteful data collection, processing, and analysis activities.[1]

In the regional land use-transportation study, a dual approach was utilized in which both mathematical models and the more traditional planning techniques are applied in parallel. Because of the possibilities for truly significant improvements in the physical planning process and the resultant possible benefits to the Region, it was decided to attempt to apply certain new and experimental planning techniques, conceptualized in a previous Commission study,[2] involving the use of mathematical models for economic forecasting and land use plan testing. A diagram illustrating the role of these mathematical models in the land use-transportation study is shown in Figure 3.

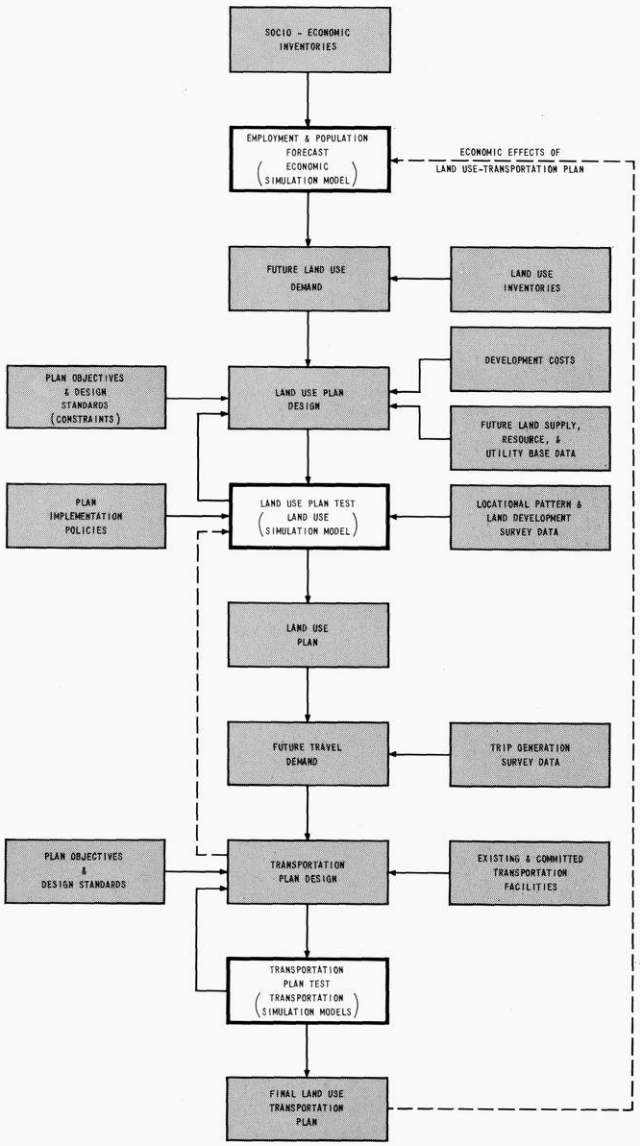
Because of the experimental nature of the new methods and the high risk associated with complete dependence on their use, however, it was

[1] See SEWRPC Study Design, August 1963.

[2] See SEWRPC Planning Report No. 1, Regional Planning Systems Study, December 1962.

Figure 3

LAND USE - TRANSPORTATION PLANNING SIMULATION MODEL METHOD

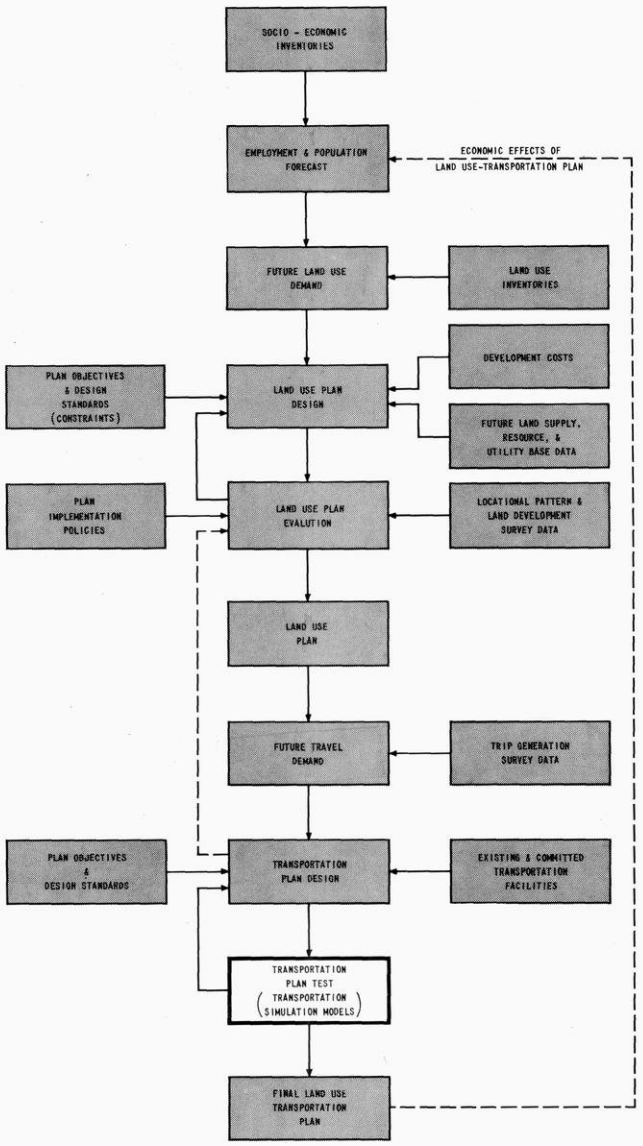


thought necessary to ensure the success of the regional land use-transportation study by providing concurrently for the performance of each of the major planning functions using more conventional and established planning techniques. A parallel diagram illustrating the role of the traditional methods in the land use-transportation study is shown in Figure 4. It should be noted that only the forecasting and land use planning functions are affected. The transportation planning functions, which utilize already well-developed mathematical models for plan test, are the same in both planning sequences.

It should also be noted that in both approaches the transportation system is designed to serve and support a planned land use pattern. Also, in both approaches the design and test of the transportation system rest upon the basic concept that travel within an urban area is an orderly and measurable occurrence directly related to land use. Based upon this concept, techniques have been developed which make it possible to calculate future travel demand quantitatively as a function of land use, instead of deriving such demand from a simple expansion of existing traffic patterns as was necessary in the past. By considering the future distribution of land use as the major factor in projecting travel patterns, integrated transportation systems can be designed which will serve not only the existing travel patterns but the entirely new travel patterns which will evolve out of changing regional development.

Figure 4

LAND USE - TRANSPORTATION PLANNING
TRADITIONAL METHOD



Formulation of Objectives and Standards

In its most basic sense, planning is a rational process for establishing and meeting objectives. The formulation of objectives is, therefore, an essential task to be undertaken before plans can be prepared. In order to be useful in the regional planning process, the objectives to be defined must not only be stated clearly and be sound logically but must be related in a clearly demonstrable way to alternative physical development proposals. This is necessary because it is the duty and function of the Commission to prepare a comprehensive plan for the physical development of the Region and, more particularly, because it is the objective of the land use-transportation study to prepare two of the key elements of such a physical development plan. Only if the objectives are clearly relatable to physical development and subject to objective test can a choice be made from among alternative plans in order to select that plan which best meets the agreed-upon objectives. Finally, logically conceived and well-expressed objectives must be translated into detailed design standards to provide the basis for plan preparation, test, and evaluation.

Inventory

Reliable basic planning and engineering data, collected on a uniform, areawide basis, is absolutely essential to the formulation of workable development plans. Consequently, inventory becomes the first operational step in any planning process, growing out of the study design. The crucial nature of factual information in the planning process should be evident, since no intelligent forecasts

can be made or alternative courses of action selected without knowledge of the current state of the system being planned.

The sound formulation of a regional land use plan requires that factual data must be developed on the existing land use pattern, on the potential demand for each of the various major land use categories, on the major determinants of these demands, and on existing local development objectives and constraints, as well as on the underlying natural resource and public utility base and its ability to support land use development.

The sound formulation of a regional transportation plan requires that factual data must be developed on the existing and potential demand for transportation between various points within the Region and outside of the Region, on the relative demand for alternative modes of transportation, and on the major determinants of these demands, as well as on the existing and potential supply of transportation system capacity.

The necessary inventories may be grouped under nine major headings: 1) aerial photography and mapping, 2) economy and population, 3) public financial resource base, 4) natural resource and public utility base, 5) existing land use, 6) community plans and zoning, 7) legislation, 8) existing and committed transportation facilities and network utilization, and 9) existing travel patterns (see Figure 5).

Each of these major inventories when considered together must be comprehensive, encompassing all the various factors which influence and are influenced by land use and transportation system development, and must be in a form which permits any finding to be related to the whole. In the interests of economy, the data collected in the inventories must be pertinent to:

1. Describing the existing situation with respect to land use and transportation development and identifying existing problems and problem patterns with respect thereto.

2. Forecasting future land use and transportation requirements.

3. Formulating alternative land use and supporting transportation plans, and

4. Testing and evaluating the alternative plans.

After the inventory data has been collected, it must be edited, coded, transferred to punch cards, checked, summarized, and analyzed before it is available for forecasting, plan design, or plan test application. The data collection and processing operation is the most time consuming and costly of the entire planning process, absorbs a major portion of the budget for land use-transportation planning, and provides the most formidable obstacle to successful completion of the planning program.

This report deals with the findings of the inventory phase of the regional land use-transportation study; and a brief description and summary of the specific findings of each of the major inventories[3] are provided in the following chapters along with a brief discussion of the need for, and significance of, each inventory in the overall planning process. Considered together, these chapters provide a description of the current state of the Region with respect to land use and transportation system development, and of the basic factors underlying this development, and thereby provide the basis for an understanding of the major land use and transportation problems of the Region and of any proposals advanced to abate these problems. More complete descriptions of the individual inventories and their findings are available in pertinent SEWRPC procedural manuals, technical reports, and Technical Record articles.

Analysis and Forecast

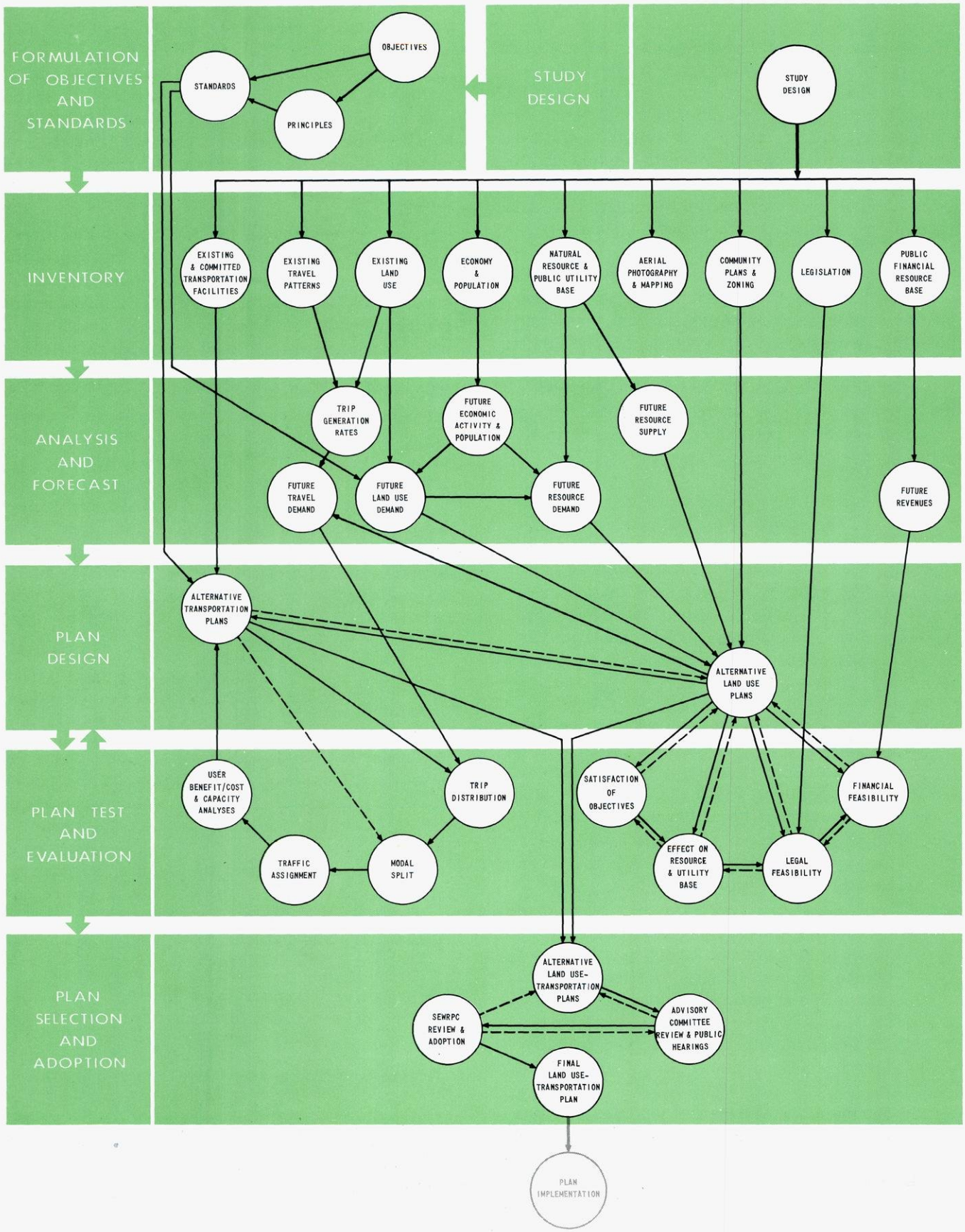
Inventories provide factual information about the present situation; but analyses and forecasts are necessary to provide estimates of future needs for resources, land, and transportation. These future needs are determined from a sequence of interlocking forecasts. Economic activity and population forecasts set the general scale of future growth, which is, in turn, translated into future resource, land use, and travel demand. These future demands can then be scaled against the existing supply and plans formulated to meet deficiencies.

Two important considerations involved in the preparation of necessary forecasts are the forecast

[3] The regional base mapping and aerial photography programs have been adequately described in other Commission publications and will not be further discussed herein. (See SEWRPC Planning Report No. 2, Regional Base Mapping Program, July 1963, and "Aerial Photographs and Their Use in the Regional Land Use Inventory," SEWRPC Technical Record, Vol. 1 – No. 2.) The scope and content of the legislation inventory cannot be properly defined until plan synthesis is begun and hence will be treated in separate SEWRPC technical reports.

Figure 5

THE LAND USE - TRANSPORTATION PLANNING PROCESS



target date and the forecast accuracy requirements. Both the land use pattern and the transportation system must be planned for anticipated demand at some future point in time. In the planning of transportation systems, this "design year" is usually established by the expected life of the first facilities to be constructed in implementation of the plan. Although it may be argued that the design year for land use development should be extended further into the future than that for facilities because of the basic irreversibility of many land development decisions, practical considerations dictate that the land use planning design year be scaled to the facility design year requirement.

Forecast accuracy requirements depend on the use to be made of the forecasts; and as applied to land use and transportation planning, the critical question relates to the effect of any forecast inaccuracies on the basic structure of the plans to be produced. It is important to keep the forecast tolerances within that range wherein only the timing and not the basic structure of the plans will be affected.

Plan Design

Plan synthesis or design forms the heart of the planning process. The most well-conceived objective, the most sophisticated data collection, processing, and analysis operations, and the most accurate forecasts are of little value if they do not ultimately result in sound plans. The outputs of each of the three previously described planning operations: formulation of objectives and standards, inventory, and forecast become inputs to the design problem of plan synthesis.

The land use plan design problem consists essentially of determining the allocation of a scarce resource—land—between competing and often conflicting demands. This allocation must be accomplished so as to satisfy the aggregate needs for each land use and comply with all of the design standards derived from the plan objectives, all at a feasible cost.

The transportation plan design problem requires a similar reconciliation between travel demand derived from the land use plan adopted, transportation design standards, existing facilities, and new facility costs.

Plan Test and Evaluation

If the plans developed in the design stage of the planning process are to be realized in terms of actual land use and transportation system development, some measures must be applied to quantitatively test alternative plans in advance of their adoption and implementation. Traffic simulation models have been developed over the past decade for application in transportation planning that make it possible to determine the existing and potential travel demand on any proposed transportation network. The complete sequence of simulation occurs in four stages:

1. Trip generation; in which the total number of future trips generated in each subarea of the Region is determined, using the relationships found to exist between land use and travel from analyses of the planning inventory data.

2. Trip distribution; in which the originating trips so generated are then allocated to destination zones and the interzonal travel desire lines established for both transit and highway travel, using a trip distribution model.

3. Modal split; in which these future trips are divided into those using transit and those using private automobiles, using a modal split model.

4. Traffic assignment; in which the interzonal trips are then assigned to existing and proposed transit and highway facility networks, using a traffic assignment model.

Using this simulation procedure, it is possible to test and verify the workability and efficiency of any proposed transportation system network. The quantitative assignment of traffic to the network will reveal areas of over or under capacity and provide the basis for network modifications ultimately resulting in a practical and efficient transportation system plan for which development costs can be calculated. Such assignment also permits the calculation of user benefits for benefit cost analyses.

While the validity and usefulness of this transportation simulation technique has been proven in other urban transportation studies, similar model techniques suitable for testing the feasibility of proposed land use plans have not been successfully applied previously.

Conventional land use planning techniques normally involve quantitative test only to the degree

that the aggregate areas allocated to the various land uses in the alternative plans are scaled against the various land use demands. Evaluation beyond such scaling of supply versus demand normally involves qualitative evaluation of the degree to which each alternative land use plan meets development objectives and of the legal feasibility of the alternatives. These conventional techniques will all be applied in the land use-transportation study; and, in addition, the effects of each alternative land use plan on the natural resource base will be both qualitatively and quantitatively evaluated and the financial feasibility of each alternative land use plan established.

Since many private decisions by land developers, builders, and individual households, as well as public decisions by units of government, determine the regional land use pattern, a need exists for testing the feasibility of any land use plan proposals even beyond that provided by the expanded conventional techniques. In the regional land use-transportation study, therefore, an experimental land use simulation model capable of representing the decision processes of households and business firms influential in land development is being developed and, if successful, will be applied. The basic problem of land use plan test using simulation model techniques may be stated as: given a target plan, determine whether this plan can be attained considering behavioral patterns of land developers, builders, and households; public land use controls; and public works programs. Using a land use simulation model, a number of experimental simulation runs can be performed with differing land use control policies and the practicality of the plan determined.

Plan Selection and Adoption

In the land use-transportation study, it is proposed to develop not one but a number of alternative land use plans, each with its supporting transportation system plan. The general approach contemplated for the selection of one plan from among these alternatives is to proceed through the use of the advisory committee structure and hearings to a final decision and plan adoption by the Commission, in accordance with the provisions of the state enabling legislation. Due consideration must be given in such selection and adoption to the ability of the public financial resource base to meet the costs of plan implementation. Plan selection and adoption necessarily involve both technical and nontechnical policy determinations and must, therefore, be founded in the active involvement of the various governmental bodies, technical agencies, and private interest groups concerned with regional development in the planning process. Such involvement is particularly important in light of the advisory role of the Commission in shaping regional development. The use of advisory committees and both formal and informal hearings appear to be the most practical and effective procedures for involving public officials, technicians, and citizens in the planning process and of openly arriving at agreement among the affected governmental bodies and agencies on objectives and on plans which can be jointly implemented.

Chapter III

THE DEMOGRAPHIC, ECONOMIC, AND PUBLIC FINANCIAL RESOURCE BASE

INTRODUCTION

Inventories of population, economic activity, and public financial resources are complementary basic studies essential to sound comprehensive planning. Since such planning is intended to improve the environment in which people live and since the primary purpose of all facilities and services in any community is to meet the needs of the resident population, it is evident that an understanding of the size, composition, and spatial distribution of the population is basic to planning for future development. The size, composition, and spatial distribution of the population are, however, greatly influenced by growth and change in the economy. In turn, population and economic change influence the amount and availability of the public financial resources ultimately required to provide for the public facility and service needs of the resident population.

This chapter presents a brief description and analysis of the current demographic, economic, and public financial state of the Region adapted to land use-transportation planning needs. Included in the presentation of demographic conditions are descriptions of the population size, distribution, and characteristics, emphasizing current age structure, household size, educational attainment, personal income, and housing values. Included in the presentation of economic conditions are descriptions of the labor force and of the size, distribution, and characteristics of the economic activities that support the regional population. Included in the presentation of the regional public financial resource base are descriptions of the amount and composition of local governmental revenues and expenditures. Finally, the significant demographic, economic, and public financial conditions and trends within the Region are presented in summary form.

Although this chapter is based upon the vast amount of current and historical data collected in the socio-economic inventories, conducted as a part of the land use-transportation study, it is not intended to comprise an in-depth analysis of the socio-economic base and structure of the Region. Detailed demographic and economic analyses were previously completed by the SEWRPC as a part of its initial planning efforts, and a detailed analysis of the regional public financial resource base will be presented in a forthcoming SEWRPC technical report.

The Socio-Economic Inventories

Three separate but related inventories were conducted to collect current and historic data relating to the population, economy, and public financial resource base of the Region. These included a data collection program for the development of a regional economic simulation model, a data collection program for the preparation of conventional (non-model) population and economic forecasts, and a public financial resources data inventory. In addition, the origin and destination (O & D) surveys, which were conducted primarily to collect data on travel habits and patterns, also obtained valuable "census-type" socio-economic data relative to the households in the Region. Included in the types of socio-economic information obtained in the O & D surveys were data on income, educational attainment, age, sex, race, occupation, household size, housing value, housing status, and migration patterns.

The data collection program for the regional economic simulation model was necessarily very extensive.[1] A great variety of data was collected for thirty industrial sectors of the regional economy. In addition, data were also collected for three other sectors of the economy; namely, a government sector, an education sector, and a household sector. Some types of data collected for each industrial sector of the regional economy include total hourly and salaried personnel, average monthly wages and salaries, total regional

[1] A complete listing of all types of data collected in this program, data sources, data collection procedures, and data reliability, together with forecasts and initial results of simulation model runs, will be available in a forthcoming SEWRPC technical report.

sales or receipts, total raw material purchases, total capital expenditures, and total plant and equipment values.

The data collection program for conventional population and economic forecasting was conducted to provide data needed to make non-model forecasts of population, employment, and income in the Region. These conventional or non-model forecasts were designed to supplement as well as complement the simulation model program; that is, the non-model forecasts were designed both to test the validity of eventual simulation model runs and to provide basic inputs for plan preparation.

This program was basically an extension of two previous programs conducted as a part of the SEWRPC initial basic planning studies. These two programs provided in-depth analyses of the regional economy and population, together with forecasts of regional employment and population for the years 1965, 1970, 1975, 1980, and 1985. The extension of these two programs was accomplished by collecting more recent data and reanalyzing the regional population and economy in light of the new data. New forecasts of regional population and employment will be prepared utilizing the techniques of the original studies. In addition, new forecasts of regional population, employment, and income will be made by a number of additional techniques not used in the initial studies, including ratio techniques for forecasting employment and population, a component technique for forecasting population, and regression techniques for forecasting income. The results of these forecasts will be compared to the updated forecasts in order to select a final range of forecasts of regional population, employment, and income for the years 1970, 1975, 1980, 1985, and 1990.

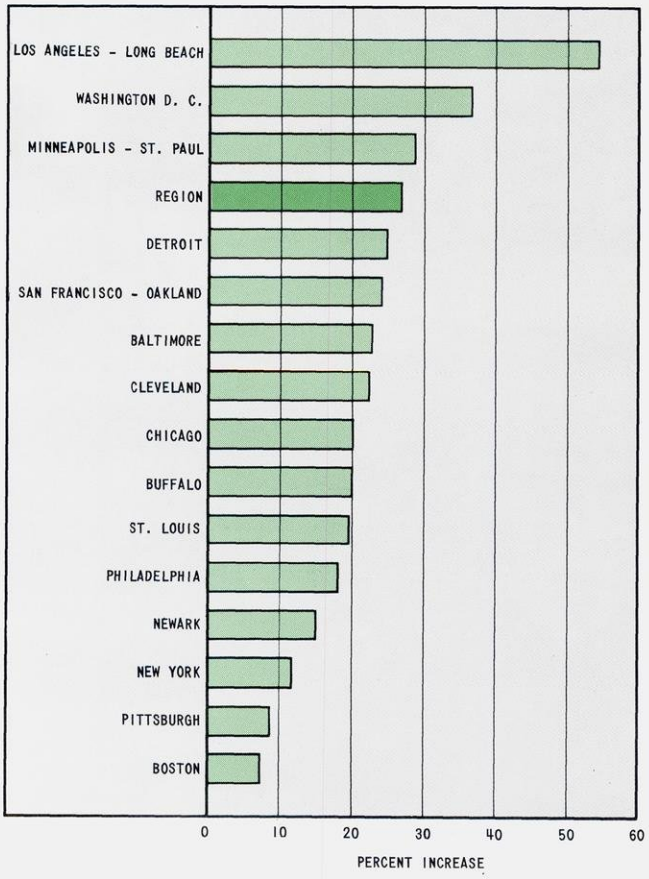
The types of data collected in this program were essentially the same as that published previously in two SEWRPC planning reports.[2] The additional data needed for the supplementary forecasts included information on regional birth, death, and migration rates and information on national population, employment, income, output, and productivity trends and projections.

The third socio-economic inventory, the financial resources data collection program, was initiated to provide the data necessary to evaluate the fiscal feasibility of the land use-transportation plans to be prepared by the land use-transportation study. This evaluation, which will relate forecasted public revenues to estimates of the public expenditures associated with the implementation of the land use-transportation plan, is a necessary prerequisite to successful plan implementation.

The types of data needed for such an evaluation include historical revenue and expenditure patterns of local governments in the Region, capital improvement cost data, and property value trends in the Region. Data of this type were collected for every governmental unit in the Region, including school districts. The data required were obtained primarily from Wisconsin State Tax and Audit Department records and supplemented with capital improvement cost information.

Figure 6

PERCENT INCREASE IN POPULATION BETWEEN 1950 AND 1960 IN THE REGION AND IN THE 15 LARGEST STANDARD METROPOLITAN STATISTICAL AREAS IN THE UNITED STATES



Source: U. S. Bureau of the Census.

[2] See SEWRPC Planning Report No. 3, The Economy of Southeastern Wisconsin, and SEWRPC Planning Report No. 4, The Population of Southeastern Wisconsin.

THE POPULATION OF THE REGION

Population Size

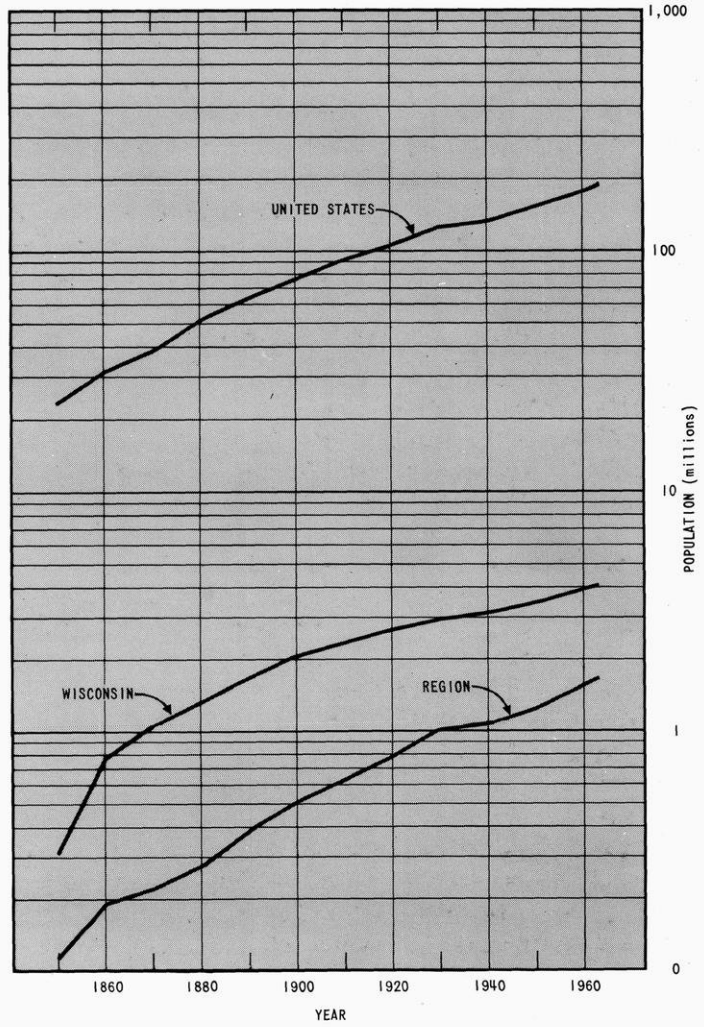
The present population of the Region is estimated at 1,674,000. The Region, therefore, presently contains approximately 1 percent of the total population of the nation and approximately 41 percent of the population of the state. The Region contains the twelfth largest city in the nation and is one of the fastest growing large metropolitan regions in the nation (see Figure 6).

The population of the Region has increased in every decade since 1850. In the late nineteenth and early twentieth centuries, the regional population increased at rates ranging from about 50,000 persons to a high of 220,000 persons per decade. Much of the regional population growth in this period reflected the flow of immigrants into the United States, particularly the immigration of German and Polish nationalities into the Region. After a relatively small increase in population during the depression years, the regional population increased by about 175,000 persons from 1940 to 1950 and by over 330,000 persons from 1950 to 1960—a historic peak. The regional population since 1960 has continued to increase at approximately the same rate as that of the last decade.

The population increase within the Region over the past century has generally occurred at a higher rate than for the state and nation (see Figure 7 and Table 1). As a result of this more rapid growth, the regional share of the total national

Figure 7

POPULATION TRENDS IN THE REGION, THE STATE OF WISCONSIN, AND THE UNITED STATES (1850 - 1963)



Source: U. S. Bureau of the Census.

Table 1

POPULATION TRENDS IN THE REGION, WISCONSIN, AND UNITED STATES (1850 - 1963)

Year	Total Population			Region Population as a Percent of	
	Region	Wisconsin	United States	U. S.	Wisconsin
1850	113,389	305,391	23,196,876	0.49	37.1
1860	190,409	775,881	31,443,321	0.61	24.5
1870	223,546	1,054,670	38,558,371	0.58	21.2
1880	277,119	1,315,497	50,155,783	0.55	21.0
1890	386,774	1,693,330	62,947,714	0.61	22.8
1900	501,808	2,069,042	75,994,575	0.66	24.2
1910	631,161	2,333,860	91,972,266	0.69	27.0
1920	783,681	2,632,067	105,710,620	0.74	29.7
1930	1,006,118	2,939,006	122,775,046	0.82	34.2
1940	1,067,699	3,137,587	131,669,270	0.81	34.0
1950	1,240,618	3,434,575	151,325,798	0.82	36.1
1960	1,573,620	3,952,771	179,323,175	0.88	39.8
1963	1,674,000	4,061,000	188,616,000	0.88	41.2

Source: U. S. Bureau of the Census; SEWRPC.

population has increased from 0.49 percent in 1850 to 0.88 percent in 1963, and the regional share of the state population has increased from 37.1 percent in 1850 to 41.2 percent in 1963. Only in the latter part of the nineteenth century did the national and state populations increase more rapidly than that of the Region.

The recent rapid increase in the regional population is in part the result of increasing birth rates and decreasing death rates within the Region. The birth rate in the Region has increased from 15.5 births per thousand persons in 1940 to 22.6 births per thousand persons in 1963, while the death rate has declined from 9.8 deaths per thousand persons to 9.0 deaths per thousand persons over the same period of time (see Table 2).

Table 2

BIRTHS AND DEATHS PER THOUSAND POPULATION IN THE REGION, WISCONSIN, AND UNITED STATES (1940 - 1963)

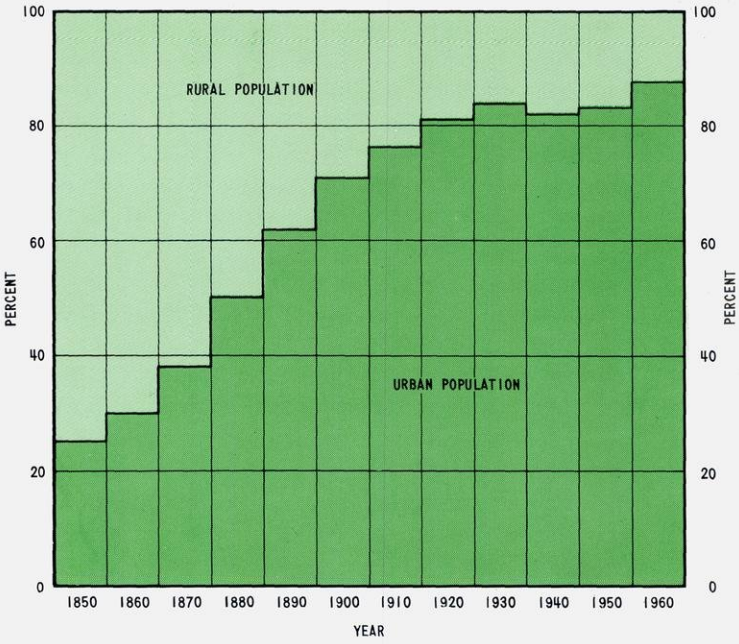
Year	Birth Rate			Death Rate		
	Region	Wis.	U. S.	Region	Wis.	U. S.
1940.	15.5	17.4	19.4	9.8	10.1	10.8
1950.	23.4	24.2	24.1	9.6	9.8	9.6
1960.	26.2	25.2	23.7	9.1	9.6	9.5
1963.	22.5	22.6	23.4	9.0	9.8	9.5

Source: Wisconsin State Board of Health; U. S. Public Health Service.

It is significant that the birth rate within the Region has increased more rapidly than that of the state or nation but is presently lower than either the state or national rates. Similarly, the regional death rate is presently lower than the state or national rates.

Figure 8

DISTRIBUTION OF URBAN AND RURAL POPULATION IN THE REGION (1850 - 1960)



Rural population includes rural non-farm residents.
Source: U. S. Bureau of the Census.

Migration has also been a significant factor in the regional population growth. In the decade from 1940 to 1950, there was an increase in the regional population due to net inmigration (excess of inmigrants over outmigrants) of over 50,000 persons. In the following decade, net inmigration more than doubled to over 109,000 persons. Since 1960 the rate of population increase due to migration has declined slightly, and it is estimated that net migration into the Region from 1960 to 1963 was approximately 25,000 persons.

Table 3

NATURAL INCREASE AND NET MIGRATION IN THE REGION BY COUNTY (1940 - 1963)

County	Natural Increase[a]				Net Migration[b]			
	1940 to 1950	1950 to 1960	1960 to 1963	Total 1940 to 1963	1940 to 1950	1950 to 1960	1960 to 1963	Total 1940 to 1963
Kenosha	8,110	13,860	5,560	27,530	3,623	11,517	490	15,630
Milwaukee	84,515	149,773	47,177	281,465	19,647	15,227	3,067	37,941
Ozaukee	2,567	5,905	2,174	10,646	1,809	9,175	976	11,960
Racine	11,326	21,364	7,140	39,830	4,212	10,832	1,641	16,685
Walworth	2,353	5,756	1,874	9,983	6,128	5,028	1,264	12,420
Washington	3,621	7,496	2,721	13,838	1,851	4,721	668	7,240
Waukesha	8,410	19,642	9,158	37,210	14,747	52,706	16,759	84,212
Total	120,902	223,796	75,804	420,502	52,017	109,206	24,865	186,088

[a] *Excess of births over deaths.*
[b] *Excess of inmigrants over outmigrants.*
Source: U. S. Bureau of the Census; SEWRPC.

The combined effect of these growth components has been to increase the regional population by over 600,000 persons in the period from 1940 to 1963. About 70 percent of this population growth, or 420,000 persons, was due to natural increase and about 30 percent, or 186,000 persons, to net inmigration. This relationship of natural increase to net inmigration within the Region, however, has not been uniform throughout the individual counties in the Region. For example, Waukesha, Ozaukee, and Walworth counties experienced more net inmigration than natural increase in the 1940 to 1963 period, whereas the overall population increase in Milwaukee County consisted almost entirely of natural increase (see Table 3).

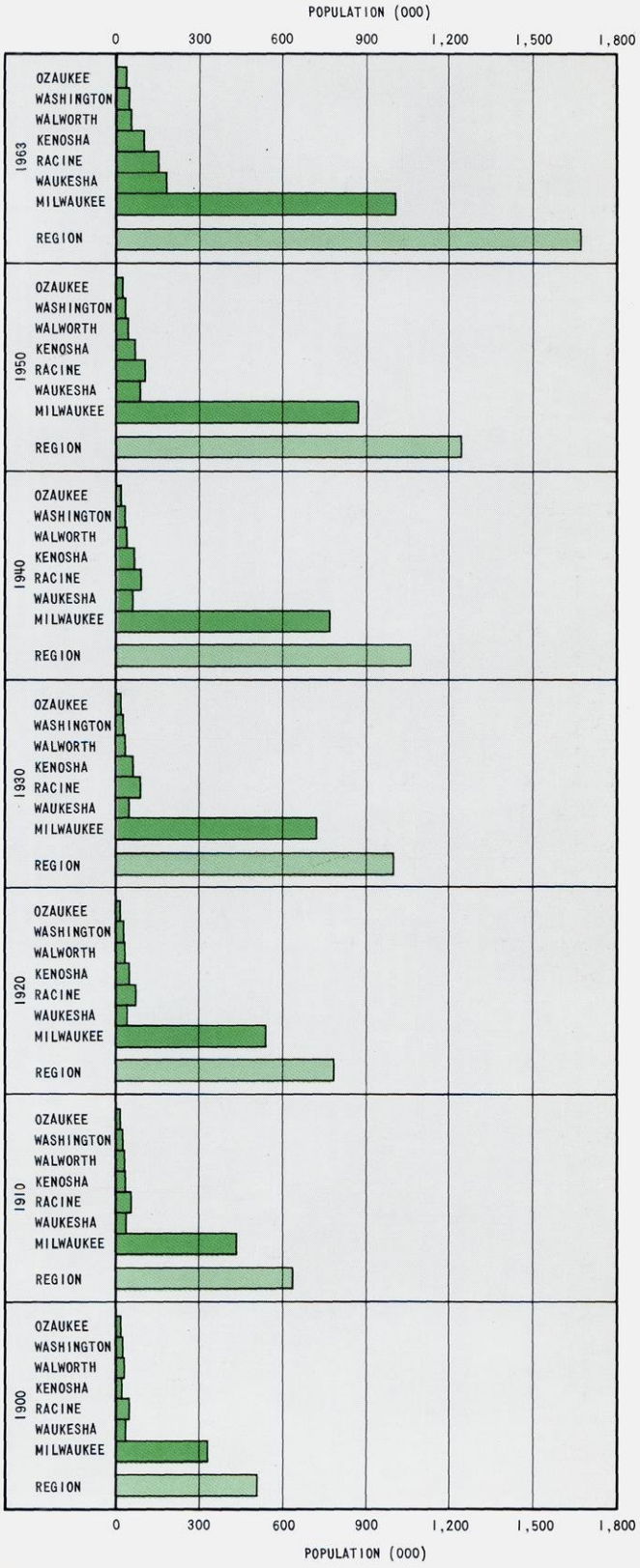
It should be noted that the three factors causing population growth in the Region have shown signs of change since 1960. The birth rate appears to have begun to decline, the death rate to stabilize, and the amount of net inmigration to decline. The recent decline in the general birth rate may be only a short run phenomenon, however, reflecting the low birth rates of the "Great Depression." Also, state and local efforts to encourage industrial expansion in southeastern Wisconsin, if successful, would tend to stabilize or reverse recent declines in net inmigration.

Population Distribution

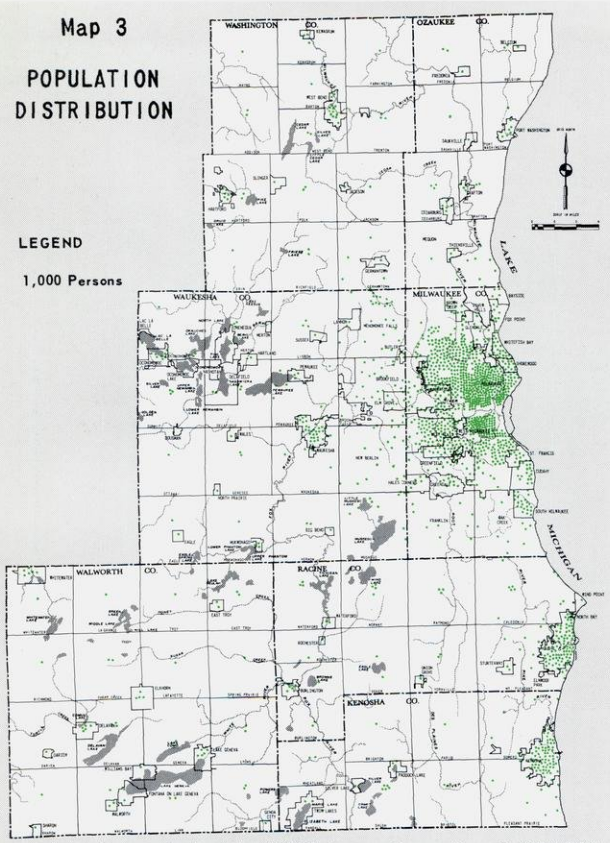
The Southeastern Wisconsin Region, in common with most metropolitan regions in the United States, is becoming increasingly urban. In 1850 the population of the Region was approximately 75 percent rural and 25 percent urban; by 1900 this relationship had nearly reversed to 30 percent rural and 70 percent urban; and by 1960 only 12 percent of the regional population was rural while 88 percent was urban. Moreover, of the 12 percent classified as rural, 10 percent was classified as rural non-farm and only 2 percent as rural-farm. The entire 110-year rural-urban change is shown graphically in Figure 8. This trend to urbanization is one of the most significant distributional changes taking place within the Region, the state, and the nation today.

Population growth since the year 1900 has not been uniform throughout the seven counties comprising the Region. During the 30-year period from 1900 to 1930, the highest rates of population increase occurred in the three urban counties of Milwaukee, Racine, and Kenosha. Urban decentralization over the last three decades, however, has reversed this trend; and the highest rates of

Figure 9
DISTRIBUTION OF POPULATION IN THE REGION BY COUNTY (1900 - 1963)



Source: U. S. Bureau of the Census; SEWRPC.



The regional population in 1963 is estimated at 1,674,000 persons, about 80 percent of which is concentrated in Milwaukee, Racine, and Kenosha counties. The effects of urban sprawl are evident, however, in the counties of Waukesha and Ozaukee.

population increase are presently occurring in certain outlying counties of the Region, notably Waukesha and Ozaukee counties (see Figure 9).

These varying rates of change of population growth in the counties of the Region have resulted in significant distributional shifts of population among the seven counties. As shown in Table 4, the most dramatic distributional changes over the entire 63-year period have occurred in Milwaukee and Waukesha counties. The Milwaukee County proportion of the total regional population increased by about 6 percent from 1900 to 1930 and then decreased by over 7 percent from 1930 to 1963. The proportion of the total regional population in Waukesha County decreased by about 2 percent from 1900 to 1930 and then increased by about 6 percent from 1930 to 1963. The result of the most recent changes in population distribution within the Region has been an areawide spread of population around the Milwaukee, Racine, and Kenosha urbanized areas. This diffusion of population has resulted in many areawide development problems, including those problems relating to changing land use and transportation (see Map 3 and the urban growth map, Map 21, in Chapter V).

Population Characteristics

The total number of inhabitants and their spatial distribution are important factors to be considered in any land use-transportation planning effort. Equally important, however, are certain population characteristics having implications for land use and transportation planning. These characteristics include age and sex composition, marital status, household size, educational attainment, personal income, and housing values. Some of these characteristics, such as age and sex composition and marital status, have indirect implications for land use-transportation planning because they affect the rate of population growth through natural increase. These and other characteristics also have a direct effect on travel demand, travel habits, and travel characteristics, including the choice of mode.

The age and sex compositions of the regional population have changed significantly from 1950 to

Table 4

POPULATION DISTRIBUTION IN THE REGION BY COUNTY
(1900 - 1963)

County	1900		1930		1960		1963	
	Population	Percent of Region	Population	Percent of Region	Population	Percent of Region	Population	Percent of Region
Kenosha	21,707	4.3	63,277	6.3	100,615	6.4	106,665	6.4
Milwaukee	330,017	65.8	725,263	72.1	1,036,047	65.8	1,086,291	64.9
Ozaukee	16,363	3.3	17,394	1.7	38,441	2.5	41,591	2.5
Racine.	45,644	9.1	90,217	9.0	141,781	9.0	150,562	9.0
Walworth.	29,259	5.8	31,058	3.1	52,368	3.3	55,506	3.3
Washington. . . .	23,589	4.7	26,430	2.6	46,119	2.9	49,508	2.9
Waukesha.	35,229	7.0	52,350	5.2	158,249	10.1	184,166	11.0
Region	501,808	100.0	1,005,989	100.0	1,573,620	100.0	1,674,289	100.0

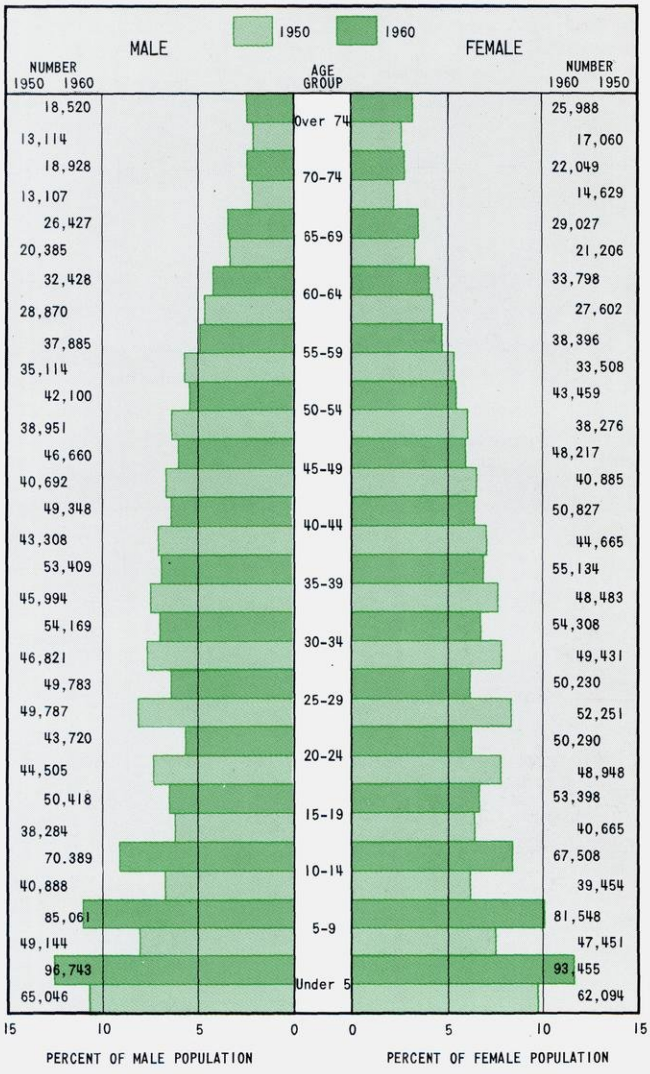
Source: U. S. Bureau of the Census; SEWRPC.

1960. The population pyramid shown in Figure 10 shows both the growth in the proportion of children under 15 years of age and of persons over 65 years of age. These changes, which are a direct result of the rising birth rates and declining death rates noted earlier, are placing great economic demands on the working-age population which has become proportionally smaller, particularly in the age group from 20 to 35 years of age. The geographic distribution of age throughout the Region is shown on Map 4. This map shows a concentration of children and younger people in suburban areas adjacent to the large central cities and of older people in many areas of the cities of Milwaukee, Racine, and Kenosha. There is also a notable concentration of older persons in southern Ozaukee County, western Waukesha County, and southern Walworth County.

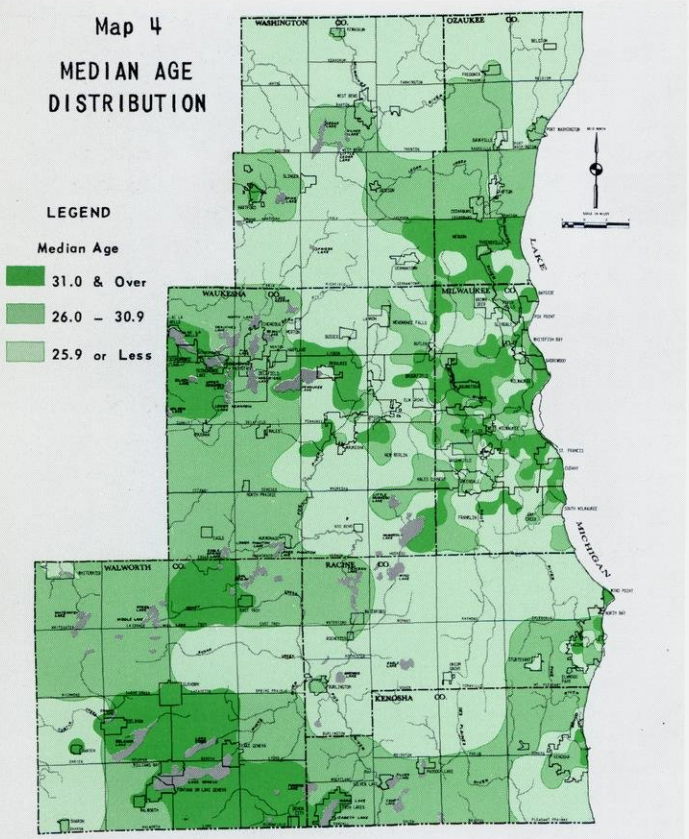
The sex composition of the regional population has also been changing. The change is generally toward a higher proportion of females in the regional population, particularly in the older age groups (see Figure 10). This change toward a more predominantly female population composition is evidenced by the fact that in 1930 the ratio of males to females in the Region was 103 males to each 100 females compared to 97 males to each 100 females in 1960. Much of this change is due to the fact that women have a longer life expectancy than do men.

Figure 10

PERCENTAGE DISTRIBUTION OF POPULATION BY AGE AND SEX FOR THE REGION (1950 and 1960)



Source: U. S. Bureau of the Census.



The median age of the regional population in 1963 was only 28 years compared to 31 years in 1950. Concentrations of older people occur in the central cities and rural areas of the Region.

One of the most noteworthy changes in the regional population composition has taken place in marital status.[3] The marital status of the regional population in 1930, 1940, 1950, and 1960 is presented in Table 5. The large increase in the proportion of married persons during the 1940 to

[3] Marital status as referred to here pertains to the proportion of single, married, and widowed or divorced persons in the population 14 years of age and over.

Table 5

MARITAL STATUS OF THE POPULATION 14 YEARS OF AGE AND OVER IN THE REGION (1930 - 1960)

Year	Single		Married		Divorced or Widowed		Total Number
	Number	Percent	Number	Percent	Number	Percent	
1930	142,928	32.9	255,318	58.8	36,109	8.3	434,551
1940	143,522	31.0	274,402	59.2	45,423	9.8	463,347
1950	227,615	23.9	631,206	66.3	93,273	9.8	952,095
1960	245,967	22.4	745,619	67.8	108,924	9.8	1,100,510

Source: U. S. Bureau of the Census.

1950 decade is evident as is the large increase in the proportion of divorced or widowed persons during the decade from 1930 to 1940. These changes, which were related to unusual national conditions of war and depression, have either maintained the high levels reached during these conditions or increased slightly. The trend toward higher numbers of married persons in the Region reflects an increasing marriage rate which has been responsible, in part, for the increasing proportion of children in the regional population.

One of the most important characteristics of the regional population is the number and size of the households in the Region because households are so closely related to land use and transportation planning.[4] The number of households in the Region has been increasing at a higher rate than has the total population since 1950 (see Table 6).

Table 6

HOUSEHOLD POPULATION TREND IN THE REGION (1950 - 1963)

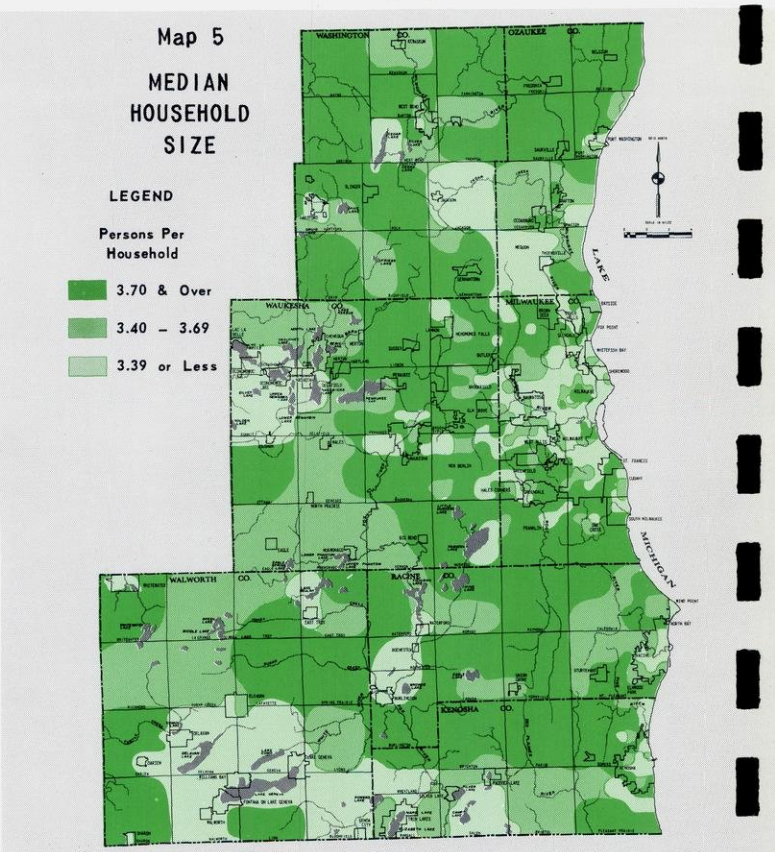
Year	Number of Households	Household Population	Persons Per Household
1950	354,544	1,190,193	3.36
1960	465,913	1,537,235	3.30
1963	482,410	1,643,577	3.41
Percent Change 1950-1963	36.1	38.1	--

Figures not adjusted for changes made in the 1960 census household definition.

Source: U. S. Bureau of the Census; SEWRPC.

This relatively rapid increase in household formation since 1950 reflects the increase in higher marriage rates previously noted. While there was a substantial increase in the total number of households and in the total household population from 1950 to 1960, the average number of persons per household declined. This decline occurred as a result of a rapid increase in the number of one-person households and was probably indicative of a tendency for unmarried persons to maintain homes away from relatives. However, since 1960 the trend toward a smaller average household size has apparently reversed; and according to the O & D surveys findings, the average household size in the Region in 1963 of 3.41 persons per household was above the 1950 level.

The geographic distribution of average household sizes in the Region is shown on Map 5. The smaller average household sizes occur in the central cities and smaller outlying cities and vil-



There were almost one-half million households in the Region in 1963 with an average size of 3.4 persons per household. In the Region larger average household sizes are generally associated with increased distance from the central cities.

[4] A household is defined as an individual or family occupying a separate dwelling unit, as opposed to persons who reside in group quarters, such as dormitories or boarding houses, or are inmates of institutions.

lages. The larger average household sizes occur in two areas near the central business district of the City of Milwaukee, in suburban areas throughout the Region, and in rural farm areas.

The educational attainment level of the regional population over 25 years of age has shown a substantial increase since 1950. The median year of schooling completed increased from 9.5 years to 11.0 years from 1950 to 1960. The 1960 level of 11.0 years is above the national average of 10.5 years. This general rise in the educational attainment of the regional population is further evidenced by the fact that in 1960 nearly 44 percent of the population over 25 had completed high school or attended college compared to only 36 percent in 1950 (see Table 7).

Table 7

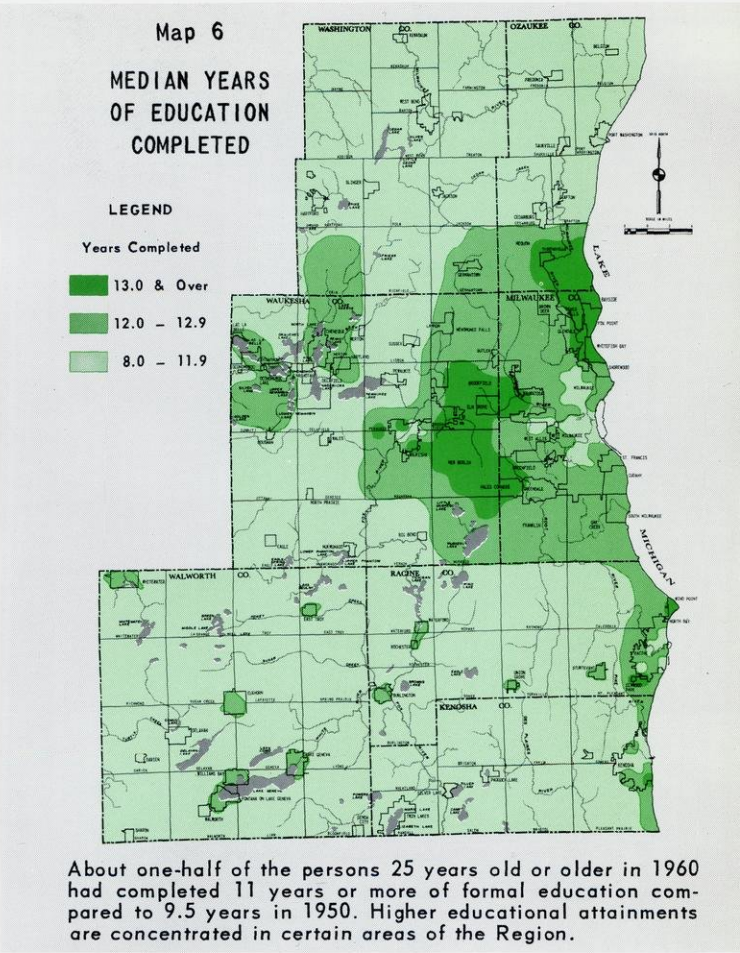
HIGHEST EDUCATIONAL ATTAINMENT LEVEL OF THE POPULATION 25 YEARS OF AGE AND OVER IN THE REGION (1950 and 1960)

Educational Attainment	1950		1960	
	Number	Percent	Number	Percent
No schooling.	8,420	1.0	11,305	1.3
Some elementary . . .	141,490	18.7	131,150	14.9
Elementary.	202,820	26.8	191,349	21.7
Some high school. . .	116,285	15.4	162,249	18.4
High school	170,830	22.6	237,848	27.0
Some college.	54,365	7.2	79,033	9.0
College*.	47,660	6.3	68,016	7.7
Schooling unknown . .	15,280	2.0	----	---
Total	757,150	100.0	880,950	100.0
Median year	9.5	---	11.0	---

* *Includes persons with 4 or more years of college.*
Source: U. S. Bureau of the Census.

Educational attainment, as might be expected, is not uniform throughout the Region (see Map 6). The highest levels of educational attainment are prevalent in northeastern and western Milwaukee County and in eastern Waukesha County. Three areas of high educational attainment are also evident in the cities of Racine, Kenosha, and Waukesha. On the other hand, lower educational attainment levels are generally prevalent in the central areas of the cities of Milwaukee, Racine, and Kenosha.

Personal income [5] in the Region has been increasing at a rapid rate, and in 1963 total personal income stood at over $4 billion (see Table 8). From 1949 to 1963, total personal income in the Region increased nearly $2.5 billion or 145 percent. This compares to a regional population increase over the same period of approximately 35 percent.



About one-half of the persons 25 years old or older in 1960 had completed 11 years or more of formal education compared to 9.5 years in 1950. Higher educational attainments are concentrated in certain areas of the Region.

Because the total amount of personal income in the Region has been increasing at a higher rate than has the total population since 1949, per capita and per household incomes have increased markedly. Per capita incomes increased over $1,000 from

Table 8

PERSONAL INCOME TRENDS IN THE REGION (1949 - 1963)

Year	Total Income (millions of dollars)		Per Capita Income (dollars)		Per Household Income (dollars)	
	Actual	Constant*	Actual	Constant*	Actual	Constant*
1949 . .	1,655	2,216	1,334	1,786	4,668	6,250
1959 . .	3,492	3,671	2,219	2,333	7,496	7,878
1963 . .	4,014	4,014	2,398	2,398	8,322	8,322

* *Adjusted for price change; base year equals 1963.*
Source: U. S. Bureau of the Census; SEWRPC.

[5] Personal income as defined by the U. S. Bureau of the Census includes income from wages, salaries, self-employment earnings, social security, pensions, rent, interest, and other transfer payments. It excludes such income as that received in kind, imputed rental income from owned homes, income from sale of property, tax refunds, insurance payments, gifts, and borrowed money.

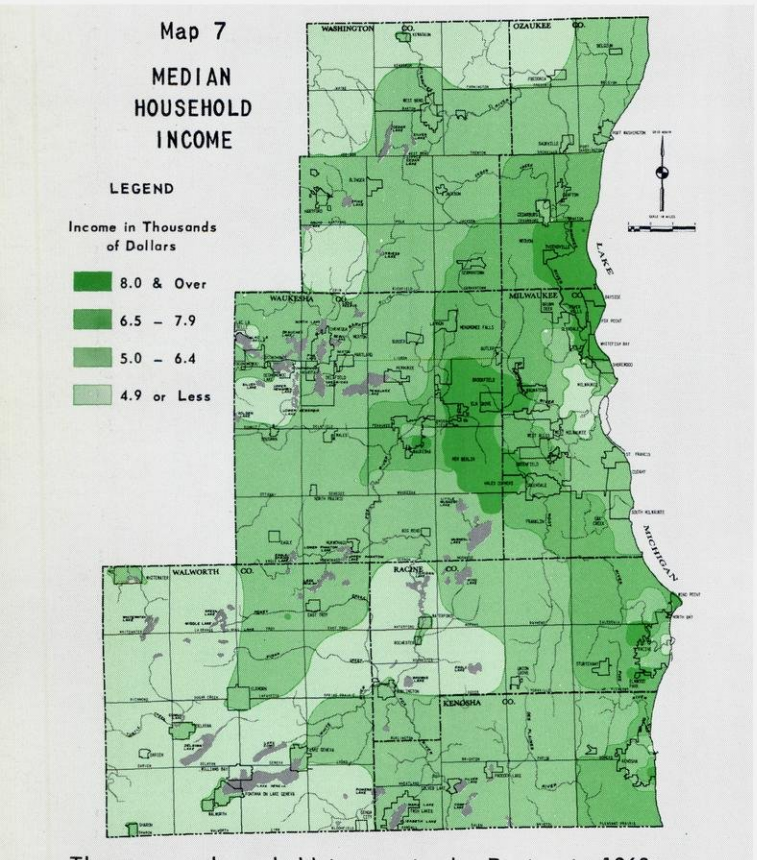
Table 9

SINGLE-FAMILY HOUSING VALUE TRENDS IN THE REGION
(1950 - 1960)

Value (dollars)	1950		1960		Percent Change 1950 to 1960
	Number	Percent	Number	Percent	
Less than 5,000	6,683	5.6	2,516	1.1	-62.4
5,000 - 7,499	17,990	15.0	8,401	3.7	-53.3
7,500 - 9,999	25,750	21.5	17,843	7.9	-30.8
10,000 - 14,999	45,369	37.8	72,371	31.9	59.5
15,000 - 19,999	14,876	12.4	73,697	32.5	395.4
20,000 & over	9,295	7.7	51,825	22.9	457.6
Total	119,963	100.0	226,653	100.0	---
Median Value	$11,100	---	$15,700	---	---

Source: U. S. Bureau of the Census.

1949 to 1963, from $1,334 to $2,398. Per household incomes increased over $3,600 in the same period, from $4,668 to $8,322. The per household income increase reflects not only an increase in the earnings of the heads of each household but also the tendency for other household members, wives in particular, to supplement household income.

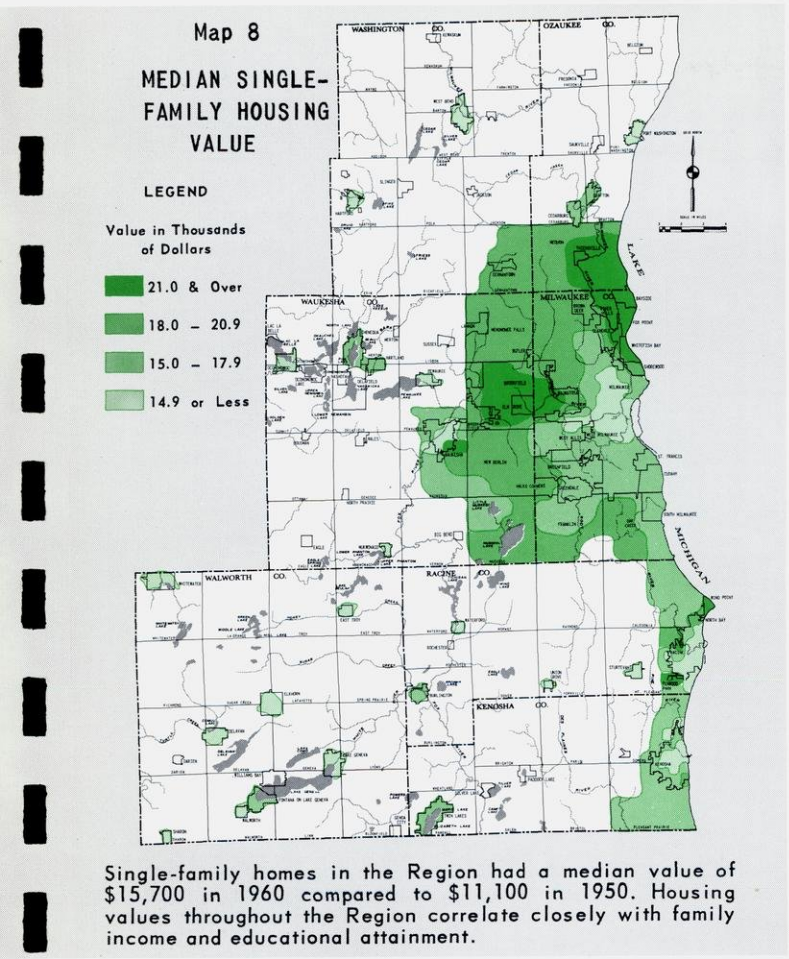


The average household income in the Region in 1963 was over $8,000 compared to less than $5,000 in 1949. Total personal income in the Region in 1963 was over $4 billion. Suburban areas show relatively high average income levels.

The distribution of personal income on a per household basis throughout the Region is shown on Map 7. It is evident that the highest average household income areas are presently in northeastern and western Milwaukee County and in eastern Waukesha County and that the lowest average household income areas are presently in the central cities of Racine and Milwaukee. It should be noted that the median educational attainment distribution throughout the Region closely approximates the median income distribution.

Housing values in the Region have followed a trend closely paralleling that of personal income; that is, a rapid increase in the market value of single-family homes has accompanied the rapid increase in total and per household personal incomes. It can be seen from Table 9 that the median market value of single-family homes increased approximately $4,600 from 1950 to 1960. This is the result of a decrease in the number of homes with values less than $10,000 and an increase in the number of homes with values over $10,000. Particularly noteworthy is the fact that the number of homes in the Region with values greater than $20,000 increased over 4.5 times in the ten-year period. This rapid increase in market values represents some increase in value of the homes existing before 1950 but more significantly reflects the high volume of new, higher value construction which has taken place in the urban and suburban areas of the Region in the recent past.

The distribution of median single-family housing values throughout the Region is shown on Map 8. Major concentrations of higher median single-family housing values occur in the north shore and western portions of the Milwaukee urbanized area, the north shore and northwestern portions of the Racine urbanized area, and in the south-



Single-family homes in the Region had a median value of $15,700 in 1960 compared to $11,100 in 1950. Housing values throughout the Region correlate closely with family income and educational attainment.

western portion of the Kenosha urbanized area. Major concentrations of lower median single-family housing values occur in the central areas of the cities of Milwaukee, Racine, and Kenosha. As might be expected, the generalized housing value distribution in the Region closely approximates the educational attainment and income distributions.

THE ECONOMY OF THE REGION

Changes in the population of an area are closely related to changes in the amount of economic activity in that area. This is true, not only because much of the population migration into an area is dependent upon the availability of jobs in that area, but also because jobs must ultimately be available to hold the natural increase and prevent the outmigration of native young people entering the labor force. The rapid growth in the population of the Region may, therefore, be basically attributed to increasing economic activity in the Region.

Size of the Economy

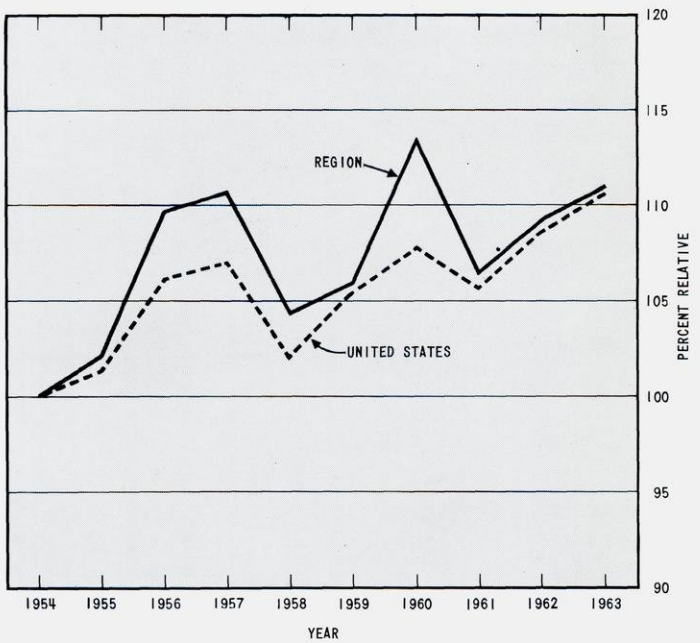
For land use-transportation planning purposes, one of the best measures of economic activity is the number of employment opportunities, or jobs, available within the planning area. The amount of economic activity in the Region, as measured by the number of jobs available, has increased at varying rates in the recent past. From 1954 to 1957, there was a rapid increase in the number of jobs available, followed by a sharp decline in 1958 corresponding with a general recession in the national economy. From 1958 to 1960, there was again a rapid increase, followed by another sharp decline in 1961, again corresponding with another national recession. Since 1961 there has been a more moderate but steady increase in jobs within the Region (see Figure 11).

This recent trend in regional economic activity has paralleled to a certain extent the recent trend in national economic activity. The regional and national long-term trends over the last decade are similar; however, fluctuations in periods of expansion and recession are much greater for the Region than for the nation. This is a reflection of the high concentration of regional economic activity in capital goods production which, as a derived demand, is highly responsive to lesser advances and declines in the general consumer demand for goods and services.

By 1963, growth in economic activity in the Region had resulted in the creation of approximately

Figure 11

RELATIVE JOB GROWTH IN THE REGION AND THE UNITED STATES (1958 - 1963)



Source: U. S. Department of Labor; Wisconsin Industrial Commission.

Table 10

DISTRIBUTION OF FIRST WORK TRIPS BY PLACE OF RESIDENCE AND PLACE OF WORK - 1963

Place of Residence	Place of Work								
	Region								
	Kenosha	Ozaukee	Milwaukee	Racine	Walworth	Washington	Waukesha	Outside Region[a]	Total
Kenosha	24,878	---	168	1,546	109	---	12	4,170	30,883
Ozaukee	5	4,537	4,820	10	4	112	95	190	9,773
Milwaukee	632	1,195	320,927	1,210	288	365	4,759	2,548	331,924
Racine	2,995	---	3,183	34,780	216	---	211	506	41,891
Walworth	275	---	574	397	8,574	12	231	1,913	11,976
Washington	8	572	2,592	20	---	6,449	615	339	10,595
Waukesha	75	155	23,462	262	175	363	20,423	1,062	45,977
Outside Region[b]	2,264	632	2,551	501	1,574	1,131	1,259	---	9,912
Total	31,132	7,091	358,277	38,726	10,940	8,432	27,605	10,728	492,931

[a] *Includes only resident work trips that originated at home; auto passenger trips were assumed to have the same trip purpose as the driver.*

[b] *Includes all nonresident work trips with destinations in the Region; auto passenger trips were assumed to have the same trip purpose as the driver.*

Source: SEWRPC.

630,000 jobs. It is estimated from income data that the economy of the Region was at this time producing about 1 percent of the total gross national product of the United States. Stated another way, the economy of the Region was generating nearly $6 billion of income in the Region in the form of gross wages and salaries, proprietary income, corporate profits, and rental and interest income.

The Labor Force

The segment of the population most closely related to the economy is the labor force. The labor force is defined as those persons 14 years of age and over who are presently employed or seeking employment. It is the employed labor force which provides the economic support of the total population. The size of the labor force in the Region cannot be equated with the number of jobs available in the Region since some resident labor force members are employed at jobs located outside of the Region; some of the jobs located in the Region are held by nonresidents; some workers hold more than one job; and some of the labor force, at any given time, are unemployed. Data collected in the SEWRPC O & D surveys on first work trips indicate that the number of regional residents working at jobs outside the Region is slightly more than the number of nonresidents working at jobs within the Region (see Table 10).

It should also be noted that the size of the labor force in individual counties of the Region does not necessarily reflect a concomitant number of job opportunities within these same counties. For example, many of the members of the labor force in suburban Ozaukee County and Waukesha County

Table 11

LABOR FORCE SIZE IN THE REGION BY COUNTY AND FOR THE UNITED STATES (1940 - 1963)

Area	Labor Force				Percent Change (1940-1963)
	1940	1950	1960	1963	
Kenosha	26,400	32,500	39,800	41,600	57.6
Milwaukee	326,900	385,300	431,800	440,700	34.8
Ozaukee	7,600	9,600	14,400	15,400	102.6
Racine	38,000	46,800	54,900	57,000	50.0
Walworth	13,000	16,400	20,400	21,600	66.2
Washington	11,300	14,300	17,400	18,300	61.9
Waukesha	24,300	33,800	58,200	66,300	172.8
Region	447,500	538,700	636,900	660,900	48.7
United States	52,705,000	59,304,000	68,144,000	72,161,000	36.9

Source: U. S. Bureau of the Census; SEWRPC.

Table 12

LABOR FORCE PARTICIPATION IN THE REGION
(1950 and 1960)

Item	1950	1960
Population (14 yrs. & over)		
Male	466,938	534,778
Female	485,157	565,719
Total	952,095	1,100,497
Labor Force		
Male	383,648	430,601
Female	155,068	206,300
Total	538,716	636,901
Participation Rate		
Male	82.4	80.9
Female	32.0	36.5
Total	56.7	58.0

Source: U. S. Bureau of the Census.

work at jobs available in Milwaukee County. In this regard, the O & D surveys data presented in Table 10 indicates that over 23,000 first work trips are made on an average weekday from residences in Waukesha County to places of work in Milwaukee County and over 4,800 such trips are made from Ozaukee County to Milwaukee County each day (see Table 10).

The regional labor force increased nearly 50 percent over the period from 1940 to 1963, while the national labor force increased by approximately 37 percent over the same period (see Table 11). Within the Region, Waukesha and Ozaukee counties experienced the fastest growth rate in the labor force over the period, the increases being approximately 173 and 103 percent, respectively. Milwaukee County experienced the slowest growth rate in the labor force with an increase of only 35 percent.

The size of the labor force in the Region is not only closely related to the amount of economic activity in the Region but is also closely related to the population. The relationship of the labor force to the population may be expressed as the labor force participation rate. This rate is a useful analytical tool for identifying trends or fluctuations in population which may occur in response to changing economic conditions. The labor force participation rate is defined for the purpose of this report as the proportion of the civilian population 14 years of age and over which is in the labor force.

Labor force participation in the Region has been increasing since 1950. The proportion of the population 14 years of age and over in the labor force increased from 56.7 percent in 1950 to 58.0 percent in 1960 (see Table 12). This increase in total labor force participation in the Region is due entirely to an increase in the proportion of females in the working age population who have either obtained a job or are actively seeking employment. This is evidenced by the fact that female labor force participation increased from 32.0 percent to 36.5 percent in the decade from 1950 to 1960, while the male participation in the labor force actually declined from 82.4 percent to 80.9 percent. Nevertheless, in 1960 male participation in the labor force was still more than twice as great as female participation. The participation trends noted are likely to continue as retirement occurs at younger ages, as males continue to spend longer periods of time acquiring formal education, and as females continue to supplement the family income.

As noted earlier, the labor force is comprised of those persons within the Region who are either working or are actively seeking work. In this regard, the employment status of the regional labor force in April of 1963 showed that approximately 96 percent of the labor force was employed and 4 percent unemployed (see Table 13). Approximately these same rates prevailed in April 1960; but in April 1950, the unemployment rate was somewhat lower, at 2.6 percent. Overall, the unemployment rate in the Region has been generally lower than the national rate. For example,

Table 13

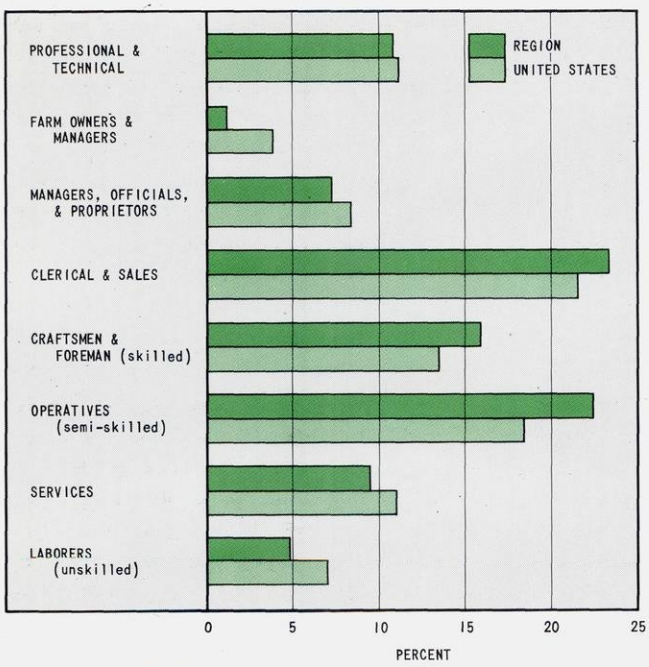
EMPLOYMENT STATUS OF THE LABOR FORCE IN THE REGION AND THE UNITED STATES
(April 1950 - 1963)

Year	United States			Region		
	Number Employed	Number Unemployed	Unemployment Rate	Number Employed	Number Unemployed	Unemployment Rate
1950.	56,449,000	2,855,000	4.8	524,500	14,200	2.6
1960.	64,639,000	3,505,000	5.1	612,700	24,200	3.8
1963.	68,098,000	4,063,000	5.6	634,900	26,000	3.9

Source: U. S. Bureau of the Census; U. S. Department of Labor; SEWRPC.

Figure 12

PERCENTAGE DISTRIBUTION OF THE EMPLOYED LABOR FORCE BY OCCUPATION FOR THE REGION AND THE UNITED STATES - 1960



Source: U. S. Bureau of the Census.

in April of 1963 the national unemployment rate averaged about 5.6 percent compared to the regional rate of 3.9 percent.

The relatively low unemployment rate in the Region is probably related to the fact that there are higher proportions of skilled and semiskilled blue collar workers in the regional labor force than the national labor force. These relationships are shown graphically in Figure 12. It can be seen from this figure that there were higher proportions of skilled and semiskilled foremen, craftsmen, and operatives and lower proportions of unskilled laborers in the regional labor force in 1960 than in the national labor force. There were, however, lower proportions of professionals, managers, and public officials in the regional labor force than in the national labor force, reflecting, in part, the fact that the regional economy is not as heavily oriented toward research as are the economies of the East, Gulf, and West Coast regions.

The skill levels of the regional labor force and of the national labor force have increased quite rapidly historically because of rapidly advancing technology. Technological change in the future may be anticipated at rates even higher than those of the past, and thus the future occupational distribution of the regional labor force will probably show much higher proportions of professional and technical personnel and a still smaller proportion of unskilled laborers than at present.

Distribution of Economic Activity

Nearly 75 percent of the economic activity of the Region, as measured by jobs, was located in Milwaukee County in 1963. An additional 14 percent was located in Racine and Kenosha counties combined. Approximately 89 percent of the regional jobs are, therefore, located in these three counties. The remaining 11 percent of the regional jobs are distributed as follows: Waukesha County, 5.3 percent; Walworth County, 2.0 percent; Washington County, 1.9 percent; and Ozaukee County, 1.7 percent (see Table 14).

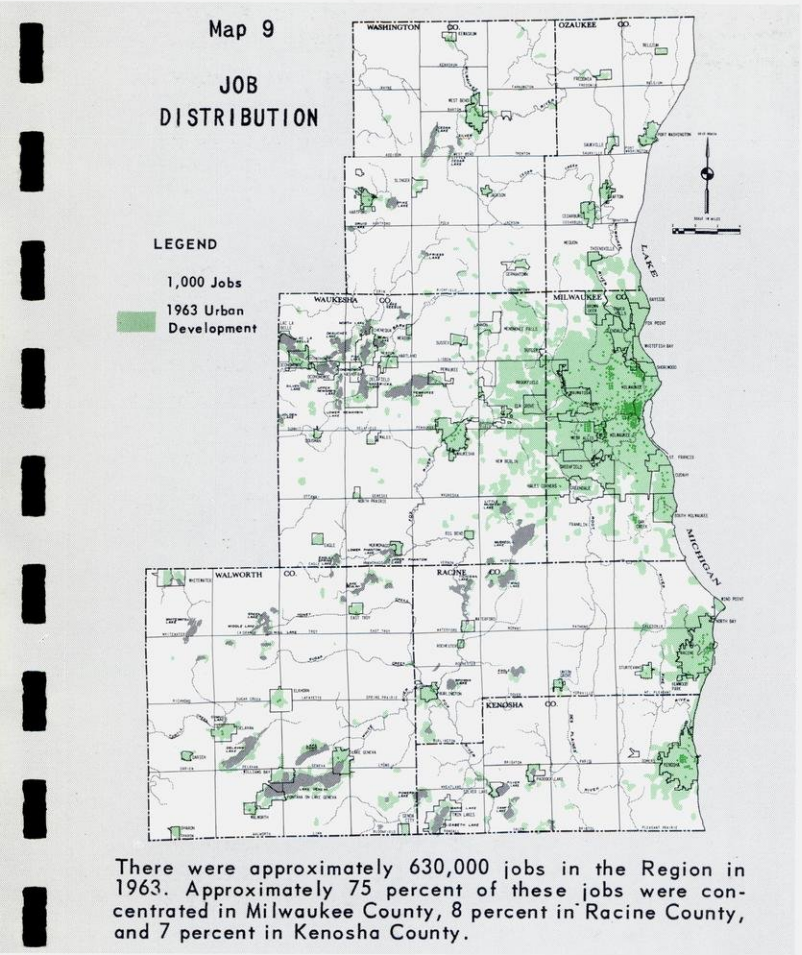
The trend in the intra-regional distribution of jobs is toward a decreasing concentration of jobs in Milwaukee County and, in turn, toward an increasing concentration of jobs in the other six counties of the Region. Waukesha County has shown the largest increase in the proportion of total regional jobs since 1955, an increase from 3.3 percent to 5.3 percent in 1963. This increase is in

Table 14

DISTRIBUTION OF JOBS IN THE REGION BY COUNTY (1955 - 1963)

County	1955		1960		1963	
	Jobs	Percent	Jobs	Percent	Jobs	Percent
Kenosha	35,600	6.3	39,800	6.5	41,400	6.6
Milwaukee	440,100	77.9	466,400	75.7	468,600	74.3
Ozaukee	7,900	1.4	9,400	1.5	10,700	1.7
Racine	44,600	7.9	48,000	7.8	52,200	8.3
Walworth	8,500	1.5	11,300	1.8	12,600	2.0
Washington	9,600	1.7	11,700	1.9	12,000	1.9
Waukesha	18,600	3.3	29,400	4.8	33,400	5.3
Region	564,900	100.0	616,000	100.0	630,900	100.0

Source: Wisconsin Industrial Commission.



There were approximately 630,000 jobs in the Region in 1963. Approximately 75 percent of these jobs were concentrated in Milwaukee County, 8 percent in Racine County, and 7 percent in Kenosha County.

direct contrast to Milwaukee County, where the proportion of total regional jobs decreased from 77.9 percent to 74.7 percent in the same period. These changes reflect a general historic trend toward decentralization of manufacturing, distribution, and service activities from highly urbanized areas to more suburban and even rural-urban fringe areas.

A more detailed analysis of the distribution of jobs throughout the Region in 1963 clearly indicates that there is a heavy concentration of jobs in the cities of Milwaukee, Racine, and Kenosha (see Map 9). Based upon the O & D surveys data, the central business district (CBD) of Milwaukee alone accounts for approximately 55,000 jobs or about 11 percent of the total. Of these 55,000 jobs, 58 percent are trade and service jobs, 18 percent are manufacturing jobs, and 24 percent are government and miscellaneous jobs. In addition to these major employment centers, there are several minor employment concentrations in outlying cities and villages.

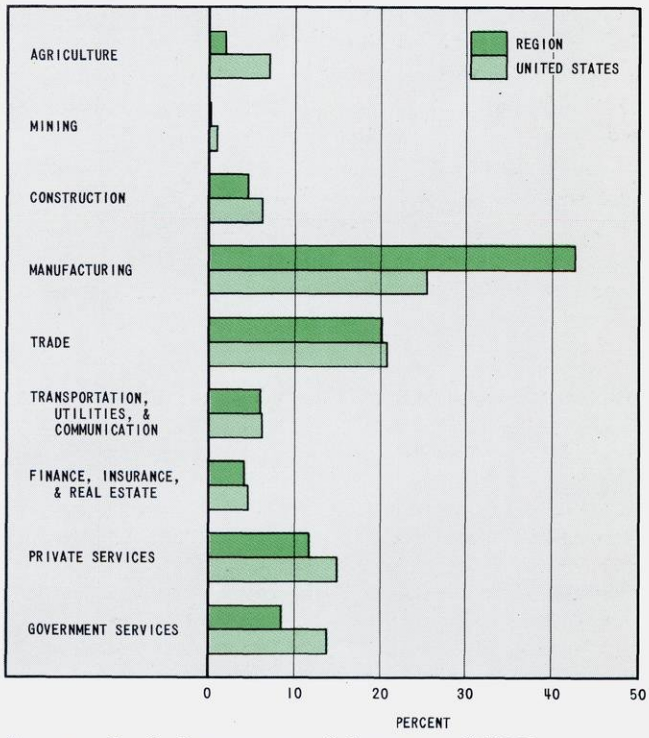
Structure of the Economy

For land use-transportation planning purposes, the character of the regional economy can probably be best described in terms of its industrial structure, since the number and types of industry directly affect land use and transportation needs. In this regard, economic activity within the Region can be classified into nine major industry groups: 1) agriculture; 2) mining; 3) construction; 4) manufacturing; 5) transportation, communication, and utilities; 6) trade; 7) finance, insurance, and real estate; 8) services; and 9) government.

Economic activity within the Region is heavily concentrated in manufacturing (see Figure 13). In 1963 approximately 43 percent of the total jobs in the Region were in manufacturing compared to 25 percent nationally. The proportion of economic activity in all other industry groups within the Region, as measured by jobs, was less than the national averages. The regional economy like that of the nation is, however, becoming less oriented toward manufacturing and more toward other industry groups. This is particularly true in the services and government industry groups which accounted for over 20 percent of total jobs in the Region in 1963 compared to 18 percent in 1954.

Figure 13

PERCENTAGE DISTRIBUTION OF TOTAL JOBS IN THE REGION AND THE UNITED STATES BY MAJOR INDUSTRY GROUP - 1963



Source: U. S. Department of Commerce; SEWRPC.

Table 15

PERCENTAGE DISTRIBUTION OF TOTAL EMPLOYMENT BY INDUSTRY FOR THE REGION AND THE UNITED STATES (1954 and 1963)

Industry Group	Percent of Total Employment			
	Region		United States	
	1954	1963	1954	1963
Agriculture . . .	3.6	2.0	10.7	7.2
Mining.	0.1	0.1	1.2	0.9
Construction. . .	4.2	4.5	5.8	6.1
Manufacturing . .	44.7	42.7	27.5	25.5
Transportation[a] .	6.2	6.0	7.1	6.1
Trade	19.8	20.2	20.0	20.7
Finance[b].	3.2	4.1	4.1	4.6
Services.	11.3	11.8	12.5	15.0
Government[c]. . . .	6.9	8.6	11.1	13.9
Total	100.0	100.0	100.0	100.0

[a] *Includes communication and utilities.*

[b] *Includes insurance and real estate.*

[c] *Includes public education.*

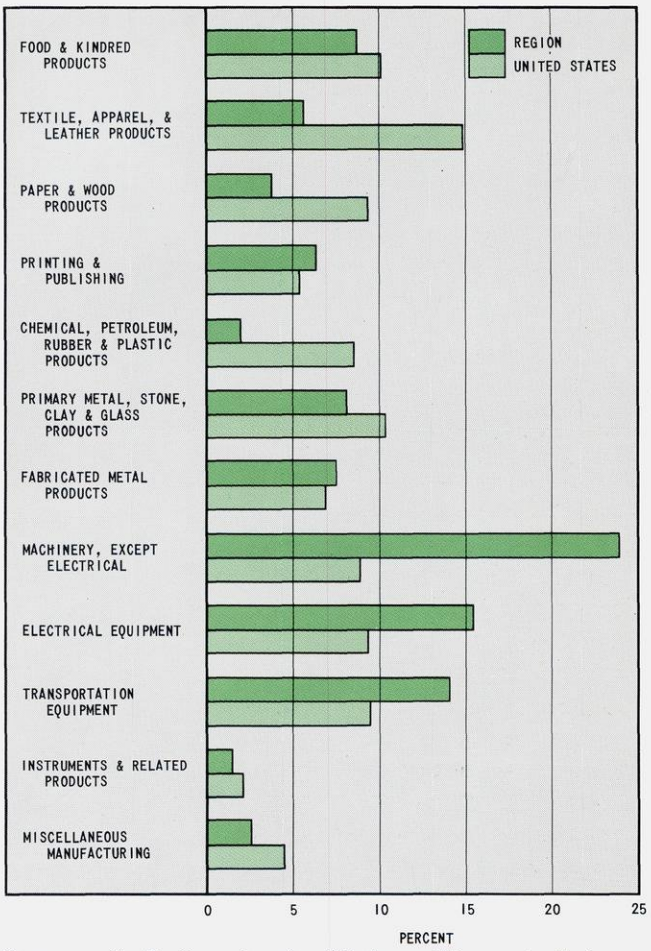
Source: U. S. Department of Labor; Wisconsin Industrial Commission.

The proportion of manufacturing jobs, on the other hand, dropped during this same period from 44.7 percent to 42.7 percent of the total jobs in the Region (see Table 15).

The structure of economic activity within the regional manufacturing industry, which is so important in the regional economy, is also quite different from the structure of the manufacturing industry nationally (see Figure 14). In contrast to the manufacturing industry of the United States, the manufacturing industry in the Region is more

Figure 14

PERCENTAGE DISTRIBUTION OF MANUFACTURING JOBS IN THE REGION AND THE UNITED STATES BY TYPE OF MANUFACTURING - 1963



Source: U. S. Department of Labor; Wisconsin Industrial Commission.

Table 16

PERCENTAGE DISTRIBUTION OF EMPLOYMENT IN THE MANUFACTURING INDUSTRY FOR THE REGION AND THE UNITED STATES (1954 and 1963)

Type of Manufacturing	Percent of Total Manufacturing Employment			
	Region		United States	
	1954	1963	1954	1963
Food and Kindred Products	9.5	8.9	11.1	10.2
Textile, Apparel, and Leather Products.	7.3	5.6	15.9	14.9
Paper and Wood Products	4.9	3.8	9.7	9.4
Printing and Publishing	6.6	6.3	5.0	5.4
Chemical, Petroleum, and Rubber and Plastic Products.	2.1	2.0	8.1	8.6
Primary Metal, Stone, Clay, and Glass Products	8.4	8.2	10.9	10.4
Fabricated Metal Products	7.2	7.6	6.6	6.8
Machinery, Except Electrical.	28.8	24.0	8.7	8.9
Electrical Equipment	13.8	15.4	7.3	9.3
Transportation Equipment.	8.6	14.1	10.8	9.5
Instruments and Related Products.	1.4	1.5	2.0	2.2
Miscellaneous Manufacturing	1.4	2.6	3.9	4.4
Total	100.0	100.0	100.0	100.0

Source: U. S. Department of Labor; Wisconsin Industrial Commission.

Table 17

GENERAL FINANCIAL CHARACTERISTICS OF THE MANUFACTURING INDUSTRY IN THE REGION - 1962

Type of Manufacturing	Amounts (in thousands of dollars)			
	Sales	Raw Material Purchases	Capital Expenditures	Plant & Equipment Values
Food and Kindred Products	983,014	517,806	14,272	730,426
Textile, Apparel, and Leather Products	215,968	71,185	1,870	36,671
Paper and Wood Products	289,075	181,944	8,168	184,156
Printing and Publishing	329,431	114,592	64,328	227,624
Chemical, Petroleum, and Rubber and Plastic Products	272,159	101,685	20,483	96,298
Primary Metal, Stone, Clay, and Glass Products	481,071	225,968	12,619	431,576
Fabricated Metal Products	453,545	218,851	50,500	118,328
Machinery, Except Electrical	1,266,468	517,423	42,307	715,149
Electrical Equipment	658,288	160,159	32,415	307,700
Transportation Equipment	1,253,842	918,632	51,418	303,106
Instruments and Related Products	87,492	20,657	1,851	27,499
Miscellaneous Manufacturing	87,703	45,733	1,571	17,972
Total	6,378,056	3,094,635	301,802	3,196,505

Source: Estimates based on sample data collected for the economic simulation model program.

heavily concentrated in the production of durable goods, particularly machinery, electrical equipment, and transportation equipment. In 1963 over half of the total manufacturing jobs within the Region were in these industries compared to less than 30 percent nationally. Compared to the national distribution, there is also a concentration in fabricated metal product manufacturing and in printing and publishing activities. On the other hand, there is a relatively low concentration of activity associated with the production of nondurable goods, such as textile, apparel, leather, paper, wood, chemical, petroleum, rubber, and plastic products. The only nondurable goods manufacturing activity, in addition to printing and publishing, which has a proportion of manufacturing employment approximating that of the national economy, is the production of food and beverage products. This is due primarily to the location in the Region of a number of very large breweries.

The trend in the individual manufacturing industries within the Region since 1954 indicates that the transportation and electrical equipment industries have shown the largest relative growth (see Table 16). Transportation equipment manufacturing was the fastest growing industry, increasing its relative proportion of total regional manufacturing employment from 8.6 percent in 1954 to 14.1 percent in 1963. Electrical equipment manufacturing showed an increase from 13.8 percent to 15.4 percent in the same period. The most important manufacturing industry in the Region, machinery production, has declined in relative importance, dropping from nearly 29 percent of the total manufacturing jobs in 1954 to 24 percent in 1963.

The capital goods industries in the Region are not only important in terms of employment but also in terms of sales, raw material purchases, capital expenditures, and plant and equipment stocks (see Table 17). In 1962, it is estimated that the machinery, electrical equipment, and transportation equipment industries combined had sales of $3.2 billion, raw material purchases of $1.6 billion, capital equipment expenditures of $126 million, and a plant and equipment stock valued at $1.3 billion. In addition, the food industry, with sales of $1.0 billion in 1962, is very important in the regional economy.

It is interesting to note that the most important manufacturing activity nationally, in terms of proportionate employment, is the production of textile, apparel, and leather goods. This industry accounted for nearly 15 percent of total national manufacturing employment in 1963. Within the Region this industry accounted for only 5.6 percent of the total manufacturing employment in 1963. Because of locational and other factors, it is likely that the structure of the regional manufacturing industry group will continue to be oriented to heavy durable equipment manufacturing in the future as it has in the past.

THE PUBLIC FINANCIAL RESOURCE BASE OF THE REGION

Major emphasis in the SEWRPC inventory of public financial resources has been placed upon an appraisal of the sources and amounts of public funds available within the Region for public implementation of transportation facility plans. Since transportation is only one of the many concerns of government, however, the proportionate share of total revenues available for the provision of transportation facilities is greatly affected by the need for other public services and facilities. It is, therefore, important to appraise the public revenues and expenditures for transportation in light of public revenues and expenditures for other services and facilities.

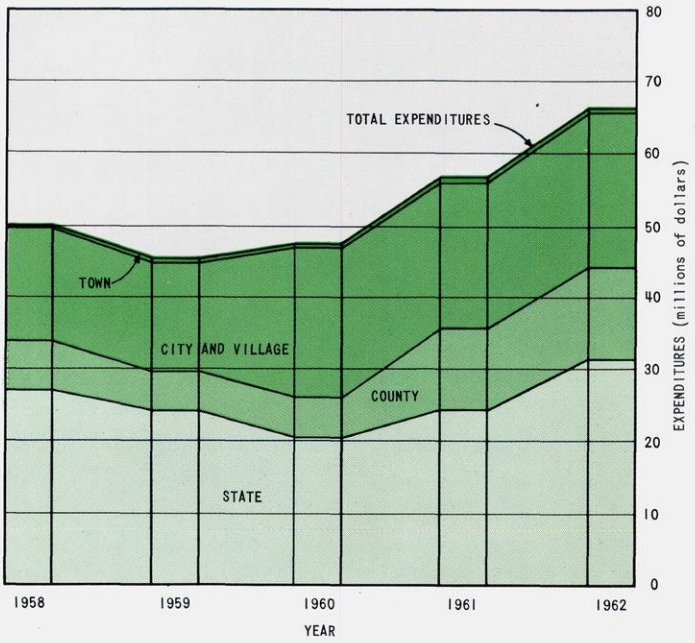
While the state and federal governments raise and expend monies for many types of public services and facilities within the Region, a large share of these monetary exchanges is transacted through the local units of government. For example, direct state expenditures for highway services and facilities in the Region amounted to $30.9 million in 1962,[6] while highway aids to local units of government amounted to an additional $14.3 million. The revenue and expenditure patterns and trends of local units of government within the Region have, therefore, been reviewed in considerable detail in order to gain an understanding of the proportion of total revenues and expenditures, including state and federal aids, received and expended by local government.

Particular attention has been given to the amounts of money received and expended by local units of government for streets, highways, and bridges. The amounts devoted to capital and non-capital outlays were also determined. In addition, data on direct state and federal expenditures for highway facilities within the Region were compiled. The trend of property valuation within the Region was also determined in order to relate revenue and expenditure trends to this important component of the financial resource base of the Region. Since transit facilities in the Region are privately owned and operated, a review of their financial revenues and expenditures was not undertaken as a part of this study.

[6] Compiled from records of the State Highway Commission of Wisconsin.

Figure 15

CAPITAL EXPENDITURES FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE (1958 - 1962)



Source: Wisconsin Department of State Audit reports; State Highway Commission of Wisconsin.

Capital and Non-Capital Outlays for Highway Purposes

Total expenditures by all levels of government for the construction, operation, and maintenance of highways, streets, and bridges within the Region from 1958 to 1962 are shown in Table 18. Fed-

Table 18

TOTAL EXPENDITURES IN MILLIONS OF DOLLARS FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE (1958 - 1962)

Government Type	1958		1959		1960		1961		1962	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
State	26.3	31	23.9	29	20.3	23	24.0	24	30.9	28
County	12.3	15	14.5	18	14.5	17	21.1	21	23.8	22
City & Village	42.9	51	41.3	50	49.2	57	50.1	51	51.8	47
Town	2.5	3	2.8	3	2.9	3	3.5	4	3.0	3
Total	84.0	100	82.5	100	86.9	100	98.7	100	109.5	100

Source: Wisconsin Department of State Audit reports.

Table 19

CAPITAL OUTLAY IN MILLIONS OF DOLLARS FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE (1958 - 1962)

Government Type	1958		1959		1960		1961		1962	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
State	26.3	53	23.9	53	20.3	43	24.0	42	30.9	47
County	6.8	14	5.7	13	5.4	12	11.2	20	12.9	19
City & Village	15.9	32	15.2	33	20.8	44	21.3	37	21.7	33
Town	0.3	1	0.5	1	0.5	1	0.6	1	0.4	1
Total	49.3	100	45.3	100	47.0	100	57.1	100	65.9	100

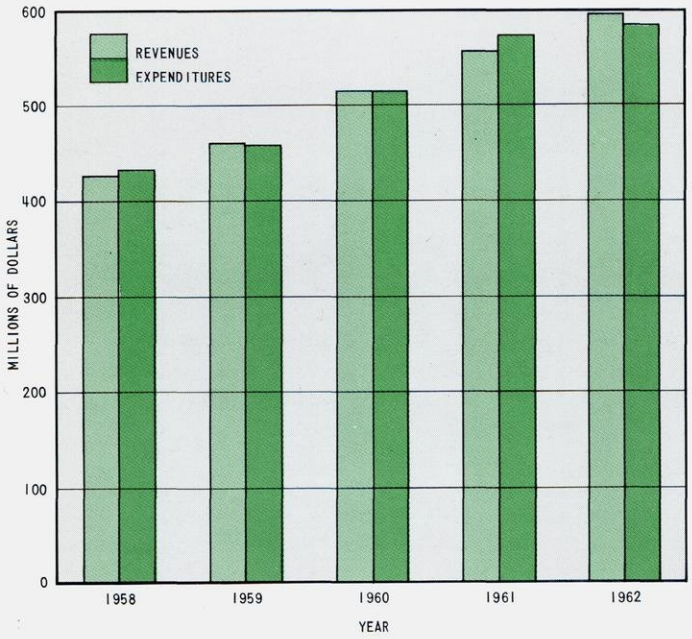
Source: Wisconsin Department of State Audit reports; State Highway Commission of Wisconsin.

eral expenditures are channeled through the state and local units of government and in order to avoid double accounting are not listed separately. The total expenditures increased by about 30 percent over this five-year period. The most dramatic relative increase was experienced at the county level, where total expenditures increased by 93 percent over the five-year period. State expenditures, which decreased steadily from 1958 to 1960, increased only 17 percent over the five-year period from 1958 to 1962.

The amounts of total expenditures devoted to capital outlay, that is, to construction of new facilities or to the substantial reconstruction of existing facilities, by all levels of government are shown in Table 19 and Figure 15. Total expenditures for capital improvements increased by 34 percent over the five-year period, and almost one-half of the total capital investment was made by the state. Since administrative expenses of the State Highway Commission are not included in the data presented herein, all of the state expenditures are recorded as capital outlay. The counties devoted over one-half of total expenditures to capital improvements in 1958, 1961, and 1962, while in 1959 and 1960 the proportion was just over one-third. Cities and villages spent considerably less than one-half of total expenditures for capital improvements, and towns spent only a very small proportion of total expenditures for capital improvements. In 1961 and 1962, a significant change in the capital investment pattern apparently occurred as counties substantially increased their proportion of total capital outlays for highway improvements. It is probable that this more active role in financing highway improvements by counties within the Region reflects an attempt to distribute costs of improvements and new facilities having areawide importance more equitably.

Figure 16

LOCAL GOVERNMENT REVENUE AND EXPENDITURE TRENDS IN THE REGION (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

General Revenue and Expenditure Trends

Total revenues and expenditures of local governments in the Region, which include counties, cities, villages, towns, and school districts, have increased every year since 1958. The five-year trend of these revenues and expenditures from 1958 to 1962 is shown in Figure 16. Revenues increased from $429.6 million to $595.8 million, or 39 percent, while expenditures increased from $432.9 million to $583.1 million, or 35 percent. Revenues generally do not equal expenditures in any one year, because surplus funds in the form of cash or investments may be carried forward from preceding years. Local government revenues and expenditures have, therefore, been increasing at the rate of about 8 percent per year. Of the five major types of local government in the Region, cities raise and expend the greatest amount of money, followed in order by school districts,

Table 20

LOCAL PUBLIC REVENUES AND EXPENDITURES IN THE REGION BY GOVERNMENT TYPE (1958 and 1962)

Government Type	Revenues (in millions of dollars)				Expenditures (in millions of dollars)			
	1958		1962		1958		1962	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
City	154.6	36.0	220.4	37.0	172.3	39.8	213.9	36.7
County	104.1	24.2	161.4	27.1	103.2	23.8	158.0	27.1
School District	150.0	34.9	184.1	30.9	137.5	31.8	183.5	31.4
Village	12.9	3.0	18.4	3.1	12.3	2.8	19.1	3.3
Town	8.0	1.9	11.5	1.9	7.6	1.8	8.6	1.5
Total	429.6	100.0	595.8	100.0	432.9	100.0	583.1	100.0

Source: Wisconsin Department of State Audit reports.

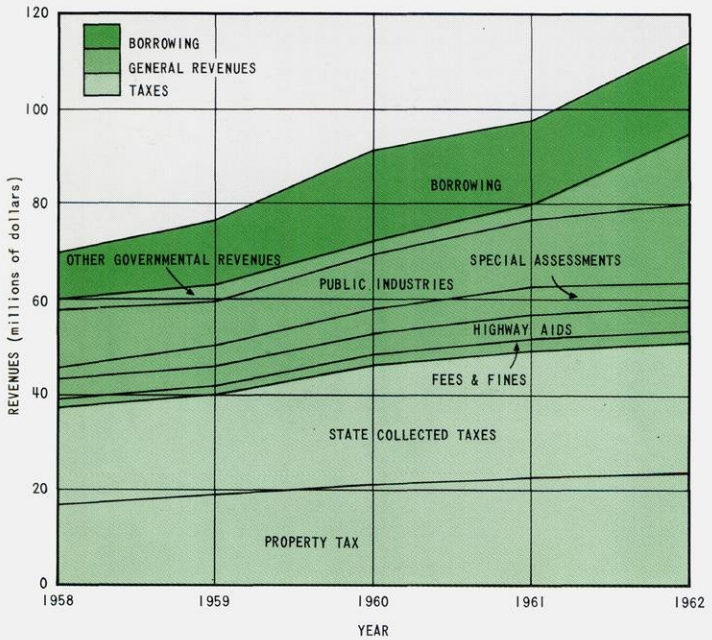
counties, villages, and towns (see Table 20). Recent trends indicate that county governments are becoming more important in terms of revenue raised and money expended.

Revenue Patterns

The money raised each year by local governments within the Region is obtained from a wide variety of revenue sources. The major categories of revenue sources include: property taxes; state collected taxes, which represent monies collected by the state and returned in part to local governments; fees and fines; special assessments; earnings from public industries such as water utilities; highway aids; educational aids; other aids and revenues including welfare aids; and borrowing for current expenses and capital outlay projects. Most local units of government within the Region employ all of these revenue sources but with differing emphases. Figures 17 through 22 show the revenue patterns within the Region of cities and villages, the City of Milwaukee, towns, school districts, counties, and the County of Milwaukee for the years 1958 to 1962.

Figure 17

DISTRIBUTION OF TOTAL PUBLIC REVENUES FOR ALL CITIES AND VILLAGES (EXCLUDING MILWAUKEE) IN THE REGION BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

Cities and Villages: The combined revenues of all cities and villages within the Region, except the City of Milwaukee, increased steadily from $70.4 million in 1958 to $114.4 million in 1962, an increase of 63 percent (see Figure 17). The revenue patterns indicate a marked stability in the proportionate share of total revenues raised from some sources and an equally marked change in the proportionate share of others.

For example, property taxes, while increasing 36 percent from $17.2 million in 1958 to $23.5 million in 1962, have consistently continued to supply approximately 23 percent of the total revenues for cities and villages. Similarly, state collected taxes, while increasing 38 percent from $20.3 million in 1958 to $28.1 million in 1962, have consistently continued to supply approximately 27 percent of total revenues. This indicates that these revenue sources are relatively responsive to increases in population and economic activity within the Region. Other proportionately stable revenue sources include fees and fines, other aids and revenues, and special assessments.

Highway aids have, however, increased by only 19 percent over the five-year period, rising from $4.2 million in 1958 to $5.0 million in 1962. The proportion of total revenues provided by highway aids has dropped from 6 percent in 1958 to 4 percent in 1962.

The increasing trend to utilize short- and long-term loans as a revenue source is indicated by the increase of 96 percent in borrowing, from $9.8 million in 1958 to $19.2 million in 1962. Most of the funds borrowed are used to finance the construction of public facilities such as fire stations, libraries, streets, sewer and water facilities, and other capital improvements required to accommodate urban growth.

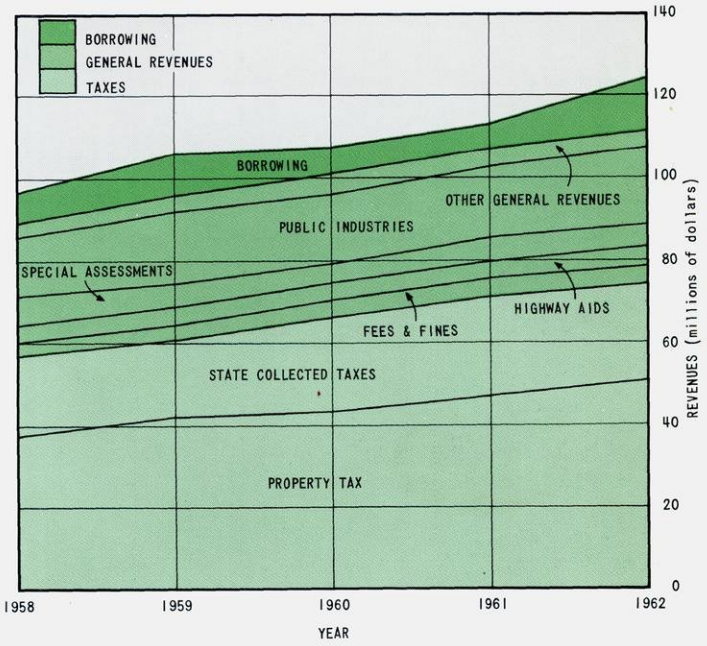
The rising level of revenue obtained through public industries reflects the growing municipal investment in public utilities accompanying urban development. Accelerated population growth and urbanization, accompanied by the incorporation of once rural towns into cities and villages, together with a growing need for service in the already developed areas of the Region have precipitated creation of five new public water utilities and ten new sanitary sewerage systems since 1958 as well as the expansion of many existing systems.[7] Revenues from this public industries category have increased by 28 percent, from $12.2 million in 1958 to $16.9 million in 1962. The proportion of total revenues provided by public industries has decreased, however, from 17 percent of total revenues in 1958 to 15 percent in 1962.

The special assessments category accounts for generally less than 5 percent of the total revenues of cities and villages. This source increased by 45 percent, from $2.6 million in 1958 to $4.7 million in 1962. While the use of the special assessment has been traditionally limited to sewer, water, street paving, sidewalk, and curb and gutter construction and reconstruction, there may be potential for an increased use of this revenue source to finance more of the municipal improvements necessitated by continued urban development within the Region.

City of Milwaukee: Revenue patterns for the City of Milwaukee are presented separately from the other cities and villages within the Region, both because of the size of the Milwaukee budget and because Milwaukee revenue patterns are significantly different from those of the other cities and villages. The City of Milwaukee relies more heavily on the property tax as a source of revenue than do the other cities and villages. In 1958 the City of Milwaukee raised $37.6 million through this source, which accounted for 39 percent of the total revenues. By 1962 this had increased by 31 percent to $49.3 million, or 40 percent of the total revenues (see Figure 18). In contrast, other cities and villages used the property tax to supply only about 23 percent of total revenues.

Figure 18

DISTRIBUTION OF TOTAL PUBLIC REVENUES FOR THE CITY OF MILWAUKEE BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

In each of the other revenue categories, except borrowing, the City of Milwaukee revenue pattern is quite similar to that of all other cities and villages in the Region; that is, the relative share of total revenue received from, and the percent of increase in, each source over the five-year period from 1958 to 1962 are similar, although the actual dollar totals are, of course, considerably greater.

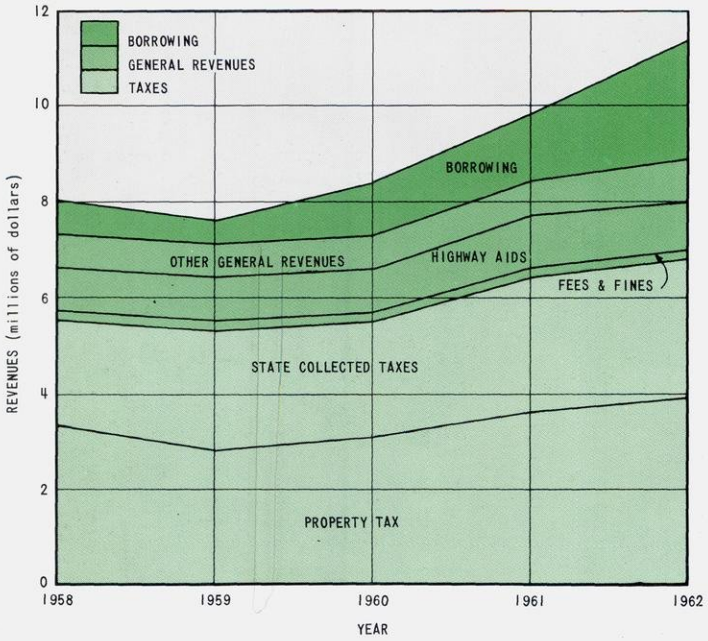
It is significant to note that the City of Milwaukee relies less upon borrowing as a source of revenue than do the other cities and villages in the Region. In 1958 the City of Milwaukee borrowed $7.7 million, which accounted for 8 percent of total revenue, while the other cities and villages combined raised $9.8 million, or 14 percent of total revenues by borrowing. In 1962 the City of Milwaukee borrowed $13.4 million, which accounted for about 11 percent of total revenues, an increase of 74 percent. All other cities and villages combined borrowed $19.2 million in that year, which accounted for 17 percent of total revenues.

Towns: The combined revenues of all towns within the Region increased steadily from $8.0 million

[7] SEWRPC Planning Report No. 6, The Public Utilities of Southeastern Wisconsin.

Figure 19

DISTRIBUTION OF TOTAL PUBLIC REVENUE FOR ALL TOWNS IN THE REGION BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

in 1958 to $11.5 million in 1962, an increase of 44 percent (see Figure 19). There is a proportionately greater reliance upon the property tax as a source of revenue in the towns than in the cities and villages of the Region. This source of revenue increased by 9 percent from $3.3 million in 1958 to $3.9 million in 1962. The proportion of total revenues provided by property taxes, however, declined from 42 percent in 1958 to 34 percent in 1962.

State collected taxes have remained a rather stable source of revenue for the towns, increasing by 32 percent from $2.2 million in 1958, or 27 percent of the total revenues, to $2.9 million in 1962, or 26 percent of the total revenues.

Highway aids are a relatively much more important source of revenue for the towns than for the cities and villages. In 1958 town governments in the Region received over $0.9 million in highway aids, or 11 percent of total town revenues. By 1962 these highway aids had increased by 11 percent to just under $1.0 million, or 9 percent of the total revenues.

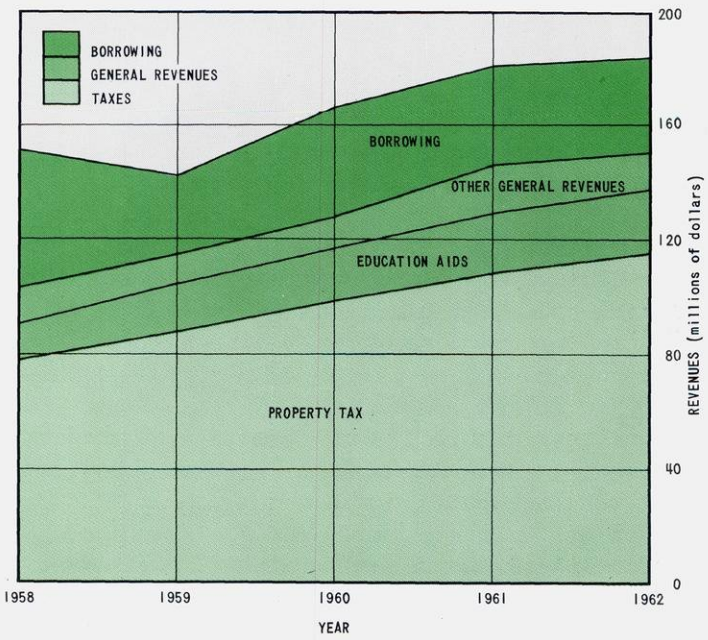
As in the case of cities and villages, greater reliance is being placed by the towns on borrowing as a source of revenue. In 1958 less than $0.7 million, or 8 percent of total town revenues, was raised by borrowing. By 1962, however, borrowing had increased by 257 percent to $2.5 million and accounted for 22 percent of the total town revenues. This increased use of credit as a means of raising funds is significant since town governments have traditionally relied heavily upon the property tax as the principal source of revenue.

School Districts: The variety of types of school districts and of their administrative organization, the constantly changing character of district boundaries and concomitant population served, and the nature of the school district as both an independent and dependent taxing authority, all combine to make the meaningful presentation of revenue data on school districts extremely difficult. Moreover, these factors tend to restrict the level of comparative detail possible between school districts and other municipal units of government. The importance of the school district to government revenue and expenditure patterns within the Region, however, requires that an attempt be made to present such comparative information in a general manner.

School district revenues within the Region increased from $150.0 million in 1958 to $184.1 million in 1962, or 23 percent (see Figure 20). The only direct tax source available to school districts is the property tax; and in 1958 school districts

Figure 20

DISTRIBUTION OF TOTAL PUBLIC REVENUES FOR ALL SCHOOL DISTRICTS IN THE REGION BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

raised $77.3 million, or 52 percent of total school district revenue, through this source. Property taxes for school purposes have increased steadily to the 1962 level of $115.4 million, or 63 percent of total school district revenue, an increase of 49 percent.

Educational aids to school districts are received from three sources: the county, the state, and the federal government. Combined, these aids amounted to $12.8 million in 1958, or 8 percent of total school district revenue. By 1962 these combined aids had increased 76 percent to $22.5 million, or 12 percent of the total school district revenue in the Region.

The pattern of borrowing by school districts has been somewhat erratic over the five-year period from 1958 to 1962. This is due, in part, to a greater utilization of short-term loans by school districts than by general purpose units of government. In 1958 school districts within the Region raised $47.5 million, or 32 percent of total revenues, through borrowing. This decreased in 1959 to $27.0 million, or 19 percent of the total, increased in 1960 to $37.9 million, or 23 percent of the total, and decreased steadily to the 1962 level of $33.3 million, or 18 percent of the total revenues raised.

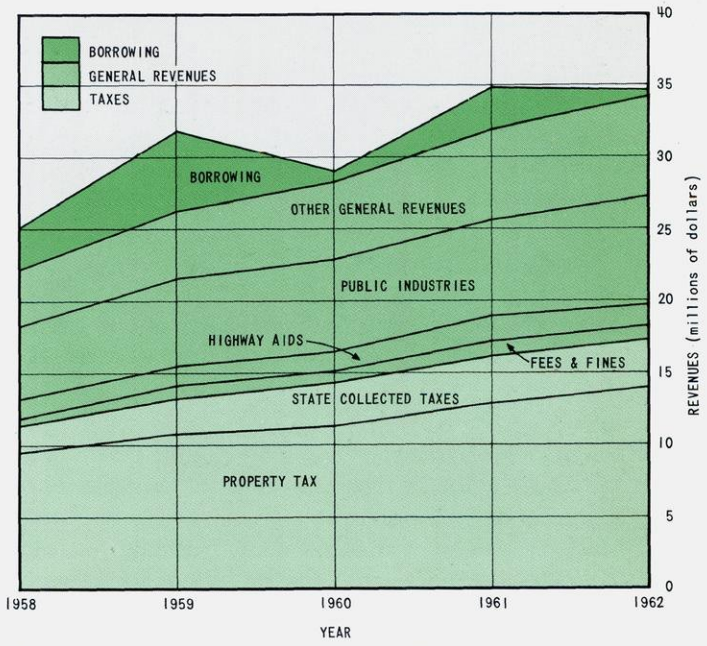
A comparison of school districts to cities and villages and towns within the Region shows that the school district relies proportionately about three times as heavily on the property tax as a source of revenue than do cities and villages, and about twice as heavily as do towns. The school district, however, has far fewer sources of revenue available to it than do either cities and villages or towns. While all of these local governmental units rely proportionately on borrowing to about an equal degree, the school districts appear to be more erratic in borrowing patterns. Proportionately, educational aids contribute about as much revenue to school districts as highway aids do to towns.

Counties: The pattern and trend of revenues received by all the counties in the Region, except Milwaukee County, are shown in Figure 21. Total revenues increased by 39 percent, from $24.8 million in 1958 to $34.5 million in 1962.

Counties, similar to towns, rely more heavily on the property tax for revenue than on any other

Figure 21

DISTRIBUTION OF TOTAL PUBLIC REVENUES FOR ALL COUNTIES (EXCLUDING MILWAUKEE) IN THE REGION BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

available source. Property taxes in the counties increased by 48 percent, from $9.4 million in 1958 to $13.9 million in 1962. The proportion of total revenues provided by property taxes remained very stable, increasing only slightly from 38 percent in 1958 to 40 percent in 1962. As noted earlier, towns rely upon the property tax for about 37 percent of total revenue and cities and villages for about 23 percent. State collected taxes are a proportionately smaller source of revenue at the county level than at the city, village, and town level.

The second most important source of revenue for the counties is the revenue obtained from public industries. This category also includes departmental earnings, such as hospital, airport, and park fees. Revenue from this source has increased steadily from $5.1 million, or 20 percent of total revenue in 1958, to $7.5 million, or 22 percent of total revenue in 1962, an increase of 47 percent.

The third largest source of revenue for the counties is the other aids and revenue category. A significant component of this category is the welfare aid received from the state and federal governments and used to defray the costs of such functions as the county home and welfare payments. Revenue from this source increased by 74 percent, from $3.9 million in 1958, or 16 per-

cent of total revenues, to $6.8 million in 1962, or 20 percent of total revenues.

Aid for highways increased by 25 percent, from $1.2 million in 1958, or 5 percent of the total county revenues, to $1.5 million in 1962, or 4 percent of the total revenues. This pattern is quite similar to that for cities and villages, which received between 4 and 6 percent of their total revenues in the form of highway aids.

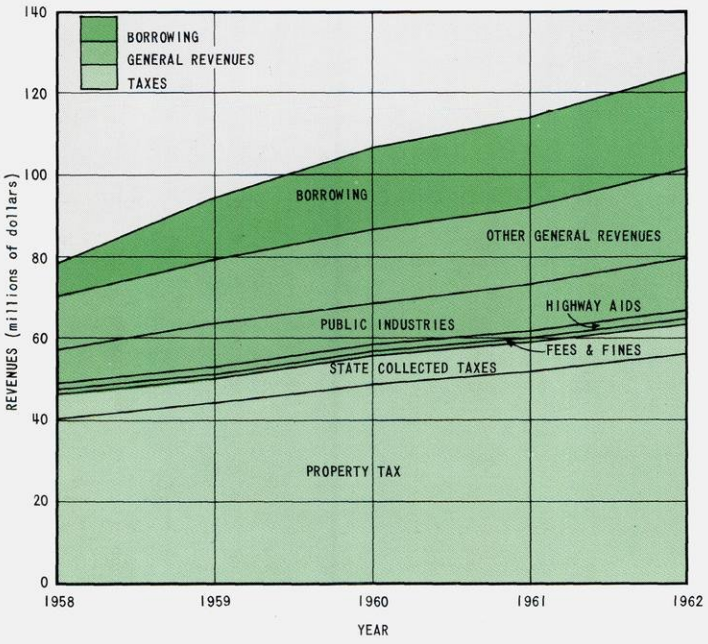
The borrowing habits of counties are, like those of school districts, somewhat erratic, ranging from a high of $5.5 million, or 17 percent of total revenues in 1959, to $0.4 million, or 1 percent of total revenues in 1962.

It is important to note that none of the counties within the Region utilize the special assessment as a means of raising revenues. A review of State Statutes, however, indicates many restrictions on the use of the special assessment by counties.

Milwaukee County: Revenue patterns for Milwaukee County are presented separately from the other counties within the Region for the same reasons that the City of Milwaukee was presented separately. Total revenues rose steadily from $79.3 million in 1958 to $126.9 million in 1962, an increase of 60 percent over the five-year period (see Figure 22).

Figure 22

DISTRIBUTION OF TOTAL PUBLIC REVENUES FOR MILWAUKEE COUNTY BY REVENUE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

Milwaukee County, in common with other counties in the Region, relies on the property tax as its principal source of revenue. In 1958, $40.5 million, or 51 percent of the total revenues, were raised through property taxes. This increased by 39 percent, to $56.2 million by 1962, or 44 percent of the total revenues. This proportion is significantly higher than in the other counties of the Region.

State collected taxes provided about 7 percent of Milwaukee County revenues each year over the five-year period, whereas in the other six counties of the Region this category was somewhat higher, averaging about 9 percent each year. The other aids and revenue category provided $13.1 million in 1958 and rose steadily to $22.7 million in 1962. This category accounted for about 17 percent of the total revenues each year, a pattern very similar to that of the other six counties.

In addition to the property tax differences described above, another significant difference between Milwaukee County and the other counties in the Region occurs in the borrowing revenue category. Milwaukee County utilizes borrowing as a regular source of funds. In 1958 the county borrowed $8.4 million, which accounted for 11 percent of total revenue. This increased by 188 percent to $24.2 million, or 19 percent of the total revenue raised in 1962. All the other counties combined raised only 1 percent of their revenue by borrowing in 1962.

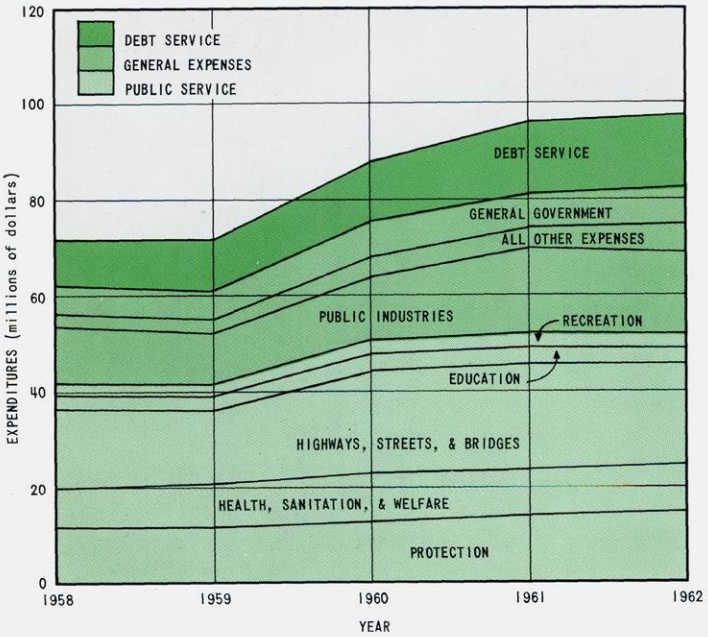
Another important difference between Milwaukee County and the other counties occurs in the public industries revenue category. In 1958 this category supplied $8.6 million, or 11 percent of total Milwaukee County revenues, as compared to 20 percent of the total revenues for the other counties. By 1962 Milwaukee County received $13.2 million from its public industries, but proportionately this amount still accounted for only 11 percent of the total. In the other six counties combined, this category accounted for 22 percent of the total revenues raised in 1962.

Highway aids supplied $1.3 million to Milwaukee County in 1958, and this accounted for only 2 percent of total revenues. After slight increases in 1959 and 1960, and a decrease to $1.5 million in

1961, the 1962 amount rose to $1.7 million, an increase of 31 percent over 1958, and accounted for only 1 percent of total revenues. In contrast, the combined total highway aids to the other six counties averaged about 5 percent of total revenues each year.

Figure 23

DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES FOR ALL CITIES & VILLAGES (EXCLUDING MILWAUKEE) IN THE REGION BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

Expenditure Patterns

Local governments within the Region expend funds for a variety of facilities and services. The major categories of expenditures include: the protection of persons and property; health, sanitation, and welfare; highways, streets, and bridges; education; recreation; general government; public industries; other expenses, including conservation; and debt service, including payment of interest and repayment of principal.

Cities and Villages: The combined expenditures of all cities and villages in the Region, except the City of Milwaukee, increased steadily from $72.0 million dollars in 1958 to $98.1 million in 1962, an increase of 36 percent (see Figure 23). The largest expenditure was for the construction and maintenance of highways, streets, and bridges, which increased by 29 percent from $16.4 million, or 23 percent of total expenditures in 1958, to $21.2 million, or 22 percent of total expenditures in 1962. It was noted earlier that highway aids provided about 5 percent of the total revenues for city and village governments within the Region. It is, therefore, significant that the cost of highways, streets, and bridges is as high as it is proportionately and that this category of expenditures represents such a large share of the total city and village expenditures each year.

The next largest expenditure category was for public industries, which includes the costs of construction of publicly-owned water and sewerage facilities. In 1958 this category accounted for $12.0 million, or 17 percent of total city and village expenditures, and by 1962 had increased by 43 percent to $17.2 million, or 18 percent of total expenditures.

Protection of persons and property was also a high-ranking cost item. In 1958 this category accounted for the expenditure of $11.3 million, or 16 percent of the total expenditures. This category increased by 30 percent to $14.7 million, or 15 percent of the total in 1962. The increasing costs in this category are clearly associated with urban growth and expansion.

Education expenditures by cities and villages, excluding school district expenditures, remained relatively stable from 1958 to 1962 and amounted to about $3.3 million each year, or 4 percent of total expenditures. Expenditures for general government in cities and villages increased by 31 percent from $5.8 million in 1958 to $7.6 million in 1962, remaining at 8 percent of total expenditures over the period.

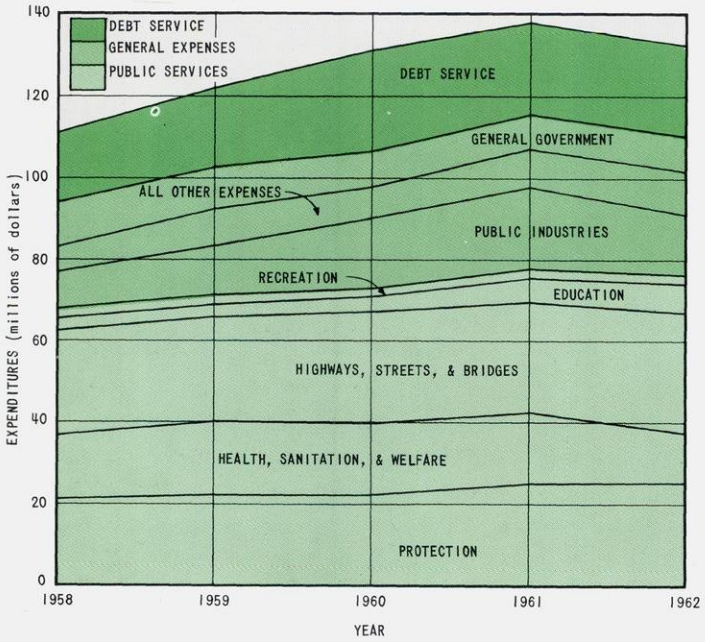
Expenditures to service and retire debt increased 59 percent from $9.5 million, or 13 percent of the total expenditures in 1958, to $15.1 million, or 15 percent of the total expenditures in 1962.

The smallest category of expenditures by cities and villages was recreation, which cost these communities, collectively, $2.5 million, or 3 percent of the total expenditures in 1958. In 1962 this category of expenditures had increased 32 percent to $3.3 million but still accounted for 3 percent of total expenditures.

City of Milwaukee: Expenditures by the City of Milwaukee increased steadily from $112.6 million in 1958 to $134.9 million in 1962, an increase of 20 percent in five years (see Figure 24). In many ways the expenditure patterns for the City of Milwaukee are similar to the pattern of other cities and villages in the Region combined; that

Figure 24

DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES FOR THE CITY OF MILWAUKEE BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

is, the proportions of total expenditures allocated to the various categories are quite similar. The singularly largest expenditure category was highways, streets, and bridges, which increased from $26.5 million in 1958, or 24 percent of total expenditures, to $30.6 million, or 22 percent of the total in 1962. This represents an increase of 15 percent over the five-year period.

The next largest expenditure category is protection of persons and property, which increased from $20.9 million in 1958 to $25.3 million in 1962, or 19 percent of the total expenditures for both years, an increase of 21 percent. Debt service increased from $17.0 million in 1958, or 15 percent of total expenditures, to $22.7 million, or 17 percent of total expenditures in 1962, an increase of 34 percent. Expenditures for recreation increased from $2.0 million in 1958 to $2.5 million in 1962 and remained at 2 percent of the total expenditures.

The only expenditure category which is significantly different for Milwaukee than for the other cities and villages within the Region was the public industries category. In 1958 Milwaukee spent $9.2 million, or 8 percent of total expenditures, on maintaining and improving its public industries, such as the water works. All other cities and villages combined spent 17 percent of total expenditures on this category in that year. In 1962 Milwaukee spent $15.8 million on this category, or 12 percent of the total expenditures, while the other cities and villages combined spent $17.2 million, or 18 percent of the total.

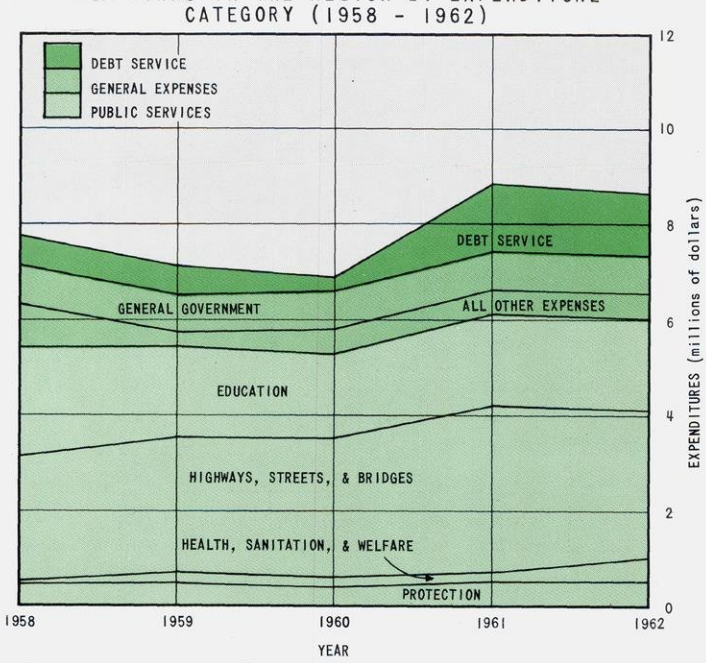
Towns: The combined expenditures of all towns within the Region increased steadily from $7.6 million in 1958 to $8.6 million in 1962, an increase of 13 percent (see Figure 25). As was the case for cities and villages, the largest expenditure was for the construction and maintenance of highways, streets, and bridges. In 1958 this category accounted for $2.6 million, or 34 percent of the total expenditures of all towns. The expenditure for this category increased by 19 percent to $3.1 million, or 36 percent of total expenditures, in 1962.

The second largest expenditure category at the town level of government is education. In 1958 town governments spent $2.3 million on high school tuition, vocational school tuition, and student transportation. This amounted to 30 percent of total expenditures in that year. After reductions in each succeeding year, the 1962 cost for this category was $1.9 million, or 22 percent of total expenditures.

The third largest expenditure category at the town level of government in 1958 was the general cost

Figure 25

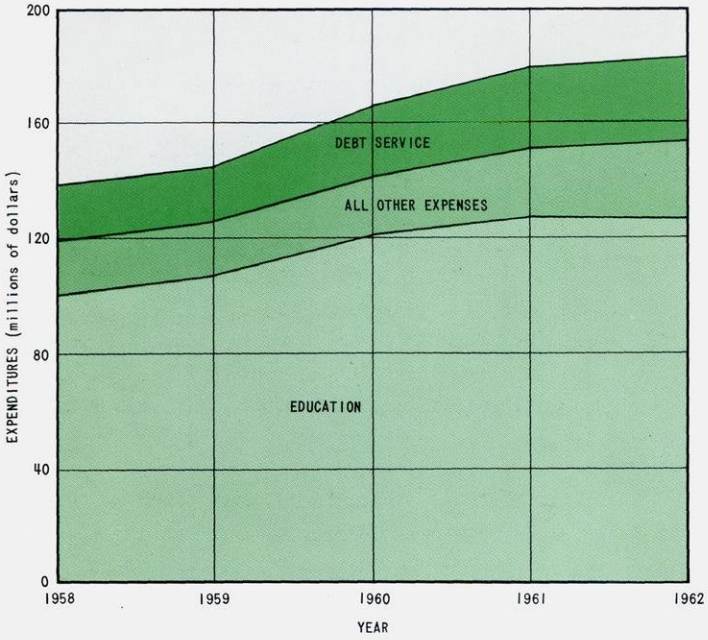
DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES FOR ALL TOWNS IN THE REGION BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

Figure 26

DISTRIBUTION OF TOTAL PUBLIC EDUCATION EXPENDITURES FOR ALL SCHOOL DISTRICTS IN THE REGION BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

of government itself. The towns spent $0.8 million, or 11 percent of total expenditures, in that year on general administrative costs. In 1962 this category also accounted for $0.8 million of the budget, but its proportionate share of total expenditures had dropped slightly to 10 percent.

The amount of money spent on debt service at the town level of government in 1958 was $0.6 million, or 7 percent of the total expenditures. By 1962 this category had more than doubled and required expenditures of $1.3 million, or 15 percent of the total expenditures. The recreation expenditure category was very small in 1958 but increased to $0.1 million by 1962 when it accounted for 1 percent of the total expenditures. It is also significant that the costs of protection of persons and property have changed only slightly over the five-year period at the town level. In 1958 and in 1962, this category accounted for an expenditure of about $0.4 million and maintained its approximately 5 percent share of total expenditures.

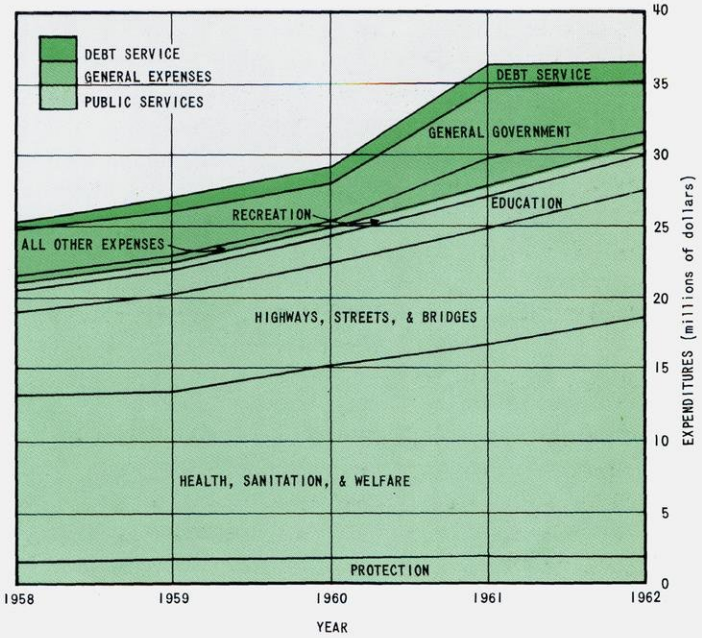
School Districts: A meaningful comparison of school district expenditures with that of general purpose units of local governments is difficult because the school district expenditure categories are unique. Total school district expenditures within the Region increased from $137.5 million in 1958 to $183.5 million in 1962, an increase of 33 percent (see Figure 26). The educational expenses amounted to $100.3 million in 1958, or 73 percent of the total expenditures. This category amounted to $126.9 million in 1962, or 69 percent of the total. A more detailed breakdown of this education category showed that well over one-half of this expenditure was for instruction purposes and nearly another one-third of the expenditure was for capital outlay, including new construction.

In 1958 school districts in the Region expended $19.1 million on debt service, or 14 percent of total expenditures. A slight decrease in 1959 to $18.5 million was followed by steady increases to 1962 when debt service costs were $29.8 million and accounted for 16 percent of total expenditures. In most years school districts spend about the same proportion of their total expenditures for debt service as the cities and villages within the Region.

Counties: The expenditure patterns for counties are quite unlike the patterns for cities and villages or towns. The combined expenditures for all counties within the Region, except Milwaukee County, increased from $25.0 million in 1958 to $36.6 million in 1962, an increase of 46 percent (see Figure 27). The largest expenditure category for the counties in each year was for health,

Figure 27

DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES FOR ALL COUNTIES (EXCLUDING MILWAUKEE) IN THE REGION BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

sanitation, and welfare. The operation and maintenance of such facilities as county homes and county hospitals and the administration of diverse welfare programs caused this category to account for well over 40 percent of the total annual expenditures of the counties. In 1958 this category accounted for an expenditure of $11.6 million, or 47 percent of total expenses; and by 1962 it had increased 36 percent to $16.8 million, or 46 percent of the total.

The second largest expenditure category for counties is the construction and maintenance of highways, streets, and bridges. This category increased steadily from $5.8 million, or 23 percent of the total county expenditures in 1958, to $8.9 million, or 24 percent of the total in 1962, an increase of 53 percent.

The third largest expenditure category for counties is the general government category which includes administrative costs. This category increased from $3.3 million, or 13 percent of total expenditures in 1958, to $3.6 million, or 10 percent of the total in 1962, an increase of 9 percent.

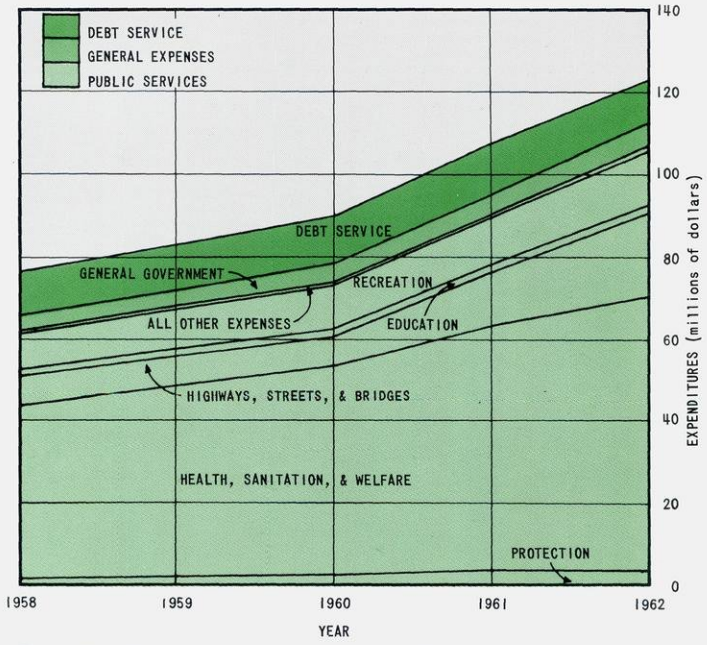
The costs of debt service are consistently low for the counties. In 1958 this category accounted for $0.7 million, or 3 percent of the total expenditures. In 1962 this category accounted for $1.4 million, or 4 percent of the total expenditures.

The lowest category of expenditures at the county level was recreation. In 1958 only $0.5 million was spent by all counties within the Region combined (excluding Milwaukee County) for recreation. This accounted for 2 percent of the total expenditures in that year. In 1962 this category of expenditure had increased to $0.8 million and still accounted for 2 percent of the total.

Milwaukee County: Total expenditures for Milwaukee County increased steadily from $78.2 million in 1958 to $121.4 million in 1962, a 55 percent increase in five years (see Figure 28). Well over 50 percent of the expenditures each year were for health, sanitation, and welfare services. In 1958 this expenditure category accounted for $43.2 million, or 55 percent of total county expenditures. This increased 61 percent to $69.4 million in 1962, or 57 percent of total expenditures. A more detailed breakdown of this category would show that more than 75 percent of the funds expended was for welfare alone.

Figure 28

DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES FOR MILWAUKEE COUNTY BY EXPENDITURE CATEGORY (1958 - 1962)



Source: Wisconsin Department of State Audit reports.

The second largest expenditure category in 1962 was for the construction and maintenance of highways, streets, and bridges. In 1958 this category accounted for $7.5 million, or 10 percent of total expenditures. In 1962 this category had almost doubled and accounted for $14.9 million, or 12 percent of total expenditures.

The third largest expenditure category was recreation. The excellent and widely acclaimed Milwaukee County park system and other recreation facilities accounted for expenditures of $9.3 million, or 12 percent of the total in 1958. This increased 41 percent to $13.1 million in 1962, or 11 percent of total county expenditures. The relatively high priority that recreation expenditures receive in Milwaukee County is particularly noteworthy. The operation of the Milwaukee County park system is closely scaled to, and coordinated with, the needs of the growing metropolitan complex. Further expansion of this complex into adjacent counties will undoubtedly create pressures for similar facilities. It is probable, then, that this category will receive increased attention in the years ahead from other counties in the Region which, as noted earlier, presently devote only 2 percent of their total expenditures to this category.

Per Capita Relationships

A useful analytical tool for planning purposes is the ratio of revenues or expenditures to population commonly expressed on a per capita basis. This ratio is derived by relating data on current and historic revenues or expenditures to data on population levels for the same points in time. The resulting per capita ratios when combined with reliable population forecasts are useful aids in forecasting future revenue or expenditure patterns, a necessary first step in appraising the financial feasibility of any given plan.

The per capita relationships and trends for the several categories of revenues and expenditures by local government in the Region for the period from 1958 to 1962 are shown in Table 21. As noted earlier, property taxes provide the major source of income for local governments in the Region; and this fact is further emphasized by the per capita relationships. The largest absolute increase in per capita revenues over the five-year period occurred in the property tax category, while the largest percentage increase occurred in the educational aids category. Highway aid revenues exhibited the smallest absolute per capita increase and the second smallest percentage increase. The largest absolute increase in per capita expenditures over the five-year period occurred in the education category, while the largest percentage increase occurred in the debt service category.

Expenditures for general government, although rising from $25.7 million in 1958 to $26.3 million in 1962, actually show a decline on a per capita basis, the only category of expenditure to show such a decline.

Property Value Trends

The tax levied against real and personal property by all local units of government in the Region accounted for $185.4 million, or 43 percent of total revenues in 1958. In 1962 this tax amounted to $262.3 million, or 44 percent of the total revenue raised, an increase of 41 percent in five years. The value of the property against which this tax was levied increased by 17 percent over this same period. In 1958 the full value of real and personal property[8] in the Region was $8.0 billion of which 85 percent was represented by real property. In 1962 this full value had increased to $9.3 billion of which 86 percent was represented by real property. The trends of real and personal property values in the individual counties of the Region are shown in Table 22. The largest absolute increase in property value between 1958 and 1962 occurred in Milwaukee County, while the largest relative increase occurred in Waukesha County. The smallest absolute increase occurred in Walworth County, and the smallest percentage increase in Milwaukee County. It should be noted that the full value of property in each county is almost entirely composed of values placed on real property and improvements thereto, ranging from 84 percent to 90 percent.

[8] The full value (often termed "equalized value") of real and personal property represents the assessed value of all real estate and improvements thereto and the assessed value of such property as livestock and merchant's and manufacturer's inventories; and furniture, fixtures, machinery, and tools adjusted to current market value by the State Department of Taxation.

Table 21

REVENUES AND EXPENDITURES PER CAPITA BY SELECTED CATEGORIES FOR THE REGION
(1958 - 1962)

Selected Categories	Per Capita (in dollars)					Change 1958-1962	
	1958	1959	1960	1961	1962	Dollars	Percent
Revenues							
Property Taxes	122.06	134.86	143.98	154.23	161.19	39.13	32
State Collected Taxes	33.60	33.26	38.85	40.08	40.49	6.89	20
Highway Aids	7.59	7.80	8.21	8.52	8.77	1.18	16
Education Aids	8.44	10.48	11.72	12.91	13.83	5.39	64
Borrowing	50.44	46.94	54.09	53.38	57.19	6.75	13
Expenditures							
Protection	23.85	25.23	25.22	27.99	28.44	4.59	19
Health, Sanitation, & Welfare	52.31	57.22	59.54	65.18	61.75	9.44	18
Highways, Streets, & Bridges	38.68	38.25	42.32	46.58	48.31	9.63	25
Education	73.20	77.32	84.43	89.06	87.82	14.62	20
Recreation	9.44	9.89	10.38	10.83	12.24	2.80	30
General Government	16.94	16.05	15.29	16.21	16.16	-0.78	-5
Debt Service	37.81	40.18	48.16	51.35	50.32	12.51	33

Table 22

FULL VALUE OF REAL AND PERSONAL PROPERTY IN THE REGION BY COUNTY (1958 - 1962)

County	Full Value (in millions of dollars)					Change 1958 to 1962	
	1958	1959	1960	1961	1962	Millions of Dollars	Percent
Kenosha	439.5	455.8	496.0	538.8	577.6	138.1	31.4
Milwaukee	5,428.3	5,590.9	5,822.3	5,885.1	6,045.6	617.3	11.1
Ozaukee	196.6	212.0	229.5	241.8	259.3	62.7	31.9
Racine	658.9	683.6	727.4	758.2	798.0	139.1	21.1
Walworth	315.2	322.3	330.8	341.2	358.2	43.0	13.6
Washington	205.3	213.1	229.8	243.3	252.5	47.2	23.0
Waukesha	735.9	807.7	890.6	952.0	1,002.5	266.6	36.2
Region	7,979.7	8,285.4	8,726.4	8,960.4	9,293.7	1,314.0	16.5

The full value (often termed "equalized value") of real and personal property represents the assessed value of all real estate and improvements thereto and the assessed value of such property as livestock and merchant's and manufacturer's inventories; and furniture fixtures, machinery, and tools adjusted to current market value by the State Department of Taxation.

Source: Wisconsin Department of Taxation.

The average rate of increase in the full value of real and personal property in the Region was 3 percent per year between 1958 and 1962, while the average rate of increase in the property tax levy by all taxing units combined has been about 7 percent per year. A continued disparity in these increases may present serious revenue problems to those communities within the Region which rely on the property tax as the principal means of raising funds.

SUMMARY

This chapter has described the historic trends and present state of the population, economy, and public financial resource base of the Region. A number of findings having significance for land use and transportation planning are evident. These include:

1. The population of the Region has been increasing at an unprecedented average rate of about 33,000 persons per year since 1950 and, as of 1963, is estimated at 1,674,000 persons. This unprecedented population growth has been concentrated primarily in the three large urbanized areas of the Region, including and surrounding the cities of Milwaukee, Racine, and Kenosha, although there has been appreciable growth in the smaller outlying municipalities.

2. The rapid population growth in the Region since 1950 has been caused by changes in birth, death, and migration rates. The birth rate in the Region has generally been rising; and the death rate has been declining, resulting in a natural population increase of about 300,000 persons since 1950. Inmigration rates have generally been higher than outmigration rates, resulting in a net migration increase in the regional population since 1950 of about 134,000 persons and a total population increase of about 434,000 persons.

3. The marital status of the population has changed since 1950, exhibiting a trend toward larger proportions of married persons in the population over 14 years of age. This change in marital status reflects a slight increase in the marriage rate in the Region over the period.

4. The household population of the Region has been increasing faster than the total population, resulting in many new household formations. The increase in the number of households in the Region since 1950 has averaged approximately 10,000 per year, and in 1963 there were about 482,000 households in the Region.

5. Educational attainment, income levels, and housing values in the Region have all increased since 1950. By 1963 approximately one-half of the population over 25 years of age had completed 11 or more years of formal education; average household incomes had risen to over $8,300; and approximately one-half of the single-family homes in the Region had market values of $15,700 or more.

6. The growth in economic activity in the Region since 1954, as measured by the creation of employment opportunities, has generally paralleled national economic growth. Job growth in the Region and in the nation has averaged slightly more than 1 percent per year since 1954, and in 1963 there were approximately 630,000 employment opportunities in the Region. A great proportion of these employment opportunities are located in Milwaukee, Racine, and Kenosha counties.

7. The regional labor force has increased at a lesser rate since 1950 than has the population but at a greater rate than have employment opportunities. This is the combined result of the changing age structure of the regional population and the fact that unemployment in the Region has increased since 1950. The present unemployment rate in the Region of approximately 4 percent of the resident labor force is, however, less than the national average. The composition of the regional labor force has also been changing. Noteworthy trends include an increase in the proportion of females in the labor force, an increase in the proportion of those occupations reflecting advanced formal and technical education, and a decentralization of the labor force away from job locations.

8. Compared to the national distribution, the employment opportunities in the Region are concentrated in the manufacturing industry group. Trends since 1954 indicate, however, that employment opportunities in other industry groups are increasing at faster rates, particularly those in service and government groups.

9. Compared to the national distribution, employment opportunities within the manufacturing industry group in the Region are concentrated in the production of machinery, electrical equipment, and transportation equipment. Trends since 1954 indicate further concentration of employment in electrical equipment and transportation equipment industries but decreasing concentration in the machinery manufacturing industry.

10. The revenues and expenditures of local governments within the Region have been increasing at the rate of about 8 percent per year. Cities and school districts account for more than two-thirds of the revenues and expenditures each year, but counties are becoming increasingly more important.

11. Accelerated highway construction programs have resulted in increasing annual expenditures for highways; and these expenditures now constitute the largest single category for cities, villages, and towns within the Region. Approximately 60 percent of the total highway expenditures represent capital outlay, and about one-half of this capital outlay is made directly by the state.

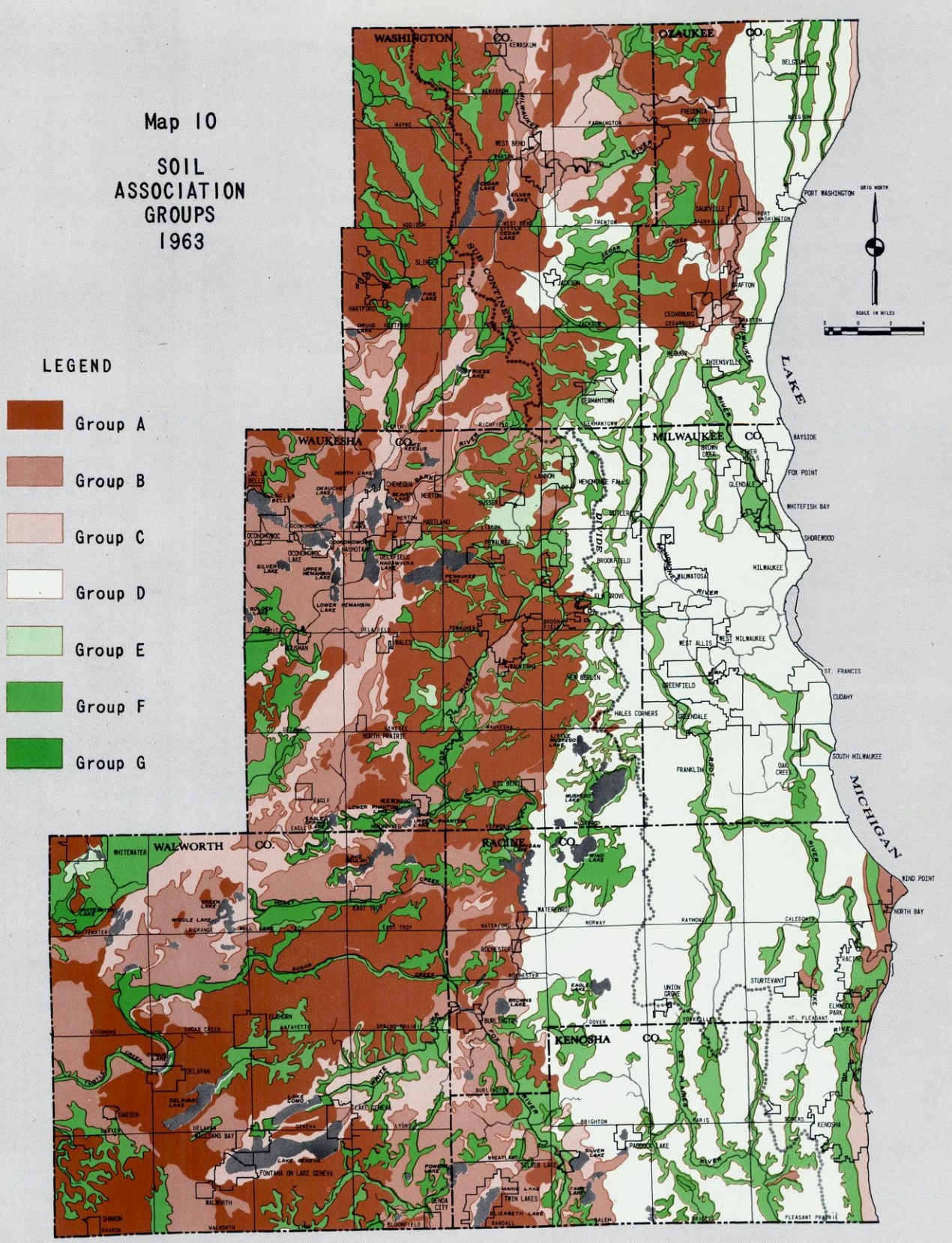
12. Special assessments, fees, and charges for facilities and services appear to be under utilized, and counties within the Region do not utilize the special assessment at all.

13. School districts receive more than 44 percent of the property taxes collected in the Region as a whole, and in some communities over one-half of the local property tax levy is for school purposes. School districts rely three times more heavily on the property tax as a revenue source than do cities and villages.

14. Urbanization has caused an increasing proportion of local government expenditures to be allocated for such services as police and fire protection and health, sanitation, and welfare activities; and the construction and operation of public industries, such as sanitary sewer and water supply systems. While recreation has been a minor expenditure of most units of government within the Region, the changing age structure and the increasing amounts of leisure time available to a significant number of people will probably increase the demands for facilities and services of this type.

Map 10

SOIL ASSOCIATION GROUPS 1963



Approximately 49 percent of the Region is covered by soils which are generally poorly suited for development with individual on-site septic tank sewage disposal systems (Groups D, E, F, G). Approximately one-third of this area, or 17 percent of the Region, is covered by soils which are generally poorly suited for any type of urban development (Groups F and G).

Chapter IV

THE NATURAL RESOURCE AND PUBLIC UTILITY BASE

INTRODUCTION

The natural resources of an area are vital elements to its economic development and to its ability to provide a pleasant and habitable environment for human life. Moreover, natural resources not only condition but are conditioned by regional growth and urbanization. Any meaningful comprehensive regional planning effort must, therefore, recognize the existence of a limited natural resource base to which urban and rural development must be properly adjusted if serious environmental problems are to be avoided. This is particularly true in southeastern Wisconsin, where an increasing number of urbanites are becoming year-round residents of outlying areas of the Region, seeking not only the varied recreational opportunities that are offered by these areas but also the feeling of open space which these areas lend to residential development. A sound evaluation and analysis of the resource capabilities is, therefore, particularly important to planning for the future development of the Region.

It is significant, then, that an extensive effort to relate regional land use and transportation plans to the underlying and supporting natural resource base has been made an integral part of the SEWRPC land use-transportation study. Land and water resources within the Region are limited and subject to grave misuse through improper land use and transportation facility development. Such misuse may lead to severe environmental problems, which are very expensive to correct, and to the deterioration and destruction of the resource base itself. Intelligent selection of the most desirable land use and transportation plan from among alternatives must, therefore, be based in part upon a careful assessment of the effects of each plan on the supporting natural resource base. Such assessment requires the collection and analysis of a great deal more information concerning the natural resource base and its ability to sustain urban development than has ever been collected before within the Region, including definitive data on water resources, forests, wildlife habitat, and soils.

This chapter presents a description and analysis of the necessary natural resource[1] inventories covering the foregoing elements adapted to land use-transportation planning needs. In addition, this chapter presents a brief description and analysis of two additional planning inventories dealing with elements not strictly a part of the natural resource base per se: 1) existing and potential scenic, historic, and recreational and related open-space sites; and 2) public sanitary sewer and water supply facilities. These elements are more usually considered in planning reports under the heading of community facilities. Both, however, are so closely linked to the underlying resource base that it was considered desirable to consider them along with that base.

Interpretations of the findings of these natural resource and related public facility inventories, with respect to land use and transportation development, are also provided. Of particular importance in this respect is the application of the concept of environmental corridors in the Region.

Although this chapter is based upon a vast amount of entirely new data collected in the natural resource and related facilities inventories, it is not intended to comprise in itself an in-depth analysis of the resource and utility base but is intended to be considered within the context of other related Commission studies and reports.[2]

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[1] For the purpose of this report natural resources are defined as water, wetlands, forests, wildlife, and soils.

[2] SEWRPC Planning Report No. 5, The Natural Resources of Southeastern Wisconsin, and SEWRPC Planning Report No. 6, The Public Utilities of Southeastern Wisconsin. The SEWRPC comprehensive watershed planning programs will also make important contributions to this aspect of environmental analysis and design.

SOILS

Soil properties exert a strong influence on the manner in which man uses land. Soils are an irreplaceable resource, and mounting pressures upon land are constantly making this resource more and more valuable. A need, therefore, exists in any comprehensive land use-transportation planning program to examine not only how land and soils are presently used but also how they can be best used and managed. This requires an areawide soil suitability study which maps the geographic locations of the various kinds of soils; identifies their physical, chemical, and biological properties; and interprets these properties for land use and public facilities planning. The resulting comprehensive knowledge of the character and suitability of the soils can be extremely valuable in every phase of the planning process. Soils information can comprise a prime input into the preparation of planning standards; the analysis of existing land uses; plan synthesis, test, and evaluation; and, perhaps most important of all, plan implementation.

For planning application, the necessary soils studies must be designed to permit careful assessment of engineering, agricultural and nonagricultural plant material properties of soils, and the relationship of wildlife population to soils. These assessments must be adapted to use in the development and selection of desirable spatial distribution patterns for residential, commercial, industrial, agricultural, and recreational land use development and in the selection of highway, railroad, airport, pipeline, and other transportation facility locations.

Soil Survey

The standard soil surveys of the Soil Conservation Service, U. S. Department of Agriculture, when accompanied by interpretations for regional planning purposes, meet the basic soils data needs of comprehensive land use-transportation planning efforts. These surveys are based upon careful field and laboratory studies of the physical, chemical, and biological properties of the soils and include the preparation of detailed maps, showing the boundaries of the various soil mapping units[3] within the planning area, and reports which describe each soil mapping unit and its properties. The surveys are carried out by experienced soil scientists and constitute a very valuable basic scientific inventory having multiple planning and engineering uses.

At the time of the creation of the Southeastern Wisconsin Regional Planning Commission, a very limited amount of useful data on the soils of the Region was available. General soil surveys which mapped broad soil groupings at a small scale and provided limited suitability interpretations for agricultural purposes had been completed at various times in the past. Modern standard soil surveys covering approximately 38 percent of the Region, but again accompanied by only agricultural interpretations, had also been completed as a part of the preparation of basic farm conservation plans.

In order to fulfill the soils data requirements of the regional planning program, a cooperative agreement was negotiated with the Soil Conservation Service for the completion of modern standard soil surveys of the entire Region, together with the provision of interpretations for planning purposes.[4] Since over 1 million acres of land

[3] A soils mapping unit is defined as the smallest soil area that can be mapped at the scale being utilized and about which definitive data can be provided.

[4] See "The Application of Soil Studies to Regional Planning," SEWRPC Technical Record, Vol. 1 – No. 4.

Figure 29

SAMPLE OF U. S. SOIL CONSERVATION SERVICE SOIL SURVEY FIELD SHEET

The soils survey field sheet shown above is 70 percent of actual size. Interpretative table and maps for that portion of the field sheet outlined are shown on Figure 30 and 31.

Figure 30

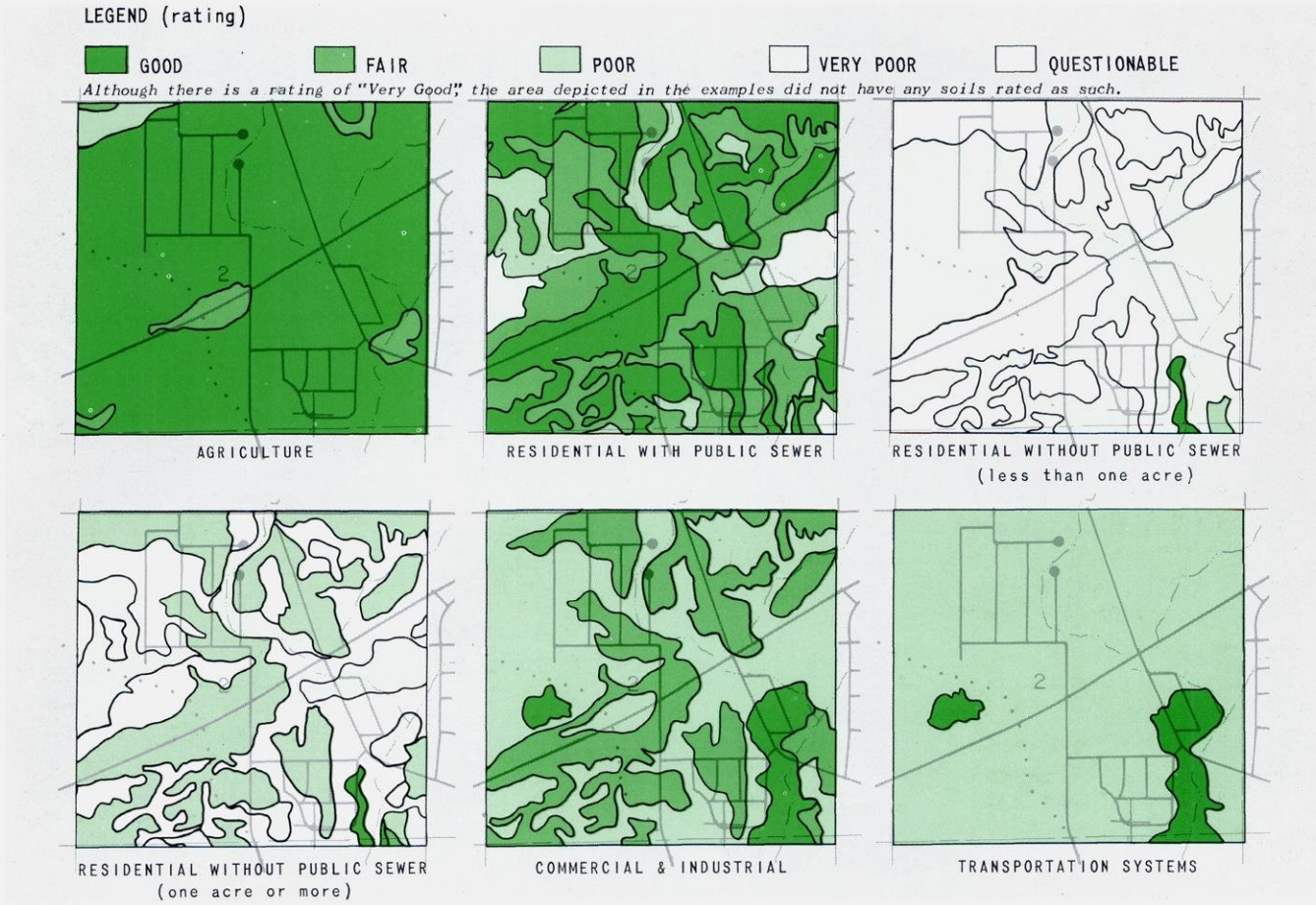
EXAMPLE OF SOIL SUITABILITY RATING TABLE FOR URBAN AND RURAL LAND USE

Soil Type and Numbers	Agriculture	Residential Development			Commercial and Industrial Development	Transportation Systems *(Highways, Railroads, Airports)*	Remarks
		With Public Sewer	Without Public Sewer: Less Than One Acre	Without Public Sewer: One Acre or More			
217 Boro Silty Clay Loam	GOOD-*When Drained* (POOR-*For Trees*)	VERY POOR	VERY POOR	VERY POOR	POOR	POOR	*High Shrink-Swell Potential* *High Water Table*
297 Morley Silt Loam	GOOD-*On 0-6% Slope* FAIR-*On 7-12% Slope* POOR-*On Slope over 12%* (FAIR-*For Trees*)	GOOD	QUESTIONABLE	POOR	FAIR-*On 0-6% Slope* POOR-*On Slopes over 6%*	POOR	*Slowly Permeable* *Large Volume Change in Subsoil and Substratum*
298 Ashkum Silty Clay Loam	GOOD-*For Crops When Drained* GOOD-*For Pasture* (POOR-*For Trees*)	VERY POOR	VERY POOR	VERY POOR	POOR	POOR	*High Water Table* *High Shrink-Swell Potential*
299 Blount Silt Loam	GOOD-*For Crops When Drained* GOOD-*For Pasture* (FAIR-*For Trees*)	FAIR	VERY POOR	QUESTIONABLE	POOR	POOR	*Seasonlly High Water Table* *Slowly Permeable* *High Shrink-Swell Potential*
398 Ashkum Silt Loam	GOOD-*For Crops When Drained* GOOD-*For Pasture* (POOR-*For Trees*)	POOR	VERY POOR	VERY POOR	POOR	POOR	*High Water Table* *Slowly Permeable* *High Shrink-Swell Potential*

Suitability rates for agricultural and transportation systems use considers entire soil profile and its position in the landscape; suitability rating for all other uses applies to both subsoil and substratum, unless otherwise noted.

Figure 31

EXAMPLES OF INTERPRETIVE SOIL MAPS FOR SELECTED URBAN AND RURAL LAND USES



Interpretive soil maps shown above are 70 percent of the original 1 inch 2000 feet scale.

within the Region required mapping, it was impossible to finish the surveys before publication of Volume 1 of the final study report. Priority areas were, therefore, assigned for the completion of the surveys; and by December 31, 1964, only 21 percent of the Region remained to be mapped. The priority areas were generally located adjacent to existing urban development, where it was anticipated that the greatest proportion of future development might occur. Boundaries of soil mapping units were to be identified on prints of aerial photographs prepared from Commission negatives at a scale of 1 inch = 1320 feet (1:15840), each photograph covering an area of six square miles (six U. S. Public Land Survey sections). The Commission was to be furnished reproducible halftone negatives of the completed field sheets at a scale of 1 inch = 2000 feet (1:24000). These reproducible negatives are suitable for the preparation of inexpensive prints by diazo process and clearly show the soils mapping with delineations and identifying symbols (see Figure 29) so that the prints may be used for planning and engineering purposes, not only by the regional planning staff, but by all units of government and by private agencies.

The soils maps will be accompanied by a soil survey report, following the format of the SEWRPC technical reports, to be issued immediately upon completion of the work in the spring of 1966. This report will contain all of the information necessary to utilize the soil surveys in plan preparation and implementation at both the regional and local level. In addition to detailed information on the physical, chemical, and biological properties of the soils mapped, the report will contain interpretations of this data for planning purposes. These interpretations will include suitability ratings for potential intensive and extensive residential, commercial, industrial, transportational, natural and developed recreational, and agricultural uses. Suitability ratings will also be included for specific uses, such as on-site soil absorption sewage disposal, building foundations, earthwork, road subgrade, lawns, golf courses, and source of material for backfill, topsoil, and water reservoir embankments and linings. All of the data and interpretations will be summarized in tabular form suitable for ready use in planning and engineering analyses (see Figure 30).

The SEWRPC technical report will be supplemented by standard U. S. Department of Agriculture soil survey publications, to be issued later, which will follow the latest federal standards for such reports. These reports will be published by county with the exception of Racine and Kenosha counties and Milwaukee and Waukesha counties which will be combined in two reports.

The Commission staff, utilizing the data provided by the soil surveys, is preparing interpretative maps suitable for planning purposes. These maps are being prepared by county on screened reproducible prints of the Commission base maps at a scale of 1 inch = 2000 feet (1:24000).

The interpretative maps will be prepared for the seven potential land uses: 1) agricultural; 2) large lot residential without public sanitary sewer service; 3) small lot residential without public sanitary sewer service; 4) residential with public sanitary sewer service; 5) industrial; 6) transportation route location; and 7) intensely developed recreational. Each interpretative map will reflect suitability ratings of very good, good, fair, poor, questionable, and very poor (see Figure 31). In addition, a slope map will be prepared for each county which will indicate changes in relief by various slope range groups.

Findings — Soils

The Region lies within a wholly glaciated area, and this glacial history has created extremely complex soil relationships and extreme variability and intermingling of soils within very small areas.[5] The usefulness of generalized soil maps for definitive planning purposes within the Region is, therefore, severely limited; and one of the primary values of the operational soil surveys lies in their detail. Any generalization of the findings of the soil surveys can only be meaningful in light of a full understanding of the complexity of the soil relationships in the Region and of the fact that such a generalization, while useful to a broad identification of general areawide development problems relating to soils, cannot be used in plan preparation or implementation.

Map 10 shows in very generalized form the major soil relationships existing within the Region, based upon seven broad suitability associations. The soils designated on this map as Group "A," which cover about 29 percent of the Region, are gener-

[5] See The Quarternary Geology of Southeastern Wisconsin, and accompanying map showing surficial deposits of Southeastern Wisconsin, by William C. Alden (Washington, D. C.: U. S. Government Printing Office, 1918).

ally well suited for both agricultural use and urban development. These soils are not only very productive as cropland but have good drainage and foundation characteristics for all types of urban development. This soils group occurs generally in a belt lying between the present westerly limits of intensive urban development and the easterly limits of the Kettle Moraine. It is interesting to note that this broad soils group does not occur at all in Milwaukee County and occurs to only a very limited extent in Ozaukee, Kenosha, and Racine counties.

The soils designated as Group "B" generally have a sandy-gravelly subsurface and are well suited to both agricultural use and urban development with septic tank sewage disposal systems. Approximately 14 percent of the Region is covered by this general soils group, which occurs in the Kettle Moraine and the Recessional Moraine areas of the Region and to a limited extent along the Lake Michigan shore.

The soils designated as Group "C" are fair to poorly suited for agricultural use. Their suitability for urban development is limited by characteristically steep slopes. These soils are suited for very large lot residential development which does not disturb the natural topography. Approximately 8 percent of the Region is covered by this soils group, which is prevalent in the Kettle Moraine and the Recessional Moraine areas of the Region.

The soils designated as Group "D" are generally well suited for agricultural use but generally unsuited for urban development requiring the use of on-site septic tank sewage disposal systems. Urban development on these soils generally requires a high level of municipal improvements and careful attention to storm water drainage. Nearly 31 percent of the Region is covered by this general soils group, which occurs primarily between the Lake Michigan shore and the westerly limits of present urban development. Much of the existing urban development in the Region has occurred on the soils in this group.

The soils designated as Group "E" are generally not well suited for either cropland or urban development. Bedrock normally occurs within four feet of the surface, and bedrock outcrops are common. Good gravel and rock deposits, which are suitable for commercial development, occur in this group. Approximately 1 percent of the Region is covered by this group, which occurs primarily in isolated pockets throughout the Region.

The soils designated as Group "F" are generally poorly drained, have a high water table, and are interspersed with areas of peat, muck, and other organic soils. Approximately 11 percent of the Region is covered by this group, which generally occurs along streams and watercourses of the Region; and for this reason the soils in this group are commonly subject to flooding. These characteristics generally preclude their use for nearly all forms of development except limited agricultural; wetland, forest, and wildlife conservation; and recreational uses.

The soils designated as Group "G" are peat and muck soils generally unsuited for urban development of any kind. These areas, when left in a natural state, are ideally suited for wildlife habitat and if properly drained are suitable for certain types of agricultural use. Approximately 6 percent of the Region is covered by this soils group, which occurs in scattered corridors and pockets throughout the Region.

It is important to note that, irrespective of the generalized groupings described above, analysis of the detailed soil survey data to date indicates that soils having questionable characteristics for on-site sewage disposal are widespread throughout the Region. Approximately 40 percent of the estimated 125 soils series[6] occurring within the Region have been found to be troublesome in this respect. Urban development undertaken in disregard of these soil conditions has actually created severe environmental problems within the Region, with the result that the State Board of Health has placed restrictions on the development of new subdivision plats in certain areas of the Region and has issued orders for the installation of public sanitary sewer facilities in other areas originally developed with on-site soil absorption sewage disposal systems. It should also be noted that soils poorly suited or unsuited for urban development, even if served by public sewer, are also widespread throughout the Region. These include generally wet soils which either have a high water table, a high water holding capacity, or are poorly drained. Urban development on these soil types is not only expensive to construct initially but expensive to maintain.

[6] A soil series is defined as a group of soils developed from a common parent material and having horizons with similar characteristics, except for the texture of the surface soil.

Again, it should be stressed that the widespread occurrence of soils having questionable characteristics for certain types of urban development, coupled with the highly complex soil relationships, indicates the need for basing regional and local development plans on the results of the detailed soil surveys rather than on any generalized soils data.

SURFACE WATER

The uses of land and water within the Region are closely interrelated. Urban development is dependent upon surface water resources for the dilution of treated sewage wastes, for the recharge of ground water tables, for recreational purposes, and in some cases for water supply. Limitations are imposed on surface water use by the natural mineral content of the water and by the organic and inorganic pollutants that are introduced into the lakes and streams by man from domestic, municipal, agricultural, and industrial uses. As urbanization increases, waste outlets along the lake and stream networks become more numerous and carry greater volumes of more concentrated and more complex wastes. Unless development is adjusted to the waste assimilation capacities of the natural streams, the multipurpose utility of these streams and their interconnected lakes will be destroyed and severe environmental problems created.

Any meaningful assessment of the possible effects of rural and urban development on the surface water resources of the Region, therefore, requires definitive information about the quantity and quality of the water in the major streams and watercourses of the Region.

For planning application the necessary water quality studies must be designed to permit: assessment of the present condition of stream water quality in relation to existing major sources of stream pollution; assessment of the effect of water quality on various water uses and concomitant effects on land use patterns; and forecast of future stream water quality in the major watersheds under alternative long-range land use development plans.

Surface Water Survey

In order to fulfill the stream water quality data requirements of the regional planning program, a cooperative agreement was negotiated with the State Board of Health and the State Committee on Water Pollution for the cooperative completion of a surface water quality investigation of the major streams within the Region, together with the provision of interpretations for planning purposes. In addition, the Public Health Service, U. S. Department of Health, Education, and Welfare, agreed to provide equipment and consultive services as might be required.[7] Without the cooperation of these state and federal agencies, the SEWRPC water quality study would not have been possible.

The surface water quality study includes the collection of water samples over a 13-month period at each of 87 sampling stations on 43 streams and watercourses within the Region. Samples were submitted to the State Board of Health for determination of biochemical oxygen demand and coliform count. Other samples were retained for Commission analyses for twenty-five parameters: dissolved oxygen, silica, iron, manganese, calcium, magnesium, sodium, bicarbonate, carbonate, sulfate, chloride, nitrate, nitrite, detergents, dissolved solids, hardness, noncarbonate hardness, calcium hardness, magnesium hardness, alkalinity "P", alkalinity "M", specific conductance at 25° C., pH, color, and turbidity.

Streamflow measurements were made at 53 of the sampling stations during high and low flow periods and were supplemented by monthly stage measurements at each sampling station and by control data obtained from nine permanent U. S. Geological Survey stream gaging stations within the Region.

Numerical expressions of the existing and probable future chemical and bacteriological qualities of surface water are not meaningful for planning purposes unless related to quality standards for the various water uses. The establishment of such standards is a particularly difficult task in that there are as many concepts of standards as there are water users. Consequently, either no standards at all or no uniform standards have been established relating water quality to the many water uses. Recommendations will, therefore, have to be made as to the level of water quality suitable for the following ten water uses in terms of the parameters analyzed in the study: public water supply, agriculture other than irrigation, preservation of fish, wildlife and cer-

[7] See "A Study of the Water Quality and Flow of Streams in Southeastern Wisconsin," SEWRPC Technical Record, Vol. 1. – No. 6.

tain plant communities, recreational use, industrial processing, irrigation, aesthetic, industrial cooling, waste water assimilation, and drainage and navigation.

Maps will also be prepared showing the geographic distribution of existing stream water quality in terms of each parameter and the approximate geographic limits of the beginnings of the zones of degredation and the ends of the zones of recovery for each major pollution source.

The time required to complete the surface water quality survey is 18 months. Since work was begun in February of 1964, no findings can be reported herein. A separate SEWRPC technical report dealing with the surface water quality findings will be issued in the fall of 1965. The results will be utilized in the plan preparation, test, and evaluation.

PUBLIC UTILITIES

Public utility systems are one of the most important and permanent elements of urban growth and development. Urban development today is highly dependent upon these utility systems which serve the individual land uses with power, light, communications, heat, water, and sewerage. How well the Region and its principal parts can sustain urban development will depend to a considerable extent upon the location and capacities of these utility facilities. Moreover, certain utility facilities are closely linked to the surface and ground water resources of the Region and may, therefore, greatly affect the overall quality of the regional environment. This is particularly true of the sanitary sewerage, water supply, and storm water drainage facilities, which are, in a sense, modifications of, or extensions to, the natural lake, stream, and watercourse system of the Region and of the underlying ground water reservoir. Knowledge of the location, capacities, and existing and potential service areas of the regional gas, electric power, telephone, water supply, sanitary sewerage, and storm water drainage systems is, therefore, essential to intelligent land use and transportation planning.

In 1963 the SEWRPC completed a study of existing utility systems within the Region.[8] The purpose of this inventory was to provide information pertaining to the existing locations, capacities, and service areas of these systems and to their physical capacity to offer service to new growth and development. The results of this inventory indicated that gas, electric power, and telephone service is extended on demand of potentially profitable consumers. The privately owned, publicly regulated utility companies providing these three services have plants functioning at adequate levels and capable of ready expansion to meet further growth. All areas of the Region can be serviced by these three utilities as development occurs; and for regional land use-transportation planning purposes, these three important utilities can be regarded as ubiquitous.

The inventory further indicated that storm water drainage facilities were not planned, designed, and constructed by the public agencies concerned in a manner similar to other utility facilities; that is, as integrated systems, except in portions of Milwaukee County and in a very few of the older and more densely populated outlying cities of the Region. Instead, the inventory indicated that in large areas of the Region the current tendency was to utilize open surface channels to as great a degree as possible for urban drainage and to install subsurface conduits only when absolutely necessary as appurtenances to street construction or maintenance programs, rather than as separate utility systems. The resulting fragmented storm water drainage "systems" do not, therefore, lend themselves to meaningful analysis for land use-transportation planning purposes. It was, therefore, determined that for land use-transportation planning purposes primary emphasis should be placed on defining the existing, proposed, and possible service areas of municipally owned public sanitary sewerage and water supply systems.

Public Utilities Inventories

All information collected in the previous SEWRPC utility study was updated by transferring service area information for existing and proposed sanitary sewerage and for water supply facilities to SEWRPC 1 inch = 4000 feet scale county base maps. The gravity drainage areas tributary to existing sewage treatment plants were then added to the plotted sanitary sewer service areas. These gravity drainage areas were derived from analyses of Commission topographic maps having a vertical contour interval of 10 feet. Wherever such gravity drainage extended for considerable distances up major stream valleys, upper limits were determined on the basis of the local planning jurisdiction of the community concerned and the possible service areas of adjacent upstream systems.

[8] Ibid. , footnote 2.

Table 23

PROPORTION OF DEVELOPED AND UNDEVELOPED AREAS IN THE REGION BY COUNTY - 1963

County	Developed Area		Undeveloped Area		Total Area in Square Miles
	Square Miles	Percent	Square Miles	Percent	
Kenosha	27.6	9.9	250.7	90.1	278.3
Milwaukee	152.5	63.0	89.7	37.0	242.2
Ozaukee	15.9	6.8	218.6	93.2	234.5
Racine	37.8	11.1	302.1	88.9	339.9
Walworth	24.0	4.2	554.1	95.8	578.1
Washington	11.8	2.7	423.7	97.3	435.5
Waukesha	70.1	12.1	510.6	87.9	580.6
Region	339.7	12.6	2,349.5	87.4	2,689.1

Developed and undeveloped areas were calculated from the 1963 urban growth ring map, Map 21, in Chapter V.

Source: SEWRPC.

Copies of these maps were then sent to the local municipal engineers responsible for the construction, maintenance, and operation of the sewerage and water utilities. Each engineer was asked to review the proposed service areas and recommend revisions based upon local system plans, proposed service extensions, committed construction, and local utility extension policies. Final sanitary sewerage and municipal water supply service area maps, at the scale of 1 inch = 4000 feet, were then completed by the Commission staff.

The sanitary sewerage maps depict the following information: 1) base map information; 2) existing sewage treatment plant locations; 3) present service area; 4) probable future service area based upon committed construction plans and local long-range (1964-1990) sewerage system plans, including establishment of new treatment plant facilities; and 5) possible future service area based upon gravity drainage to existing treatment plant facilities.

The water utility maps depict the following information: 1) base map information; 2) existing well, water intake, and filtration plant locations; 3) present service areas; and 4) probable future service areas based upon committed construction plans and local long-range (1964-1990) water system plans, including establishment of new sources of supply.

Findings — Sanitary Sewerage Service

Of the 339.7 square miles of the Region presently developed for urban purposes, 217.0 square miles, or approximately 64 percent, are presently served by public sanitary sewerage facilities (see Table 23 and Table 24). Local plans have been prepared for the extension of sewer service to an additional 33.6 square miles, or 9.9 percent of the presently developed area. This latter area plus the remaining 89.1 square miles, or 26.2 percent of the presently developed area, is served by on-site soil absorption sewage disposal systems (see Map 11).

In addition, local plans have been prepared for the ultimate extension of sewer service to 182.5 square miles of the presently undeveloped area. This represents 7.8 percent of the presently remaining undeveloped area of the Region or 6.8 percent of the total area of the Region, and is equal to over one-half of the presently developed area. An additional 186.5 square miles, or 7.9 percent

Table 24

SANITARY SEWER SERVICE AREAS IN THE REGION BY COUNTY - 1964

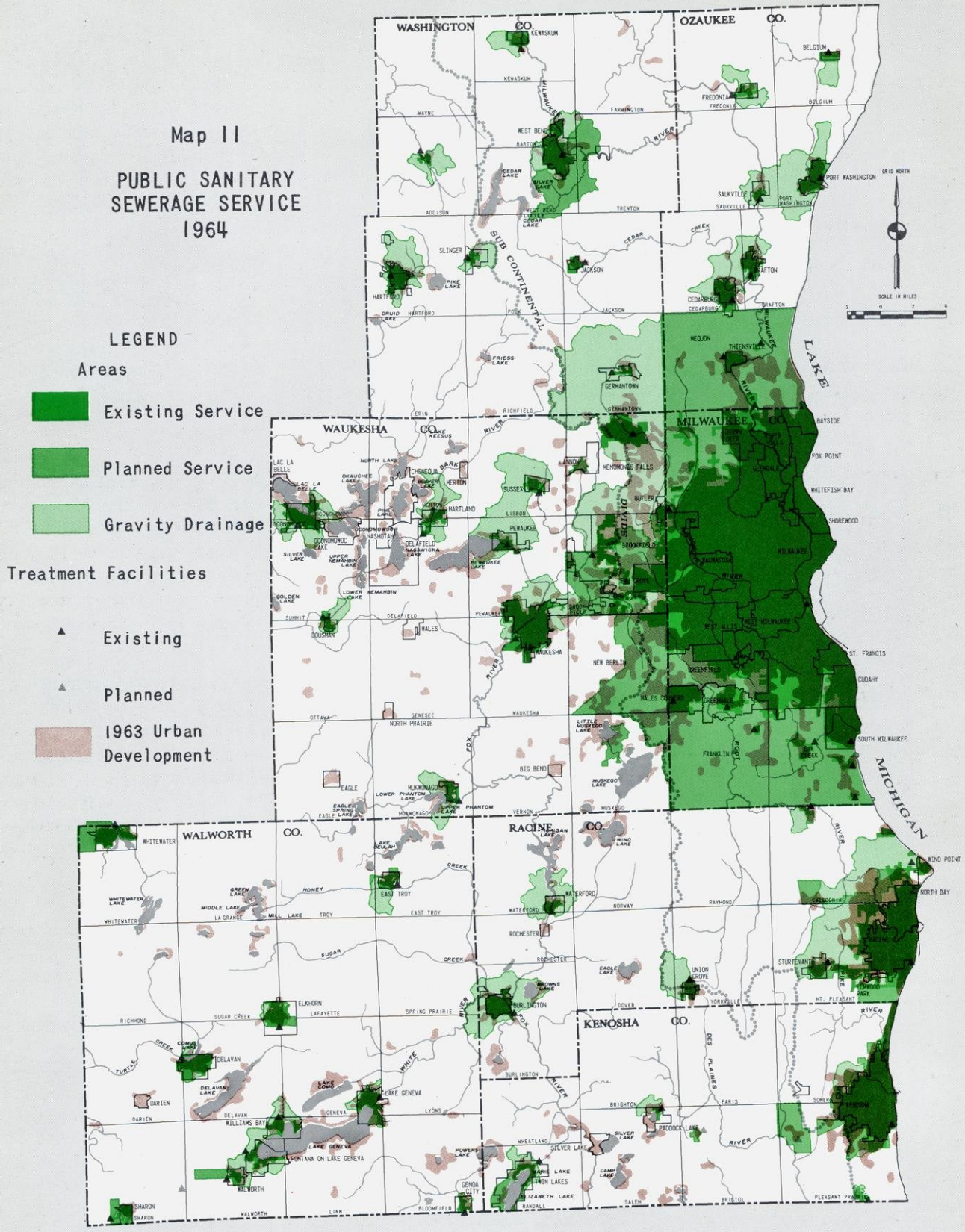
County	Total Area[a] (square miles)		Existing Sanitary Sewer Service Area		Proposed Sanitary Sewer Service In:				Tributary Gravity Drainage Areas[b]	
					Developed Areas		Undeveloped Areas			
	Developed	Undeveloped	Square Miles	Percent of Developed Area	Square Miles	Percent of Developed Area	Square Miles	Percent of Undeveloped Area	Square Miles	Percent of Undeveloped Area
Kenosha	27.6	250.7	14.0	50.7	2.4	8.7	9.4	3.7	5.7	2.3
Milwaukee	152.5	89.7	142.3	93.3	10.2	6.7	89.7	100.0	0.0	-
Ozaukee	15.9	218.6	6.2	38.9	5.2	32.7	40.6	18.6	24.4	11.2
Racine	37.8	302.1	19.1	50.5	2.5	6.6	5.2	1.7	46.8	15.5
Walworth	24.0	554.1	8.6	35.8	0.7	2.9	4.4	0.8	10.6	1.9
Washington	11.8	423.7	6.1	51.7	0.5	4.2	6.2	1.5	49.1	11.6
Waukesha	70.1	510.6	20.7	29.5	12.1	17.3	27.0	0.5	49.9	9.8
Region	339.7	2,349.5	217.0	63.9	33.6	9.9	182.5	7.8	186.5	7.9

[a] *Developed and undeveloped areas were calculated from the 1963 urban growth ring shown on Map 11.*

[b] *Additional gravity drainage areas tributary to present facilities were calculated from SEWRPC 1 inch = 2000 feet scale county topographic maps having a vertical contour interval of 10 feet.*

Map II

PUBLIC SANITARY SEWERAGE SERVICE 1964



Only about 8 percent of the area of the Region is presently served by sanitary sewer facilities. Over one-third of the present urban development within the Region is served by individual on-site sewage disposal systems.

of the remaining undeveloped area of the Region, lie within gravity drainage areas tributary to existing sanitary sewage treatment facilities.

Of the 146 cities, villages, and towns within the Region, 68 are served to some extent by public sanitary sewerage facilities. All of Milwaukee County is presently either served by public sanitary sewer or proposed for such service. It should be noted that the Metropolitan Sewerage Commission of Milwaukee County is the largest single public sanitary sewer service utility in the Region, presently serving an area of approximately 136 square miles, or 62.6 percent of the total serviced area in the Region. An estimated population of 1,007,570 persons, or approximately 60 percent of the total population of the Region, reside within the service area which presently includes 20 communities in Milwaukee, Waukesha, and Ozaukee counties.

It is also important to note that a subcontinental divide traverses the Region in a generally northwesterly-southeasterly direction (see Map 11). This divide separates the Region into two major drainage areas, an easterly portion (Milwaukee and Ozaukee counties and the easterly portions of Washington, Waukesha, Racine, and Kenosha counties), which drains to the Atlantic Ocean via the St. Lawrence River, and a westerly portion, which drains to the Gulf of Mexico via the Mississippi River.

This major geographic feature is of great importance to any consideration of water-related public utility systems within the Region. The numerous small streams and rivers which traverse the area west of this divide all have relatively limited upstream drainage areas and relatively low flows during dry weather. Consequently, the capacities of these streams for liquid waste disposal and assimilation is severely limited; and pollution loads transmitted to these rivers must be carefully adjusted to their dry weather waste assimilation capacities if serious environmental problems are to be avoided and multiple use of the streams permitted. The problem of waste disposal in the area west of the divide is further aggravated by soil conditions, for, as already noted herein, the Region has a relatively high percentage of its area covered by soils unsuited to the utilization of on-site soil absorption sewage disposal systems.

Findings — Public Water Service

The Region is unique with respect to water resources in that there are four principal natural sources of supply (see Figure 32): 1) surface water east of the subcontinental divide including Lake Michigan; 2) surface water west of the subcontinental divide; 3) shallow ground water in the glacial till and connected limestone aquifers; and 4) ground water in the generally deep sandstone aquifers.

As already noted, the streams and rivers west of the subcontinental divide all have relatively limited upstream drainage areas and relatively low flows during dry weather. As a result they have a very limited potential as a source of water supply for urban development, which must instead presently rely entirely on the two ground water aquifers. Urban development east of the subcontinental

Table 25

PUBLIC WATER SERVICE AREAS IN THE REGION BY COUNTY - 1964

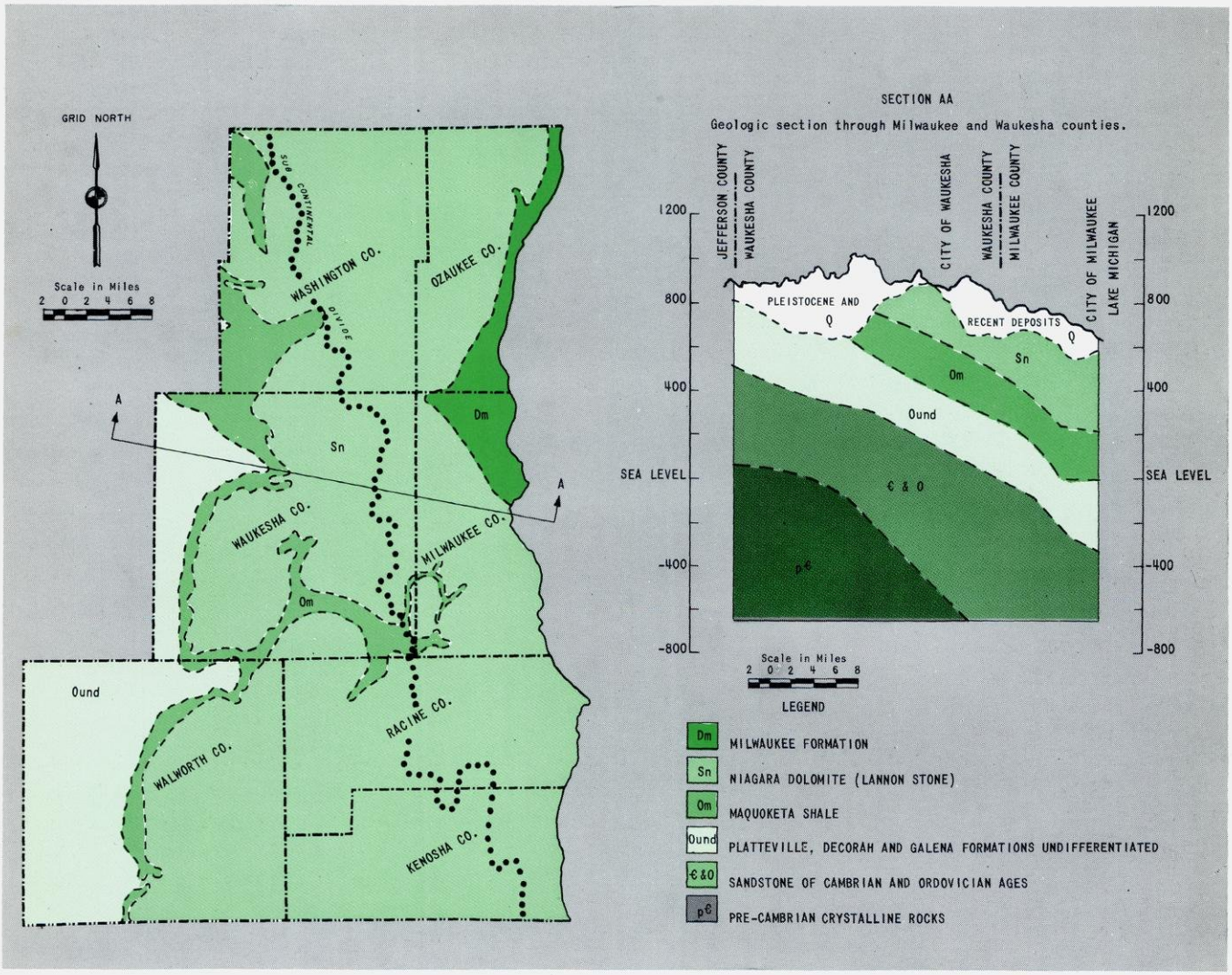
County	Total Area* (square miles)		Existing public Water Service Area		Proposed Public Water Service In:			
					Developed Areas		Undeveloped Areas	
	Developed	Undeveloped	Square Miles	Percent of Developed Area	Square Miles	Percent of Developed Area	Square Miles	Percent of Undeveloped Area
Kenosha	27.6	250.7	13.6	49.3	0.0	-	0.0	-
Milwaukee	152.5	89.7	129.1	84.7	9.8	6.4	23.2	25.9
Ozaukee	15.9	218.6	5.5	34.6	0.3	1.9	0.4	0.2
Racine	37.8	302.1	18.3	48.4	0.8	2.1	1.4	4.6
Walworth	24.0	554.1	11.5	47.9	0.9	3.8	5.1	0.9
Washington	11.8	423.7	5.8	49.2	0.3	2.5	1.8	0.4
Waukesha	70.1	510.6	16.2	23.1	8.0	11.4	25.9	5.1
Region	339.7	2,349.5	200.0	58.8	20.1	5.9	57.8	2.5

* *Developed and undeveloped areas were calculated from the 1963 urban growth ring shown on Map 12.*

Source: SEWRPC.

Figure 32

SUBSURFACE GEOLOGIC MAP AND CROSS SECTION OF THE REGION



Source: U. S. Geological Survey, Water Report No. 1229; U. S. Geological Survey, Ground Water Branch; SEWRPC.

divide can readily utilize both Lake Michigan and the ground water aquifers as sources of supply.

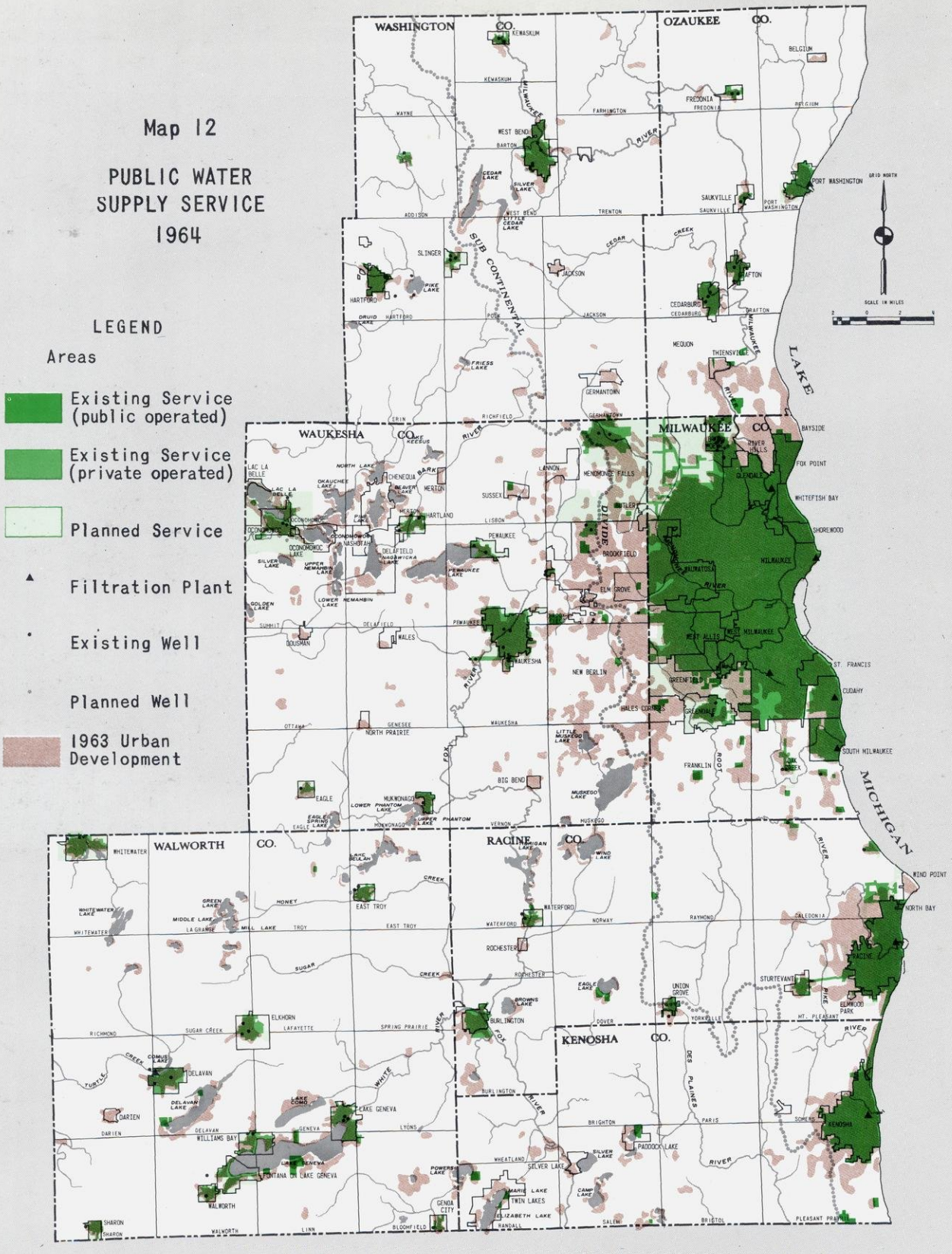
Of the 339.7 square miles of the Region presently developed for urban purposes, 200.0 square miles, or approximately 59 percent, are presently served by public water supply facilities (see Table 25). Local plans have been prepared for the extension of water service to an additional 20.1 square miles, or 5.9 percent of the presently developed area. This latter area plus the remaining 119.6 square miles, or 35.2 percent of the presently developed area, is served by private water supply systems (see Map 12).

In addition, local plans have been prepared for the ultimate extension of water service to 57.8 square miles of presently undeveloped area. This represents 2.5 percent of the remaining undeveloped area of the Region, or 2.1 percent of the total area of the Region, and is equal to approximately 17 percent of the presently developed area.

Of the 146 cities, villages, and towns in the Region, 75 are serviced to some extent by public water supply facilities. Three systems exist within the Region which may be considered as offering areawide service. The largest of these is the City of Milwaukee Water Works, which in 1963 served 103 square miles in seven communities within Milwaukee County, or 51.5 percent of the total area within the Region presently served by public water supply facilities. The second is the Racine Water Department, which in 1963 served 13.9 square miles in six communities in Racine County, or 6.9 percent of the total area served

Map 12

PUBLIC WATER SUPPLY SERVICE 1964



Only about 7 percent of the Region is presently served by public water supply facilities. Over two-fifths of the present urban development within the Region is served by individual private water supply systems.

within the Region. The third is the North Shore Water Utility, which in 1963 served 10.6 square miles in three communities in Milwaukee County, or 5.3 percent of the total area served within the Region. Twenty-eight of the communities, or approximately 37 percent, presently served have prepared long-range plans for the extension of their facilities.

PARKS, OUTDOOR RECREATION AREAS, AND RELATED OPEN SPACES

In an urbanizing region, open space[9] should serve three primary purposes. First, it should lend form to regional development by shaping urban growth and providing a desirable setting for the more intensive types of urban land uses. Second, it should serve to provide outdoor recreational opportunities to the resident population. Third, it should be utilized to conserve and enhance the natural resource base and to protect certain important community values. When properly related to woodlands, wetlands, and prime wildlife habitat areas, open space can be used to conserve soils, fish and game, and certain species of trees and plants and to improve surface and ground water quality and quantity. Open space may also be used to protect sites having scenic, historic, or scientific value. Planning for the provision of the necessary open space in an urbanizing region, therefore, requires definitive knowledge of the woodlands, wetlands, and wildlife habitat areas; of the scenic, historic, and scientific sites; and of the existing and potential park and outdoor recreation sites.

The Inventories

In order to meet land use-transportation planning needs in this respect, five inventories were conducted: 1) existing outdoor recreation sites, 2) potential park and related open-space sites, 3) historic sites, 4) wildlife habitat areas including fishery areas, and 5) forests.

The inventories were primarily directed at identifying prime resource values so that these values could be considered in the plan preparation and thereby protected from inadvertent destruction through poorly located urban development or transportation route location.

It is important to note that, although water resources are an important element of the recreational resources of the Region, it was not necessary to conduct special recreation oriented surface water and wetland inventories as part of the land use-transportation study. Such inventories had already been completed by the Wisconsin Conservation Commission; and reports, entitled "Surface Water Resources," setting forth the inventory results have been published for each county in the Region. In addition, water and wetland areas were delineated as part of the SEWRPC existing land use inventory, described in Chapter V of this report.

The SEWRPC conducted the existing outdoor recreation sites and the historic sites inventories with its own staff and resources. The remaining inventories were carried out under a cooperative agreement negotiated with the Wisconsin Conservation Commission and the State Department of Resource Development, thus utilizing the extensive knowledge and experience of these two agencies in the land-use transportation study.

The existing outdoor recreation sites inventory, the historic sites inventory, and the potential park, recreation, and related open-space sites inventory have all been described in detail in previous Commission publications and will not be further discussed herein.[10] It should be acknowledged, however, that these inventories would not have been possible without the close cooperation of the county park and planning commissions and committees, the county historical societies, certain municipal park departments, and many private organizations concerned with outdoor recreation and natural resources within the Region, as well as the Wisconsin Conservation Commission and State Department of Resource Development.

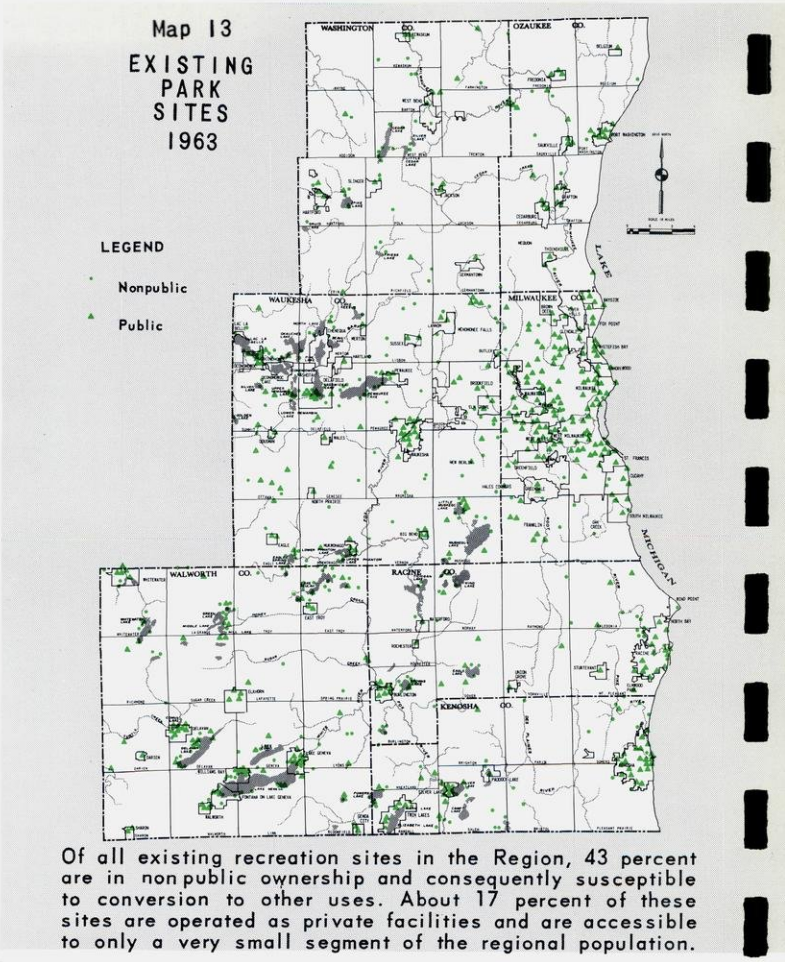
The wildlife habitat area inventory was conducted by teams of fish and game biologists provided by the Wisconsin Conservation Commission. The field inventories involved the identification and delineation of stream and lake areas which were known to be inhabited by pan and game fish and of land areas inhabited by various forms of wildlife. Each fish and wildlife area was delineated

[9] For the purposes of this volume open space is defined as consisting of those areas and sites not devoted to urban use having features which enhance the recreational value of any proximate existing or potential park or outdoor recreation area.

[10] See "Inventory of Potential Park and Related Open Space Sites," SEWRPC Technical Record, Vol. 1 – No. 4 and SEWRPC Technical Report No. 1, Potential Parks and Related Open Spaces.

on prints of SEWRPC aerial photographs and assigned a value rating based upon on-site evaluation by the fish and game biologists and local conservation wardens and managers. After all areas within each county were identified, delineated, classified, coded, and edited on the air photos, the information was transferred to SEWRPC 1:62500 scale county base maps and the total acreage of each area measured.

The forest inventory was conducted by teams of foresters provided by the Wisconsin Conservation Commission. Utilizing a combination of field inventory, aerial reconnaissance, and aerial photo interpretation, the foresters identified all forest areas in the Region having an area of 20 acres or more. Each such forest area was delineated on prints of SEWRPC aerial photographs, classified as having either commercial timber value or aesthetic value, and then ranked within these two major categories as being of low, medium, or high value. It should be noted that, under the inventory methodology, forests classified as commercial timber may also have aesthetic value; but forests classified as aesthetic would not have commercial timber value. After all forest areas within each county were identified, delineated, classified, coded, and edited on the air photos, the information was transferred to SEWRPC 1:62500 scale county base maps and the total acreage of each area measured.



Of all existing recreation sites in the Region, 43 percent are in nonpublic ownership and consequently susceptible to conversion to other uses. About 17 percent of these sites are operated as private facilities and are accessible to only a very small segment of the regional population.

Table 26

EXISTING PARK AND OUTDOOR RECREATION SITES IN THE REGION BY COUNTY BY OWNERSHIP - 1963

County		Public Ownership					Nonpublic Ownership				Total
		State	County	City or Village	Town	Sub-Total	Private	Organization	Commercial	Sub-Total	Sites
Kenosha	Sites	---	6	45	--	51	3	8	21	32	83
	Acres	---	900	490	--	1,390	315	736	677	1,728	3,118
Milwaukee	Sites	3	84	60	--	147	12	2	9	23	170
	Acres	186	10,257	447	--	10,890	1,046	60	84	1,190	12,080
Ozaukee	Sites	3	6	19	--	28	2	3	7	12	40
	Acres	4	440	176	--	620	464	302	228	994	1,614
Racine	Sites	3	8	27	1	39	4	4	27	35	74
	Acres	15	179	441	3	638	434	185	1,059	1,678	2,316
Walworth	Sites	6	2	67	1	76	12	29	47	88	164
	Acres	161	158	300	19	638	1,112	2,404	1,863	5,379	6,017
Washington	Sites	3	--	17	--	20	2	13	22	37	57
	Acres	26	--	239	--	265	2	1,067	707	1,776	2,041
Waukesha	Sites	14	5	71	1	91	23	20	66	109	200
	Acres	419	1,118	732	8	2,277	1,365	729	1,705	3,799	6,076
Region	Sites	32	111	306	3	452	58	79	199	336	788
	Acres	811	13,052	2,825	30	16,718	4,738	5,483	6,323	16,544	33,262

Existing park and outdoor recreation site acreage includes all sites owned and used for outdoor recreation, except for large state-owned forest, conservation areas, or park lands which have only a small portion of their area devoted to active recreation activities (see Table 29 for acreage owned by the Wisconsin Conservation Commission).

Source: SEWRPC.

Table 27

ACRES OF EXISTING PARK AND OUTDOOR RECREATION LAND PER THOUSAND POPULATION IN THE REGION BY COUNTY - 1963

County	Public Site			Nonpublic Site			Total Sites		
	Sites	Acres	Acres per Thousand Population	Sites	Acres	Acres per Thousand Population	Sites	Acres	Acres per Thousand Population
Kenosha	51	1,390	13	32	1,728	16	83	3,118	29
Milwaukee	147	10,890	10	23	1,190	1	170	12,080	11
Ozaukee	28	620	15	12	994	24	40	1,614	39
Racine	39	638	4	35	1,678	11	74	2,316	15
Walworth	76	638	12	88	5,379	100	164	6,017	112
Washington	20	265	5	37	1,776	36	57	2,041	41
Waukesha	91	2,277	12	109	3,799	21	200	6,076	33
Region	452	16,718	10	336	16,544	10	788	33,262	20

Existing park and outdoor recreation site acreage includes all sites owned and used for outdoor recreation, except for large state-owned forest, conservation areas, or park lands which have only a small portion of their area devoted to active recreation activities (see Table 29 for acreage owned by the Wisconsin Conservation Commission).

Source: SEWRPC.

Findings — Existing Outdoor Recreation Sites

The existing outdoor recreation sites inventory revealed that there are a total of 788 outdoor recreation sites totaling 33,262 acres in the Region. The spatial distribution of these sites is shown on Map 13, and the acreage and number of sites are shown in Table 26.

Based on the estimated 1963 population, the ratio of outdoor recreation area to population within the Region is about 10 acres per thousand in public ownership and an additional 10 acres per thousand in nonpublic ownership. As shown in Table 27, this ratio varies from four acres per thousand population in Racine County to 15 acres per thousand in Ozaukee County under public ownership, and from one acre per thousand population in Milwaukee County to 100 acres per thousand in Walworth County under nonpublic ownership.

It is significant that 78 percent of the total developed public recreation acreage, with an average area of 117.6 acres per site, is presently in county ownership. Seventeen percent of the total developed public recreation acreage, with an average area of 9.2 acres per site, is presently in city and village ownership. The Region contains only three town owned facilities, encompassing a total of 30 acres, all of which are joint ventures between the town and either the

Table 28

PERCENTAGE DISTRIBUTION OF EXISTING PARK AND OUTDOOR RECREATION SITES AND ACREAGE IN THE REGION BY OWNERSHIP - 1963

Ownership	Number of		Percent of Public		Percent of Nonpublic		Percent of Total	
	Sites	Acreage	Sites	Acreage	Sites	Acreage	Sites	Acreage
Public								
State	32	811	7.1	4.8	---	---	4.0	2.5
County	111	13,052	24.6	78.0	---	---	14.1	39.2
City or Village	306	2,825	67.7	16.8	---	---	38.8	8.5
Town	3	30	0.6	0.4	---	---	0.1	0.1
Subtotal	452	16,718	100.0	100.0	---	---	57.0	50.3
Nonpublic								
Private	58	4,738	---	---	17.3	29.0	7.5	14.2
Organization	79	5,483	---	---	23.5	33.0	10.1	16.5
Commercial	199	6,323	---	---	59.2	38.0	25.4	19.0
Subtotal	336	16,544	---	---	100.0	100.0	43.0	49.7
Total	788	33,262	---	---	---	---	100.0	100.0

Existing park and outdoor recreation site acreage includes all sites owned and used for outdoor recreation, except for large state-owned forest, conservation areas, or park lands which have only a small portion of their area devoted to active recreation activities (see Table 29 for acreage owned by the Wisconsin Conservation Commission).

Source: SEWRPC.

state or another municipality (see Table 28).

The Wisconsin Conservation Commission owns 24,491 acres of land in the Region, as shown in Table 29. Of this, 46 percent is devoted to fish and game management, 53 percent to state forests, and only 1 percent to state parks. On the basis of actual development, only 583 acres of the total Wisconsin Conservation Commission ownership were classified as active park and outdoor recreation areas in the SEWRPC inventory. An additional 228 acres of active park and outdoor recreation areas in the Region are owned or operated by other state agencies, for a total of 811 such acres as reflected in Tables 26 and 28.

Nonpublic recreation sites include sites in three ownership categories: 1) private, which are privately owned and operated for members only and, therefore, not generally open to the public; 2) organizational, which are privately owned and operated by nonprofit organizations but are generally open to the public for a fee; and 3) commercial, which are privately owned and operated and open to the public for a fee. Private sites comprise 29 percent of the nonpublic acreage and average 81.7 acres per site. Organizational sites comprise 33 percent of the nonpublic acreage and average 69.4 acres per site. Commercial sites comprise the remaining 38 percent of the nonpublic acreage and average 31.8 acres per site. Nonpublicly owned sites comprise 43 percent of the total number of outdoor recreation sites within the Region and 50 percent of the acreage. It is important to note that these sites are subject to conversion as urbanization continues and cannot be relied upon as a permanent recreational resource.

Table 29

LANDS IN THE REGION THAT ARE OWNED BY THE WISCONSIN CONSERVATION COMMISSION BY COUNTY - 1964

County	Land Area (in acres)			
	Wildlife Areas*	Forest	State Parks	Total
Kenosha . . .	1,350	---	---	1,350
Milwaukee . .	---	---	---	---
Ozaukee . . .	19	870	---	889
Racine. . . .	1,204	---	---	1,204
Walworth. . .	1,363	3,270	268	4,901
Washington. .	4,067	2,639	31	6,737
Waukesha. . .	3,281	6,120	9	9,410
Region	11,284	12,899	308	24,491

* *Fish and game management areas.*

Source: Wisconsin Conservation Commission.

Milwaukee County has one of the finest existing park and parkway systems in the United States. The county owned recreational acreage is the highest in the Region, and there is more land in the Milwaukee County park system than in any other category of recreation ownership in the entire Region. The Milwaukee County park sites account for 76 percent of the total number of county owned sites in the Region and over 78 percent of total county park area in the Region. The major parks are generally located along the rivers and streams and the Lake Michigan shoreline but are also interspersed throughout the various communities in the county in the form of neighborhood and community parks. Generally, these community parks, such as playgrounds and playfields, serve the needs of the neighborhood in which they are located. While Milwaukee County contains a high proportion of both the total county park sites and acreage within the Region, it contains only 22 percent of the total number of recreation sites and only 36 percent of the total acreage. These sites and acreage serve a county which contains about 65 percent of the regional population, so that the ratio of total outdoor recreation area per thousand resident population is well below the regional average. Of the 23 nonpublic sites in Milwaukee County, totaling 1,190 acres, the majority are private golf courses and country clubs.

The remaining six counties of the Region together contain 78 percent of the total number of recreation sites within the Region and 64 percent of the total acreage. Most of the existing recreation sites outside of Milwaukee County are water oriented, and many of the nonpublicly owned sites are clustered along the shores of inland lakes and rivers. Unfortunately, the Lake Michigan shoreline has not been utilized to any great extent for park and recreation purposes outside of the larger cities.

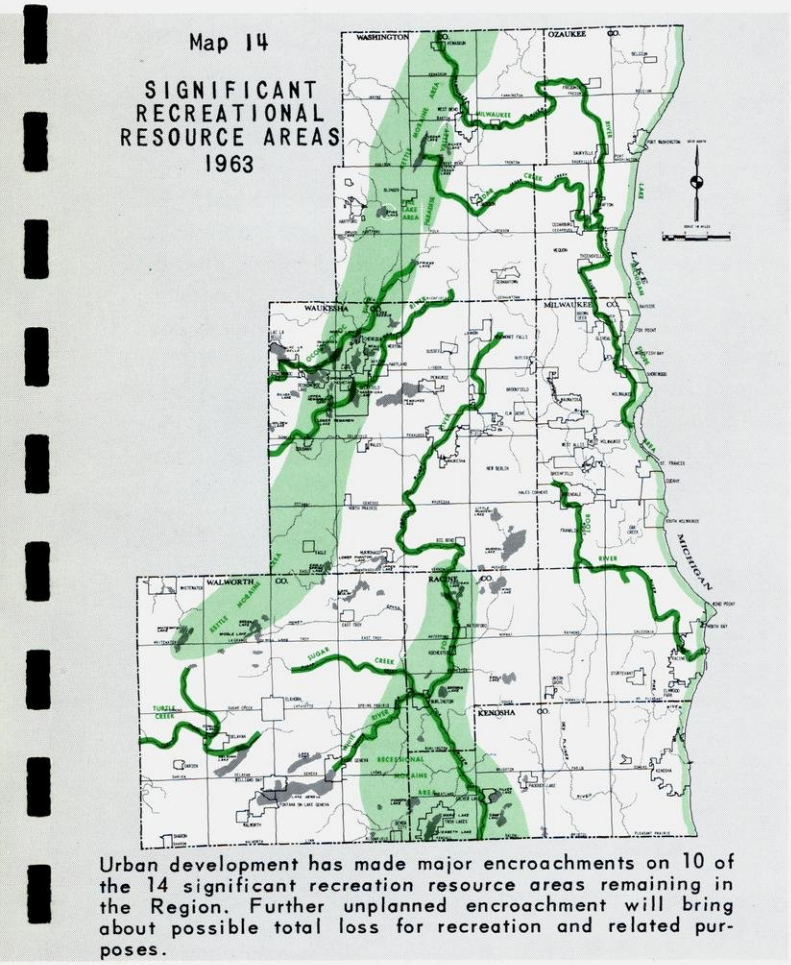
Findings — Potential Park and Related Open-Space Sites

The potential park and related open-space sites inventory findings have been reported in detail in a previous Commission publication and will, therefore, only be briefly summarized here.[11] Fourteen broad areas within the Region were identified in the inventory as possessing recreational resource values of regional significance and warranting careful consideration for conservation and enhancement. These are: the Lake Michigan shoreline, the Kettle Moraine, the Recessional Moraine, the Milwaukee River, the Fox River, the Root River,

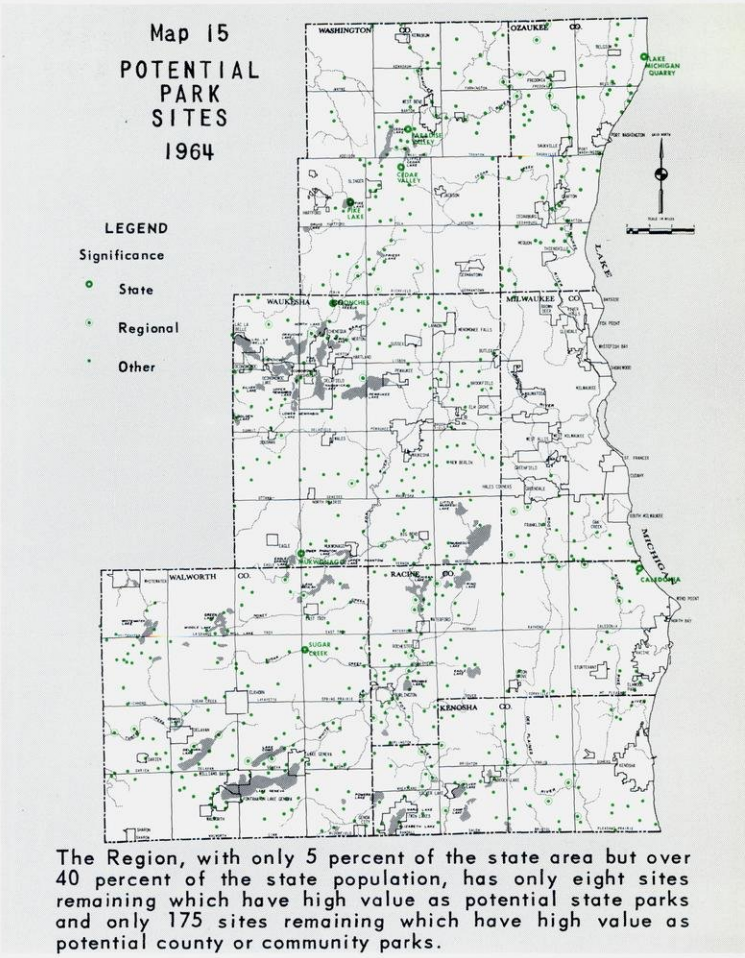
[11] See SEWRPC Technical Report No. 1, Potential Parks and Related Open Spaces.

the White River, the Oconomowoc River, the Bark River, the Sugar Creek, the Cedar Creek, the Turtle Creek, the Paradise Valley, and the Pike Lake areas (see Map 14). As broad areas, all possess multi-use potential for park, parkway, and related open space; wildlife habitat preserve; water impoundment; forest preserve; and nature study.

In addition to these fourteen broad recreational resource areas, a total of 606 specific potential park and related open-space sites were identified in the inventory; and of these, less than one-third were found to be of high value. The spatial distribution of the inventoried sites is shown on Map 15 and in Table 30. Most of the potential park sites occur within, or adjacent to, the fourteen broad recreational resource areas identified in the inventory. Many of the 183 high value sites lie along the major waterways or in the moraine areas of the Region. Relatively few potential park sites still remain along the Lake Michigan shore, and the few that do are extremely vulnerable to loss through urban development.



Urban development has made major encroachments on 10 of the 14 significant recreation resource areas remaining in the Region. Further unplanned encroachment will bring about possible total loss for recreation and related purposes.



The Region, with only 5 percent of the state area but over 40 percent of the state population, has only eight sites remaining which have high value as potential state parks and only 175 sites remaining which have high value as potential county or community parks.

It is significant that of all of the 606 potential park sites inventoried only eight are of such size and contain such exceptional resource values as to warrant consideration as possible state parks. These eight sites are identified on Map 15 and represent the best remaining potential park sites in the Region. Because of their unique value, these sites warrant immediate consideration for acquisition as public recreation sites. The remaining 598 sites are more limited in either size or resource value and, therefore, warrant consideration as possible county or community, rather than state parks.

The inventory also identified the ten remaining sites of highest value within each county, as indicated on Map 15. In Milwaukee County, however, where there are relatively few good potential park sites remaining, only five such sites could be identified. A brief summary of the inventory findings by county, supplementing the data provided in Table 30, follows.

Urban development in Kenosha County has occurred at a relatively high rate, especially along

the Lake Michigan shoreline, and has destroyed many of the original fine potential park areas in this county. Although the Lake Michigan shoreline has been almost entirely developed, small potential swimming beaches still remain between areas of development and offer some remaining local park potential. The Fox River, which flows through an area of irregular recessional moraine in western Kenosha County, offers the best potential recreational resource area remaining within the county; and the northeastern end of Silver Lake, in the Fox River basin, comprises the best potential park site remaining in the county.

Table 30

POTENTIAL PARK SITES IN THE REGION BY COUNTY BY VALUE - 1964

County		Site Value			
		High	Medium	Low	Total
Kenosha	Sites . .	14	25	28	67
	Acres . .	2,655	3,205	3,100	8,960
Milwaukee	Sites . .	9	11	7	27
	Acres . .	2,135	1,675	520	4,330
Ozaukee	Sites . .	26	16	23	65
	Acres . .	5,015	3,095	1,690	9,800
Racine	Sites . .	21	38	32	91
	Acres . .	4,462	5,038	2,425	11,925
Walworth	Sites . .	40	41	61	142
	Acres . .	13,115	4,323	3,078	20,516
Washington	Sites . .	32	22	29	83
	Acres . .	9,749	2,852	3,310	15,911
Waukesha	Sites . .	41	48	42	131
	Acres . .	8,892	7,050	4,430	20,372
Region	Sites . .	183	201	222	606
	Acres . .	46,023	27,238	18,553	91,814

Source: SEWRPC.

Rapidly expanding urban development in Milwaukee County has also eliminated many good potential park sites. The best remaining sites are located primarily in the Franklin-Oak Creek area of the county. The Root River and the Lake Michigan shoreline are the prime recreational resources in Milwaukee County, and the Root River particularly still has many good sites remaining along its stream valleys which have good potential for parkway development. Milwaukee County, with a population of over 1 million, generates a high demand for park land; and in view of this high demand, the medium and low value sites remaining may take on added value for their open space character in this highly urbanized county.

Ozaukee County contains the only significant portion of Lake Michigan shoreline remaining within the Region in a relatively undeveloped state and, therefore, still possessing a very high potential park value. Particular attention should, therefore, be given to preserving this shoreline, which has both stretches of low bluffs with wide sandy beaches and high bluffs. One potential site is of particularly high value because it has lake frontage with one mile of good sand beach, a heavy forest cover, and an old quarry site within the forest which has filled with water to become a small inland lake. This site is one of the eight prime park sites remaining within the Region which has statewide significance and, therefore, deserves immediate consideration for acquisition as a public recreation area. The Milwaukee River and Cedar Creek, which enter the county from the west and join together to flow south into Milwaukee County, also comprise prime recreational resources in Ozaukee County. These streams form lineal areas which have good potential for parkway development. Possible expansion of such a parkway development into both Washington and Milwaukee counties along the waterways raises the potential recreational value of these stream areas.

The Fox River offers the best remaining recreational resource in Racine County. The river flows through a gently rolling to hilly recessional moraine area; and a considerable number of high and medium value sites are located along the river, giving the stream valley regional significance as a recreational resource. The area between Burlington and Waterford offers the highest potential in this respect. The Root River in eastern Racine County also is an area of high value, and many sites here indicate good remaining potential for parkway development. The Lake Michigan shoreline is almost entirely developed; however, one of the eight prime potential park sites remaining in the Region is located on Lake Michigan in the Town of Caledonia and deserves immediate consideration for acquisition as a public recreational area.

In Walworth County the areas of high recreational value include the White River, Sugar Creek, Turtle Creek, Kettle Moraine, and the few remaining undeveloped inland lake areas. The most desirable frontage on the lakes has now been almost totally occupied, however; and further encroachment by urban development can only take place at the expense of the remaining recrea-

tional resource potential. Several opportunities for recreational development still exist on the smaller lakes which are scattered throughout the county. The Sugar Creek area comprises the outstanding recreational site in the county and is one of the eight prime park sites remaining within the Region. Impoundment potential exists, and a prime water-related recreational resource could be created on this site. The recreational value of such a water-related site may, however, be limited by water quality and quantity problems. Walworth County has the highest total number of potential sites and of high value sites of any county in the Region. Thus, a very good opportunity remains for park development within this county.

Washington County, which presently has no existing county parks or parkways, has an abundance of high value potential park sites. Three of the eight prime park sites remaining in the Region are located here. Two of these are located in a belt of drift hills which occupies the western half of the county and provides the best example of the Kettle Moraine in Wisconsin. A pattern of high value sites runs through this area from the Monches area immediately south of the County Line in Waukesha County to Kewaskum in the north. The sites of particular significance in this area of the county are just southwest of West Bend in the Paradise Valley area. The eastern shoreline of Pike Lake comprises the third prime site. The Milwaukee River and Cedar Creek flow through the county, and both offer good recreational resources. The Milwaukee River has particularly good potential for a lineal type of development, and the possibility of expansion of such lineal development into Ozaukee County further enhances its value.

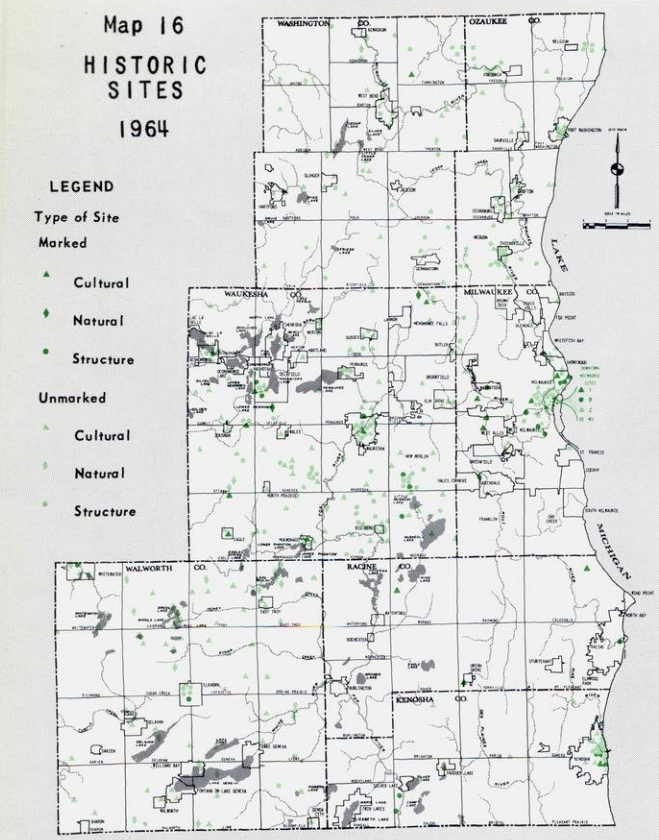
Areas of high recreational value in Waukesha County include the Fox River south of the City of Waukesha, the Kettle Moraine, and many inland lake sites. The northwestern corner of the county, where the many inland lakes and the Kettle Moraine intersect, was at one time the outstanding recreational resource area in the Region. It offered several large lakes, marshes, rivers, creeks, glacial hills, forest cover, and wildlife. Urbanization has now spoiled its full recreational potential, and little is left for potential park or open-space development. What remains should, however, be preserved. The continuous belt of state forest land, which was proposed as the Kettle Moraine State Forest, was to have crossed this prime recreational area; but, because of urban development, it now appears doubtful that the originally proposed forest unit will ever be acquired in this area to join the two existing northern and southern units. The two outstanding sites in the county are both examples of the Kettle Moraine and comprise two of the eight prime park sites remaining in the Region. One is at the south end of the county near Mukwonago, and the other is at the north end of the county near Monches. Although many high value sites remain in this county, the extremely rapid rate of urbanization occurring in this county will require early protection of these sites.

In summary, it is important to note that the key resource element present in most of the high value sites remaining within the Region is surface water. Water-based recreational activities are generally preferred by a large segment of the population over any others; and water is, of course, essential to such recreational activities as swimming, boating, and fishing. Choice camp sites and picnic areas are usually those adjacent to, or within sight of, a lake or stream. The touch of variety added by a pond or marsh also enriches the pleasures of hiking or nature study. This importance of water to recreation emphasizes the necessity for concern about the quality and quantity of the remaining useable regional surface water resources.

Findings — Historic Sites

The historic sites inventory revealed that there are presently 515 historic sites remaining in the Region, of which 56 are presently marked. These may be broadly classified by type as natural features, structures, and cultural features. The spatial distribution of these sites is shown on Map 16 and the type of sites by county in Table 31.

Most of the cultural historic sites within the Region are sites of early white or Indian settlements or are closely related to such settlements, including old plank roads, early trails, and burial grounds. The few remaining natural feature historic sites are located primarily in the Kettle Moraine area in Walworth, Washington, and Waukesha counties and are related to waterways or significant physiographic features. The majority of the remaining historic structures are located in the more highly urbanized areas of the Region, particularly in the cities of Milwaukee and Waukesha. There are, however, many examples of historic structures, including mills, taverns, barns, homesteads, churches, and factories, located in the more rural areas of the Region.



Of the 515 historic sites identified in the Region, less than 11 percent have been officially recognized and marked. Because of the dynamic nature of regional development today, all remaining historic sites are in danger of destruction.

As already noted, the primary purpose for obtaining information on the location of historic sites in southeastern Wisconsin as part of the land use-transportation study was to provide for the protection of these sites, wherever possible, in the preparation of regional land use and transportation plans. However, every agency within the Region, preparing and implementing plans, must become aware of the remaining historic sites if the destruction of these sites and, along with them, an irreplaceable part of the regional natural and cultural heritage is to be avoided.

Findings — Wildlife Habitat Areas

Wildlife in southeastern Wisconsin is composed primarily of small upland game such as rabbit and squirrel, some predators such as fox and raccoon, game birds including water fowl, and pan and game fish. Deer are also found in some areas, but the herds are small when compared with other regions of the state. Some commercial fisheries still operate within the Region, although their size and importance have declined in recent years. The remaining wildlife provides a valuable and much sought recreational resource and contributes both directly and indirectly to economic activity within the Region (see Map 17).

Table 31

HISTORIC SITES IN THE REGION BY TYPE OF SITE BY COUNTY[a]

Type of Sites	Kenosha	Milwaukee	Ozaukee	Racine	Walworth	Washington	Waukesha	Region
Cultural Features								
Marked[b]	2	10	--	3	--	1	7	23
Unmarked[c]	26	11	20	--	42	25	73	197
Subtotal	28	21	20	3	42	26	80	220
Natural Features								
Marked	--	--	--	--	--	--	2	2
Unmarked	--	--	--	--	33	6	15	54
Subtotal	--	--	--	--	33	6	17	56
Structures								
Marked	4	18	--	1	--	--	8	31
Unmarked	--	65	50	--	10	23	60	208
Subtotal	4	83	50	1	10	23	68	239
Total Sites								
Marked	6	28	--	4	--	1	17	56
Unmarked	26	76	70	--	85	54	148	459
Total	32	104	70	4	85	55	165	515

[a] *Identified by each county historical society for the SEWRPC during 1963 and 1964.*

[b] *Marked sites are those which have been officially recognized and marked in some manner by the county and state historical societies.*

[c] *Unmarked sites are those which the county historical societies have indicated should be marked and preserved.*

Table 32

WILDLIFE HABITAT AREAS AND RELATED LANDS IN THE REGION BY COUNTY - 1963

County		Wildlife Habitat Areas[a] (acres)				Woodlands & Wetlands[b]	Croplands & Pasture[b]
		High Value	Medium Value	Low Value	Total		
Kenosha	Acres	10,004	6,336	5,957	22,297	24,787	115,832
	Percent	44.9	28.4	26.7	100.0	---	---
Milwaukee	Acres	1,251	636	---	1,887	6,175	33,915
	Percent	66.3	33.7	---	100.0	---	---
Ozaukee	Acres	6,180	8,334	1,336	15,850	21,714	104,002
	Percent	39.0	52.6	8.4	100.0	---	---
Racine	Acres	9,001	8,024	9,613	26,638	26,016	153,040
	Percent	33.8	30.1	36.1	100.0	---	---
Walworth	Acres	28,957	20,144	14,404	63,505	57,571	265,963
	Percent	45.6	31.7	22.7	100.0	---	---
Washington	Acres	19,829	21,229	10,476	51,534	58,940	191,946
	Percent	38.5	41.2	20.3	100.0	---	---
Waukesha	Acres	32,318	28,238	17,041	77,597	68,914	214,978
	Percent	41.6	36.4	22.0	100.0	---	---
Region	Acres	107,540	92,941	58,827	259,308	264,117	1,079,676
	Percent	41.5	35.8	22.7	100.0	---	---

[a] *Source: Wisconsin Conservation Commission.*

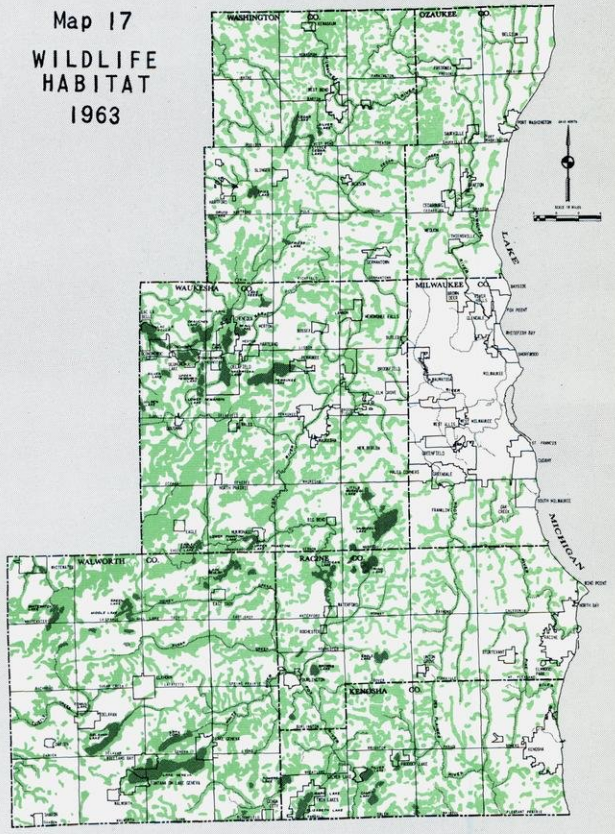
[b] *As determined in the SEWRPC existing land use inventory; does not include lakes, rivers, or streams.*

The wildlife habitat inventory identified approximately 259,000 acres, or 15 percent of the land and inland water area of the Region, as the best wildlife habitat, exclusive of the approximately 2,820 square miles of Lake Michigan surface which lie within the boundaries of the Region.[12] Wildlife habitat is closely related to areas which furnish food, cover, and protection. Consequently, areas of the Region having large proportions of forest, wetland, pastureland, and cropland and small proportions of land devoted to urban development have the largest areas and best quality of wildlife habitat remaining (see Table 32 and Maps 17, 18, and 19). For example, Milwaukee County, with 2.3 percent of the regional woodlands and wetlands and 3.1 percent of the regional cropland and pastureland, has only 0.7 percent of the regional wildlife habitat area. Walworth County, on the other hand, with 21.8 percent of the regional woodlands and wetlands and 24.6 percent of the regional cropland and pastureland, has 24.5 percent of the regional wildlife habitat area.

[12] The boundaries of the state and of the riparian counties within the Region legally extend to the geographic center of Lake Michigan. It should be noted that, for the purposes of this report, the area of Lake Michigan within the Region is not normally included in the area of the Region. The latter, as usually expressed herein, consists only of the land and inland water area.

Map 17

WILDLIFE HABITAT 1963



Only a limited number of high value wildlife habitat areas remain in close proximity to present urban development within the Region. Further urban encroachment into these areas will destroy them for such use.

Significant concentrations of high value wildlife habitat occur in the Kettle Moraine area in northwestern Walworth County, western Waukesha and Washington counties, and in a band 12 to 16 miles wide along the Fox River in eastern Walworth County and western Racine and Kenosha counties. It is significant that a majority of the inland lakes within the Region also lie within these two areas.

If the remaining wildlife habitat in the Region is to be preserved, the forest lands, wetlands, and related surface water, together with the proximate croplands and pasturelands, must be protected from mismanagement and continued urban encroachment.

Findings — Forest Areas

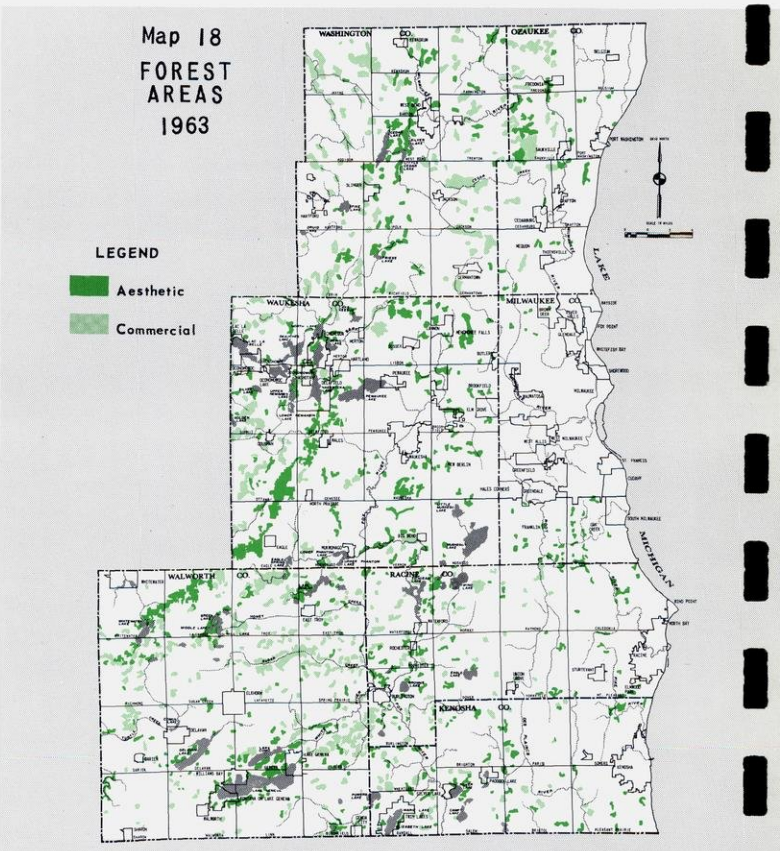
There are four major types of forests in southeastern Wisconsin: oak-hickory, northern hardwood, pine, and lowland.[13] For regional planning purposes, however, all forests within the Region have been classified with respect to their existing and potential use, regardless of type, into two major categories: commercial forests and aesthetic forests. Like wildlife, these forests also provide a valuable recreational resource and contribute both directly and indirectly to economic activity within the Region.

During the forest inventory it was found that approximately 133,000 acres, or 7.7 percent of the total area of the Region, were devoted to forests having either commercial or aesthetic value. Of this total forest area, approximately 49 percent is of commercial value. Much of the commercial forest remaining in the Region lies within the Kettle Moraine, the remainder occurring in scattered tracts throughout the still rural areas of the Region. Although the acreage of commercial forest is limited within the Region compared to northern areas of the state, these forests do support some local wood-using industries.

The forests remaining within the Region having aesthetic value occur primarily in clusters around the inland lakes; but some also occur in widely separated small tracts throughout the Region, often associated with topographic features having recreational or scenic value. The forests having aesthetic value overlap much of the wildlife habitat area remaining within the Region and contribute indirectly to the quantity and quality of surface waters for fishery and wildlife resources.

The remaining forests in the Region generally are found on land which has been difficult to farm intensively and which has not as yet been converted to urban use. In some areas the forests have been utilized for pasture, a practice which greatly depreciates the value for both commercial and aesthetic use.

The distribution of forest land within the Region is given in Table 33 and shown on Map 18. Washington County, with 30.7 percent of the total commercial forest land in the Region, has the largest concentration of such forest. Moreover, the forests occur in large tracts primarily associated with wetland areas. Walworth County, with 30.1 percent of the total commercial forest land in the Region, has the second largest concentration of such forest; but this total is comprised of a great number of small scattered



Forests in the urbanizing areas of the Region are rapidly disappearing, and only a small amount of commercial and aesthetic forests remain in four of the seven counties.

[13] These forest types are defined as follows: oak-hickory — a mature stand of predominantly oak with hickory; northern hardwood — pure or intermingled mature stands of maple, basswood, rock elm, yellow birch, beech, and oak; pine — pure or intermingled stands of white, norway, or jack pine; lowland — pure or intermingled stands of black spruce, tamarack, cedar, aspen, black ash, soft maple, and elm.

Table 33

FOREST AREAS AND WOODLANDS IN THE REGION BY TYPE AND VALUE RATING BY COUNTY - 1963

County		Forest[a] (by value)									State Owned Forest (1964)
		Commercial				Aesthetic				Total Forest	
		High	Medium	Low	Sub-Total	High	Medium	Low	Sub-Total		
Kenosha	Acres	310	1,434	1,899	3,643	667	1,387	3,494	5,548	9,191	--
	Percent	3.4	15.6	20.6	39.6	7.3	15.1	38.0	60.4	100.0	--
Milwaukee	Acres	--	--	--	--	424	490	1,099	2,013	2,013	--
	Percent	--	--	--	--	21.1	24.3	54.6	100.0	100.0	--
Ozaukee	Acres	728	4,811	890	6,429	1,139	2,507	479	4,125	10,554	870
	Percent	6.9	45.6	8.4	60.9	10.8	23.8	4.5	39.1	100.0	--
Racine	Acres	290	2,018	2,759	5,067	629	2,762	3,530	6,921	11,988	--
	Percent	2.4	16.8	23.0	42.2	5.2	23.1	29.5	57.8	100.0	--
Walworth	Acres	1,701	8,278	9,581	19,560	3,360	4,717	6,888	14,965	34,525	3,270
	Percent	4.9	24.0	27.8	56.7	9.7	13.6	20.0	43.3	100.0	--
Washington	Acres	4,797	12,757	2,424	19,978	4,010	4,176	885	9,071	29,049	2,639
	Percent	16.5	43.9	8.3	68.7	13.8	14.4	3.1	31.3	100.0	--
Waukesha	Acres	1,616	5,549	3,128	10,293	8,698	9,670	7,070	25,438	35,731	6,120
	Percent	4.5	15.5	8.8	28.8	24.2	27.0	20.0	71.2	100.0	--
Region	Acres	9,442	34,847	20,681	64,970	18,927	25,709	23,445	68,081	133,051	12,899
	Percent	7.1	26.2	15.5	48.8	14.2	19.4	17.6	51.2	100.0	--

[a] *As delineated by the Wisconsin Conservation Commission for the SEWRPC; includes only those forests 20 acres or over in area.*

tracts. Milwaukee County has no commercial forest area remaining.

Waukesha County, with 37.4 percent of the total aesthetic forest land in the Region, has the largest concentration of such forest, while Milwaukee County has the smallest proportion of aesthetic forest in the Region, less than 3 percent of the total. Waukesha County has the greatest concentration of all forest area, with approximately 27 percent of the regional total.

The forest areas of the Region are in jeopardy due to rapidly changing land use, both in shifts from less intensive to more intensive agricultural use and in shifts from rural to urban use. The remaining forest areas have very obvious and important direct values as wildlife habitat, aesthetic settings for urban development, nature study, scientific areas, and for outdoor recreation. They also have indirect and, while not so obvious, significant values for the reduction of soil erosion and stream sedimentation, reduction of runoff, maintenance of water tables and stream and lake levels, and promotion of ground water recharge. These values will disappear as quickly as the forest areas themselves unless measures are taken to preserve the relatively few remaining forest areas in the Region.

Findings — Surface Water and Wetland Areas

Surface waters in southeastern Wisconsin are defined, for the purposes of this report, as all inland lakes and those rivers and streams which are approximately 50 feet in width. Wetlands include all marshes and swamps and those areas which are excluded from cultivation or other use because they are intermittently wet. Most wetland areas are adjacent to lakes, rivers, and streams and are subject to periodic flooding. The recreational characteristics and quality of the surface waters and wetlands in the Region are summarized in recently issued Wisconsin Conservation Commission study reports entitled "Surface Water Resources," and will not be reported here.

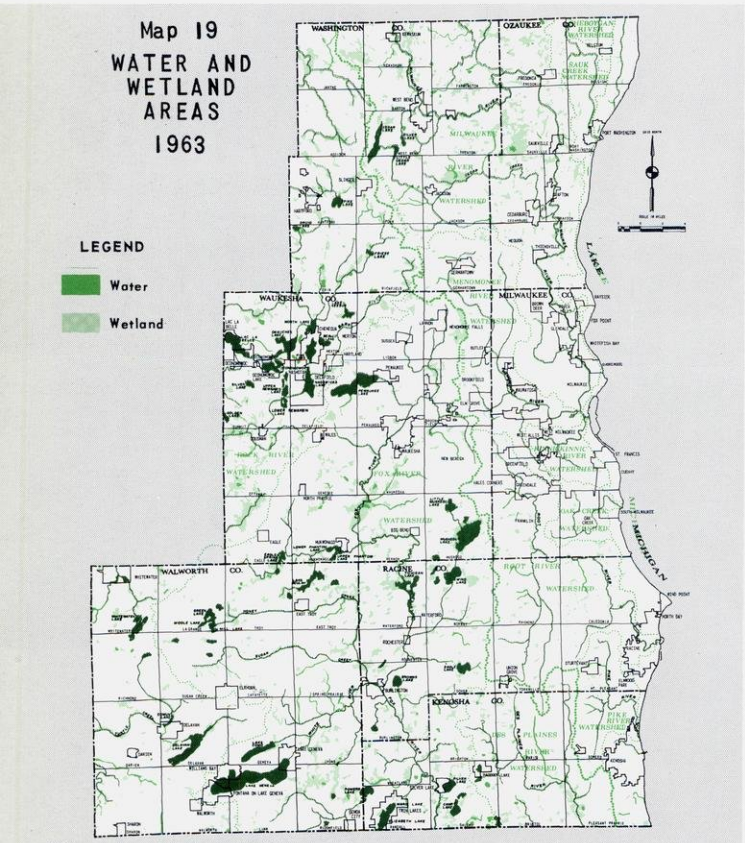
The SEWRPC existing land use inventory identified 179,058 acres, or approximately 10 percent of the total regional area, as water and wetland (see Table 34 and Map 19). Of the total water and wetland area in the Region, 22.7 percent occurs in Waukesha County. With the exception of the Vernon Marsh, southwest of the City of Waukesha, the Menomonee Marsh in Menomonee Falls, Little Muskego and Muskego lakes, and the Fox River, most of the total water and wetland

area is comprised of the many lakes and streams in the northwest quarter of Waukesha County.

Water and wetland areas probably provide the singularly most important landscape feature within the Region and can serve to enhance all proximate uses. Their contribution to resource conservation and recreation within the Region is immeasurable, and they contribute both directly and indirectly to the regional economy. It should be noted that the designation of water areas as recreational does not lend itself readily to expression on an area basis, since the areas involve stream banks and lake edges as well as open water. Generally, the Wisconsin Conservation Commission recommends retaining, wherever possible, 25 percent of lake shoreline in an undeveloped state and recognizing all water surface as having recreational value.

ENVIRONMENTAL CORRIDORS

One of the most important tasks to be performed as part of the regional land use planning effort is the identification and delineation of those areas of the Region in which concentrations of scenic, recreational, and cultural resources occur and which, therefore, should be preserved and protected. Such areas should encompass those elements of the sustaining natural resource base which are essential to maintenance of both the ecological balance and natural beauty of the Region. These elements within the Region include: 1) lakes, rivers, and streams, together with their natural flood plains; 2) wetlands; 3) forests and woodlands; 4) wildlife habitat areas; 5) rough topography; 6) significant geological formations; and 7) wet or poorly drained soils.



Water and especially wetland areas are conspicuously absent from areas devoted primarily to intensive urban or to intensive agricultural use. Further conversion of wetlands may have serious deteriorating effects upon the regional environment.

Table 34

SURFACE WATER AND WETLANDS IN THE REGION BY COUNTY - 1963

County	Surface Water & Wetlands	
	Acres	Percent
Kenosha	19,650	11.0
Milwaukee	4,257	2.4
Ozaukee	15,056	8.4
Racine	17,059	9.5
Walworth	38,324	21.4
Washington	35,139	19.6
Waukesha	49,573	27.7
Region	179,058	100.0

Source: SEWRPC.

The foregoing elements are integral parts of the natural resource base. In addition, there are certain other elements which, although not a part of the natural resource base as such, are closely related to, or centered on, that base. These include: 1) existing outdoor recreation sites, 2) potential outdoor recreation and related open-space sites, 3) historic sites and structures, and 4) significant scenic areas or vistas.

If each of the seven primary natural resource elements is delineated on a map of the Region, linear patterns will appear which may be thought of as environmental corridors. These corridors encompass a complex of resources which act upon the ecology of the Region and ultimately determine the overall quality of the environment.[14] If the additional four resource-related elements listed above are also delineated on a map of the Region, a large majority will be found to lie within the environmental corridor pattern.

[14] The concept of the environmental corridor was first expressed in Wisconsin in a report, entitled Recreation in Wisconsin, (Madison: State of Wisconsin, Department of Resource Development, Nov. 1962).

The primary environmental corridors, which encompass three or more of the foregoing 11 natural resource and resource-related elements in the Region, are shown on Map 20. These primary corridors are based upon, and represent refinements of, the total environmental corridor pattern delineated in the State Plan[15] and shown on Map 20 as secondary corridors.

The primary environmental corridors are found to occupy approximately 474 square miles, or approximately 18 percent of the total area of the Region. The distribution of the areas of these corridors by county is indicated in Table 35.

Table 35

AREAS OF PRIMARY ENVIRONMENTAL CORRIDORS IN THE REGION BY COUNTY

County	Area (square miles)	Percent of County or Region
Kenosha.	42.6	15.3
Milwaukee. . . .	20.5	8.5
Ozaukee.	35.3	15.1
Racine	38.0	11.2
Walworth	122.3	21.2
Washington . . .	81.4	18.7
Waukesha	133.5	23.0
Region	473.6	17.6

Source: SEWRPC.

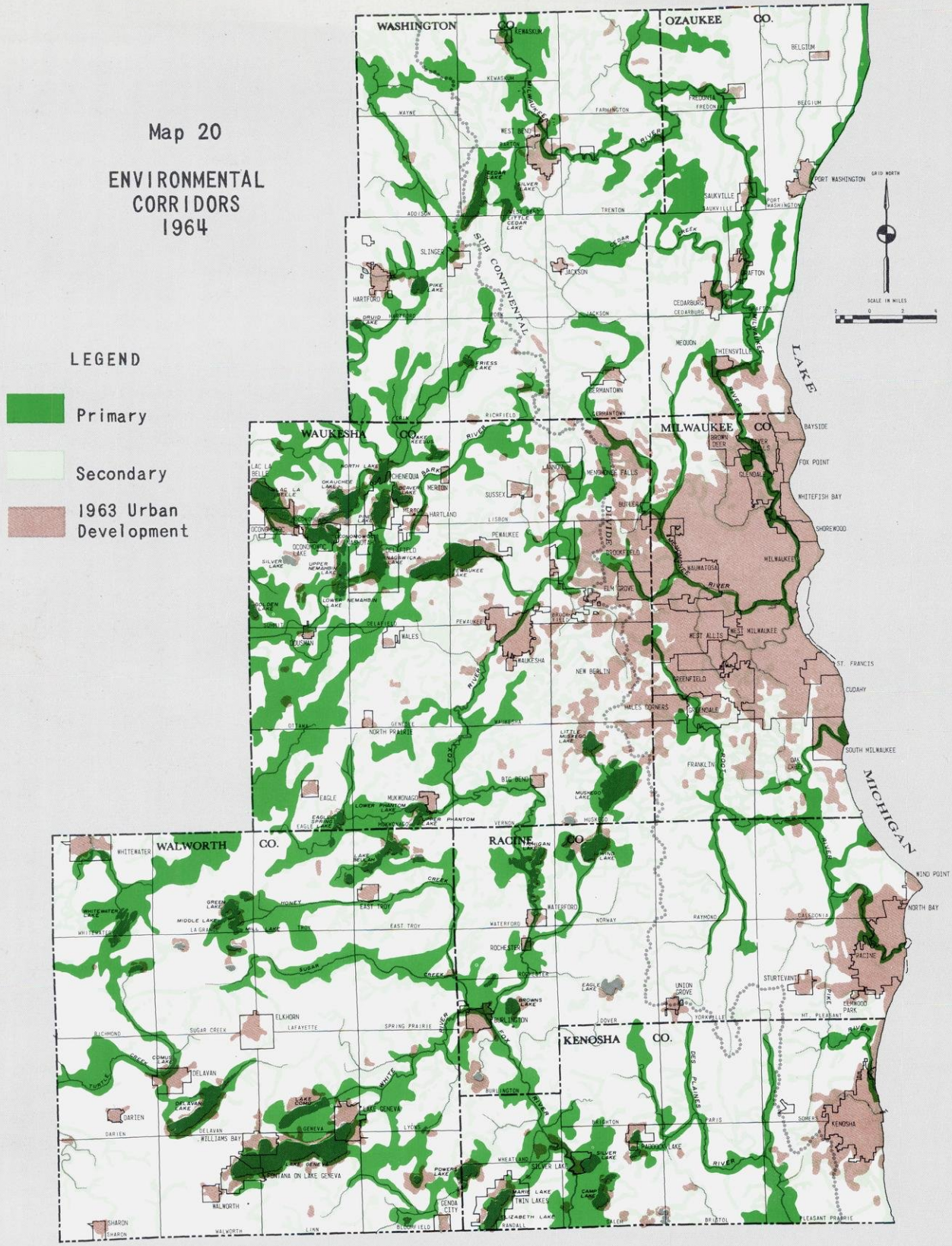
It is important to note that the primary environmental corridors contain all of the remaining high value wildlife habitat and forest areas within the Region in addition to most of the wetlands, lakes, rivers, and streams and adjacent flood plains. These corridors also contain portions of the 14 high value recreational areas identified in the potential park and related open-space inventory and many of the best potential park sites. The preservation of these corridors in a natural state or in park and related open-space uses, including limited agricultural use, will do much to maintain a high level of environmental quality in the Region and protect its unique natural beauty. It is important to recognize that, while the resource values located in the environmental corridors define areas that are most suitable for preservation and protection, many areas between these primary corridors also contain similar but isolated resources that merit consideration for preservation and protection on a local level.

[15]This pattern is shown on a 1 inch = 2 mile scale map of southeastern Wisconsin, entitled "Landscape Resource Inventory," prepared by the State of Wisconsin, Department of Resource Development.

Recent trends within the Region have resulted in the encroachment of urban development into the primary environmental corridors. Unfortunately, unplanned or poorly planned intrusion of urban development into these corridors not only tends to destroy the very resources and related amenities sought by the development but tends to create severe environmental problems having areawide repercussions.

It is important to point out that, because of the many interlocking and interacting relationships existing between living organisms and their environment, the destruction or deterioration of one element of the total environment may lead to a chain reaction of deterioration and destruction. The drainage of wetlands, for example, may have far-reaching effects, since such drainage may destroy fish spawning grounds, game habitat, ground water recharge areas, and the natural filtration action and flood water storage areas of interconnecting lake and stream systems. The resulting deterioration of surface water quality may, in turn, lead to a deterioration of the quality of the ground water which serves as a source of domestic, municipal, and industrial water supply and on which low flows in rivers and streams may depend. Similarly, the destruction of forest cover, which may have taken a half century to develop, may result in soil erosion and stream siltation and in more rapid runoff and increased flooding, as well as destruction of wildlife habitat. Although the effects of any one of these environmental changes may not in and of itself be overwhelming, the combined effects must lead eventually to serious deterioration of the supporting resource base. The need to maintain the integrity of the remaining environmental corridors thus becomes apparent.

Most of the primary environmental corridors within the Region lie in the Kettle Moraine area or along major river and stream valleys. These remaining primary environmental corridors do not represent an overabundance of resource values. This is due, in part, to the fact that, compared with other regions of the state, Southeastern Wisconsin is lacking in many resource values. It is also due, in part, to the pressure of the large population concentration in the Region on the limited resource base. Little in the way of natural assets remains in eastern Racine, Kenosha, and Waukesha counties, in southern Ozaukee County, or along the Lake Michigan shore south of Port Washington. These areas are rap-



Approximately one-sixth of the Region lies within primary environmental corridors, which encompass the remaining prime forests, prime wildlife habitat areas, rivers, streams, lakes, wetlands, and significant topographical and geological features. These environmental corridors must serve for all time the future population of the Region and once destroyed can never be replaced.

idly being converted to urban development, and the few remaining high value recreational resources in these areas are often as desirable for residential development as for park and related open-space reservation.

While it is desirable that all of the remaining environmental corridors in the Region be preserved, it is imperative that all of the primary corridors be preserved and protected. If man is to sustain himself within the Region at a reasonable level of amenity, there is a "point of no return" with respect to the deterioration and destruction of the underlying resource base, beyond which that base can no longer meet the demands upon it without a reduction in the standard of human life. No one can calculate precisely when that point will be reached, but our society cannot afford the risk that it will be reached.

SUMMARY

This chapter has described the natural resource and related public facility and utility base of the Region. Findings having particular significance for regional land use and transportation planning include:

1. The highly complex soil relationships existing within the Region and extreme variability and intermingling of soils within even very small areas, together with the widespread occurrence of soils having questionable suitability for certain types of urban development, indicate the need for basing regional and local development plans on the results of detailed soil surveys. Approximately 15 percent of the Region is covered by soils which generally are unsuited for any type of urban development and which should be maintained in conservation, recreation, or limited agricultural use. These soils occur primarily in the flood plains of streams and watercourses and in the historic and existing wetland areas of the Region. In addition, prevailing soil types in approximately 30 percent of the Region are not generally suited for intensive urban development without a high level of municipal improvement, including sanitary sewer service, and careful attention to drainage.

2. About 217 square miles, or 64 percent, of the approximately 340 square miles of highly developed urban area within the Region are presently served by public sanitary sewer facilities. Local plans have been prepared for the extension of such sewer service to an additional 34 square miles, or approximately 10 percent, of the presently highly developed urban area of the Region not now served by public sanitary sewer facilities.

   Approximately 369 square miles of presently rural area in the Region have been planned for sanitary sewer service extension or are within the gravity drainage area tributary to existing sewage treatment plants. This area is more than 1.5 times the size of the developed area within the Region presently served by sanitary sewer and is approximately 10 percent greater than the entire area presently devoted to urban development within the Region.

3. About 200 square miles, or 59 percent, of the approximately 340 square miles of highly developed urban area within the Region are presently served by public water supply facilities. Local plans exist for the extension of such service to an additional 20 square miles, or approximately 6 percent, of the presently highly developed urban area of the Region not now served. In addition, local plans have been prepared for the extension of public water supply service into approximately 58 square miles of presently rural area within the Region.

4. There are presently a total of 788 existing outdoor recreation sites within the Region totaling 33,262 acres of area in outdoor recreation use. Public ownership accounts for 57 percent of these sites but for only 50 percent of the total active recreation acreage. Public sites presently provide an area in outdoor recreation use of 10 acres per thousand resident population within the Region, while nonpublic sites provide an additional area of 10 acres per thousand resident population. In addition, state forests, fish and game management areas, and state park areas not actually devoted to active outdoor recreation use within the Region provide an open-space area of 15 acres per thousand resident population.

5. There are a total of 606 potential park and related open-space sites remaining within the Region, less than one-third of which are of such area or possess such resource values as to comprise prime sites. Only eight remaining potential park sites within the Region warrant consideration as state or regional parks.

6. The most important elements of the regional resource base, including the best remaining forest; wildlife habitat; surface water; wetland areas; and historic, scenic, and scientific sites, when combined, are found to occur in linear patterns or corridors. The preservation and protection of these environmental corridors will do much to maintain a good environment within the Region and to preserve its unique cultural and natural heritage as well as natural beauty.

Since these environmental corridors are endowed by nature and can not be created by man, they constitute the only such areas that will ever exist within the Region. They must, therefore, serve the Region not only for today but for all time. Once lost they are lost forever.

Failure to properly adjust land use development within the Region to these environmental corridors will ultimately result in: loss of the remaining prime potential park and related open-space sites; deterioration or destruction of the best remaining wildlife habitat; encroachment of urban development upon the natural floodways and flood plains of streams and watercourses; loss of water impoundment areas and reduction of ground water recharge; loss of the largest and best remaining commercial and aesthetic forests; and continued deterioration of surface water quality within the Region.

Chapter V

LAND USE

INTRODUCTION

One of the central concepts underlying the regional land use-transportation study is that land use and transportation are closely interrelated. The type, intensity, and spatial distribution of land use determines the number and variety of trips generated by each subarea of the Region. A complete inventory of existing land use is, therefore, required to determine the quantitative relationships existing between land use and travel for transportation system planning. Moreover, such an inventory when coupled with a knowledge of historic development patterns provides one of the best available bases for understanding urban activity and determining feasible future land use patterns. Existing land use patterns can be identified at the necessary level of detail through well-developed land use survey techniques. Historic land use patterns, on the other hand, are much more difficult to identify at the desired level of detail since complete reliance must be placed upon historic documentation.

Land Use Inventories

This chapter presents a brief description and analysis of the historic and existing land use inventories adapted to land use-transportation planning needs. The historic development of the Retion is described together with the existing land use pattern, which is the product of that historic development. Finally, significant forces shaping land use development within the Region are identified and discussed.

Two separate but related inventories were conducted by the SEWRPC staff to collect the necessary current and historic land use data: a historic development inventory and an existing land use inventory.

The historic development inventory was conducted from historic maps and photographs. As might be expected, preliminary research indicated that consistent and uniform data and maps on historic development patterns were unavailable for the Region as a whole. A few communities had well-documented local historic growth information, but most communities did not. Other possible information sources investigated included: historical society records, land subdivision plat books, farm plat maps, Soil Conservation Service aerial photographs, U. S. Geological Survey maps, and Wisconsin Geological and Natural History Survey records. Investigation of these data sources revealed a wealth of historic development data and indicated that the major problem involved in a historic development inventory would be the reconciliation of the different data sources in order to obtain uniform, areawide coverage for common points in time. Table 36 lists the information sources finally utilized in the historic development inventory. Because of the limitations inherent in the source material, the data for the years 1850, 1880, and 1920 represent the extent of urban development[1] at about these points in time, rather than precisely for these points in time, as do the other urban growth rings.

[1] Urban development is defined for the purposes of this report as including those areas of the Region wherein houses or other buildings have been constructed in relative compact groups or where a closely spaced network of minor streets has been constructed, thereby indicating a concentration of residential, commercial, industrial, governmental, or institutional land uses. The continuity of such development was considered interrupted if a quarter-mile or more of non-urban type land uses, such as agriculture, woodlands, or wetlands, prevailed and the above conditions were generally absent.

Table 36

YEAR AND DATA SOURCE FOR UNIFORM HISTORIC DEVELOPMENT INFORMATION FOR THE REGION (1850 - 1963)

Year	Data Source
1850. . . .	Farm Plat Maps & Milwaukee Dept. of City Development Records
1880. . . .	Farm Plat Maps & Milwaukee Dept. of City Development Records
1900. . . .	U. S. Geological Survey Maps (15 minute quadrangles)
1920. . . .	Farm Plat Maps
1940. . . .	U. S. Soil Conservation Service Aerial Photographs
1950. . . .	U. S. Soil Conservation Service Aerial Photographs
1963. . . .	SEWRPC Land Use Inventory

The historic development information from the various data sources were assembled, organized chronologically, and then transferred to SEWRPC 1 inch equals 4000 feet scale county base maps. The approximate extent of urban development for each selected base year was then delineated by a growth ring and the areas encompassed within each ring measured by polar planimeter and tabulated. This resulted in a concise expression of historic urban development within the Region in the form of a historic urban development time series map.

Existing land use information was not available on a uniform, areawide basis for the Region in a form suitable for both land use and transportation planning. Consequently, an extensive existing land use survey was required. A land use classification system was developed for use in the inventory and approved by the technical coordinating and advisory committee. This classification system utilizes nine major land use categories, which are divisible into a total of 57 minor categories,[2] and is suitable for both land use and transportation planning; adaptable to storm water drainage, public utility, and community facility planning; and compatible with existing land use classification systems already in use within the Region.[3] With the exception of the most intensively developed urban areas, where field surveys were utilized, the existing land uses were delineated by photo interpretation on SEWRPC aerial photographs at a 1 inch equals 400 feet scale, measured, checked, coded, edited, and transferred to punch cards for machine processing.[4] The U. S. Public Land Survey quarter section was chosen as the basic geographic data collection unit, and the land uses were identified in terms of the actual activities taking place on the land without regard to ownership characteristics.

In order to produce a high quality inventory for an area as large and diverse as the Region, careful attention was given to quality control. Quality control checks included determination of the amount of error in the scale of the aerial photographic prints upon which the land uses were delineated and measured; verification of the photographic interpretation and delineation on a sample basis by field inspection; and control balancing of measured totals by quarter section, section, civil division, and county as well as by the Region as a whole.

The regional land use inventory incorporated current data furnished by the cities of Kenosha, Milwaukee, and Racine. The City of Milwaukee data was particularly valuable since that city had completed an existing land use survey as a part of its community renewal program in 1962, utilizing a classification system having 373 land use categories. This inventory was checked and converted to the regional classification system.

HISTORIC GROWTH

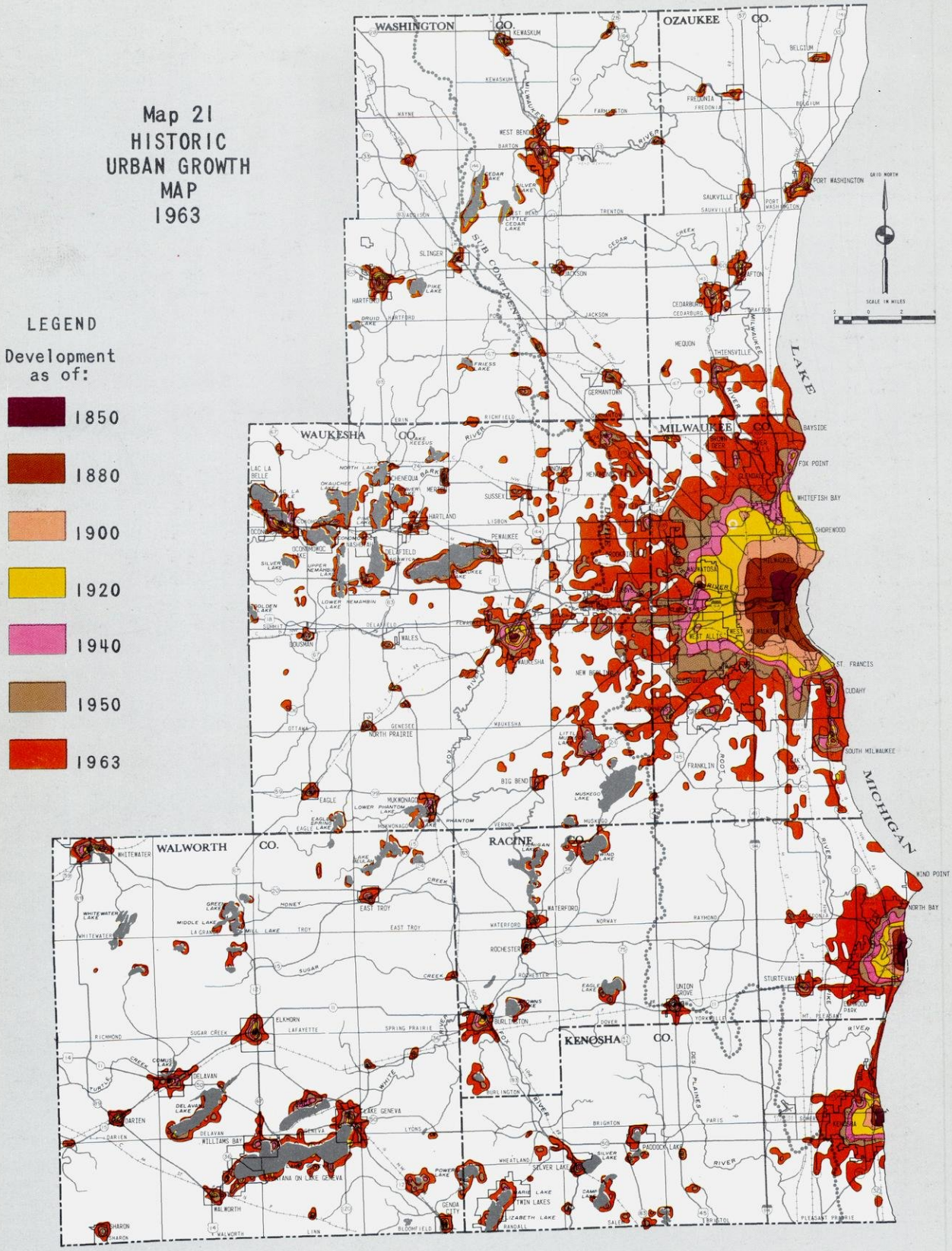
The first permanent white settlement in the Region was established in 1795, as a trading post on the east side of the Milwaukee River just north of what is now Wisconsin Avenue. The movement of settlers into the Region was well underway by 1830, and most of the cities and villages within the Region can trace their origins to trading posts established in the early nineteenth century. Completion of the U. S. Public Land Survey in the Region by 1836, and subsequent sale of the public lands, brought many settlers from New England, Germany, Austria, and Scandinavia.

By 1850 there were more than 113,000 people in the Region, and the accompanying historic development map (Map 21) shows the many scattered developments existing in the Region at that time. In addition to the larger urban centers of Burlington, Kenosha, Milwaukee, Racine, Waukesha, and West Bend, traces of early development are evident for many of the smaller communities that exist in the Region today. These include: the still unincorporated community of Wilmot in southern Kenosha County; the cities of Cudahy, South Milwaukee, and Wauwatosa in Milwaukee County; the cities and villages of Cedarburg, Port Washington, Saukville, and Thiensville and the unincorporated community of Freistadt, now a part of the city of Mequon, in Ozaukee County; the villages of Rochester, Sturtevant, Union Grove, and Waterford in Racine County; the still unincorporated community of Springfield and the cities and villages of Delavan, East Troy, Elkhorn, Genoa City, and Whitewater in Walworth County; the still unincorporated communities of Boltonville and Newburg and the City of Hartford and villages of Germantown and Slinger in Washington County; and the cities and villages of Delafield, Eagle,

[2] See Appendix E, Table A1 for general land use data by traffic analysis district and Appendix E, Table A2 for detailed land use data by county.

[3] A detailed description of the methodology and classification scheme utilized is contained in SEWRPC Procedural Manual No. 5, Land Use Inventory.

[4] See "Aerial Photographs and Their Use in the Regional Land Use Inventory," SEWRPC Technical Record, Vol. 1 – No. 2.



Like the growth rings of a tree, the historic urban growth rings encircling the communities in the Region reveal many things. The location of natural resources, such as water, woodlands, and fertile soils, has been nearly as important an influence on original settlement patterns and subsequent urban growth as have transportation facilities, such as railroads and highways. Long established independent and isolated communities are "growing together" to form a complex urban region.

Elm Grove, Hartland, Menomonee Falls, Merton, Mukwonago, North Prairie, Oconomowoc, and Pewaukee in Waukesha County. Many of these communities did not incorporate until after 1900 and did not show signs of widespread development until after 1920.

Historic Growth Patterns

Urban development in the Region increased significantly between 1850 and 1880, between 1900 and 1920, and between 1950 and 1963. The 1920 to 1940 period, which included a severe national depression and slow recovery, and the 1940 to 1950 period, while inaugurating the post-war housing boom, do not show marked increases in urban development. This is true in spite of the fact that the 1920 to 1930 decade exhibited the second largest population increase in the history of the Region. The 13-year period from 1950 to 1963 shows the most dramatic increase in urban development. The pattern of development occurring around the existing communities of the Region during this period is quite descripively referred to as "urban sprawl." While the regional population increased 35 percent during this period, land devoted to urban use increased by 146 percent.

To the north and west, urban development in the Milwaukee metropolitan area is reaching once far-removed rural communities, such as Germantown, Grafton, Muskego, Sussex, and Waukesha. To the south, urban development is "filling up" the long established communities of Cudahy and South Milwaukee and spreading into Oak Creek. The Town of Caledonia in Racine County is subject to the outward spread of urban development from two metropolitan centers, Milwaukee and Racine. Between Racine and Kenosha there is much evidence to support the thesis that the Chicago-Kenosha-Racine-Milwaukee complex will eventually become part of a continuous band of urban development extending along the southern and western shores of Lake Michigan from South Bend, Indiana, to Port Washington, Wisconsin.

The historic development map for the Region does not reveal the same marked influence of transportation routes on urban development patterns that have been identified by transportation studies in other large metropolitan areas. Although the influence of certain major highway routes, such as STH 15, 24, 30, 36 and USH 18, 41, and 141, on the spatial location of urban development is clearly evident in more recent years, the historic influence of the railroad and electric interurban networks is much less evident than in other large metropolitan regions; and urban growth appears to have occurred more by accretion than by axial expansion. Where the latter has occurred, it has apparently been centered on automotive transportation and been closely followed by interstitial development. The 1920 growth ring for the Milwaukee urban area, however, still approximates the outer limits of the then existing local street railway network and still approximates the outer limits of the highest population densities and the highest level of mass transit service within the Region.

The historic development map supports the thesis that the spatial location of urban development in the Region has been as strongly influenced by resource amenities as by transportation. This is evidenced by the lineal development existing around the many inland lakes, along the Lake Michigan shore, and along the stream valleys of the Region. It appears that, although transportation routes did have some influence on historic urban development within the Region, that influence was modified by the location and quality of the resource amenities and by utility service availability. It also appears, however, that the influence of transportation routes on urban development has become more marked since the introduction of the high speed, all-weather highway.

Historic Density Trends

The change in population density within the Region from 1850 to 1963 is shown in Tables 37 and 38. During this 113-year period, the population of the Region increased nearly 14-fold from 113,389 to 1,674,300 while the land developed for urban use increased 85-fold, from 4 square miles to 340 square miles. Overall population density within the Region has increased steadily from 42 persons per square mile in 1850 to 619 persons per square mile in 1963. Population density within urban areas, however, shows a different trend. The overall population density of the urban areas of the Region in 1850 was 7,156 persons per square mile. This density increased to a peak in 1920 of 11,346 persons per square mile. After 1920 the diffused nature of new urban development caused a sharp and steady decrease in population density within the urban area. By 1963 overall urban population densities within the Region had dropped to 4,806 persons per square mile, a sharp reduction from the 1920 peak and significantly lower than the 1850 level. Much of this reduction occurred

Table 37

POPULATION DENSITY TRENDS IN THE REGION (1850 - 1963)

Year	Urban Population		Rural Population		Total Population	Area (square miles)		Persons Per Square Mile	
	Number	Percent of Total	Number	Percent of Total		Urban	Total	Urban	Total
1850	28,623	25.2	84,766	74.8	113,389	4	2,689	7,155.8	42.2
1880	139,509	50.3	137,610	49.7	277,119	18	2,689	7,750.5	103.1
1900	354,082	70.5	147,726	29.5	501,808	37	2,689	9,569.8	186.6
1920	635,376	81.0	148,305	19.0	783,681	56	2,689	11,346.0	291.4
1940*	996,535	93.3	76,164	6.7	1,067,699	90	2,689	11,072.6	397.1
1950*	1,179,084	95.0	61,534	5.0	1,240,618	138	2,689	8,544.1	461.4
1963	1,634,200	97.6	40,100	2.4	1,674,300	340	2,689	4,806.5	619.2

* *The "rural-nonfarm" population is included in the urban total.*

Source: Bureau of the Census; SEWRPC.

during the 1950-1963 period. These dramatic reductions in urban population densities have important implications for regional land use and public facilities planning, particularly for highway and mass transit system planning.

The significant increase in the area devoted to new urban development in Racine and Kenosha between 1950 and 1963 is particularly noteworthy. The Racine urban development area grew from 8.6 square miles to 27.6 square miles, an increase of more than 220 percent over this 13-year period. The Kenosha urban development area grew from 6.4 square miles to 20.4 square miles, an increase of 218 percent. The urban development around the Milwaukee area has also spread dramatically in the past 13 years, increasing from 94.0 square miles to 144 square miles, or 53 percent. The 50 square mile increase in the Milwaukee urban area, while smaller percentage-wise, is larger in absolute area than the Racine and Kenosha increases combined.

These increases in population and urban area and decreases in population density were accompanied by significant changes in the way of life within the Region. Widespread urban development in the rural-urban fringe areas of the Region well beyong the historic central cities and their suburbs is a fairly recent phenomenon. In this area residents can enjoy many of the amenities of rural life, yet also avail themselves of a wide variety of urban services, including employment in urban industries. The extent to which this form of diffused urban development continues will be of prime importance to future environmental conditions within the Region.

EXISTING LAND USE

Completion of the SEWRPC existing land use inventory marked the first time that existing land use data suitable for both rural and urban land use and public facilities planning became available on a uniform, areawide basis for the Region. Consequently, the findings of this inventory pro-

Table 38

ESTIMATED POPULATION DENSITY TRENDS IN THE MILWAUKEE, RACINE, AND KENOSHA URBAN DEVELOPMENT AREAS (1850 - 1963)

Year	Milwaukee			Racine			Kenosha		
	Population	Area (square miles)	Persons Per Square Mile	Population	Area (square miles)	Persons Per Square Mile	Population	Area (square miles)	Persons Per Square Mile
1850	24,000	2.1	11,430	5,600	0.7	8,000*	3,500	0.2	17,500*
1880	126,000	13.0	9,690	17,000	1.2	14,167	6,000	0.5	12,000*
1900	314,000	29.1	10,790	31,000	2.7	11,482	13,000	1.3	10,000
1920	530,000	42.0	12,619	62,000	4.8	12,917	41,000	3.1	13,226
1940	748,000	65.9	11,350	73,000	7.2	10,139	53,000	4.7	11,277
1950	850,000	94.0	9,043	84,000	8.6	9,767	63,000	6.4	9,844
1963	1,140,000	144.0	7,917	106,000	27.6	3,841	82,000	20.4	4,020

* *Equivalent density due to area being less that one square mile.*

Source: SEWRPC.

Table 39

DISTRIBUTION OF LAND USE IN THE REGION BY COUNTY - 1963

County		Land Use (acres and percent)								Total
		Residential[a]	Commercial	Industrial[b]	Transportation[c]	Governmental[d]	Water & Wetlands	Open Lands[e]	Agricultural	
Kenosha	Acres	11,913	453	685	8,798	3,190	19,650	17,015	116,391	178,095
	Percent	6.7	0.3	0.4	4.9	1.8	11.0	9.6	65.3	100.0
Milwaukee	Acres	41,984	2,582	4,428	32,383	15,420	4,257	18,819	35,121	154,994
	Percent	27.0	1.7	2.9	20.9	10.0	2.8	12.1	22.6	100.0
Ozaukee	Acres	9,337	307	313	7,199	2,104	15,056	10,498	105,199	150,013
	Percent	6.3	0.2	0.2	4.8	1.4	10.0	7.0	70.1	100.0
Racine	Acres	13,371	641	749	11,557	3,526	17,059	17,007	153,636	217,546
	Percent	6.2	0.3	0.4	5.3	1.6	7.8	7.8	70.6	100.0
Walworth	Acres	11,855	523	730	10,882	3,884	38,324	37,531	266,251	369,980
	Percent	3.2	0.1	0.2	2.9	1.1	10.4	10.2	71.9	100.0
Washington	Acres	7,429	244	384	10,533	1,904	35,139	30,828	192,271	278,732
	Percent	2.7	0.1	0.1	3.8	0.6	12.6	11.1	69.0	100.0
Waukesha	Acres	33,468	956	957	18,701	7,396	49,573	44,320	216,275	371,646
	Percent	9.0	0.3	0.3	5.0	2.0	13.3	11.9	58.2	100.0
Region	Acres	129,357	5,706	8,246	100,053	37,424	179,058	176,018	1,085,144	1,721,006
	Percent	7.5	0.3	0.5	5.8	2.2	10.4	10.3	63.0	100.0

The nine major land use categories as inventoried were: residential, retail and service, wholesale and storage, manufacturing, transportation, institutional and governmental, recreational, agricultural, and open land and water. These categories have been rearranged for presentation and analysis purposes. The detailed inventory information can be found in Appendix E, Table A2.

[a] *Includes residential areas developed and underdevelopment.*

[b] *Includes all manufacturing, wholesaling, and storage.*

[c] *Includes utilities, communication facilities, and off-street parking of over 10 spaces.*

[d] *Includes institutional and active recreational areas.*

[e] *Includes woodlands, open pits, and quarries.*

Source: SEWRPC.

vide a stock of entirely new and important information about the Region and permit comparative analyses of regional and local development never before possible.

The amount and spatial distribution of the land uses presently (March, 1963) existing within the Region are summarized graphically on the regional map enclosed in the pocket attached to the back cover of this report.[5] This map comprises a striking picture of existing regional development at a given point in time, and its study can provide many valuable insights into an understanding of regional activity and development and of areawide problems related thereto. The absolute and proportional areas presently devoted to each major land use category within the Region are summarized by county in Table 39.

Although southeastern Wisconsin is an "urban region," less than 17 percent of its total area is presently devoted to urban type land uses (see Table 40). However, as will be shown later, these urban uses are so diffused within the Region that they have not only created an impression of widespread urbanization but many serious areawide environmental problems as well. The largest land use category within the Region is still agriculture, which presently occupies 63.0 percent of the total area of the Region. The next largest land use category is the water and wetland group, which occupies 10.4 percent of the total area of the Region. Woodlands and open lands presently occupy another 10.3 percent of the total area of the Region. Therefore, over 83 percent of the Region is presently devoted to agriculture, woodlands, other open lands, or lies under water.

[5] A basic and important difference exists between the analyses of the regional land use inventory as presented herein and such analyses as commonly presented for urban planning purposes. In this report land uses have been analyzed on the basis of the proportion of the total area of the Region devoted to each use. In urban planning practice, such analyses are more commonly made on the basis of developed area; and agricultural lands, woodlands, wetlands, and open lands are regarded as "vacant" and potentially available for urban land use. This difference in approach is a reflection of the need to bring together rural and urban planning in a single comprehensive regional effort. The data presented in this report can, however, be readily converted to the more common urban planning practice basis.

The "urban" type land use occupying the greatest area is residential, which presently accounts for 7.5 percent of the total area of the Region. A close second is the use category of transportation, utilities, and communications, which accounts for 5.8 percent of the total area. The proportional importance of this category reflects the vast areas of land devoted to airports, parking lots, and rights-of-way for streets and highways, railroads, and utility lines within the Region.

The very small amount and proportion of land presently devoted to the urban economic activities, which are so important to the support of regional growth and development, are both surprising and significant. The total land area presently devoted to commercial, manufacturing, and wholesaling functions within the Region (minus on-site parking) amounts to only 13,952 acres, or 0.8 percent, of the total land area, yet this small area provides the basis for more than 83 percent of the jobs in the Region.

Table 40

PROPORTION OF URBAN AND NON-URBAN LAND USES IN THE REGION BY COUNTY - 1963

County	Urban Land Use[a]		Non-Urban Land Use[b]		Total
	Acres	Percent	Acres	Percent	Acres
Kenosha. .	25,039	14.1	153,056	85.9	178,095
Milwaukee.	96,797	62.5	58,197	37.5	154,994
Ozaukee. .	19,260	12.9	130,753	87.1	150,013
Racine . .	29,844	13.8	187,702	86.2	217,546
Walworth .	27,874	7.5	342,106	92.5	369,980
Washington	20,494	7.3	258,238	92.7	278,732
Waukesha .	61,478	16.6	310,168	83.4	371,646
Region	280,786	16.3	1,440,220	83.7	1,721,006

[a] *Includes residential; commercial; manufacturing, wholesaling, and storage; transportation, utilities, communication, and off-street parking; and governmental, institutional, and active recreational land uses.*

[b] *Includes water and wetlands; woodlands, open lands, and quarries; and agricultural land uses.*

Source: SEWRPC.

Current Use Ratios

An analytical relationship useful in the planning process is the ratio between the area devoted to a given land use and the resident population creating the demand for that land use. Such ratios are commonly developed for several major land use categories and are called people-use ratios. The application of these people-use ratios occurs primarily in the preparation of conditional forecasts of future land use requirements, which are accomplished by combining the ratios, modified if necessary over time, with forecasts of future population level to arrive at the probable future demand for specific land use categories. Present people-use ratios for certain major land use categories are presented by county in Table 41. Because of the intensive nature of the urban land uses in Milwaukee County, this county exhibits the lowest value for each ratio tabulated. Racine County most closely approximates the regional average for each ratio in nearly every land use category.

Table 41

DEVELOPED ACRES OF SELECTED LAND USES PER THOUSAND PERSONS IN THE REGION BY COUNTY - 1963

County	Selected Land Use Category			
	Residential[a]	Retail Commercial[b]	Governmental[c]	Active Recreational
Kenosha.	91.4	4.2	9.0	21.0
Milwaukee. . . .	36.5	2.4	5.8	8.4
Ozaukee.	181.9	7.4	17.3	33.3
Racine	77.6	4.3	9.0	14.4
Walworth	180.9	9.4	17.7	52.3
Washington . . .	132.3	4.9	13.9	24.6
Waukesha	150.2	5.2	12.4	27.8
Region	67.4	3.4	7.9	14.4

Rural-farm population was included in determining the above rates.

[a] *Includes farm homesteads.*

[b] *Includes services.*

[c] *Includes institutional.*

Source: SEWRPC.

A second series of analytical relationships, which fulfill a purpose similar to the people-use ratios, are employee-land use ratios. In these ratios the number of commercial or manufacturing employees is related to the amount of land consumed by commercial and industrial activities. Present employee-land use ratios for certain major land use categories are presented by county in Table 42. Because of the concentration of commercial, manufacturing, and wholesaling activity in Milwaukee County, the employee-land use ratios are significantly greater in this county than the regional average.

It should be noted that the commercial and industrial land use areas utilized in compiling the people-use ratios and the employee-land use ratios did not include on-site parking. This basis of use delineation was deliberately selected as the most flexible for planning analyses, since it per-

mits varying assumptions to be made concerning the future provision of on-site parking. For example, if it were assumed that all commercial uses provided on-site parking to the same extent as new shopping centers, such as Mayfair in the City of Wauwatosa, which provides about three acres of parking for each acre of ground floor building area, and if this parking area were included in the commercial use area, then the number of commercial acres per thousand persons would change from 3.4 acres to 13.6 acres per thousand persons (see Table 41). Also, if this same assumption were followed for the employee-land use ratio, the ratio would change from 38.8 employees per acre to 9.7 employees per acre (see Table 42). The choice of one basis of such areal measurement over another must, therefore, be guided by the basic assumptions underlying the applications.

Table 42

EMPLOYEES PER ACRE OF SELECTED LAND USES IN THE REGION BY COUNTY - 1963

County	Selected Land Use Category		
	Retail Commercial & Services	Manufacturing	Wholesaling
Kenosha	18.9	76.2	1.4
Milwaukee	67.2	62.9	15.8
Ozaukee	9.4	25.5	1.2
Racine	22.9	40.9	9.0
Walworth	10.6	10.4	0.6
Washington	13.9	20.4	1.8
Waukesha	13.4	21.5	2.9
Region	38.8	48.1	9.7

Source: SEWRPC.

Residential Land Use

The residential land use category of the inventory included and identified both land actually occupied by a residence of some kind and vacant land which was either under development for residential use or immediately available for such use. The latter category included vacant building sites between existing residences and improved but still vacant residential subdivisions.

At the time of the land use inventory, there were 129,357 acres of residential land in the Region. Table 43 details the amounts and relative proportions of land devoted to the different types of residential use. The largest land consumer in this group is the single-family detached residence, which occupies 81.1 percent of the total residential land area in the Region. Lands under residential development accounted for 12.7 percent of the total, while two-family residences accounted for 4.3 percent of the total. Mobile homes and multi-family residences combined consumed less than 2 percent of the total residential land in the Region.

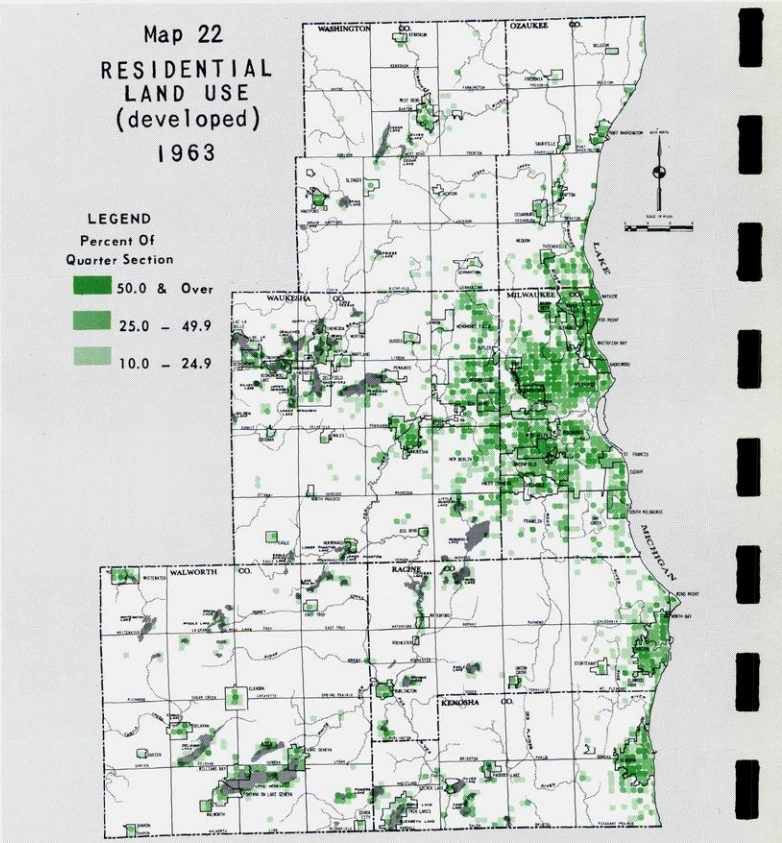
Table 43

RESIDENTIAL LAND USE IN THE REGION BY TYPE - 1963

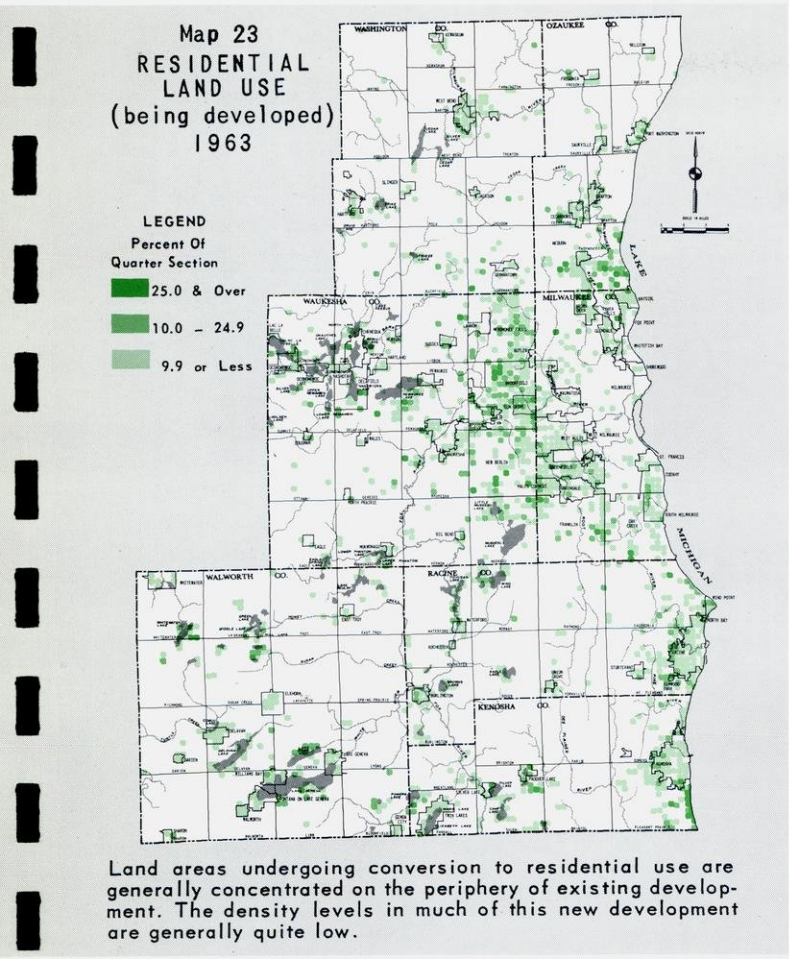
Type of Residential Use	Acres	Percent
Single-family	104,868	81.1
Two-family	5,563	4.3
Multi-family (less than 4 stories)	2,082	1.6
Multi-family (4 or more stories)	80	0.1
Mobile Homes	309	0.2
Residential Land Under Development	16,455	12.7
Total	129,357	100.0

Source: SEWRPC.

The Region contains all or portions of 10,800 U. S. Public Land Survey quarter sections. The approximate area of these quarter sections is 160 acres



Less than 7 percent of the land in the Region is used to house its 1.6 million residents. The urban settlements are clearly evident as focal points of past residential development.

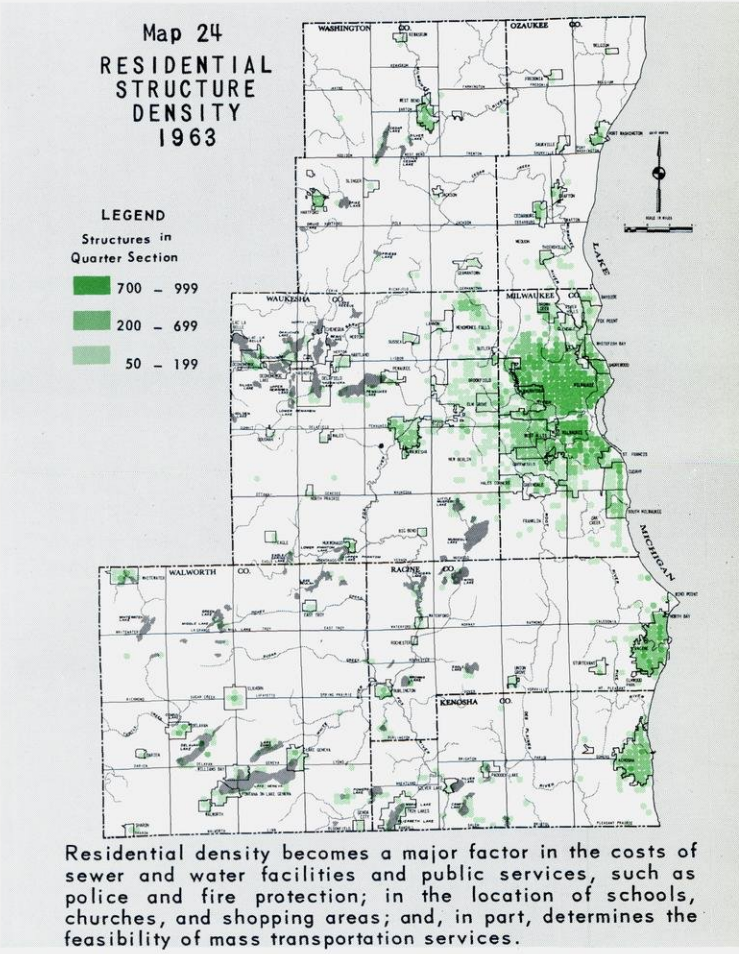


Land areas undergoing conversion to residential use are generally concentrated on the periphery of existing development. The density levels in much of this new development are generally quite low.

or one-fourth of a square mile (see Appendix D, Figure A1). The diffused nature of existing residential land use within the Region is indicated by the fact that of these 10,800 quarter sections only 1,120 presently contain no residential land uses. The quarter sections which have over fifty percent of their area devoted to residential use are shown on Map 22. These occur primarily in and about the Kenosha, Milwaukee, and Racine urban concentrations. There are, however, scattered residential concentrations in and around the City of Port Washington and Village of Thiensville in Ozaukee County; the City of Burlington in Racine County; the cities of Elkhorn, Lake Geneva, and Whitewater in Walworth County; the cities of Hartford and West Bend in Washington County; and the City of Waukesha in Waukesha County.

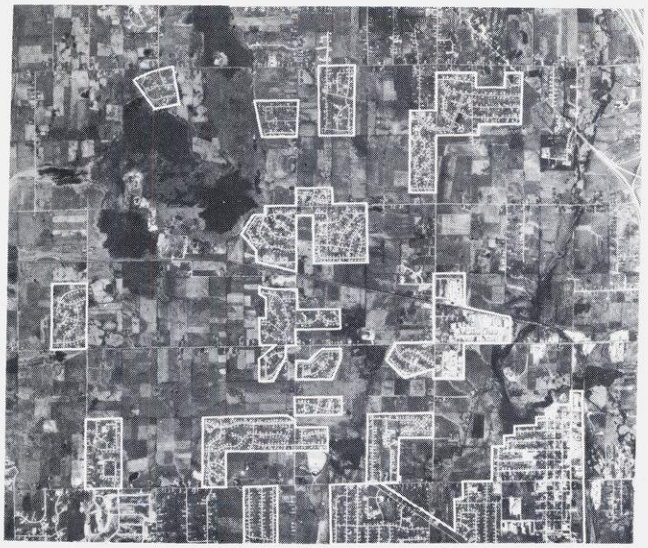
The spatial distribution of land under development for residential use, totaling 16,455 acres, is shown on Map 23. While most of the quarter sections showing extensive residential development activity are located in close proximity to the existing urban development, there are many quarter sections scattered throughout the Region which are being converted from agricultural to residential use. Many of the latter appear to be oriented toward major high-speed highway routes and high-value resource amenities.

The density of residential land use, expressed in terms of housing units per quarter section, is shown on Map 24. All of the highest density levels (700 or more housing units per quarter section or 9,000 or more people per square mile) occur only in quarter sections within the cities of Kenosha, Milwaukee, and Racine. Medium density levels (200 to 699 housing units per quarter section, or 2,600 or more people per square mile) occur primarily in quarter sections within outlying cities and villages, such as Waukesha, Menomonee Falls, West Bend, Port Washington, Burlington, and several other communities, in addition to the cities of Kenosha, Milwaukee, and Racine. Low density levels (less than 200 housing units per quarter section or 2,600 persons per square mile) occur in the balance of the Region. (See Appendix E, Table A3 for a comparison of



Residential density becomes a major factor in the costs of sewer and water facilities and public services, such as police and fire protection; in the location of schools, churches, and shopping areas; and, in part, determines the feasibility of mass transportation services.

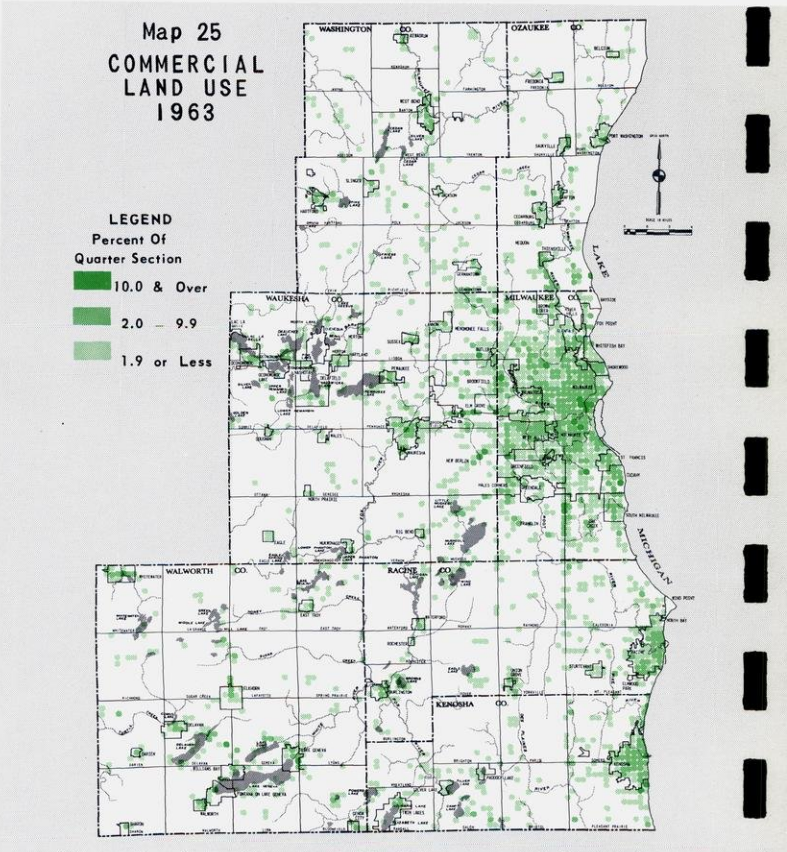
Figure 33
TYPICAL EXAMPLE OF LEAPFROG DEVELOPMENT



population densities for the Region with selected urbanized areas in the United States.)

The increasing density of residential use in areas of the Region presently served by existing public water and sewerage facilities will create additional utility system expansion and capacity problems. Such increasing intensity of use in areas of the Region, not presently served by public water and sewerage facilities, will intensify problems of declining ground water levels and of water pollution and may ultimately require the construction of new utility systems. The increasing intensity of residential use around many of the inland lakes of the Region, if improperly planned, will create severe environmental problems. While a certain amount of this development may initially be "active" only during summer months, the ease and frequency with which summer homes are converted to year-round use may suddenly change the character of the development and create serious problems which the community may be ill-prepared or ill-equipped to meet.

The spatial distribution of residential development within the Region, as indicated on Maps 22, 23, and 24, forewarns of another type of potential land use development problem. Experience indicates that recent land development tends to follow a "leapfrog" pattern. Land developers, seeking inexpensive or low cost land, purchase a large tract of agricultural land; upon request, the local community grants zoning changes in anticipation of an increased tax base; an urban development potential is imputed to adjacent lands and the speculative value of these lands rises; and these lands are then often assessed at the speculative value based on the imputed urban potential. Land developers, seeking additional low cost land, then bypass these "high-priced" areas in favor of cheaper land further removed; and the cycle repeats itself. Examples of this "leapfrog" development pattern are clearly evident in Figure 33. This kind of development leaves in its wake incomplete neighborhoods requiring extensive urban services and makes the provision of these services costly and inefficient. Police and fire protection, schools, and refuse collection, as well as sewerage and water supply, are affected; and the area may be left with serious financial and environmental problems. This kind of development also breaks up economical farm units and reduces the quality and productivity of wildlife habitat. Moreover, attempts to finance the necessary urban improvements may place an impossible burden upon intervening pockets of land still held in agricultural use.



Occupying less than one-half of 1 percent of the land area of the Region, commercial lands provide employment for nearly one-half the labor force. On these lands more than $2 billion of retail sales are transacted each year.

Table 44

DISTRIBUTION OF COMMERCIAL LAND USE IN THE REGION BY COUNTY - 1963

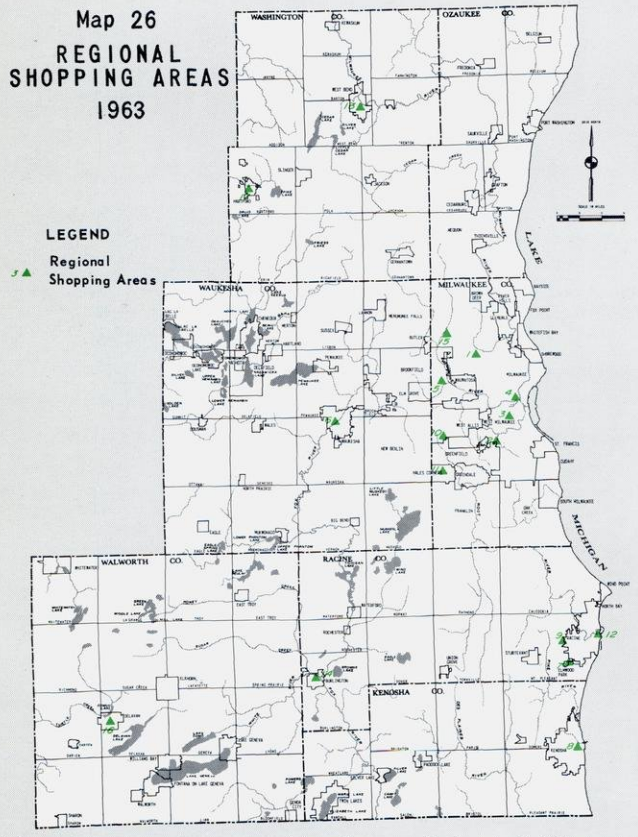
County	Commercial Land Use			Percent of Total Population	Rank Order By Population
	Acres	Percent	Rank Order		
Milwaukee	2,582	45.2	1	65.8	1
Waukesha	956	16.8	2	10.1	2
Racine	641	11.2	3	9.0	3
Walworth	523	9.2	4	3.4	5
Kenosha	453	7.9	5	6.4	4
Ozaukee	307	5.4	6	2.4	7
Washington	244	4.3	7	2.9	6
Region	5,706	100.0	---	100.0	---

Represents ground floor site area and includes parking areas of 10 spaces or less.

Source: SEWRPC.

Commercial Land Use

The commercial land use category includes all retail and service-type commercial uses, including both local and regional shopping centers, highway oriented commercial areas, and professional and executive offices, excluding, however, on-site parking of 10 or more spaces. The strong dependence of commercial activity upon population concentrations is clearly indicated in Table 44. The rank order of the counties by percentage of total commercial land closely parallels the rank order by percentage of total population. Walworth County, however, ranks higher in commercial land than in population, a fact which probably reflects the seasonal variations in the population and the scattered nature of the urban concentrations in that county. That the spatial distribution of commercial land use is dependent upon accessibility as well as population concentration is evidenced by Map 25. The axial pattern of commercial land use closely approximates the pattern of certain highways, as well as of major concentrations of residential land.



The shopping trip attraction characteristics of 17 areas has qualified them as regional shopping areas. The number of shopping trips attracted and the distance travelled were the primary criteria utilized.

Locally oriented commercial uses are considered "followers" of residential development. Consequently, for regional planning purposes, such local commercial uses may be treated as implicit components of neighborhood unit development. Regional commercial uses, however, may often precede other types of urban development and actually generate or stimulate urban growth. Therefore, such commercial uses must be treated explicitly in any regional planning effort; and special efforts were made in the inventory to identify the existing regional shopping areas.

In the SEWRPC travel inventories, considerable information was obtained concerning the amount, purpose, and specific origins and destinations of trips within the Region by various modes of travel on an average weekday. Utilizing this information, the number of home-to-shopping trips made to the various internal traffic analysis zones within the Region[6] was determined together with zones of origin of these trips. Analysis of these data suggested criteria for identification of com-

[6] See Appendix D, Figure A1 for identification of the traffic analysis zones as an areal unit for data analysis.

Table 45

AVERAGE TRAVEL TIME AND DISTANCE TRAVELED TO REGIONAL COMMERCIAL AREAS IN THE REGION[a] - 1963

Regional Commercial Area[b]		Number of Trips[c]	Number of Contributing Zones	Percent of Trips Traveling			Average Travel Time[d] (minutes)
Number	Outlets or Area			0 to 5 Miles	5 to 10 Miles	Over 10 Miles	
1	Capitol Court & Boston Village Shopping Centers	9,316	92	88	7	5	7.7
2	Southgate & Point Loomis Shopping Centers	8,374	74	90	5	5	9.1
3	Mitchell St. - Gimbels-Schusters & Sears	7,764	71	85	10	5	9.8
4	Downtown Milwaukee	7,049	128	74	20	6	16.3
5	Mayfair Shopping Center	4,808	89	73	15	12	11.6
6	Downtown Waukesha	3,663	55	74	19	7	7.1
7	Elmwood Park Shopping Center	3,328	57	72	22	6	9.9
8	Downtown Kenosha	2,742	43	83	9	8	----
9	Turnstile Shopping Center	2,459	34	89	5	6	7.3
10	Shopper's Fair Shopping Center	2,265	34	78	13	9	8.9
11	U-Tell Discount Dept. Store	2,240	31	58	32	10	15.8
12	Downtown Racine	2,025	37	88	5	7	9.1
13	Downtown West Bend	1,548	25	80	15	5	----
14	Downtown Burlington	1,334	28	63	15	22	----
15	More-Way Discount Dept. Store	1,247	24	65	34	1	10.0
16	Downtown Delavan	900	15	85	14	1	----
17	Downtown Hartford	818	12	68	26	6	----

[a] *Regional significance was determined by an analysis of home-to-shopping trips as reported in the SEWRPC origin & destination surveys.*

[b] *The commercial outlets listed may not be the only or even the largest shopping trip attractor in the area; the identification is for reader's convenience only. The commercial area number refers to the number shown on Map 26, as well as the rank order of trip attraction*

[c] *Trips shown are from home-to-shopping only.*

[d] *Average travel time was determined from inter-zonal driving time over the SEWRPC arterial network and excludes terminal time at each end of the trip, time differentials for transit, and time delays caused by abnormal travel conditions.*

Source: SEWRPC.

mercial areas having a primarily regional orientation.[7] The principal criteria developed included: the number of home-to-shopping trips made to a given commercial area on an average weekday;[8] the proportionate distribution of the lengths of these trips; and the travel time between the zones of origin and the zone of destination.[9]

Regional commercial areas were identified as those areas which received more than 500 home-to-shopping trips, 5 percent of which traveled 10 or more miles from origin to destination or 15 percent of which traversed over 5 miles. The 17 areas which so qualified as regional shopping areas are indicated in Table 45 and on Map 26.

Industrial Land Use

This land use category includes all manufacturing activities, wholesaling offices, warehouses, and storage yards but excludes on-site parking of 10 or more spaces. The spatial distribution

Table 46

DISTRIBUTION OF INDUSTRIAL LAND USE IN THE REGION BY COUNTY - 1963

County	Acres	Percent
Kenosha	685	8.3
Milwaukee	4,428	53.7
Ozaukee	313	3.8
Racine	749	9.0
Walworth	730	8.9
Washington	384	4.7
Waukesha	957	11.6
Region	8,246	100.0

Industrial land includes all manufacturing and wholesaling uses and includes parking areas of 10 spaces or less; excludes quarries.

Source: SEWRPC.

[7] A detailed description of the methodology used in the analysis of commercial activity within the Region is provided in a technical report currently under preparation.

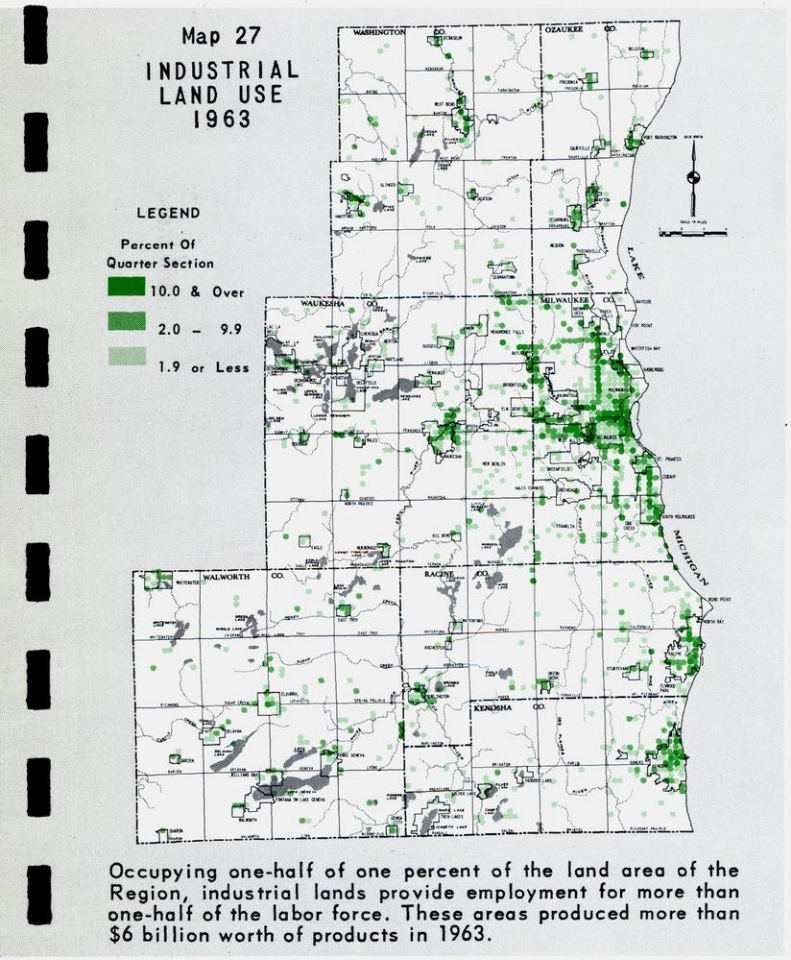
[8] It should be emphasized that no attempt was made to determine the types and varieties of goods sold by retail outlets located in these zones. The determination of regional shopping orientation was based strictly on shopping trips from home to specific zones. It should also be recognized that the trips analyzed were only of the home-to-shopping variety. Many trips to shopping came from other functions or activities, such as work-to-shop, personal business-to-shop, and shopping-to-shop.

[9] The average travel time was obtained by: 1) multiplying the number of trips from each zone by the minimum travel time over the highway network from that zone to the destination zone, 2) accumulating this total travel time from all the contributing zones to the particular destination zone, and 3) dividing the accumulated product by the total number of trips to the destination zone.

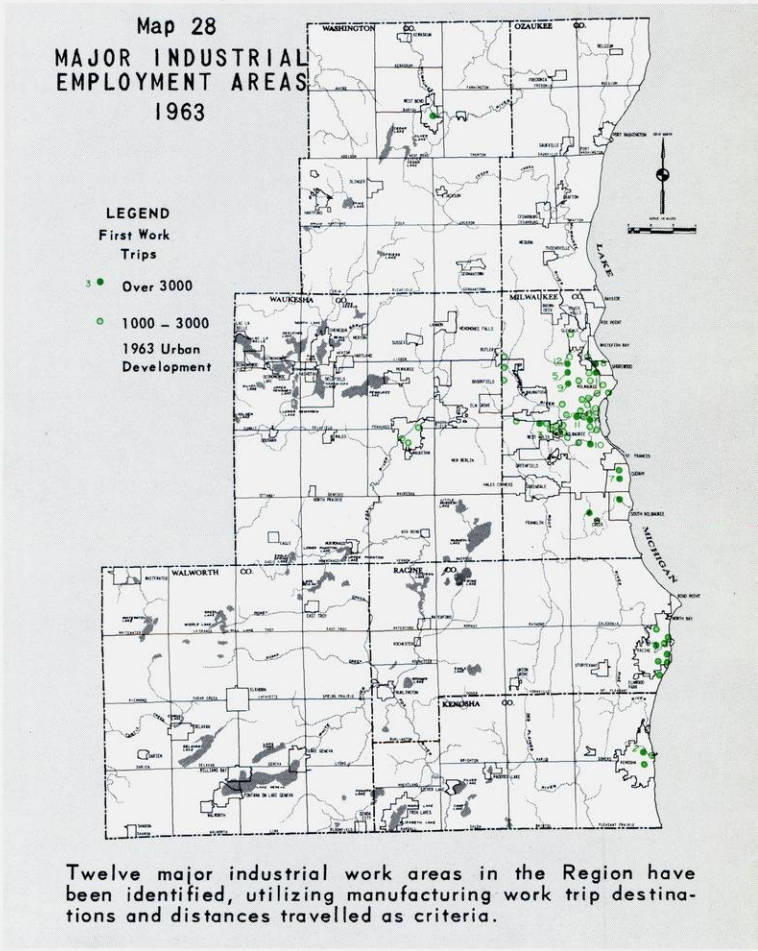
of this land use category is particularly significant since more than one-half of the regional labor force is employed in this combined activity group, which occupies less than one percent of the total land area of the Region. As shown in Table 46 more than one-half of the land in this category is presently located in Milwaukee County, which ranks first in industrial land use acreage. The spatial distribution of industrial land use within the Region is shown on Map 27. The heavily industrialized Menomonee River Valley in Milwaukee County is particularly evident on this map.

Because of the high proportion of industrial employment in the regional labor force, the importance of the industrial work trip becomes particularly important to regional land use-transportation planning. Therefore, it was necessary to examine industrial land uses in terms of employment concentration and employee trend patterns as well as land consumption and spatial distribution. In this examination all internal traffic analysis zones which showed a concentration of 1,000 or more manufacturing first work-trip destinations were identified. Only 62 of the 619 internal traffic analysis zones were so identified, and their spatial distribution is shown on Map 28. From an analysis of the origin and destination survey data for these areas, the following factors were determined: 1) the number and spatial distribution of zones contributing manufacturing work trips to each industrial area, 2) the approximate one-way distance between home and place of work, and 3) the average travel time between home and place of work.[10] A summary of the results of this examination for the 12 industrial areas having 3,000 or more first work trips to manufacturing are shown in Table 47. The manufacturing plants listed in the table are merely intended to be descriptive of the industrial area and are not necessarily the only employment concentration in the area described. Industrial Area 1, which includes the American Motors Corporation, Milwaukee Body Plant, represents the singularly largest employment concentration in the Region. It

[10] Ibid., footnote 9.



Occupying one-half of one percent of the land area of the Region, industrial lands provide employment for more than one-half of the labor force. These areas produced more than $6 billion worth of products in 1963.



Twelve major industrial work areas in the Region have been identified, utilizing manufacturing work trip destinations and distances travelled as criteria.

Table 47

AVERAGE TRAVEL TIME AND DISTANCES TRAVELED TO MAJOR INDUSTRIAL AREAS IN THE REGION - 1963

Major Industrial Area[a]		Number of Trips[b]	Number of Contributing Zones	Percent of Trips Traveling			Average Travel Time[c] (minutes)
Number	Firms Name			0 to 5 Miles	5 to 10 Miles	Over 10 Miles	
1	American Motors Corp., Milw. Body Plant	13,210	200	57	27	16	17.7
2	American Motors Corp., Kenosha Plant	11,414	105	75	12	13	12.3
3	Allis Chalmers Manufacturing Co.	10,449	192	68	21	11	13.9
4	Allen Bradley Co.	8,067	142	62	29	9	14.7
5	A. O. Smith Corp.	7,611	144	74	17	19	12.6
6	A. C. Spark Plug Div., General Motors Corp.	4,964	158	28	32	40	22.2
7	Ladish Co.	4,727	73	71	22	7	12.6
8	Square D Co. & Milprint Inc.	4,611	107	57	28	15	15.2
9	Master Lock Co. & T. L. Smith Co.	4,244	109	68	20	12	12.0
10	Nordberg Manufacturing Co. & Perfex Corp.	4,228	93	73	17	10	12.2
11	International Harvester Co., Milw. Works.	3,065	80	74	22	4	15.2
12	Evinrude Motors, Div. of Outboard Marine Corp.	3,039	82	70	19	11	15.2

[a] *The industrial plants listed may not be the only, or even the largest, work trip attractors in the area; the identification is for reader's convenience only. The industrial area number refers to the numbers shown on Map 28, as well as the rank order of trip attraction.*

[b] *First work trips to manufacturing land use as reported in the SEWRPC origin & destination surveys.*

[c] *Average travel time was determined from inter-zonal driving time over the SEWRPC arterial network and excludes terminal time at each end of the trip, time differential for transit, and time delays caused by abnormal travel conditions.*

Source: SEWRPC.

receives 13,210 work trips on an average weekday from 200 different zones. The average travel time of each of these trips was determined as nearly 18 minutes. Fifty-seven percent of the workers at this employment concentration live within five miles of the area; 27 percent live between 5 and 10 miles away; and 16 percent live more than 10 miles away. Industrial Area 6, which includes the Oak Creek Plant of A. C. Spark Plug Division, General Motors Corporation, exhibited the longest average home-to-work travel time. This employment concentration draws employees from 158 zones, and 40 percent of the workers travel over 10 miles to work. This may be accounted for by the fact that the plant is relatively new and the work force have not, en masse, moved closer to their place of work, but rather have chosen to commute longer distances.

The amount, variety, and location of future industrial areas in the Region will depend upon many important factors, one of which concerns the accessibility of any given plant location to the resident labor force. This analysis indicates that the majority of manufacturing workers within the Region travel less than 5 miles to work each day and spend less than one-half hour in the journey to work. Adjustments for factors not considered in the determination of average travel time, such as a 10 percent increase in travel time for peak-hour delays and allowance for terminal times, would not increase the travel time significantly.

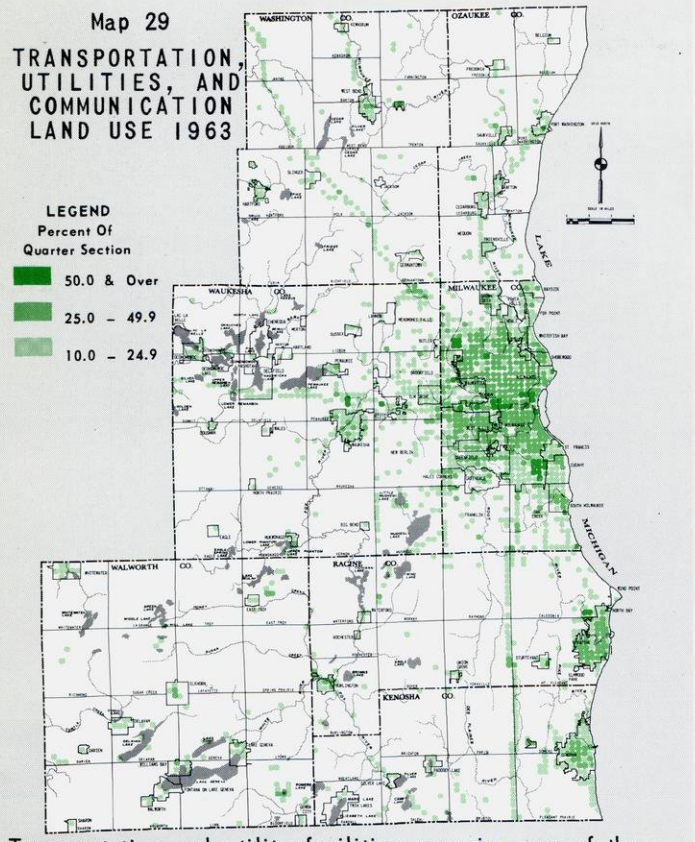
Transportation, Communication, and Utility Land Use

The transportation, communication, and utility land use category includes all street and highway rights-of-way; railroad rights-of-way and yards; airport, rail, ship, bus, and truck terminals; communications facilities, such as radio or television stations and transmission towers; utility rights-of-way and plants, such as sewage disposal and water treatment and storage facilities; and all off-street parking areas containing more than 10 parking spaces.

These uses are closely associated with urban development, and the greatest concentrations of these land uses occur in the urban centers (see Map 29). More than 100,000 acres of land, or approximately 6 percent of the total area of the Region, is presently devoted to this land use category, as shown in Table 48. Milwaukee County, with almost 21 percent of its total area devoted to this land use category, contains over 32 percent of the regional total.

Governmental, Institutional, and Active Recreational Land Use

The land areas devoted to governmental, institutional, and active recreational uses were clas-



Transportation and utility facilities comprise one of the major land uses within the Region, occupying almost 6 percent of the total area of the Region. Nearly one-third of the acreage in this category is in Milwaukee County – the smallest county in the Region.

sified in the land use inventory according to local or regional service orientation. If the service emphasis of a governmental or institutional use was oriented toward more than one community (minor civil division), it was classified as regional. If such service emphasis was oriented toward a single community or neighborhood, except for high schools in the City of Milwaukee, it was classified as local. Regional uses included universities and colleges, high schools, large central libraries, zoological and botanical gardens, museums, golf courses, bathing beaches, marinas, major athletic fields, hospitals, county courthouses, welfare agencies, and military installations. Local uses included elementary schools; churches; branch libraries; fire stations; all active park areas other than those classified as regional; and city, village, and town halls. All recreation facilities were further classified as public or nonpublic.

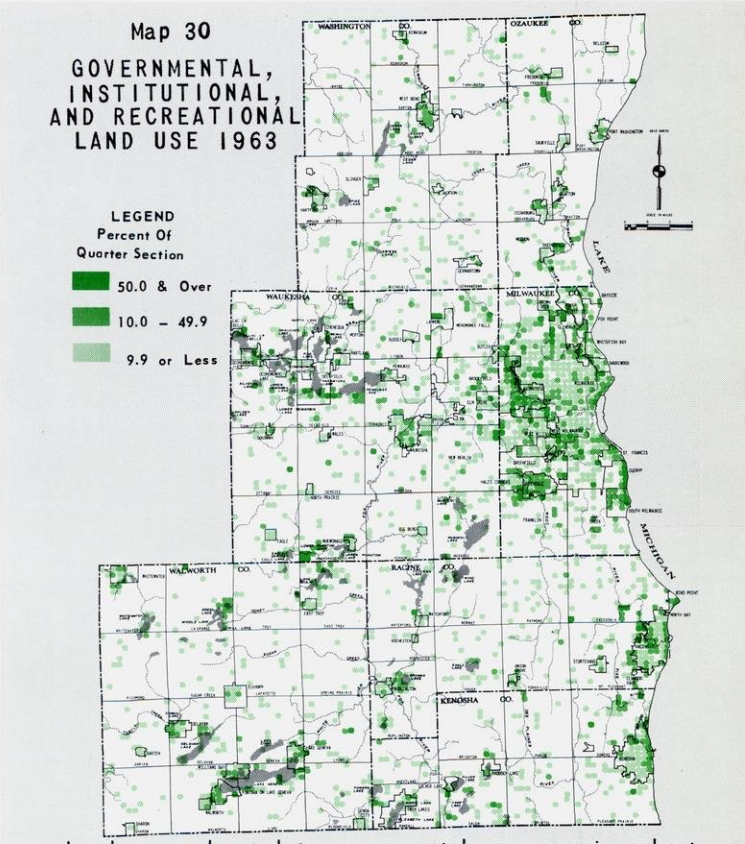
Table 48

DISTRIBUTION OF TRANSPORTATION, UTILITIES, AND COMMUNICATION LAND USES IN THE REGION BY COUNTY - 1963

County	Acres	Percent	Percent of County Area
Kenosha	8,798	8.8	4.9
Milwaukee	32,383	32.4	20.9
Ozaukee	7,199	7.2	4.8
Racine	11,557	11.5	5.3
Walworth	10,882	10.9	2.9
Washington	10,533	10.5	3.8
Waukesha	18,701	18.7	5.0
Region	100,053	100.0	---

Source: SEWRPC.

Table 49 details the acreage devoted to these land use categories by county, and Map 30 shows the spatial distribution thereof. Milwaukee and Waukesha counties together account for more than 64 percent of the total land area within the Region devoted to governmental and institutional uses and nearly 60 percent of the total land area devoted to active recreational uses. There are 78.2 percent, or 29,271 acres, of the 37,424 acres within the Region devoted to this land use category which are oriented towards Region-serving activities. This is not surprising when the land-consuming nature of such uses as golf courses, cemeteries, and military installations are considered.



Land areas devoted to governmental use comprise about one-third of this land use category; the remainder being devoted to active recreation such as park areas. Milwaukee County has nearly 40 percent of the total recreational land within the Region.

Table 49

DISTRIBUTION OF GOVERNMENTAL, INSTITUTIONAL, AND ACTIVE RECREATIONAL LAND USES IN THE REGION BY COUNTY - 1963

County	Governmental & Institutional Use		Active Recreational Use		
	Acres	Percent	Acres	Percent	Percent of County Area
Kenosha	956	7.2	2,234	9.3	1.3
Milwaukee	6,313	47.5	9,107	37.7	5.9
Ozaukee	718	5.4	1,386	5.7	0.9
Racine	1,353	10.2	2,173	9.0	1.0
Walworth	984	7.4	2,900	12.0	0.8
Washington	687	5.2	1,217	5.1	0.4
Waukesha	2,275	17.1	5,121	21.2	1.4
Region	13,286	100.0	24,138	100.0	---

Source: SEWRPC.

Woodlands and Open Lands

This land use category includes all land areas presently containing trees or heavy brush; lands which are not presently devoted to urban use, cropped, or grazed; and land areas presently devoted to such temporary uses as open pits for trash or garbage disposal, and quarries either operating or nonoperating. There are presently 176,018 acres of land, or 10.3 percent of the regional total, devoted to this land use category. Approximately 75 percent of this area is devoted to woodlands, and most of the remaining 25 percent is in the open lands category. Only 4 percent, or 7,800 acres, are classified as quarries or pits. The amount of land within the Region devoted to this land use category is given in Table 50 by county. Waukesha County has the largest amount of land in this use category with 44,319 acres or 25.2 percent of the total, while Walworth County ranks second and Washington County third. The large size of these counties, the generally scattered urban development patterns, and the presence of large tracts of wooded lands within, and adjacent to, the Kettle Moraine State Forest all contribute to the high rank order of these counties. The spatial distribution of this land use category is shown on Map 31. The presence of the Kettle Moraine State Forest in Walworth, Waukesha, and Washington counties is readily apparent on this map as are the Sugar Creek Valley, the Turtle Creek Valley, and the Lake Geneva area in Walworth County. In Kenosha County the

Table 50

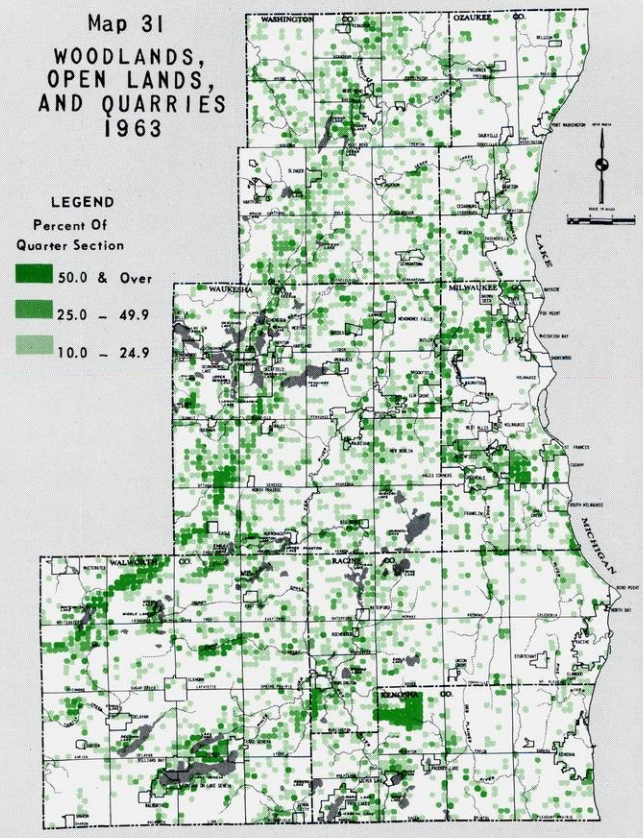
DISTRIBUTION OF WOODLANDS AND OPEN LAND ACREAGE IN THE REGION BY COUNTY - 1963

County	Acres	Percent
Kenosha	17,015	9.7
Milwaukee	18,819	10.7
Ozaukee	10,498	5.9
Racine	17,007	9.7
Walworth	37,531	21.3
Washington	30,828	17.5
Waukesha	44,320	25.2
Region	176,018	100.0

Source: SEWRPC.

Map 31

WOODLANDS, OPEN LANDS, AND QUARRIES 1963



Significant concentrations of woodlands are located in the Kettle Moraine State Forest and several stream valley areas. The abandoned Bong Air Force Base is clearly identifiable as an open land area.

Table 51

DISTRIBUTION OF WATER AND WETLAND ACREAGE IN THE REGION BY COUNTY - 1963

County	Acres	Percent
Kenosha	19,650	11.0
Milwaukee	4,257	2.4
Ozaukee	15,056	8.4
Racine	17,059	9.5
Walworth	38,324	21.4
Washington	35,139	19.6
Waukesha	49,573	27.7
Region	179,058	100.0

Source: SEWRPC.

presence of the abandoned Bong Air Force Base is clearly evident, and in Milwaukee County many former agricultural areas appear as clusters of open land awaiting conversion to urban use.

Water and Wetlands

The water and wetland land use category includes: all inland lakes excluding Lake Michigan; all streams, rivers, and canals over 50 feet in width; open lands which are intermittently covered with water or which are wet due to a high water table.

Presently there are 179,058 acres of water and wetland areas in the Region, as shown in Table 51; and over 27 percent of this total is located in Waukesha County. Milwaukee County contains only 4,257 acres of water and wetland area, or 2.4 percent of the total in the Region. This reflects the extensive urban development in this county and the accompanying land fill operations and drainage improvements.

The spatial distribution of water and wetlands in the Region is shown on Map 32, which clearly indicates the presence of inland lakes, rivers, and streams, together with the flood plains adjoining these waterways, and large wetland areas such as the Cedarburg Bog in Ozaukee County, the Vernon and Menomonee marshes in Waukesha County, and scattered pockets of wetlands in the Kettle Moraine State Forest.

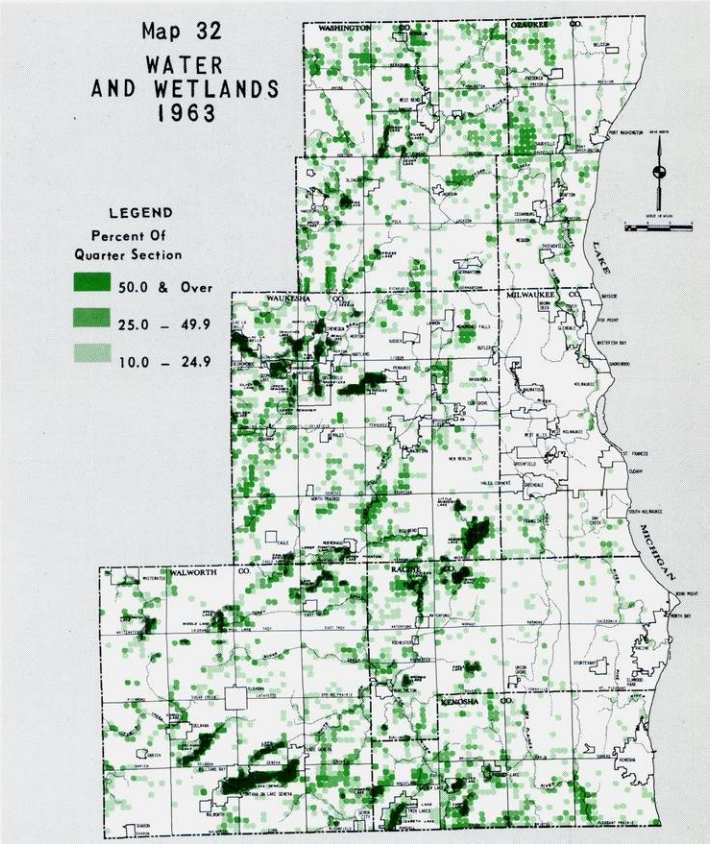
Water and wetland areas have had an important influence on urban development within the Region, and this influence must receive careful consideration in the preparation of alternative land use plans. Factors to be considered in this respect include: the manner in which wetlands act as flood water storage and retention reservoirs and ground water recharge areas; the rate at which streams and lakes are able to assimilate pollutants of various kinds; the suitability of wetland areas as a wildlife habitat; the extent to which these areas are attractive to urban uses; and the amount and variety of land uses in the immediate area.

Agricultural Land Use

The agricultural land use category includes: all croplands, pasturelands,orchards, nurseries, and fowl and fur farms. Farm dwelling sites were classified as residential land and assigned a site area of 20,000 square feet. All other farm buildings were included in the agricultural land use.

Agriculture is the singularly largest land use in the Region, and 63 percent of the total area of the Region is devoted to this use. This land use activity, comprised principally of dairy, livestock, and field crop farms, presently provides employment for more than 12,000 workers and produces more than 84 million dollars worth of income. The average farm size in the Region is 125 acres, which is somewhat smaller than the state average of 161 acres.[11]

[11] Compiled from SEWRPC Planning Report No. 3, The Economy of Southeastern Wisconsin.



Comprising more than 10 percent of the total area of the Region, lake and marsh areas are an important element of the resource base, providing opportunities for outdoor recreation and contributing to the ecological balance of the Region in many important ways.

Table 52

DISTRIBUTION OF AGRICULTURAL LAND USE IN THE REGION BY COUNTY - 1963

County	Acres	Percent
Kenosha	116,391	10.7
Milwaukee	35,121	3.3
Ozaukee	105,199	9.7
Racine	153,636	14.2
Walworth	266,251	24.5
Washington	192,271	17.7
Waukesha	216,275	19.9
Region	1,085,144	100.0

Source: SEWRPC.

Table 52 indicates the distribution of farmland within the Region by county. Walworth County ranks first in the quantity of agricultural land use, with 71.9 percent of its area presently devoted to agricultural use and 24.5 percent of the total regional agricultural land. Waukesha County ranks second, and Washington County third in this respect. Highly urbanized Milwaukee County still contains approximately 35,000 acres of agricultural land, or 3.3 percent of the regional total. Nearly all of this agricultural land is located in the cities of Franklin and Oak Creek and in the northwestern corner of the City of Milwaukee.

The spatial distribution of agricultural land is shown on Map 33. Major concentrations of agricultural land use occur in northeastern Ozaukee County, in central and southwestern Walworth County, and in east-central Racine and Kenosha counties. Other more scattered concentrations occur in Waukesha and Washington counties. Milwaukee County has only a few intensively farmed quarter sections remaining.

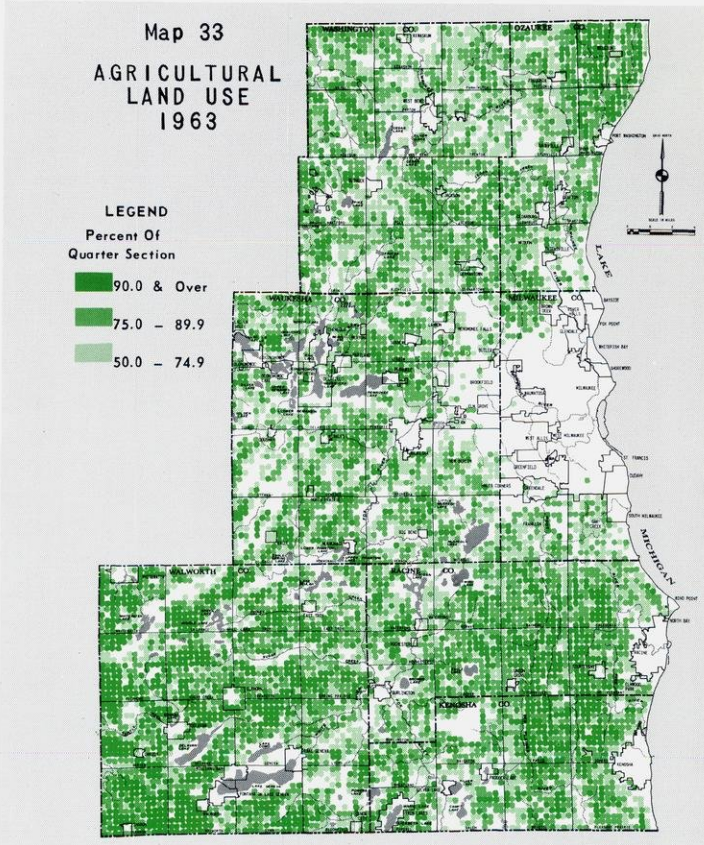
The spatial distribution of existing agricultural land uses requires careful evaluation in light of detailed soil survey data. The relationship of current agricultural uses to good agricultural soils should be an important consideration in the development of alternative regional land use arrangements. Most urban development occurs at the expense of agricultural land; and if agriculture is to be maintained within the Region for economic, environmental, and aesthetic reasons, careful attention will have to be given to the preservation of those existing agriculture uses which occur on good agricultural soil areas.

SUMMARY

This chapter has described the historic development of the Region and the existing land use pattern which is the product of that historic development. Certain findings having particular significance for regional land use and transportation planning are evident. These include:

1. Although urban development within the Region has been continuous since 1850, the character of this development has changed dramatically since 1950. Compact, concentric urban development has been supplanted by a diffused pattern of areawide sprawl; and in the past 13 years, a 35 percent increase in population has been accompanied by a 146 percent increase in land devoted to urban use. The direction and nature of this growth supports the thesis that a continuous band of urban development is being created within the Region from the state line north to Port Washington and from the Lake Michigan shore west into the Fox River Valley.

2. The spread of urban development within the Region has been accompanied by marked



Nearly two-thirds of the land in the Region is used for agriculture. These land areas provide employment for more than 12,000 workers and produce more than $80 million worth of products annually.

reductions in urban population densities, which declined from over 11,300 persons per square mile in 1920 to slightly more than 4,800 persons per square mile in 1963. These decreased densities, particularly as a product of scattered, large lot land subdivision, have had important impacts on the amounts of land devoted to other urban and non-urban uses.

3. The high speed, all-weather highway has had a marked influence on the spatial location of urban development within the Region; but this influence has been significantly modified by the location and quality of resource amenities. Continued demands for the conversion of high value resource areas to urban uses, as highway facilities continue to improve, may, in the absence of sound land use planning, create severe environmental problems which will be costly if not impossible to alleviate.

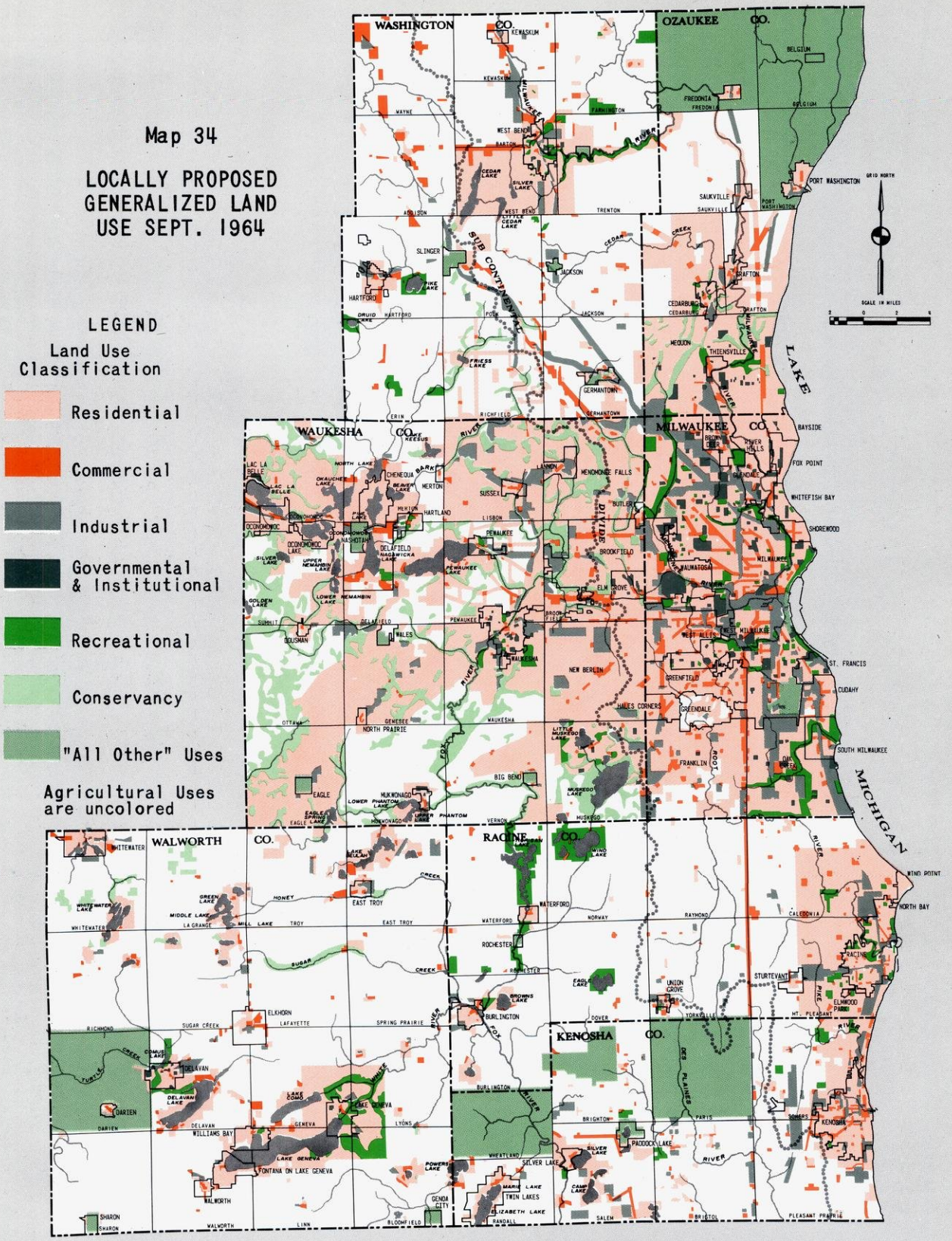
4. Urban land uses presently occupy approximately 340 square miles, or approximately 16 percent of the total area of the Region; and the greatest proportion of this urban land is devoted to residential use, while transportation, communication, and utilities rank second. Non-urban land uses presently occupy approximately 84 percent of the total area of the Region, and the greatest proportion of this land is devoted to agricultural use. If regional development trends continue as in the recent past, between 10 and 15 square miles of rural land will be converted to urban use each year.

5. The total land area presently devoted to commercial, manufacturing, and wholesaling functions within the Region amounts to only 21.8 square miles, or 0.8 percent of the total area of the Region. Yet this small area provides the basis for more than 83 percent of the jobs in the Region.

6. The major concentrations of agricultural land uses require careful consideration in land use and transportation planning if agriculture is to be maintained within the Region as an economic, environmental, and aesthetic asset. Evaluation of the relation of the remaining large agricultural use concentrations to good agricultural soils will provide an important contribution to deliberation concerning areawide land use development.

Map 34

LOCALLY PROPOSED GENERALIZED LAND USE SEPT. 1964



The land use proposals of the 146 communities in the Region, when mapped together, present an interesting picture of how southeastern Wisconsin would develop in accord with local objectives. It is apparent that the more recent pattern of area-wide urban development is intended to be continued by many communities.

Chapter VI

COMMUNITY PLANS AND ZONING

INTRODUCTION

An understanding of local community development objectives and of the effects these objectives may have upon regional development is essential to the formulation of practical regional land use and transportation plans. Local land use plans and zoning ordinances, if adopted in accordance with the Wisconsin Statutes, probably represent the best available expression of these objectives. Some local land use plans contain an explicit expression of the community development objectives underlying the plans. Where such explicit expression is omitted, it may be reasonably assumed that the community development objectives are implicit in the plan proposals.

The land use plan is defined as a graphic expression of proposals for future use of land throughout a community and its immediate environs. The zoning ordinance and its accompanying district map constitute one of the most important legal devices used to implement the land use plan. In practice, however, zoning often precedes the formulation of a land use plan; and many communities within the Region have prepared zoning ordinances and district maps without prior preparation and adoption of long-range land use plans. In such situations the zoning ordinance and district map become a substitute for the necessary long-range land use plan and, together with other plan implementation devices, such as subdivision control and official map ordinances, must bear the full weight of guiding and shaping the physical development of the community. In the absence of a land use plan, the zoning ordinance and map, therefore, become the best available expression of current local community development objectives.

Knowledge of local community plans and zoning, viewed in a regional context, thus becomes an important basis for synthesizing and testing alternative regional land use and transportation plan proposals. The need for recognizing and incorporating local development objectives in the regional planning effort to the maximum extent possible is particularly important in view of the advisory nature of regional planning. To be viable, regional plans must be designed to fulfill, wherever possible, local as well as regional development objectives and, therefore, be more readily accepted and implemented by local communities.

This chapter contains a brief description of the procedures followed in, and the findings of, an extensive inventory of the existing land use plans, zoning ordinances, and district maps of the 153 local units of government in the Region. The changes in land use that would occur within the Region if the development proposals expressed in the local land use plans and zoning ordinances were fully carried out are analyzed and significant relationships identified.

COMMUNITY PLANS AND ZONING INVENTORY

The SEWRPC, as a part of its previous work program, had conducted a survey of the status of local planning within the Region.[1] As a part of this survey, all available local plan documents were assembled, including land use plans and zoning ordinances and district maps. In order to meet regional land use-transportation study needs, this information was carefully analyzed. All local land use plan and zoning district categories were identified and the relevant land use development objectives abstracted. A regional land use and zoning district classification system was then developed which could be used to reduce the many local land use plans and zoning district maps to a common, uniform, areawide basis, suitable for regional planning analysis. This classification system is set forth in Appendix E, Table A 4.It not only permits analyses of the local planning data for regional planning purposes without losing locally established density patterns but also permits individual communities within the Region to analyze local land use and zoning proposals in light of areawide land use demands. The classification system is compatible with the land use classifications to be used in the SEWRPC regional land use plan preparation and recognizes existing standards

[1] See SEWRPC Planning Guide No. 4, Organization of Planning Agencies, June 1964.

established for sanitary sewer and water service at varying development densities (see Map 34).

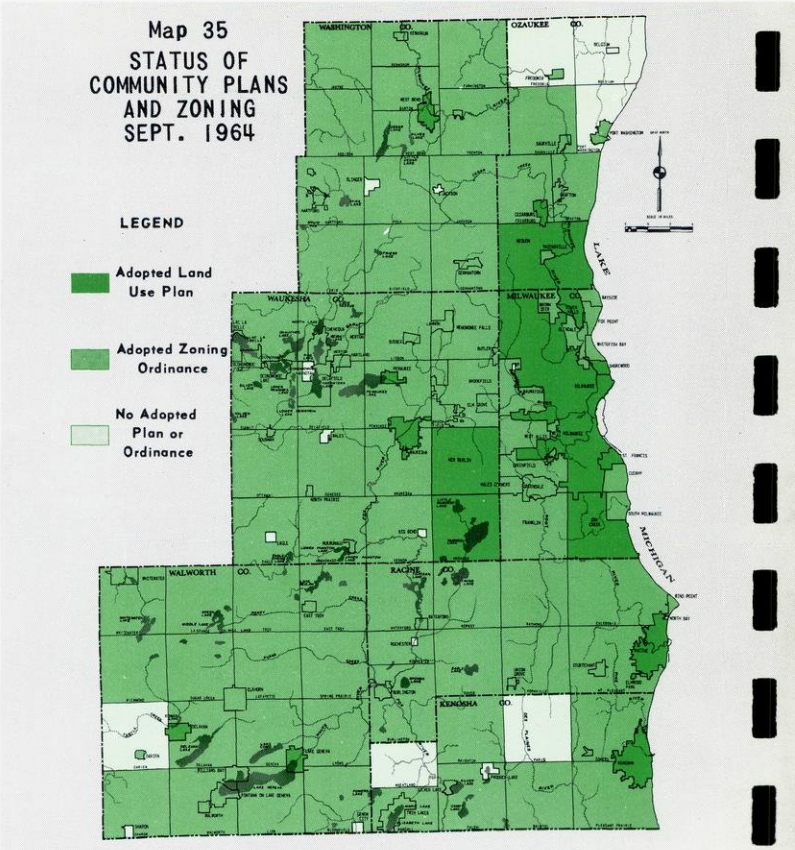
All adopted local land use plan and zoning district categories were converted to the regional classification system and their boundaries delineated on SEWRPC 1" = 4000' scale county base maps. On these maps differentiation was made between those land use plans that had been adopted pursuant to Wisconsin Statute and those which had been prepared but not so adopted.[2] Land use plans which extended beyond the 1963 corporate limits lines of the community preparing the plan were mapped only where the unincorporated area affected did not have its own land use plan or zoning ordinance. Wherever the extraterritorial jurisdictions of two or more communities overlapped, the area so affected was divided on a line, all points of which were equidistant from the boundaries of each municipality concerned. This resulted in a composite map which depicted no more than one set of local land use development objectives for any given area within the Region.

The land use planning and zoning information so mapped was then quantified by U. S. Public Land Survey quarter section within minor civil divisions, and the areas devoted to each category measured as of September 1964. These results were tabulated and transferred to punch cards for machine processing and analysis. A composite map of these community plans and zoning districts was then prepared on a SEWRPC 1" = 8000' scale regional base map.

INVENTORY FINDINGS

General

The inventory revealed that only 26, or 18 percent, of the 146 cities, villages, and towns within the Region had prepared land use plans. Of these 26 local land use plans, only 15 had been formally adopted by the local municipality pursuant to State Statute. Of the 15 adopted plans, only 3 were prepared for an established target date. Combined, the adopted land use plans cover an area of 491 square miles, or 18.2 percent of the total area of the Region. These 15 adopted land use plans had been prepared primarily for municipalities of an urban type (see Map 35), and the limits of these plans were found to be generally quite widely separated by unplanned lands.



Of the 146 cities, villages, and towns within the Region, 15 have adopted land use plans, 129 have adopted comprehensive zoning ordinances, and 15 of the remaining 17 have adopted interim zoning ordinances.

The inventory further found that 129, or 88 percent, of the 146 cities, villages, and towns within the Region have adopted a zoning ordinance and district map. Fifteen of the remaining 17 municipalities have adopted interim zoning ordinances or are presently in the process of preparing a comprehensive zoning ordinance. Only two communities within the Region are presently unzoned and have taken no action toward the preparation of a zoning ordinance.

In some communities which had both an adopted land use plan and a zoning ordinance, it was found that the zoning ordinance was not being used to implement the land use plan. In fact, in some cases the zoning ordinance actually permitted uses incompatible with the uses expressed in the plan and in many cases permitted significantly higher densities than those expressed in the plan.[3]

The inventory also revealed that the zoning districts lying along corporate limits lines were often

[2] Where a land use plan had been prepared and not adopted pursuant to Statute, the zoning ordinance and district map were used for tabulation and analysis.

[3] In these cases the adopted land use plan was used for the purposes of this study as the better expression of long-range development objectives.

Table 53

EXISTING[a] AND PROPOSED[b] LAND USE
BY URBAN DEVELOPMENT AREA IN THE REGION

Land Use	Land Area Inside 1963 Urban Development Ring				Land Area Outside 1963 Urban Development Ring				Total Land Area			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Residential	123,711	56.9	152,518	70.1	35,192	2.4	297,619	19.8	158,903	9.2	450,137	26.2
Commercial	6,642	3.1	13,151	6.0	1,311	0.1	18,365	1.2	7,953	0.5	31,516	1.8
Industrial	8,803	4.1	20,610	9.5	2,594	0.2	49,869	3.3	11,397	0.7	70,479	4.1
Governmental[c]	14,782	6.8	8,602	4.0	3,613	0.2	2,097	0.2	18,395	1.1	10,699	0.6
Recreational	10,503	4.7	8,734	4.0	14,031	0.9	22,563	1.5	24,534	1.4	31,297	1.8
Agricultural	17,394	8.0	4,903	2.3	1,098,046	73.0	885,880	58.9	1,115,440	64.8	890,783	51.8
All Other	35,666	16.4	8,983	4.1	348,718	23.2	227,112	15.1	384,384	22.3	236,095	13.7
Total	217,501	100.0	217,501	100.0	1,503,505	100.0	1,503,505	100.0	1,721,006	100.0	1,721,006	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

[c] *Includes institutional uses.*

incompatible between communities and that the local zoning district maps often did not reflect the probable impact of adjacent zoning districts in neighboring communities. Other common inconsistencies showed state-owned lands intended for recreational and related open-space uses zoned for agricultural, residential, or commercial instead of recreational use. Federally-owned lands were often found to be zoned for agricultural use or left entirely unzoned.

Analysis of the district use regulations accompanying the zoning district maps indicated that certain zoning districts permitted land uses quite different from those implied by the district title. For example, the use of "recreational" districts around inland lakes implies that the areas so zoned are intended primarily for recreational use. Analysis of the ordinance regulations covering such districts, however, revealed that in many cases such districts were really intended to permit ordinary residential development around inland lake areas. Similarly, many agricultural districts were found not only to permit areawide residential development but actually to permit such development at higher densities than corresponding residential districts in the same local ordinance.

Proposed Land Uses

In order to assess properly the areawide effects of the long-range land use development objectives implicit in the locally prepared and adopted land use plans and zoning ordinances, it was necessary to provide a uniform basis of comparison between existing and proposed land uses. The principal adjustment required to render existing land use comparable to proposed land use, as expressed in local community plans and zoning ordinances, was to allocate existing street, highway, and off-street parking acreages to their principal associated uses. In addition, the 15 categories of the

Table 54

CHANGE IN EXISTING LAND USE AS IMPLIED IN THE COMMUNITY PLANS
AND ZONING ORDINANCES IN THE REGION

Land Use	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Residential	28,807	23	262,427	746	291,234	183
Commercial	6,509	98	17,054	1,301	23,563	296
Industrial	11,807	134	47,275	1,822	59,082	518
Governmental*	- 6,180	- 42	- 1,516	- 42	- 7,696	- 42
Recreational	- 1,769	- 17	8,532	61	6,763	28
Agricultural	-12,491	- 72	-212,166	- 19	-224,657	- 20
"All other uses"	-26,683	- 75	-121,606	- 35	-148,289	- 39

* *Includes institutional.*

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.

Table 55

EXISTING[a] AND PROPOSED[b] RESIDENTIAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Residential Land Inside 1963 Urban Development Ring				Residential Land Outside 1963 Urban Development Ring				Total Residential Land			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	10,962	8.9	11,325	7.4	3,084	8.7	10,548	3.6	14,046	8.8	21,873	4.9
Milwaukee	49,734	40.2	63,963	42.0	7,561	21.8	31,660	10.7	57,295	36.1	95,623	21.2
Ozaukee	6,090	4.9	7,318	4.8	4,315	12.2	37,749	12.6	10,405	6.5	45,067	10.0
Racine	12,333	10.0	16,336	10.7	3,741	10.5	18,432	6.2	16,074	10.1	34,768	7.7
Walworth	9,072	7.3	11,615	7.6	4,874	13.8	24,177	8.1	13,946	8.8	35,792	8.0
Washington	4,467	3.6	4,467	2.9	3,939	11.2	26,773	9.0	8,406	5.3	31,240	7.0
Waukesha	31,053	25.1	37,494	24.6	7,678	21.8	148,280	49.8	38,731	24.4	185,774	41.2
Region	123,711	100.0	152,518	100.0	35,192	100.0	297,619	100.0	158,903	100.0	450,137	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

regional land use and zoning district classification system and the nine major categories of the existing land use classification system were each regrouped into seven reasonably comparable categories. Furthermore, all seven categories of both existing and proposed land uses were measured and tabulated separately, by county, for the areas lying inside and outside of the 1963 urban growth ring, as delineated in the historic development inventory. This was done in order to provide an analytical perspective of the spatial distribution of existing and proposed land use.

The spatial distribution of future land uses within the Region, as proposed by the locally prepared and adopted land use plans and zoning ordinances, is shown on Map 34. This map provides a generalized picture of land use within the Region as it would exist if all the currently adopted local land use plans and zoning ordinances were carried out. Table 53 provides a quantitative comparison of existing and proposed land uses both inside and outside of the 1963 limits of urban development within the Region. Table 54 indicates the changes which would occur within the Region if local development proposals are carried out.

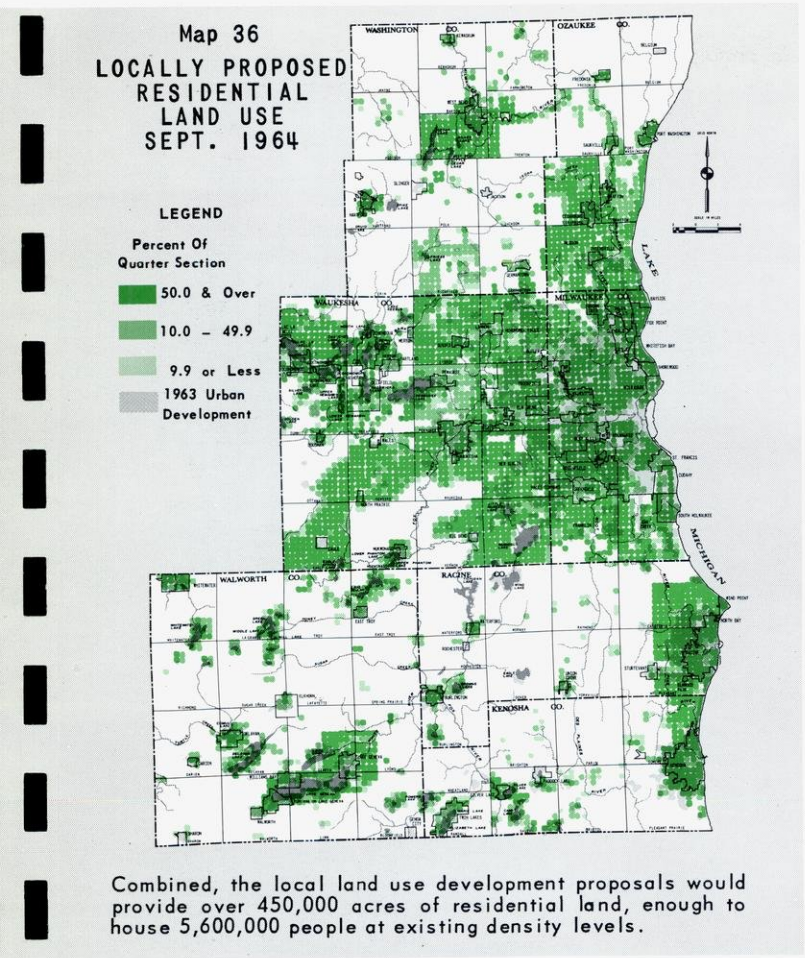
Within the present limits of urban development, the largest absolute increase would occur in the residential land use category, in which 28,807 acres of new development are proposed. This change represents an increase of 23 percent over existing residential acreage. The largest percentage increase within the present limits of urban development would occur in the industrial land use category, in which 11,807 acres of new development are proposed, an increase of 134 percent over the existing industrial acreage. The largest absolute decrease would occur in the "all other uses" category, in which a conversion of 26,683 acres is proposed, a 75 percent decrease. This category includes such land use as: woodlands and wetlands, other open lands, water, and all transportation,

Table 56

CHANGES IN EXISTING RESIDENTIAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN THE COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	363	3	7,464	242	7,827	56
Milwaukee	14,229	29	24,099	319	38,328	67
Ozaukee	1,228	20	33,434	776	34,662	333
Racine	4,003	32	14,691	493	18,694	116
Walworth	2,543	28	19,303	396	21,846	157
Washington	---	---	22,834	580	22,834	272
Waukesha	6,441	21	140,602	1,831	147,043	380
Region	28,807	23	262,427	746	291,234	183

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.



Combined, the local land use development proposals would provide over 450,000 acres of residential land, enough to house 5,600,000 people at existing density levels.

communication, and utility uses except streets, highways, and off-street parking.

Within the presently rural areas of the Region, the largest absolute increase would also occur in the residential land use category, in which 262,427 acres of new development are proposed, an increase of 746 percent. The largest percentage increase would occur in the industrial land use category, in which 47,275 acres of new development are proposed, a 1,822 percent increase over the existing acreage. Commercial acreage is proposed to be increased by 17,054 acres of new development, an increase of 1,301 percent over the existing acreage. As might be expected, the largest absolute decrease would occur in the agricultural land use category in which a conversion, primarily to urban uses, of 212,166 acres is proposed, a 19 percent decrease.

For the Region as a whole, the land use changes proposed by the community plans and zoning ordinances would increase the stock of residential land by 291,234 acres, or 183 percent;[4] the stock of commercial land by 23,563 acres, or 296 percent; the stock of industrial land by 59,082 acres, or 518 percent; and the stock of recreational land by 6,763 acres, or 28 percent. To accomplish these increases, the proposed changes call for a decrease in the stock of agricultural land by 224,657 acres, or 20 percent; the stock of governmental and institutional land by 7,696 acres, or 42 percent; and a decrease in the "all other uses" category by 148,289 acres, or 39 percent.

Residential Land Use

The residential land use category includes all existing or proposed residential land uses, together with the associated supporting street and highway areas. Table 55 provides a comparison of existing

[4] The proposed residential land use would contain 255,057 acres of low-density development, 147,205 acres of medium-density development, and 47,875 acres of high-density development.

Table 57

EXISTING[a] AND PROPOSED[b] COMMERCIAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Commercial Land Inside 1963 Urban Development Ring				Commercial Land Outside 1963 Urban Development Ring				Total Commercial Land			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	494	7.4	1,560	11.9	85	6.5	1,695	9.2	579	7.3	3,255	10.3
Milwaukee	3,463	52.2	5,591	42.5	523	39.9	1,439	7.8	3,986	50.1	7,030	22.3
Ozaukee	288	4.3	574	4.3	87	6.7	1,375	7.5	375	4.7	1,949	6.2
Racine	622	9.4	1,236	9.4	201	15.3	2,022	11.0	823	10.3	3,258	10.3
Walworth	441	6.6	851	6.5	209	15.9	2,015	11.0	650	8.2	2,866	9.1
Washington	222	3.3	715	5.4	81	6.2	6,793	37.0	303	3.8	7,508	23.8
Waukesha	1,112	16.8	2,624	20.0	125	9.5	3,026	16.5	1,237	15.6	5,650	18.0
Region	6,642	100.0	13,151	100.0	1,311	100.0	18,365	100.0	7,953	100.0	31,516	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

Table 58

CHANGES IN EXISTING COMMERCIAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,066	216	1,610	1,894	2,676	462
Milwaukee	2,128	61	916	175	3,044	76
Ozaukee	286	99	1,288	1,480	1,574	420
Racine	614	99	1,821	906	2,435	296
Walworth	410	93	1,806	864	2,216	341
Washington	493	222	6,712	8,268	7,205	2,378
Waukesha	1,512	136	2,901	2,321	4,413	357
Region	6,509	98	17,054	1,301	23,563	296

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.

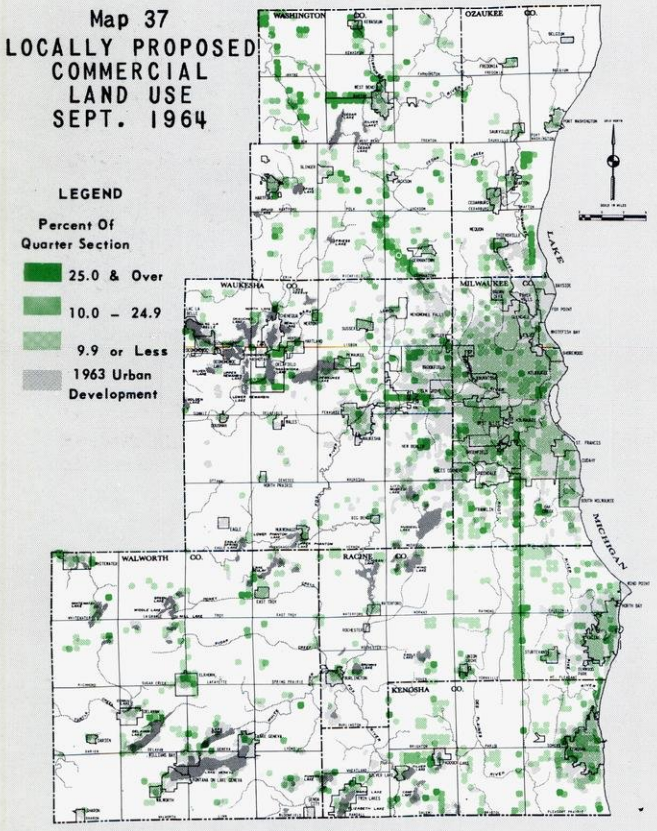
and proposed residential land use, by county, for the areas inside and outside of the present limits of urban development within the Region. Table 56 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 36 shows the future spatial distribution of residential land in the Region as proposed in the adopted local land use plans and zoning ordinances.

The amount of additional residential land planned for development by local communities in the Region is 291,234 acres, or 183 percent more than existed in 1963.[5] More than 90 percent of this increase would occur outside the present limits of urban development. The largest increase is expected to occur in Waukesha County, where a gain

[5] This does not include use districts such as some agricultural districts which may permit residential development.

Map 37

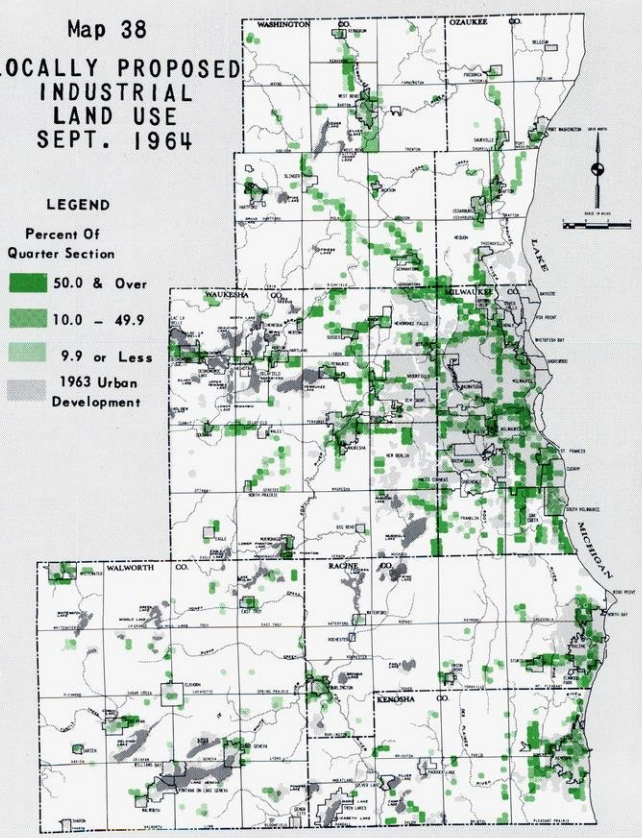
LOCALLY PROPOSED COMMERCIAL LAND USE SEPT. 1964



Combined the local land use development proposals would provide more than 31,000 acres of commercial land, enough to employ over 800,000 workers, or four times the present level, at existing employee-use ratios.

Map 38

LOCALLY PROPOSED INDUSTRIAL LAND USE SEPT. 1964



Combined, the local land use development proposals would provide more than 70,000 acres of industrial land within the Region, enough to employ over 1,700,000 workers, at eight times the present level, at existing employee-use ratios.

Table 59

EXISTING[a] AND PROPOSED[b] INDUSTRIAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Industrial Land Inside 1963 Urban Development Ring				Industrial Land Outside 1963 Urban Development Ring				Total Industrial Land			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	819	9.3	2,001	9.7	95	3.7	5,492	11.0	914	8.0	7,493	10.6
Milwaukee	5,607	63.7	12,095	58.7	1,099	42.4	11,562	23.2	6,706	58.8	23,657	33.6
Ozaukee	299	3.4	674	3.3	84	3.2	3,125	6.3	383	3.4	3,799	5.4
Racine	828	9.4	2,759	13.4	148	5.7	2,605	5.2	976	8.6	5,364	7.6
Walworth	265	3.0	673	3.2	543	20.9	2,643	5.3	808	7.1	3,316	4.7
Washington	318	3.6	636	3.1	149	5.7	7,369	14.8	467	4.1	8,005	11.4
Waukesha	667	7.6	1,772	8.6	476	18.4	17,073	34.2	1,143	10.0	18,845	26.7
Region	8,803	100.0	20,610	100.0	2,594	100.0	49,869	100.0	11,397	100.0	70,479	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

of 147,043 acres, or 380 percent, is planned. Milwaukee County would decrease its relative share of regional residential use from 36.1 percent to 21.2 percent. Waukesha County would increase its relative share from 24.4 percent to 41.2 percent.

Commerical Land Use

This land use category includes all existing or proposed retail commercial and service uses, together with associated supporting street and highway and off-street parking areas. Table 57 provides a comparison of existing and proposed commercial land use, by county, for the areas inside and outside the present limits of urban development within the Region. Table 58 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 37 shows the future spatial distribution of commercial land in the Region as proposed in the adopted local land use plans and zoning ordinances.

The amount of additional commercial land planned for development by local communities in the Region is 23,563 acres, or 296 percent more than existed in 1963. More than 72 percent of this increase would occur outside the present limits of urban development. The largest increase would occur in Washington County, where a gain of 7,205 acres, or 2,378 percent, is planned. Most of this increase would occur along the major transportation routes. Milwaukee County would decrease its relative share of commercial land from 50.1 percent to 22.3 percent. Washington County would increase its share from 3.8 percent to 23.8 percent. Racine County would not, in spite of an absolute acreage increase, experience a change in its relative share of 10.3 percent of the commercial land in the Region.

Industrial Land Use

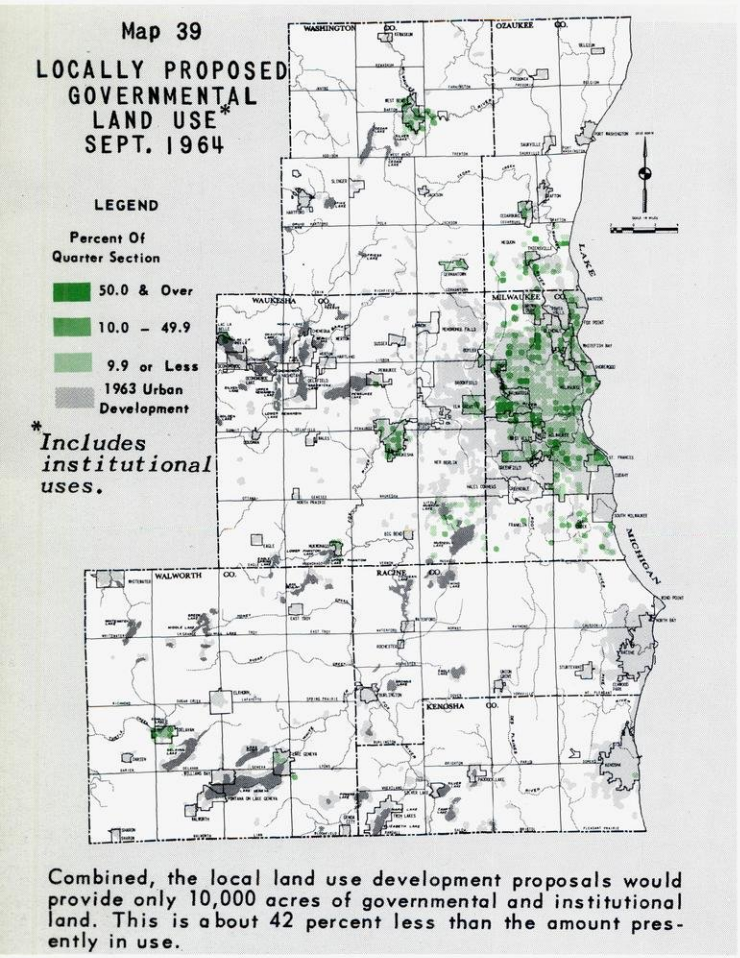
This land use category includes all existing or proposed manufacturing, wholesaling, and storage

Table 60

CHANGES IN EXISTING INDUSTRIAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,182	144	5,397	5,681	6,579	720
Milwaukee	6,488	116	10,463	952	16,951	253
Ozaukee	375	125	3,041	3,620	3,416	892
Racine	1,931	233	2,457	1,660	4,388	450
Walworth	408	154	2,100	387	2,508	310
Washington	318	100	7,220	4,846	7,538	1,614
Waukesha	1,105	166	16,597	3,487	17,702	1,549
Region	11,807	134	47,275	1,822	59,082	518

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.



Combined, the local land use development proposals would provide only 10,000 acres of governmental and institutional land. This is about 42 percent less than the amount presently in use.

uses, together with associated supporting street and highway and on-site parking areas. Table 59 provides a comparison of existing and proposed industrial land use, by county, for areas inside and outside the present limits of urban development within the Region. Table 60 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 38 shows the future spatial distribution of industrial land within the Region as proposed in the adopted local land use plans and zoning ordinances.

The amount of additional industrial land planned for development by local communities in the Region is 59,082 acres, or 518 percent more than existed in 1963. About 80 percent of this increase would occur outside the present limits of urban development. The largest increase would occur in Waukesha County, where a gain of 17,702 acres, or 1,549 percent, is planned. In spite of an absolute gain of 16,951 acres, or 253 percent, Milwaukee County would decrease its relative share of industrial land from 58.8 percent of the regional total to 33.6 percent. Waukesha County would increase its relative share from 10.0 percent to 26.7 percent.

Governmental and Institutional Land Use

This land use category includes all existing or proposed governmental and institutional uses, together with associated supporting street and highway and off-street parking areas. Table 61 provides a comparison of existing and proposed governmental and institutional land use, by county, for areas inside and outside of the present limits of urban development in the Region. Table 62 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 39 shows the future spatial distribution of these uses within the Region as proposed in the locally prepared and adopted land use plans and zoning ordinances.

Table 61

EXISTING[a] AND PROPOSED[b] GOVERNMENTAL AND INSTITUTIONAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Governmental and Institutional Land Inside 1963 Urban Development Ring				Governmental and Institutional Land Outside 1963 Urban Development Ring				Total Governmental and Institutional			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,014	6.8	5	0.1	218	6.0	---	---	1,232	6.7	5	0.1
Milwaukee	8,345	56.5	6,902	80.2	1,346	37.3	895	42.7	9,691	52.7	7,797	72.9
Ozaukee	497	3.4	506	5.9	333	9.2	619	29.5	830	4.5	1,125	10.6
Racine	1,406	9.5	---	---	352	9.7	---	---	1,758	9.6	---	---
Walworth	750	5.1	217	2.6	458	12.7	123	5.9	1,208	6.6	340	3.1
Washington	528	3.5	223	2.5	305	8.5	193	9.2	833	4.5	416	3.8
Waukesha	2,242	15.2	749	8.7	601	16.6	267	12.7	2,843	15.4	1,016	9.5
Region	14,782	100.0	8,602	100.0	3,613	100.0	2,097	100.0	18,395	100.0	10,699	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

Table 62

CHANGES IN EXISTING GOVERNMENTAL AND INSTITUTIONAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

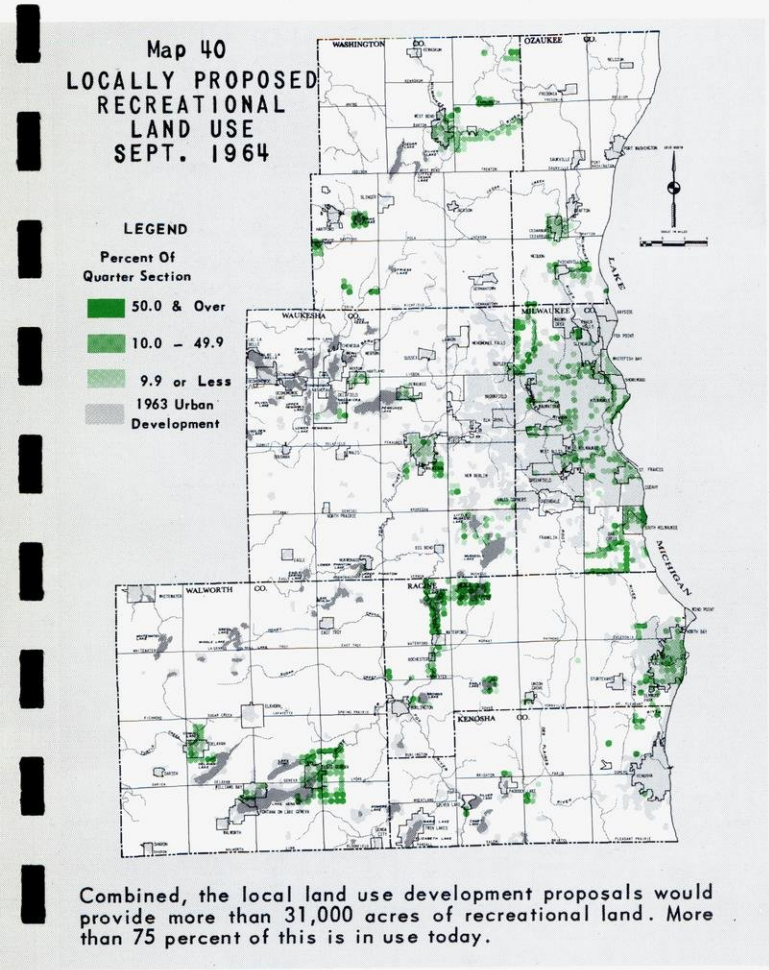
County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	-1,009	-100	- 218	-100	-1,227	-100
Milwaukee	-1,443	- 17	- 451	- 34	-1,894	- 20
Ozaukee	9	2	286	86	295	36
Racine	-1,406	-100	- 352	-100	-1,758	-100
Walworth	- 533	- 71	- 335	- 73	- 868	- 72
Washington	- 305	- 58	- 112	- 37	- 417	- 50
Waukesha	-1,493	- 67	- 334	- 56	-1,827	- 64
Region	-6,180	- 42	-1,516	- 42	-7,696	- 42

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.

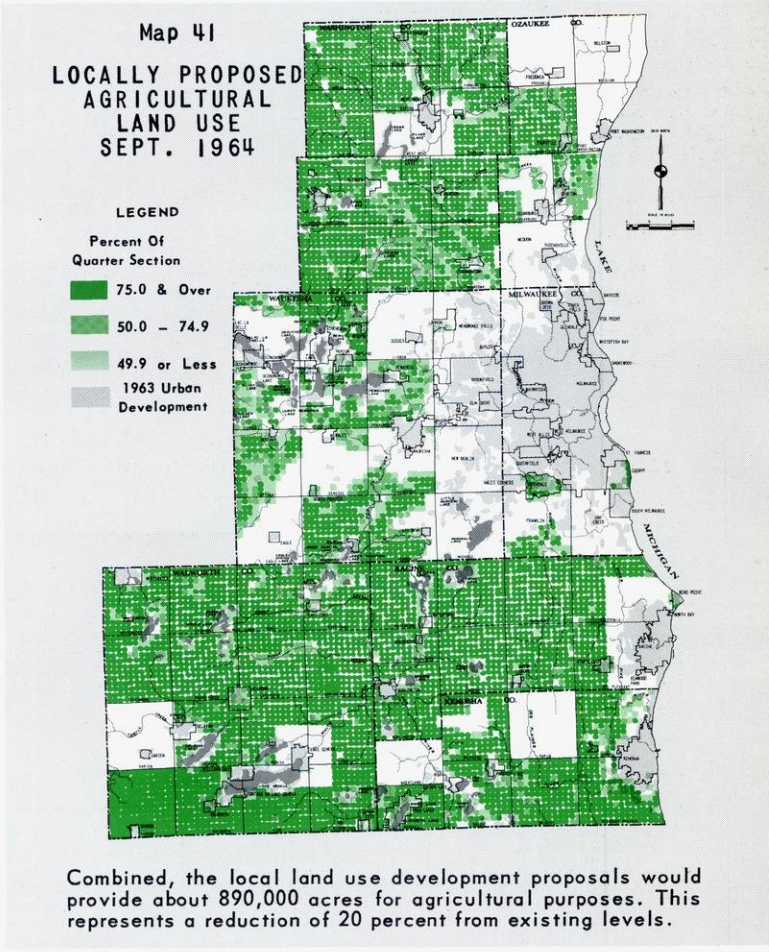
The proposed governmental and institutional acreage in the Region would decrease by 7,696 acres, or 42 percent, if the local plans and zoning proposals were carried out. Many communities, however, particularly those in Racine and Kenosha counties, do not provide a land use plan or zoning district category of this kind but do permit governmental and institutional uses in many of their other zoning districts. Consequently, Milwaukee County would increase its relative share of this land use category from 52.7 percent to 72.9 percent of the regional total.

Recreational Land Use

This land use category includes all existing or proposed recreational land uses, together with associated supporting street and highway areas. Table 63 provides a comparison of existing and



Combined, the local land use development proposals would provide more than 31,000 acres of recreational land. More than 75 percent of this is in use today.



Combined, the local land use development proposals would provide about 890,000 acres for agricultural purposes. This represents a reduction of 20 percent from existing levels.

Table 63

EXISTING[a] AND PROPOSED[b] RECREATIONAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Recreational Land Inside 1963 Urban Development Ring				Recreational Land Outside 1963 Urban Development Ring				Total Recreational Land			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	507	4.8	38	0.4	1,776	12.7	1,299	5.8	2,283	9.3	1,337	4.3
Milwaukee	7,110	67.8	4,452	50.9	2,076	14.8	4,259	18.9	9,186	37.4	8,711	27.8
Ozaukee	296	2.8	211	2.4	1,125	8.0	1,129	5.0	1,421	5.8	1,340	4.3
Racine	1,042	9.9	2,541	29.1	1,162	8.3	5,224	23.2	2,204	9.0	7,765	24.8
Walworth	283	2.7	656	7.6	2,668	19.0	4,793	21.2	2,951	12.0	5,449	17.4
Washington	351	3.3	464	5.3	889	6.3	3,802	16.8	1,240	5.1	4,266	13.6
Waukesha	914	8.7	372	4.3	4,335	30.9	2,057	9.1	5,249	21.4	2,429	7.8
Region	10,503	100.0	8,734	100.0	14,031	100.0	22,563	100.0	24,534	100.0	31,297	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

proposed recreational land use, by county, for the areas inside and outside the present limits of urban development within the Region. Table 64 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 40 shows the future spatial distribution of recreational land within the Region as proposed in the locally prepared and adopted land use plans and zoning ordinances.

In total, 6,763 acres of recreational land would be added to the existing stock of such land within the Region if the local development proposals were carried out, an increase of 28 percent. The largest increase would occur in Racine County, where a gain of 5,561 acres, or 252 percent, is proposed. Washington County would add 3,026 acres, or 244 percent, to its present stock of recreational land; and Walworth County, 2,498 acres, or 85 percent. All other counties would experience a net decrease in recreational land. The largest loss would occur in Waukesha County, where 2,820 acres, or 54 percent, of the existing stock would be changed to some other use.

Agricultural Land Use

This land use category includes all existing or proposed agricultural lands, together with associated supporting street and highway areas. Table 65 provides a comparison of existing and proposed agricultural land uses, by county, for the areas inside and outside the present limits of urban development within the Region. Table 66 indicates the changes which would occur in this land use category within the Region if the local development proposals are carried out. Map 41 shows the future spatial distribution of agricultural land in the Region as proposed in the adopted local land use plans and zoning ordinances.

If local development proposals are carried out, 224,657 acres, or 20 percent, of the existing agri-

Table 64

CHANGES IN EXISTING RECREATIONAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	- 469	- 93	- 477	- 27	- 946	- 41
Milwaukee	-2,658	- 37	2,183	105	- 475	- 5
Ozaukee	- 85	- 29	4	1	- 81	- 6
Racine	1,499	144	4,062	350	5,561	252
Walworth	373	132	2,125	80	2,498	85
Washington	113	32	2,913	328	3,026	244
Waukesha	- 542	- 59	-2,278	- 53	-2,820	- 54
Region	-1,769	- 17	8,532	61	6,763	28

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.

Table 65

EXISTING[a] AND PROPOSED[b] AGRICULTURAL LAND USE BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	Agricultural Land Inside 1963 Urban Development Ring				Agricultural Land Outside 1963 Urban Development Ring				Total Agricultural Land			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,919	11.0	1,721	35.1	117,819	10.7	93,804	10.6	119,738	10.7	95,525	10.7
Milwaukee	4,239	24.5	693	14.1	32,867	3.0	7,236	0.8	37,106	3.3	7,929	0.9
Ozaukee	1,076	6.2	61	1.2	107,465	9.8	32,260	3.6	108,541	9.7	32,321	3.6
Racine	4,926	28.3	1,086	22.1	152,986	13.9	159,788	18.0	157,912	14.2	160,874	18.0
Walworth	390	2.2	530	10.8	270,881	24.7	280,935	31.7	271,271	24.3	281,465	31.6
Washington	700	4.0	377	7.8	197,203	18.0	219,302	24.8	197,903	17.8	219,679	24.7
Waukesha	4,144	23.8	435	8.9	218,825	19.9	92,555	10.5	222,969	20.0	92,990	10.5
Region	17,394	100.0	4,903	100.0	1,098,046	100.0	885,880	100.0	1,115,440	100.0	890,783	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

cultural acreage within the Region would be converted to other uses. The largest decrease would occur in Waukesha County, where a conversion of 129,979 acres, or 58 percent, is proposed. Ozaukee County would lose 76,220 acres, or 70 percent, of its existing agricultural land; Milwaukee County would lose 29,177 acres, or 79 percent; and Kenosha County would lose 24,213 acres, or 20 percent. Washington County would actually increase its stock of agricultural land by 21,776 acres, or 11 percent. Walworth County would also increase its agricultural acreage by 10,194 acres, or 4 percent; and Racine County would increase its agricultural land by 2,962 acres, or 2 percent.

All Other Land Uses

The "all other uses" category includes all existing or proposed land uses which could not be meaningfully compared separately. These include: woodlands; water and wetlands; other open lands; unplanned and unzoned lands; conservancy districts; and all transportation, communication, and utility uses except streets and off-street parking. Table 67 provides a comparison of the existing and proposed "all other uses," by county, for the areas inside and outside the present limits of urban development within the Region. Table 68 indicates the changes which would occur in this category within the Region if the local development proposals are carried out.

Map 42 shows the spatial distribution of one of the more significant land use proposals contained in this category—the conservancy district. The majority of land proposed for this use is located in Waukesha County, where more than 72 percent of the proposed 64,942 acres in this "all other uses" category would be allocated to conservancy use.

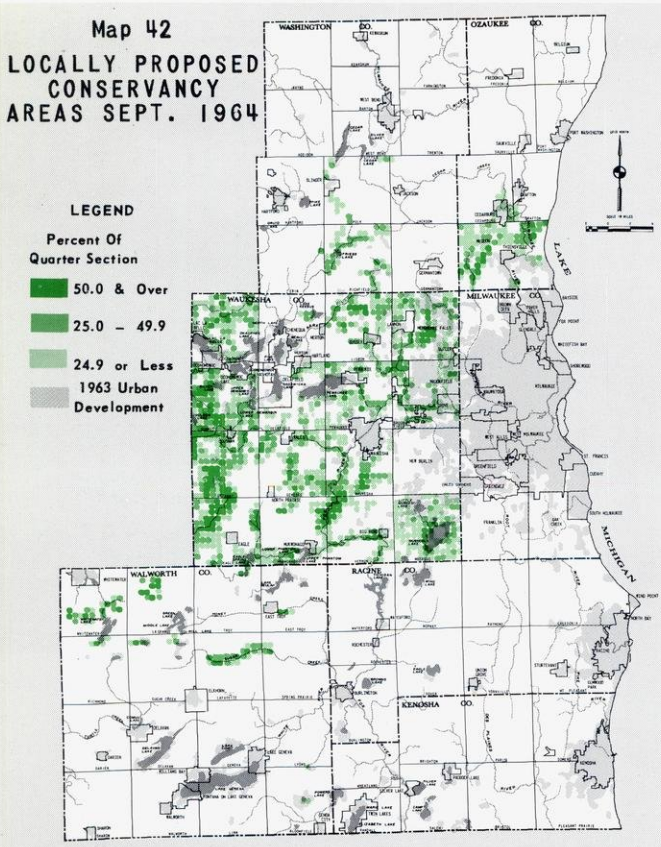
Except in Waukesha County, the "all other uses" category, together with the agricultural catcgory, would provide the land for much of the proposed expansion of the remaining land use categories. The amount of acreage devoted to "all other uses"

Table 66

CHANGES IN EXISTING AGRICULTURAL LAND USE BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	- 198	-10	- 24,015	-20	- 24,213	-20
Milwaukee	- 3,546	-84	- 25,631	-78	- 29,177	-79
Ozaukee	- 1,015	-94	- 75,205	-70	- 76,220	-70
Racine	- 3,840	-78	6,802	4	2,962	2
Walworth	140	36	10,054	4	10,194	4
Washington	- 323	-46	22,099	11	21,776	11
Waukesha	- 3,709	-90	-126,270	-58	-129,979	-58
Region	-12,491	-72	-212,166	-19	-224,657	-20

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.



Combined, the local land use development proposals would set aside 57,000 acres of land in conservancy districts. This represents a significant recognition of the need for resource protection.

would decrease by 148,289 acres, or 39 percent, if the land use proposals in the local land use plans and zoning ordinances were carried out. The largest decrease would occur in Washington County where a conversion of 61,962 acres, or 89 percent, is proposed. Ozaukee County, with three unplanned and unzoned townships, would gain an additional 36,354 acres, or 130 percent, in this category.

SUMMARY

This chapter has described the findings of the local community plans and zoning inventory carried out under the regional land use-transportation study, with emphasis upon the changes that would occur within the Region if the local development proposals were fully carried out. Certain findings have particular significance for the regional land use and transportation planning effort which is intended to incorporate, to the extent possible, local as well as regional development objectives. These findings are:

1. The long-range land use development objectives of the local communities within the Region, as reflected in the existing local land use plans and zoning ordinances, indicate a continuation of the low-density urban development prevalent in the Region today. A continuation of such low-density, areawide development within the Region, in accordance with the local plans and zoning ordinances, holds important implications for transportation, utility, and community facilities planning and for the wise use of the natural resource base.

2. Local communities have set aside more than 450,000 acres of residential land in adopted land use plans and zoning ordinances. Only a little more than one-third of this has been developed to date. To reach this target figure at the existing de-

Table 67

EXISTING[a] AND PROPOSED[b] "ALL OTHER" LAND USES BY URBAN DEVELOPMENT AREA AND COUNTY IN THE REGION - 1963

County	All Other Inside 1963 Urban Development Ring				All Other Outside 1963 Urban Development Ring				Total All Other			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,934	5.4	999	11.1	37,369	10.6	47,608	21.0	39,303	10.2	48,607	20.6
Milwaukee	19,123	53.6	3,925	43.7	11,901	3.4	322	0.1	31,024	8.1	4,247	1.8
Ozaukee	1,653	4.6	855	9.5	26,405	7.6	63,557	28.0	28,058	7.3	64,412	27.2
Racine	3,087	8.7	286	3.2	34,712	10.0	5,231	2.3	37,799	9.8	5,517	2.3
Walworth	4,169	11.7	828	9.2	74,977	21.5	39,924	17.6	79,146	20.6	40,752	17.3
Washington	969	2.7	673	7.5	68,611	19.7	6,945	3.0	69,580	18.1	7,618	3.2
Waukesha	4,731	13.3	1,417	15.8	94,743	27.2	63,525	28.0	99,474	25.9	64,942	27.6
Region	35,666	100.0	8,983	100.0	348,718	100.0	227,112	100.0	384,384	100.0	236,095	100.0

[a] *Adapted from SEWRPC land use inventory, 1963.*

[b] *Proposed by local communities in locally prepared and adopted land use plans and zoning ordinances, 1964.*

Table 68

CHANGES IN EXISTING "ALL OTHER" LAND USES BY COUNTY AND URBAN DEVELOPMENT AREA AS IMPLIED IN COMMUNITY PLANS AND ZONING ORDINANCES

County	Change Inside 1963 Urban Development Ring		Change Outside 1963 Urban Development Ring		Total Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	- 935	-48	10,239	27	9,304	24
Milwaukee	-15,198	-79	- 11,579	- 97	- 26,777	- 86
Ozaukee	- 798	-48	37,152	141	36,354	130
Racine	- 2,801	-91	- 29,481	- 85	- 32,282	- 85
Walworth	- 3,341	-80	- 35,053	- 47	- 38,394	- 49
Washington	- 296	-31	- 61,666	- 90	- 61,962	- 89
Waukesha	- 3,314	-70	- 31,218	- 33	- 34,532	- 35
Region	-26,683	-75	-121,606	- 35	-148,289	- 39

Source: Local community planning and zoning documents, 1964; SEWRPC, 1963.

velopment rate of about 10 square miles per year would take nearly 50 years. If this proposed residential acreage were to reflect existing density patterns, it could house a population of over 5,600,000 people.

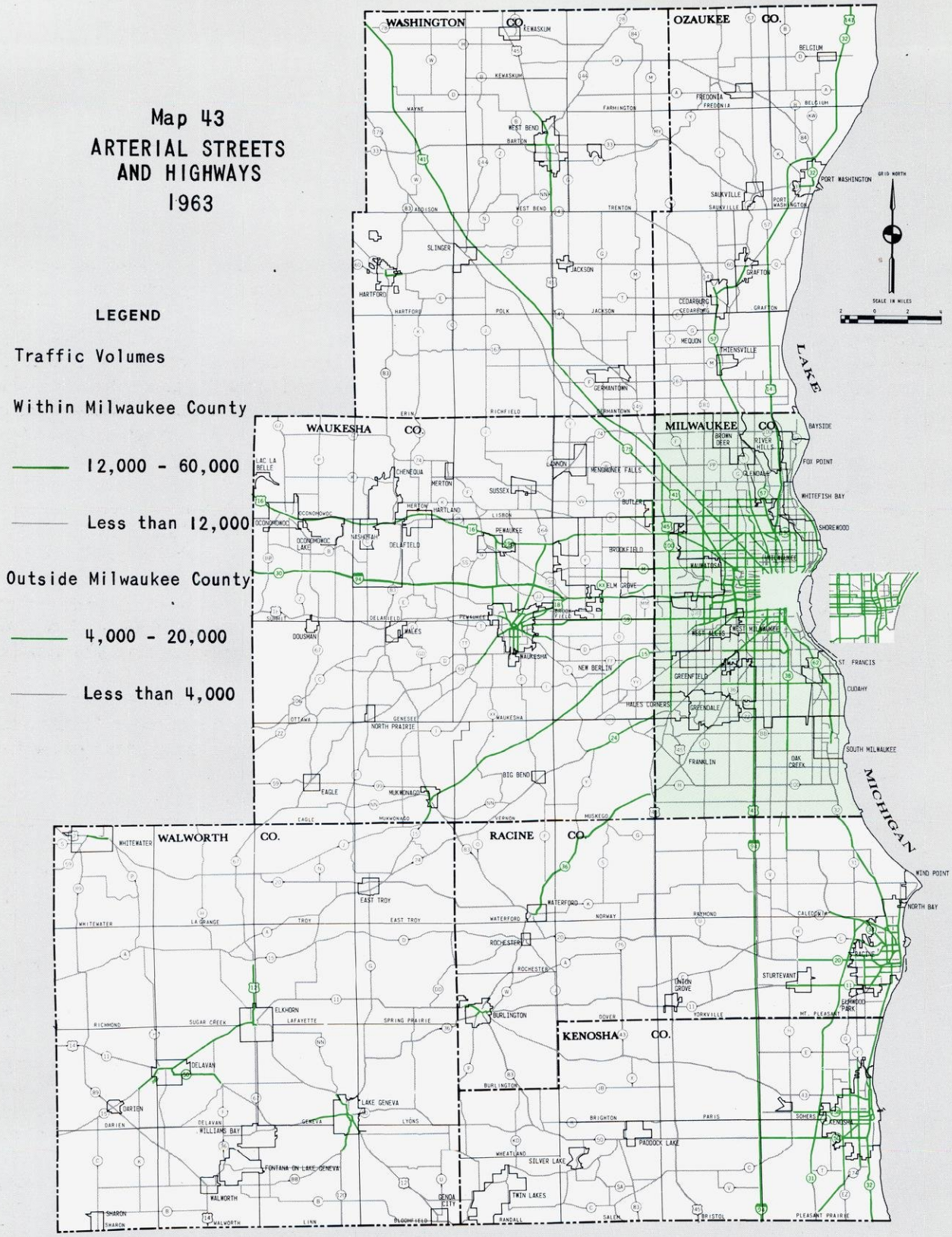
3. Local communities have set aside more than 31,500 acres of commercial land and almost 70,500 acres of industrial land in adopted land use plans and zoning ordinances. Less than 20 percent of this combined acreage has been developed to date.

4. Lands presently devoted to agricultural and "all other uses," including woodlands, wetlands, and open lands, would be reduced by about 373,000 acres. The conversion of this amount of rural land to urban use requires careful evaluation with respect to the potential effects upon the resource base if severe environmental problems are to be avoided.

5. The spatial distribution of the land uses proposed in the adopted local land use plans and zoning ordinances would often result in certain undesirable development practices; such as, the continued encroachment of intensive land uses upon the floodways and flood plains of streams, encouragement of extensive strip commercial and industrial development along major streets and highways, utilization of soils having severe development limitations, encroachment of development into remaining high value potential park and recreation areas, and possible mixing of incompatible land uses. The end result of such undesirable development practices would be an extension and intensification of such areawide problems as flooding, traffic congestion, increased traffic safety hazards, increased costs of municipal services, destruction of land and water resources, and the deterioration of some aspects of the community environment.

6. The community plans and zoning inventory indicates that, when viewed in a regional context, the amount of land allocated for certain uses is based more on hope than the ability of the regional economy, at present growth rates, to generate a demand for the proposed land use changes in the reasonably foreseeable future.

Map 43
ARTERIAL STREETS AND HIGHWAYS 1963



Within highly urbanized Milwaukee County, arterial streets and highways that carry over 12,000 vehicles per average weekday are found throughout the entire area. Outside Milwaukee County most of the arterials carrying over 4,000 vehicles per average weekday are either major routes through the Region or are located within, or radiate from, cities and villages.

Chapter VII

TRANSPORTATION FACILITIES

INTRODUCTION

Transportation facilities are among the most critical elements that influence travel characteristics and shape the spatial distribution of rural and urban development within an area. The availability of a transportation facility, or the lack thereof, will influence the path and mode as well as the frequency of personal travel. The accessibility of a site to population and employment concentrations and to community facilities and services will influence the type and intensity of its development; and this accessibility is, in turn, a function of the transportation system. Thus, transportation facilities form the basic framework for both rural and urban development and, to a considerable extent, determine the efficiency of the other functional elements of such development.

A land use-transportation study must, therefore, include an evaluation of the supply as well as of the demand side of the transportation equation. Evaluation of the demand for transportation is achieved through the travel inventories, while evaluation of the supply of transportation is achieved through an inventory of the location and capacity of the existing transportation system. These supply and demand inventories must be complemented by an evaluation of the manner in which the existing transportation system is being utilized, both as a measure of the existing level of service[1] and of deficiencies in the existing transportation system under present loadings. Any excess capacity which may be available in the system for future loadings will thereby be identified and an important step toward plan synthesis achieved. The location, capacity, and utilization inventories are also necessary to calibrate the traffic simulation models used in transportation system plan test and evaluation.

This chapter presents a brief description and analysis of the location, capacity, and loading of the existing arterial street and highway and transit systems of the Region and of the associated terminal facilities. Included in the latter are parking facilities located in the central business districts of the cities of Kenosha, Milwaukee, and Racine and major truck terminals throughout the Region. Finally, significant findings relating to regional land use and transportation development are summarized.

SUPPLY AND USE OF ARTERIAL STREETS AND HIGHWAYS

The total street and highway system of the Region must serve several important functions. It must provide for the free movement of traffic throughout the Region and for the access of this traffic to the various land uses within the Region. In addition, it must provide an important part of the urban storm water drainage system and, to a considerable extent, the location for the utilities serving both rural and urban areas of the Region.

Functional Classification

Because the street and highway system must serve several functions, and because two of these functions—traffic movement and land access—are basically incompatible, street and highway system layout must be based upon a functional grouping of streets and highways. Such a functional grouping should be made according to the primary character of service the facilities will be expected to provide without regard to governmental jurisdiction or fiscal responsibility. Such a functional classification is essential to sound transportation planning, not only because it defines the service which any particular street or highway should render, but also because it provides a means for defining travel paths for the flow of trips through the total street and highway system which will incorporate directness of routing and minimize duplication of service.

From a traffic planning standpoint, at least three functional classifications of streets and highways

[1] The term "level of service" refers to a qualitative description of such factors as travel speed, safety, convenience, and comfort.

should be recognized: arterial, collector, and minor (local). Arterials are defined as those streets and highways which are intended to serve the through movement of fast or heavy traffic and provide transportation service between two or more major subareas of the Region, between such subareas and points outside of the Region, or through the Region. Together the arterials should form an integrated, areawide system, located and designed to carry the imposed traffic loadings. Freeways, expressways, and certain parkways, as well as "standard" arterial streets and highways,[2] are all types of facilities which may be included in this arterial system. The primary function of these facilities should be to facilitate the expeditious movement of vehicular traffic. Access to abutting property may be a secondary function of some types of arterial streets and highways, but it should always be subordinate to the primary function of traffic movement.

Collector streets are defined as those streets and highways which are intended to serve as connections between the arterial system and the minor street system. In addition to collecting and distributing traffic from and to the minor streets, the collector streets usually provide a secondary function of access to abutting property.

Minor streets are defined as those streets and highways which are intended to serve primarily as a means of access to abutting property.

Collector and minor streets are usually built to standard cross-sections, which are determined by the demands of storm water drainage, utility location, snow removal, emergency access, and maintenance rather than by the demands of traffic. Anticipated traffic volume is, therefore, not generally a critical factor in their location and design. Existing and anticipated traffic volumes, however, are a critical factor in the location and design of arterials. The arterial system identified through an application of the foregoing functional considerations is, therefore, the system to which long-range, areawide, transportation planning efforts must be primarily directed; and the identification of this arterial system is a prerequisite to any highway transportation system inventory for planning purposes.

The SEWRPC was able to utilize the results of the 1958 Wisconsin Highway Needs Determination Study as a basis for the necessary functional classification of streets and highways within the Region. This statewide study was conducted under the direction of the State Legislature and included a functional classification of all streets and highways utilizing a classification system having seven categories. In the statewide study, the actual task of classification was accomplished at the municipal level with review and consolidation at both the county and state levels. Consequently, the resulting designations were based upon the experience and judgment of the officials most intimately familiar with the total street and highway system and represented a consensus at the municipal, county, and state level concerning the intended functions of the component parts of the existing total street and highway system.

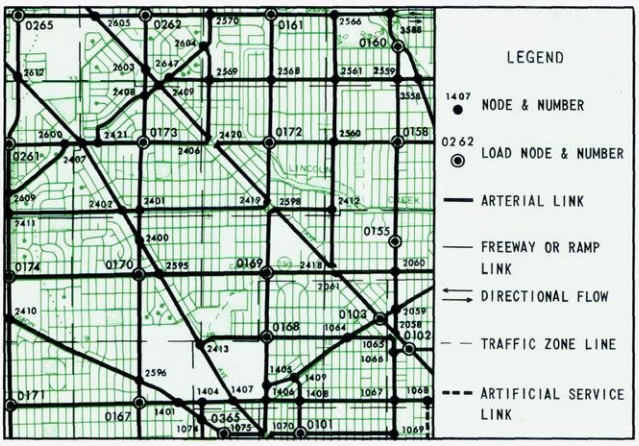
The three higher use classes of the statewide study—"Expressway, Major Primary, and Primary"— were selected for inclusion in the existing regional arterial street and highway system; and the system so identified was delineated on SEWRPC base maps. Prints of the resulting arterial system map were then sent to state, county, and local municipal, highway, and traffic engineers, for review and updating to 1963. After incorporating the necessary changes and additions, the updated arterial street and highway system map was reviewed and approved by the SEWRPC Technical Coordinating and Advisory Committee on Land Use-Transportation Planning.

The regional arterial street and highway system map was then converted to an arterial network map by assigning node numbers to all intersections, each segment between two nodes being defined as a link in the system (see Figure 34). The network thus obtained was described in numerical code; and punch cards were prepared, containing the link identification code and all data necessary for system analysis for each link in the network. A digital computer can then be used to calculate minimum time paths through the arterial network and to assign traffic to these minimum time paths, thus simulating the utilization of the arterial street and highway system.

[2] A freeway may be defined as a divided arterial highway with full control of access and grade separations at all intersections. An expressway may be defined as a divided arterial highway with full or partial control of access and grade separations at some, but not necessarily all, intersections. A parkway may be defined as an arterial highway provided for noncommercial traffic with full or partial control of access and usually located within a ribbon of park-like development. The term parkway as defined herein should not be confused with park roads or drives which are not intended to serve as arterials. "Standard" arterial streets and highways may be defined as arterials with intersections at grade with no control of access; i.e., direct access to abutting property.

Figure 34

EXAMPLE OF ARTERIAL STREET NETWORK MAP



One-half original size.

Inventory and Capacity Determination

In order to permit such network analysis and system simulation, data delimiting link lengths, travel times, and traffic capacities had to be collected for the selected arterial network. This data includes, in addition to the length of each link: existing traffic volume, average operating speed, pavement width, approach gradient, type of facility, type of area, and existence of turning lanes. This data had to be collected for a network consisting of 4,350 links intersecting at 2,650 nodes and comprising over 3,275 miles of arterial streets and highways, ranging from urban freeways to rural county trunk highways. The detailed procedures followed in the physical inventory necessary to collect this data are fully described in other Commission publications.[3] The determination of arterial link capacities from the physical inventory data is a particularly complex problem, since it involves not only consideration of the measurable physical characteristics of the facilities themselves but also the behavioral characteristics of the individuals utilizing the facilities.

One measure of street and highway capacity is the maximum number of vehicles which can pass a given point on a facility in a unit of time under the existing roadway and traffic conditions. Such capacities may be relatively very high but occur under conditions of traffic congestion which result in a relatively low level of service. Another measure of street and highway capacity is the number of vehicles which can pass a given point on a facility in a unit of time under existing roadway and desirable operating conditions. The latter measure implies a better balance between full utilization of the facility and the level of service in terms of operating speed.

It is this second measure of capacity, expressed in number of vehicles per 24 hours, that was selected to be used in the SEWRPC system evaluation for long-range planning purposes. This selection was made in order to provide for the ultimate abatement of traffic congestion within the Region. The selection of the proper value for this "design" capacity is one of the most critical steps in the transportation planning process. If the value selected is too high, subsequent comparisons with existing and future traffic volumes may indicate that improvements are not required and result in a congested and inefficient transportation system. If the value selected is too low, subsequent comparisons with existing and future traffic volumes may indicate the need for improvements which actually are not needed and, therefore, represent an extravagant expenditure of public funds. Careful attention was, therefore, given to the determination of design capacity values;[4] and these values were carefully reviewed and approved by the Technical Coordinating and Advisory Committee.

Except for freeway components, the capacity of which are generally limited by pavement width, arterial network capacities are generally limited by intersection capacity. Determination of such capacity under the method adopted by the SEWRPC requires first a determination of three primary capacity factors: 1) the population size of the urban area under consideration, 2) a load factor, and 3) a peak-hour factor.[5] These factors are used to determine relationships between approach pavement width and design capacity. Secondary capacity factors are then determined and applied to modify the foregoing relationships. These secondary factors include: percent of average weekday traffic occurring in the peak hour (K factor), directional imbalance (D factor), signal setting, approach gradient, turning movements, parking,

[3] See "Arterial Network and Traffic Analysis Zones," SEWRPC Technical Record, Vol. 1 – No. 2; and "Inventory of the Arterial Street Network," SEWRPC Technical Record, Vol. 1 – No. 5.

[4] See "Capacity of Arterial Network Links," SEWRPC Technical Record, Vol. 2 – No. 2.

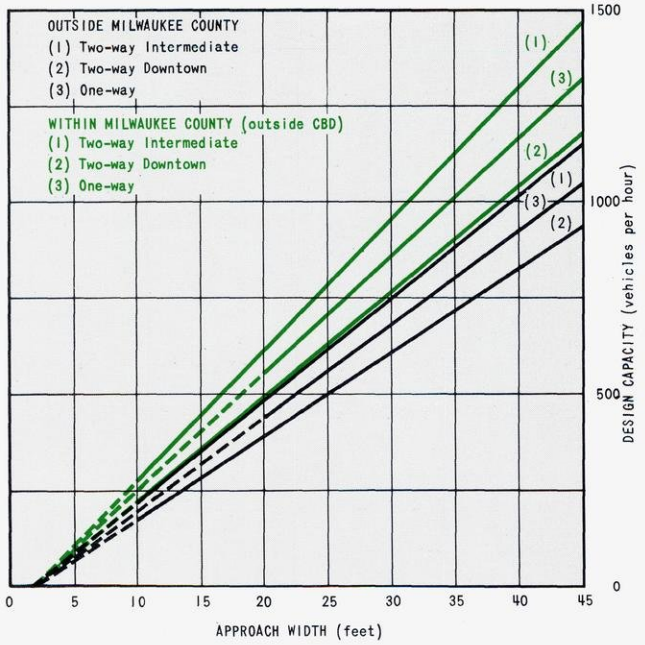
[5] The concept of the peak-hour factor, load factor, and urban population as primary factors influencing traffic capacity are set forth in "Variations in Flow at Intersections as Related to Size of City, Type of Facility and Capacity Utilization," by O. K. Normann, HRB Bulletin 352. Load factor is defined as: "The ratio between the total number of traffic signal green phases that were fully utilized during the peak hour divided by the total number of green phases for that approach during the same period." The peak-hour factor is defined as: "The ratio between the number of vehicles entering the intersection during the peak hour divided by four times the number of vehicles entering the intersection during the peak 15-minute period."

commercial traffic, existence of separate turning lanes, and the type of area and route.

In the SEWRPC capacity determination procedure, the approach pavement width at intersections, together with the three primary capacity factors, were, therefore, used as the basic measure of capacity. The approach pavement width was measured; the population size of the urban area under consideration was known by subareas of the Region; and appropriate values were assumed for the load and peak-hour factors, 0.70 and 0.85, respectively. All secondary factors affecting capacity were then applied as modifiers to the raw capacity values so obtained. For long-range planning purposes, the problem of capacity determination involves the determination of the future capacity of existing and proposed intersections; and, therefore, only generalized assumptions can be realistically made about most of the secondary factors. The assumptions made with respect to the secondary factors were: 1) peak-hour factor equals 8 percent for freeways and expressways and 10 percent for all other arterials, 2) directional imbalance equals 60 percent in the dominant direction for arterials outside of the City of Milwaukee central business district and 50 percent within that district, 3) the intersection will be shared equally in time with traffic entering from the cross streets, 4) left- and right-turn movements will comprise 10 percent of each of the total entering volumes, 5) commercial vehicles will comprise 10 percent of the total entering volumes, 6) no parking will be permitted at or near intersections, and 7) no additional reduction will be made for bus stops. The remainder of the secondary factors were actually inventoried.

Figure 35

HOURLY DESIGN CAPACITIES



Source: SEWRPC.

Using the design capacity curves illustrated in Figure 35, which reflect both the primary factors and the assumed secondary factors, a table of hourly capacity multipliers was developed (see Table 69). These multipliers were applied to the approach pavement width minus two feet. The resulting capacity was then modified on the basis of the inventoried secondary factors as follows:

Table 69

HOURLY CAPACITY MULTIPLIERS FOR ARTERIAL STREETS AND HIGHWAYS IN THE REGION BY TYPE OF AREA AT INTERSECTION
(in vehicles per hour per foot of pavement width)

Type of Arterial	Type of Area							
	Within Milwaukee County*				Outside Milwaukee County*			
	Down-town	Inter-mediate	Out-lying	Rural	Down-town	Inter-mediate	Out-lying	Rural
Freeway	100	100	100	100	76	76	76	76
Expressway.	90	93	96	96	57	60	62	65
Other Arterials (two-way) . .	27	34	36	39	22	27	30	33
Other Arterials (one-way) . .	31	36	39	42	24	28	32	35

Ramp capacity was calculated as follows: Those requiring a stop at the exit are considered as having capacity equivalent to that of one-way streets. Those having a merge condition without a stop at the exit are considered as having capacity equivalent to that of expressways.

The capacity multiplier is applied to the approach width minus two feet.

** Milwaukee County is used here to approximate traffic analysis ring 4 (see Appendix E, Figure A1).*

Source: SEWRPC.

1) for an adverse approach gradient of 3 to 6 percent, a factor of 0.95 was applied; 2) for an adverse approach gradient greater than 6 percent, a factor of 0.90 was applied; 3) if a left-turn refuge lane existed, a factor of 1.10 was applied; 4) if a right-turn refuge lane existed, a factor of 1.05 was applied; and 5) if both right- and left-turn refuge lanes existed, a factor of 1.15 was applied. For two-way arterials such capacity determinations were made for each end of each link and combined to determine the two-way capacity.

Table 70

COMPUTED LINK DESIGN CAPACITIES FOR TYPICAL ARTERIALS IN THE REGION BY TYPE - 1963

Type of Arterials By Area		Total Pavement Width (feet)	24-Hour Design Capacity
Freeway			
Within Milwaukee Co.		72	85,000
Outside Milwaukee Co.		48	41,800
Other Arterials			
Two-way:	Downtown	50	14,900
	Intermediate	50	15,640
	Outlying	50	16,560
	Rural	48	17,160
One-way:	Downtown	36	10,540
	Intermediate	36	12,240

Source: SEWRPC.

Utilizing this procedure, a link capacity was calculated for each link in the arterial network. The results were then posted on the network maps and compared with actual traffic volumes for reasonableness. Table 70 illustrates some typical link capacities established by application of the SEWRPC procedures. These posted values were then reviewed by the state and local traffic engineers and by the Technical Coordinating and Advisory Committee.

Network Utilization

In order to provide a measure of the present utilization of the existing arterial street and highway system, the average weekday traffic volume was obtained for each link in the system. Traffic volume counting programs are conducted by the Wisconsin State Highway Commission and by the County and City of Milwaukee on a regular, continuing basis and provided much of the necessary current traffic volume data. In order to obtain complete data for the entire arterial network, however, these counts had to be supplemented through an intensive traffic volume counting program conducted by the SEWRPC. This program, which included control and sampling counts for the arterial system as a whole, also included the cordon and screen line counts necessary to evaluate the accuracy of the origin and destination surveys. The complete counting program made it possible to estimate the average weekday and peak-hour traffic flows on all links in the arterial network and to calculate total vehicle-miles of travel on the arterial street and highway system within the Region. Upon completion of the counting program, the information was coded, edited, and transferred to punch cards for machine processing and analysis. Map 43 indicates the most heavily traveled arterials in the Region at the present time.

Findings

The physical inventory of the arterial street and highway system, together with the supplementary utilization inventory, provided definitive information on the spatial distribution of the arterial network within the Region and on the amount of traffic that presently utilizes each link in this network on an average weekday. The physical inventory also provided the data from which design capacities could be calculated for each link of the arterial network.

The distribution of the existing arterial network mileage within the Region by functional subclassification, as determined in the inventory, is shown in Table 71. There were 3,275 miles of arterial network representing arterial streets and highways open to traffic as of May 1963, within the Region, of which 224 miles, or less than 7 percent, consisted of freeways and expressways and their associated entrance and exit ramps.[6] Milwaukee County, with about 9 percent of the total area of the Region and about 66 percent of the population, was found to have about 25 percent of the total arterial mileage and about 24 percent of the total freeway and expressway mileage including ramps. Waukesha County, with about 22 percent of the total area of the Region and about 10 percent of the total population, was found to have 22 percent of the total arterial street and highway mileage. No other county in the Region has more than 13 percent of the total mileage.

[6] The freeway and expressway mileage quoted represents link mileage in which the length of all divided facilities is measured in each direction. There were 87 route miles of freeways and expressways, exclusive of ramps, open to traffic within the Region as of May 1963, comprising about 2.8 percent of the approximately 3,138 route miles of total arterial streets and highways within the Region at that time.

Table 71

DISTRIBUTION OF ARTERIAL NETWORK MILEAGE IN THE REGION BY TYPE OF FACILITY AND COUNTY - 1963

County	Mileage by Type of Facility				Percent of Total Mileage
	Freeway & Expressway*	Ramp	Other Arterials	Total	
Kenosha	24.7	8.5	260.6	293.8	9.0
Milwaukee	37.2	17.3	755.6	810.1	24.7
Ozaukee	4.9	1.7	260.7	267.3	8.2
Racine	23.2	6.9	332.8	362.9	11.1
Walworth	---	---	399.7	399.7	12.2
Washington	56.6	3.7	370.3	430.6	13.1
Waukesha	27.7	11.9	671.3	710.9	21.7
Region	174.3	50.0	3,051.0	3,275.3	100.0
Percent of Total	5.3	1.5	93.2	100.0	---

* *Actual route-mileage is approximately 1/2 of the link mileage value shown (87 miles for the Region).*

Source: SEWRPC.

The inventory also found that over 13 million vehicle-miles of travel occurred within the Region over the arterial network on an average weekday. Table 72 indicates the distribution of this travel within the Region. As might be expected, most of the arterial street and highway network utilization occurred within the intensely urbanized areas of the Region. Milwaukee County alone accounted for more than 56 percent of the total vehicle-miles of travel and exhibited, by far, the most intensive use of the existing arterial system, with over 9,000 vehicle-miles of travel per mile of arterial street and highway. Waukesha County accounted for approximately 14 percent of the total vehicle-miles of travel; however, the intensity of the arterial utilization was higher in both Kenosha and Racine counties than in Waukesha County.

The relationship existing between the average daily weekday traffic utilizing a particular section of the arterial system and its design capacity, referred to as the volume/capacity ratio, is a useful means of identifying and quantifying existing imbalances between street useage and street supply. This relationship, when determined and evaluated for the entire arterial system, will assist in the identification of major corridors wherein additional capacity is needed even under existing travel demands.

Table 72

VEHICLE-MILES OF TRAVEL ON THE ARTERIAL NETWORK WITHIN THE REGION ON AN AVERAGE WEEKDAY BY COUNTY - 1963

County	Vehicle-Miles of Travel (000)		Vehicle-Miles of Travel Per Mile of Arterial
	Mileage	Percent	
Kenosha	938	7.2	3,193
Milwaukee	7,348	56.2	9,071
Ozaukee	484	3.7	1,809
Racine	1,125	8.6	3,100
Walworth	685	5.2	1,713
Washington	696	5.3	1,616
Waukesha	1,796	13.8	2,527
Region	13,072	100.0	3,991

Source: SEWRPC.

This volume/capacity ratio was computed for each link of the arterial network, and the results of this analysis are indicated on the regional Arterial Street and Highway Map enclosed in the pocket attached to the back of this report. In order to facilitate analysis, four categories of volume/design capacity ratio (V/C) were defined: Undercapacity, V/C = 0.7 or less; at capacity, V/C = 0.8 to 1.1; overcapacity, V/C = 1.2 to 1.9; and twice capacity, V/C = 2.0 or more.

The map indicates that most of the links which are presently operating at or over design capacity are located within the intensely developed urban areas of the Region. As shown in Table 73, almost 42 percent of the existing arterial street and highway mileage in Milwaukee County was operating either at or over capacity in May 1963. The counties of Kenosha, Racine, and Waukesha each had more than 10 percent of their arterial street and highway mileage operating at or over capacity.

As might be expected, proposed and committed arterial street and highway construction is directed at eliminating the worst deficiencies of the existing system; and certain of the facilities which were most congested in 1963 are presently in the process of being relieved by the completion of

Table 73

DISTRIBUTION OF ARTERIAL STREET AND HIGHWAY NETWORK MILEAGE AT OR OVER DESIGN CAPACITY IN THE REGION BY COUNTY - 1963

County	Mileage	Percent of Total Arterial Mileage
Kenosha	36.7	12.5
Milwaukee	336.2	41.5
Ozaukee	20.8	7.8
Racine	37.1	10.2
Walworth	15.3	3.8
Washington	6.2	1.4
Waukesha	93.9	13.2
Region	546.2	16.7

Source: SEWRPC..

new or improved facilities. It should be noted that the opening of a new facility may not only relieve congestion on paralleling streets and highways but may also improve traffic operations on a number of cross streets, although it may compound traffic problems on others.

SUPPLY AND USE OF MASS TRANSIT

Regional transportation planning, to be comprehensive, must consider all modes of travel, with particular emphasis on how such modes may affect the utilization of the arterial street and highway system. If a balanced regional transportation system is to be designed, in which each mode of transportation is assigned that portion of the total travel demand which it is best able to carry, then careful attention must be given to mass transit. The principal emphasis in such attention at the regional level, however, must be focused on a determination of the major mass transit facilities which may be needed and must be designed as integral parts of the total regional transportation system. Such major facilities, in effect, consist of rapid transit facilities which combine high-speed service with high capacity. The provision of purely local transit facilities serving school and other non-centralized transit travel demand is less a matter of system planning than it is of scheduling available equipment to meet needs, a problem best left to the transit operators themselves. Existing mass transit facilities of all types must, nevertheless, be inventoried since they will form the basic feeder system to any major rapid transit facilities that might be proposed, since they carry a substantial portion of the person trips within certain subareas of the Region, and since they affect any evaluation of modal split.

Mass transit for the purposes of this study was defined as the transportation of persons by bus, rail, or other conveyance providing relatively frequent service to the general public on regular schedules over prescribed routes. In its most common form today, mass transit is provided by buses operating on urban streets. Some form of mass transit service is essential in any sizeable urban area, not only to meet the needs of that segment of the population unable to command direct use of private personal transportation, but also to provide more efficient movement for certain types of personal trips within the urban area.

Rapid transit may be defined as mass transit operating over exclusive grade-separated rights-of-way to provide high-speed service. In its most common form today, rapid transit is provided by dual rail vehicles operating over private rights-of-way. It should be noted that the term mass transit includes rapid transit and that the latter is distinguished primarily by the high level of service offered. It should also be noted that a "modified" form of rapid transit service can be provided by buses operating on freeways as long as the freeways utilized for such service continue to operate at or under design capacities and at design speeds. A crude analogy can thus be drawn between the types of arterial streets and highways and the types of transit service: mass transit corresponding to the total arterial street and highway system, rapid transit corresponding to the freeway system, and modified rapid transit corresponding to the expressway system.

System Identification

Public transportation service within the Region is furnished by a number of privately owned railroad, interurban and suburban bus, and city bus lines. As an initial step in the inventory,[7] those portions of this total public transportation system which could be regarded as providing intra-regional service had to be identified as distinguished from those lines which provided primarily inter-regional service. It was then necessary to determine those portions of the intra-regional system which could be regarded as providing mass transit service. It was determined best to do this on the basis of the frequency of service provided. All those rail and bus lines which offered regular service throughout the weekday, except for the

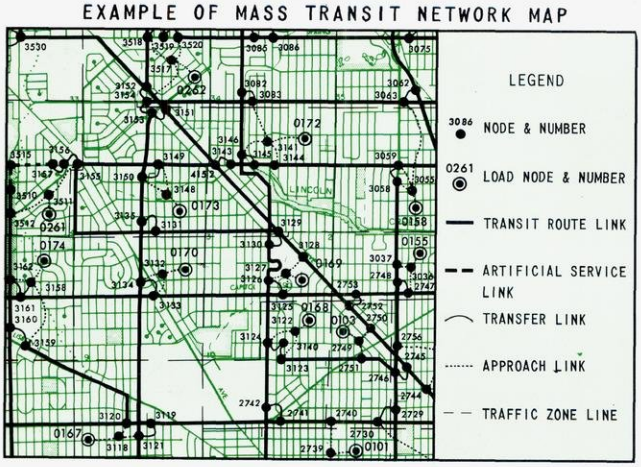
[7] For a detailed description of the SEWRPC transit inventory, see "Rail and Transit Inventory and Design of the Transit Network," SEWRPC Technical Record, Vol. 1 – No. 3.

early hours of the morning, at maximum headways of about one hour were included in the mass transit system. This basis of classification was adopted because the use of mass transit is restricted, not only if the service is not complete between the points of trip origin and destination, but also if the service is not provided at the time a trip must be made or if subsequent trips during the day require the command of private transportation.

All the companies offering rail or bus service within the Region were contacted; and information on routes, schedules, equipment capacities, fares, revenues, and passenger loadings was obtained. Applying the foregoing criteria, the facilities comprising the total public transportation system of the Region were then broken down into two classes, those providing primarily inter-regional public transportation service and those providing intra-regional mass transit service The resulting mass transit system was mapped on SEWRPC base maps. This system map was then converted to a transit network map by assigning node numbers to all transfer and terminal points, each section between two nodes being defined as a link in the network. The resulting regional transit network is more complex than the arterial network, since "friction" links representing walk and wait times and transfer times and "artificial service" links representing combination auto-transit service had to be utilized in the development of the network (see Figure 36). The transit network finally developed consisted of 2,884 links intercepted at 2,095 nodes. It included over 700 miles of mass transit lines, ranging from railroad to city bus lines.

Figure 36

EXAMPLE OF MASS TRANSIT NETWORK MAP



One-half original size.

The network thus obtained, like the arterial street and highway network, was described in numerical code; and punch cards were prepared containing the link identification code and all data necessary for each link in the network for system analysis. A digital computer can then be used to calculate minimum time paths through the network and to assign traffic to the minimum time paths, thus simulating the utilization of the mass transit system.

Inventory and Capacity Determinations

Capacity determinants are quite different for mass transit systems than they are for arterial street and highway systems. The capacity of a mass transit system is limited by such features as the type of facility, rail or bus; the type of equipment; the passenger capacity of the equipment; and the number of units which are operated over a route in a given time period. The capacity of mass transit facilities is, therefore, much more flexible than that of an arterial street or highway. Since existing mass transit systems are rarely operated at the full potential capacity of a given type of facility, actual operating capacities can be readily increased or decreased by adding or subtracting from the scheduled service.

Capacity is, therefore, a less useful criteria for the evaluation of an existing transit system than it is for an existing arterial street and highway system. Service provided in terms of seat-miles is a more meaningful criteria for such evaluation. It lends itself readily to comparison with passenger-miles, a measure of transit utilization, on both an individual link or on a system-wide basis. The frequency of service, in terms of units per hour or per day on a given route, is a factor in the determination of seat-miles provided. It is, however, also an important measure in itself of the service provided, since waiting time is a significant component of overall transit travel time. Both measures were, therefore, utilized in the SEWRPC transit inventory.

Findings

The transit inventory revealed that mass transit service within the Region was primarily provided by city bus lines confined to the more intensely developed urban areas. Only a limited amount of intra-regional mass transit service was provided by railroad and by interurban and suburban bus lines, the latter operating along the principal state and federal numbered highways.

Rail Service: During the spring of 1963, railroad passenger service within the Region was provided

by three railroads: the Chicago and North Western Railway (C&NW); Chicago, Milwaukee, St. Paul and Pacific Railroad Company (Milwaukee Road); and the Soo Line Railroad Company. The Chicago, North Shore and Milwaukee Railroad, the last of the high-speed electric interurbans to operate in Wisconsin, had been abandoned in 1963 prior to the beginning of the inventory.[8] The location of the existing railroad network within the Region, together with the routes over which passenger trains were operated in May 1963, is shown on Map 44.

From the inventory, it was found that the C&NW operates 10 passenger trains per weekday in each direction in the Chicago-Milwaukee corridor, with stops in the cities of Racine and Kenosha. The Milwaukee Road operates eight passenger trains per weekday in each direction between the cities of Milwaukee and Watertown. Only one of these trains, however, stops in the cities and villages of Milwaukee, Wauwatosa, Elm Grove, Pewaukee, Hartland, Nashotah, Okauchee, and Oconomowoc, within the Region and, therefore, provides commuter service. The only other rail line having more than two passenger trains per day in each direction and carrying intra-regional traffic was the C&NW line between the cities of Milwaukee and West Bend. Here, three passenger trains are operated in each direction on an average weekday.

The inventory further revealed that the only rail route within the Region providing intra-regional passenger service of such frequency as to warrant mass transit classification was the C&NW line which serves the cities of Milwaukee, Racine, and Kenosha. Passenger service on this route was operated on headways varying from 20 minutes to three hours throughout the day and when combined with paralleling intercity bus service operating in the same corridor met the maximum headway criterion for inclusion as a part of the mass transit network.

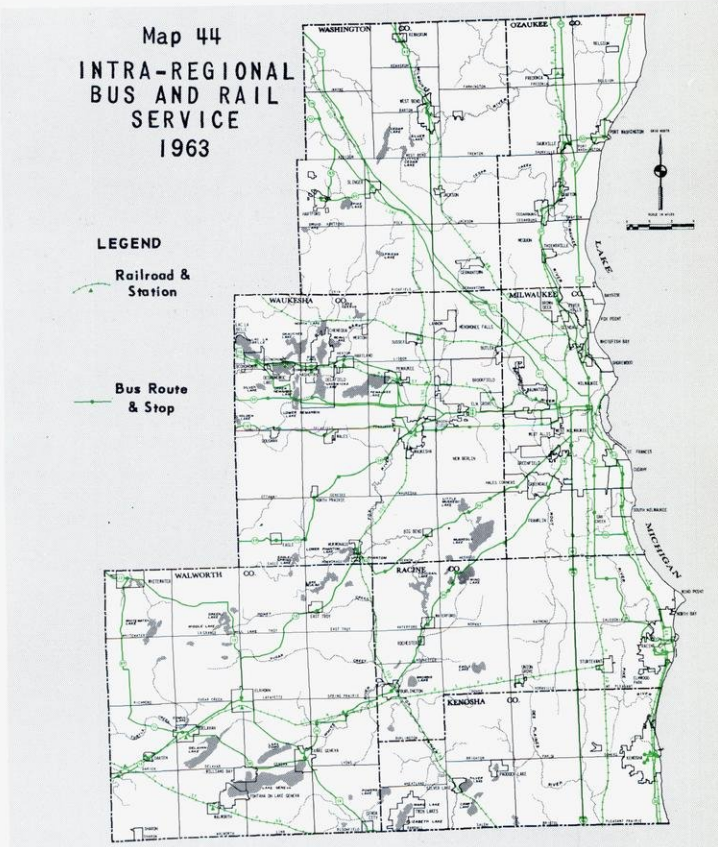
The total route miles of railroad which offer passenger service was measured at 360 miles, of which only 35 miles met the criteria for classification as mass transit service. Utilization of this mode of transportation was found to be very light, with only 375 intra-regional person trips being made by rail on an average weekday within the Region.

[8] For details on the historic development of the railroad and electric interurban networks in the Region, see "A Backward Glance," SEWRPC Technical Record, Vol. 1 – No. 4; and SEWRPC Technical Record, Vol. 2 – No. 2.

Interurban and Suburban Bus Service: The inventory revealed that interurban and suburban bus service is provided over approximately 600 route miles within the Region, most of which are over arterial streets and highways, as shown on Map 44. Companies providing this service include The Greyhound Lines, Inc., Badger Coach, Inc., Wisconsin Coach Lines, Inc., Lakeshore Transit, Inc., and Peoria-Rockford Bus Company.

The most frequent interurban bus service is provided in the Milwaukee-Chicago corridor. Greyhound operates 12 buses in each direction per weekday between Milwaukee and Chicago over Interstate Highway 94 without any intermediate stops within the Region. In addition, Greyhound operates two buses in each direction per weekday in this same corridor with stops in the cities of Racine and Kenosha.

As already noted, the combination of the Wisconsin Coach Lines, Inc., and the Lakeshore Transit, Inc., bus service between the cities of Milwaukee, Racine, and Kenosha provided sufficiently frequent



Interurban and suburban bus service within the Region is provided by five bus companies, operating over 600 route miles of streets and highways. Three railroad companies provide passenger service over 360 route miles of railway.

headways when combined with the C&NW railroad passenger service to warrant inclusion in the mass transit network. The Wisconsin Coach Lines, Inc., provides 10 buses in each direction per weekday; and the Lake Shore Transit, Inc., provides 11 buses in each direction per weekday between the cities of Racine and Kenosha.

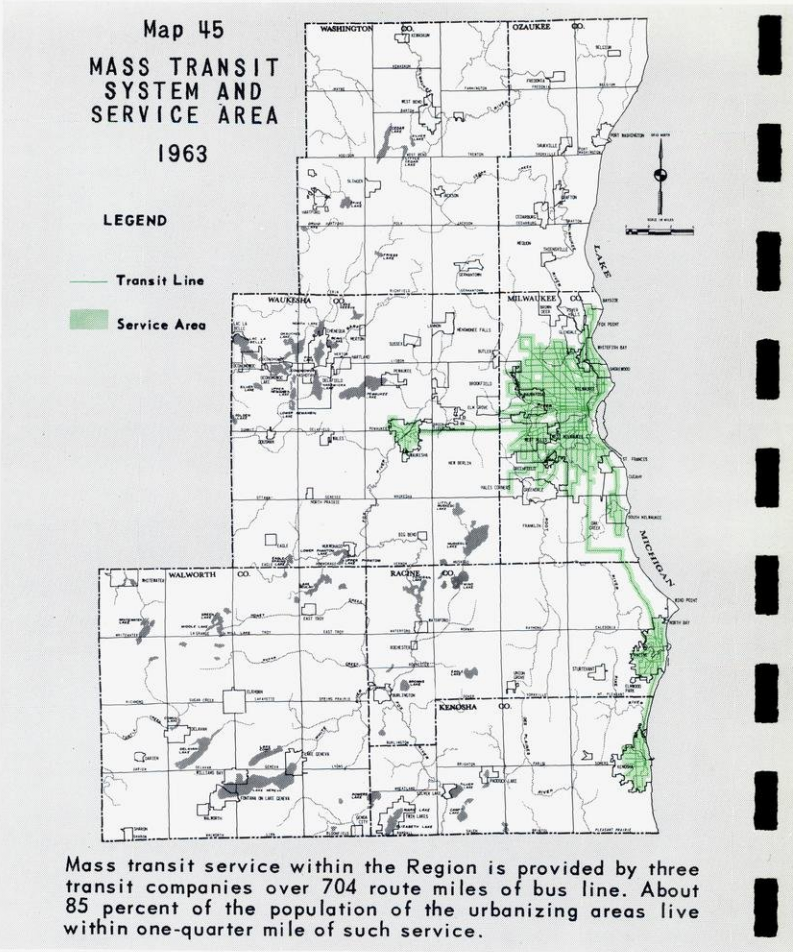
The most frequent suburban bus service in the Region was provided by the Wisconsin Coach Lines, Inc., on its route between the cities of Milwaukee and Waukesha, with 32 buses in each direction per weekday. Headways average approximately one-half hour throughout the day. One other suburban bus line operated by Greyhound[9] offers limited commuter service between the cities of Milwaukee and Port Washington along USH 141 and STH 57, with a total of 12 buses in each direction per weekday and with headways varying from one-half to three hours. All other intra-regional bus service having scheduled stops within the Region provided less than eight trips in each direction per weekday, with the majority of the routes having only two trips in each direction per weekday.

The total route miles of intercity and suburban bus lines within the Region was measured at 604 miles, of which 55 miles met the criteria for classification as mass transit service.

City Transit Service: Regularly scheduled city transit service on headways of one hour or less throughout the weekday was found to be available only in the Milwaukee, Racine, Kenosha, and Waukesha areas. This service was provided by the Milwaukee & Suburban Transport Corp., Lakeshore Transit, Inc., and Wisconsin Coach Lines, Inc. Very limited city transit service was also provided in the City of Port Washington by the Port Transit Lines, Inc., but was not scheduled on a continuous hourly basis through the weekday.

The combined rail, interurban, and suburban bus and city bus lines meeting the minimum headway criteria for classification as mass transit service are shown on Map 45; and the service area of this combined mass transit system, defined as lying within one-quarter mile of the mapped transit routes, is also indicated on this map.

The distribution of the transit routes and service areas are indicated in Table 74. Approximately 50 percent of Milwaukee County and 93 percent



Mass transit service within the Region is provided by three transit companies over 704 route miles of bus line. About 85 percent of the population of the urbanizing areas live within one-quarter mile of such service.

of its population were found to be within the existing mass transit service area. Approximately 5 percent of the total land area and approximately 70 percent of the total population of both Racine and Kenosha counties were found to be within the respective existing transit service areas. The only other county within the Region having transit service was Waukesha County, with approximately 2 percent of its area and 24 percent of its population within the existing transit service area.

The service provided by the existing transit facilities within the Region, together with the utilization of this service, is summarized in Table 75. The largest number of seat-miles of transit service per weekday is provided in Milwaukee County; and the largest number of passenger-miles of transit travel on an average weekday also occurs in that county, both accounting for over 90 percent of the regional totals. Within the service areas, the ratios of seat-miles provided to passenger-miles utilized range from 3.3 in Milwaukee County to 5.3 in Kenosha County. These ratios are high when compared to urban areas such as Pitts-

[9] This line was acquired by the Wisconsin Coach Lines, Inc., in June 1963.

Table 74

MASS TRANSIT MILEAGE AND PROPORTION OF POPULATION WITHIN THE TRANSIT SERVICE AREA IN THE REGION BY COUNTY - 1963

County	Route Miles of Transit Lines[a]	Transit Service Area[b]		Percent of Population Within Service Area[b]
		Acres	Percent of County or Region Total Area	
Kenosha	50	8,300	5	69
Milwaukee	539	78,800	50	93
Ozaukee	---	---	---	---
Racine	72	11,700	5	70
Walworth	---	---	---	---
Washington	---	---	---	---
Waukesha	43	7,800	2	24
Region	704	106,600	---	---

[a] *Includes transit facilities with regularly scheduled weekday service and maximum headway of approximately one hour (excludes railroads & school buses).*

[b] *For the purpose of this report, transit service area is defined as the area within one-quarter mile of a transit line.*

Source: SEWRPC.

burgh and Chicago, wherein similar ratios are below the 3 to 1 level. Historic trends in mass transit utilization within the Region are discussed in Chapter VIII.

A more detailed analysis of transit utilization was made with respect to the central business districts (CBD) of the cities of Kenosha, Milwaukee, and Racine. Utilization and service data at maximum loading points for each route entering the central business district were summarized by direction of travel and hour of day. Results are displayed graphically in Figures 37 through 39 and indicate that passengers exceed seats during the morning and afternoon peak hours for a total of two and one-half hours in Milwaukee, one hour in Racine, and four hours in Kenosha. Kenosha is the only city that has more passengers than seats in both directions between 3:00 p.m. and 4:00 p.m. of an average weekday. It should be pointed out that these graphical comparisons represent a gross evaluation of service provided and utilized and do not reflect the actual number of standees on a particular route since this number

Table 75

UTILIZATION OF SCHEDULED TRANSIT SERVICE ON AN AVERAGE WEEKDAY IN THE REGION BY COUNTY - 1963

County	Scheduled Transit Service[a]				Ratio Service Provided to use
	Provided		Used		
	Seat-Miles	Percent of Total	Passenger-Miles	Percent of Total	
Kenosha	80,800	2.4	15,100	1.5	5.3
Milwaukee	3,156,700	92.5	958,000	94.5	3.3
Ozaukee	---	---	---	---	---
Racine	129,900	3.8	31,800	3.1	4.1
Walworth	---	---	---	---	---
Washington	---	---	---	---	---
Waukesha	44,600	1.3	8,700	0.9	5.1
Region	3,412,000	100.0	1,013,600	100.0	3.4
PATS (1958)[b]	4,718,509	---	1,775,805	---	2.7
CATS (1956)[c]	20,060,000	---	7,950,000	---	2.5

[a] *Includes transit facilities with regularly scheduled weekday service and maximum daily headway of approximately one hour (excludes railroads & school bus service).*

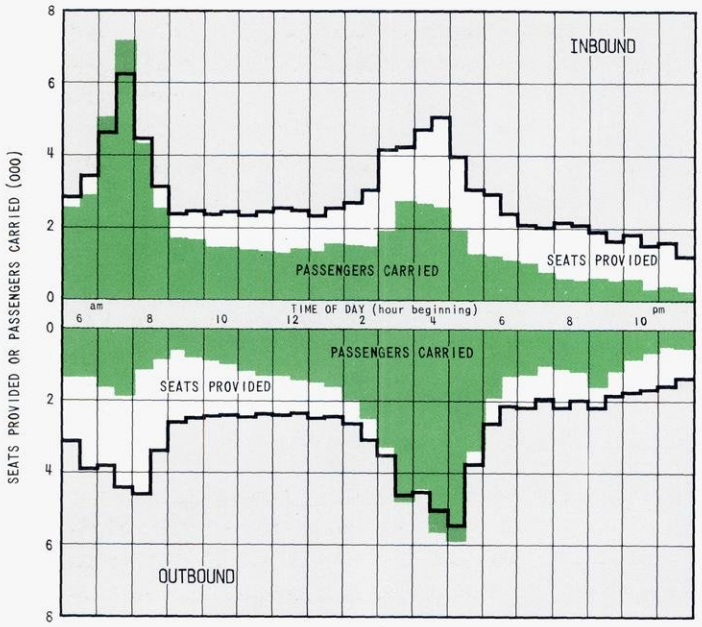
[b] *Pittsburg Area Transportation Study, includes school bus service but excludes railroad service.*

[c] *Chicago Area Transportation Study, includes school bus service but excludes subway, elevated, and suburban railroads.*

Source: SEWRPC; PATS; CATS.

Figure 37

COMPARISON OF BUS SEATS PROVIDED AND PASSENGERS CARRIED TO AND FROM THE MILWAUKEE CBD BY HOUR OF WEEKDAY



Source: Milwaukee & Suburban Transport Corp.; Data for Spring of 1963.

would be greatly influenced by unequal loading of buses.

The high ratio of service provided to service utilized found for the system as a whole, together with the gross comparisons of seat utilization for service provided to each CBD of the three largest urbanized areas within the Region, indicates that the overall level of transit service within the Region is good. No true rapid transit service can be said to exist within the Region. Very limited modified rapid transit service, however, has been recently inaugurated in Milwaukee County between the Mayfair shopping center in the City of Wauwatosa and the CBD of the City of Milwaukee. Experience has shown that utilization of this service, which operates over the existing freeway system, has been very good. The number of passengers carried has increased from approximately 290 per day in April 1964 to over 600 per day in March 1965. This "Freeway Flyer" service has been increased from a total of 8 buses per weekday in 1964 to 13 buses per weekday in 1965.

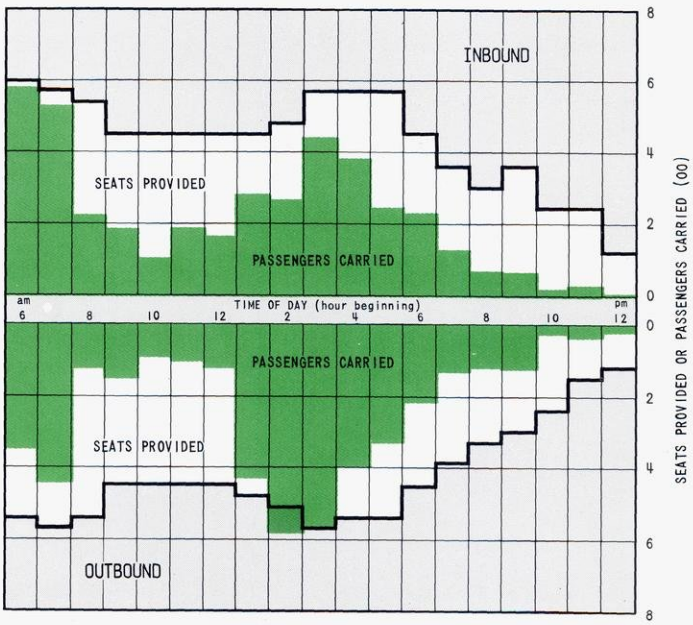
A special survey, conducted by the SEWRPC in cooperation with the Milwaukee & Suburban Transport Corp., indicates that 39 percent of the passengers utilizing this service previously made the trip as an auto driver or passenger, 58 percent made the trip by other transit service, and 3 percent did not make the trip prior to provision of the service. This study further found that: 86 percent of the total passengers utilizing this service were licensed drivers, 70 percent of the total passengers were "choice passengers" and had a car available at the time the trip was made, 93 percent of all trips were related to a work purpose, and 58 percent of the passengers parked their auto at Mayfair.

It is estimated that on an average weekday during the first quarter of 1965 approximately 200 auto trips were kept off the arterial system, including streets in the CBD, during the peak hours by this service. Moreover, this service has reduced the weekday parking demand in the Milwaukee CBD by approximately 100 autos, which would occupy these parking spaces for approximately eight hours. These findings indicated that expansion of such modified rapid transit service warrants consideration in the transportation plan preparation.

Table A3, Appendix E, relates population size and density to the availability of rail rapid transit service for the 20 largest urbanized areas in the United States and for the Racine and Kenosha urbanized areas. Only 5 of the 12 central cities with a higher population density than Milwaukee have existing rail rapid transit service. The central

Figure 38

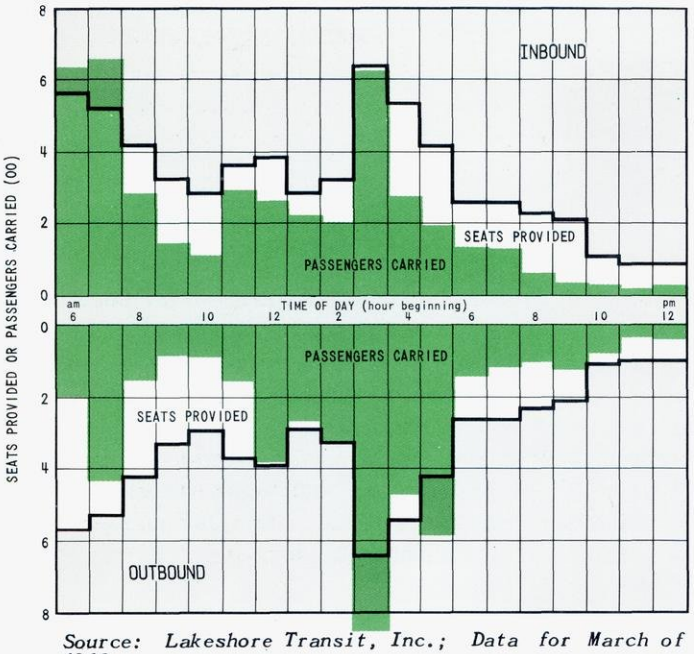
COMPARISON OF BUS SEATS PROVIDED AND PASSENGERS CARRIED TO AND FROM THE RACINE CBD BY HOUR OF WEEKDAY



Source: Lakeshore Transit, Inc.; Data for March of 1963.

Figure 39

COMPARISON OF BUS SEATS PROVIDED AND PASSENGERS CARRIED TO AND FROM THE KENOSHA CBD BY HOUR OF WEEKDAY



Source: Lakeshore Transit, Inc.; Data for March of 1963.

city having the lowest population density and existing rail rapid transit service within the United States is Cleveland, with an average density of 10,789 persons per square mile, as compared to 8,137 persons per square mile for the City of Milwaukee.

TERMINAL FACILITIES

Terminal facilities are an important element of any transportation system and affect system utilization, operation, and efficiency in many ways. With respect to highway transportation, such terminal facilities consist of automobile parking space and truck terminals. For regional transportation planning purposes, the principal emphasis in any study of such highway terminal facilities must be placed upon gross area analyses for the purpose of evaluating the existing supply of parking and other terminal space versus the existing and probable future demand for such space. Shortages of parking facilities are generally most critical in the central business districts; and the necessary regional studies must, therefore, concentrate primarily but not exclusively on these areas.

Parking Facilities

Parking information was gathered as an integral part of both the origin and destination and land use inventories. In addition, data on the supply of parking facilities was obtained and analyzed for the central business districts of Milwaukee, Racine, and Kenosha urbanized areas.

In the home interview origin and destination survey, information was collected on the disposition of the auto at the destination of auto driver trips and, if the auto was parked, information was also collected on the number of blocks walked from the parking space utilized to the ultimate destination of the trip.[10] In the land use inventory, all areas devoted to off-street automobile parking large enough for 10 or more spaces were identified, delineated, and measured as a special land use category. The parking supply data obtained from the municipalities further supplemented the land use data by providing definitive data on the actual number of parking spaces by type.

Table 76 presents a summary of the inventory findings with respect to the supply of parking space

[10] The number of parkers entering the CBD includes all auto trips, except trips in which the auto was parked on residential property. For a description of the Milwaukee, Racine, and Kenosha central business districts, see Appendix D.

Table 76

PARKING SUPPLY IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS BY TYPE OF PARKING FACILITY[a] - 1963

Type of Parking	Milwaukee[b]		Racine[c]		Kenosha[d]	
	Spaces	Percent	Spaces	Percent	Spaces	Percent
On-Street	5,056	19	1,143	34	1,891	42
City Surface Lot	2,322	9	985	29	1,262	29
Privately Owned Surface Lot	13,872	52	914	27	1,268	29
Structure City Owned	1,307	5	300	9	---	---
Structure Privately Owned	4,065	15	50	1	---	---
Total	26,662	100	3,392	100	4,421	100

[a] *Excludes all spaces on residential property and on-street spaces where parking is prohibited.*

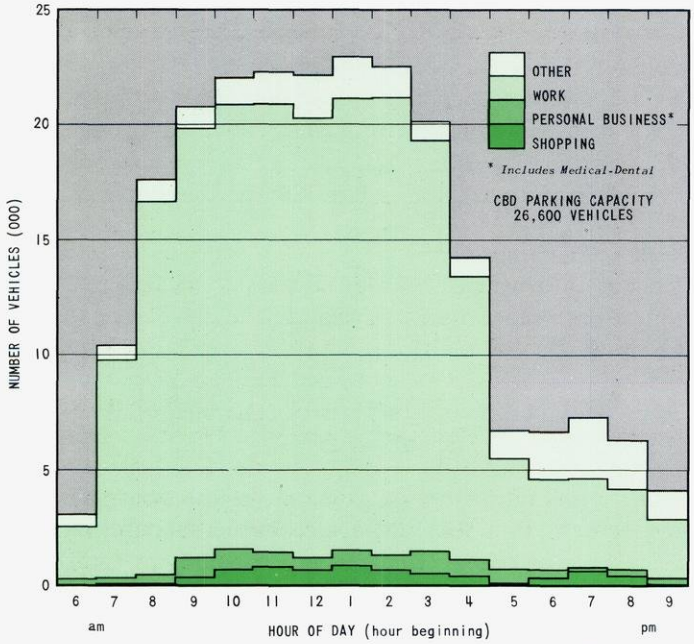
[b] *Source: Report on the Off-Street Parking Program of the City of Milwaukee (Milwaukee: City of Milwaukee, Department of Public Works, April 1964).*

[c] *Source: Report on Parking in the Central Business District—Racine, Wisconsin (Racine: DeLeuw, Cather & Co., March 1964).*

[d] *Source: Information provided by the City Engineer's Office, City of Kenosha.*

Figure 40

PARKING ACCUMULATION OF VEHICLES IN THE MILWAUKEE CBD BY TRIP PURPOSE AND HOUR OF DAY



See Appendix D for description of Milwaukee CBD.
Source: SEWRPC.

in the CBD of each of the three largest urbanized areas within the Region. An estimate of the average weekday parking demand for each CBD was prepared from the origin and destination survey data by accumulating, by hour and trip purpose, the number of parkers entering the CBD and subtracting, by hour and trip purpose, the succeeding auto driver trips out of the CBD by parkers. The hourly accumulation by selected trip purposes so obtained for the Kenosha, Milwaukee, and Racine central business districts is summarized in Figures 40 through 42. The twin-peak accumulations for the Racine CBD and Kenosha CBD and the single long-duration peak accumulation for the Milwaukee CBD are typical for central business districts of the respective size urbanized area. It was found that an overwhelming proportion of the parking accumulation in each CBD was for work purposes. Only relatively small proportions of the total parking accumulation were for shopping, social, recreational, or personal business purposes.

Table 78

PERCENTAGE DISTRIBUTION OF PARKERS BY PURPOSE IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS - 1963

Trip Purpose	Milwaukee	Racine	Kenosha
Work	60	39	41
Shop	7	19	19
Personal Business	14	24	22
Other	19	18	18
Total	100	100	100

Source: SEWRPC.

A gross evaluation of the adequacy of the supply of parking facilities versus the existing demand was made by comparing the peak accumulations for each area with the existing parking supply. The summary of these findings are presented in Table 77, which indicates that approximately 86 percent of the available spaces are occupied during the peak accumulation of an average weekday in the Milwaukee CBD and Racine CBD while approximately 74 percent of the spaces are so occupied in the Kenosha CBD. The relatively high occupancy between 8:00 a. m. and 4:00 p. m. and the relatively low turnover rate for the Milwaukee CBD are primarily due to the higher percentage

Table 77

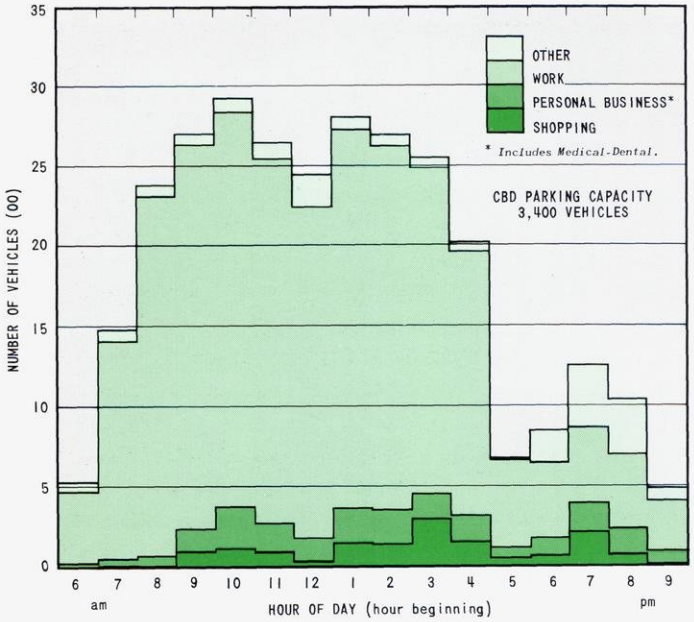
SELECTED PARKING DATA FOR AN AVERAGE WEEKDAY IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS - 1963

Selected Parking Data	Milwaukee	Racine	Kenosha
Auto Driver Trips			
Total Destination[a]	77,900	16,500	16,200
Number Parked[b]	57,800	12,800	12,700
Percent Parked	74	78	79
Peak-Hour of Parking	(1 to 2 p.m.)	(10 to 11 a.m.)	(10 to 11 a.m.)
Number Parked	22,900	2,950	3,250
Spaces Available	26,620	3,390	4,420
Percent of spaces used	86	87	74
Turnover Rate(average weekday)			
Parkers per space	2.2	3.8	2.9

[a] *Includes intra-CBD trips, but excludes "thru trips."*
[b] *Includes all parking (except residential property) where the driver of the auto had a destination in the CBD.*
Source: SEWRPC.

Figure 41

PARKING ACCUMULATION OF VEHICLES IN THE RACINE CBD BY TRIP PURPOSE AND HOUR OF DAY



See Appendix D for description of Racine CBD.
Source: SEWRPC.

of work trips with destinations in the CBD as compared with the Racine and Kenosha areas. It is important to note that care must be used in interpreting the information presented in these figures, since an apparent adequacy of CBD parking facilities on a gross basis does not necessarily indicate that the supply of parking facilities is adequate on a more localized basis. For example, certain local areas within each CBD may be deficient in long-term parking space, while other such local areas may be deficient in short-term parking space, even though on a gross area basis the overall supply of parking facilities for the entire CBD may appear quite adequate.

Table 79

PERCENTAGE DISTRIBUTION OF PARKERS BY TYPE OF PARKING USED IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS - 1963

Type of Parking	Milwaukee	Racine	Kenosha
On-Street, Free. . .	27	17	25
On-Street, Meter . .	13	44	35
Off-Street, Free . .	30*	36	35
Off-Street, Paid . .	30	3	5
Total	100	100	100

* *Off-street free parking includes validated parking.*
Source: SEWRPC.

Other average weekday parking characteristics for these three central business districts were also derived from the inventories and are summarized in Tables 78 through 81. These characteristics include: trip purpose, type of parking facility used, parking duration, and blocks walked from parking facility to ultimate destination. The inventories indicate that the parking characteristics in the Racine CBD and Kenosha CBD are quite similar except for the type of parking facility used, wherein Racine has less on-street free parking and conversely more on-street metered parking than Kenosha. As might be expected, the Milwaukee CBD exhibits parking characteristics which differ markedly from those of Racine and Kenosha. Only 7 percent of the parkers in the Milwaukee CBD were there for shopping as compared to 19 percent for Racine and Kenosha. About

Table 80

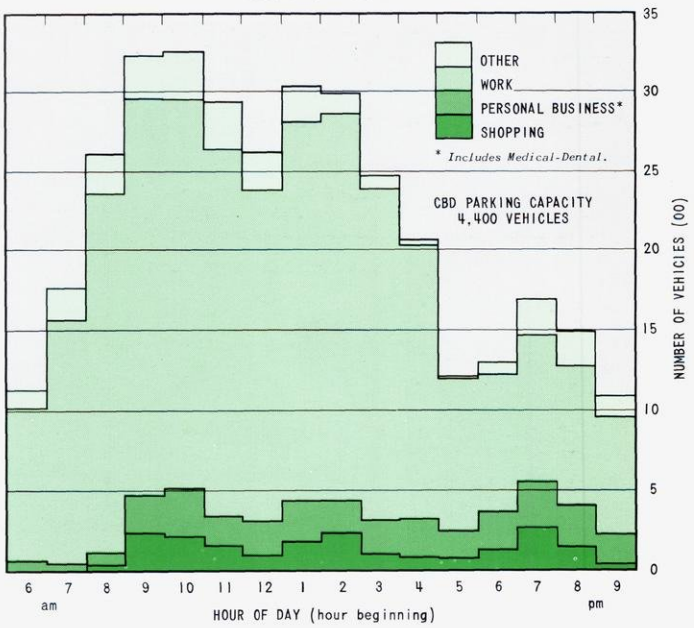
PERCENTAGE DISTRIBUTION OF PARKERS BY DURATION OF PARKING IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS - 1963

Parking Duration (in hours)	Milwaukee	Racine	Kenosha
Under 0.5.	16	36	34
0.5 - 0.9.	11	17	15
1.0 - 1.9.	14	11	13
2.0 - 7.9.	26	24	23
8.0 & over	33	12	15
Total	100	100	100

Source: SEWRPC.

Figure 42

PARKING ACCUMULATION OF VEHICLES IN THE KENOSHA CBD BY TRIP PURPOSE AND HOUR OF DAY



See Appendix D for description of Kenosha CBD.
Source: SEWRPC.

Table 81

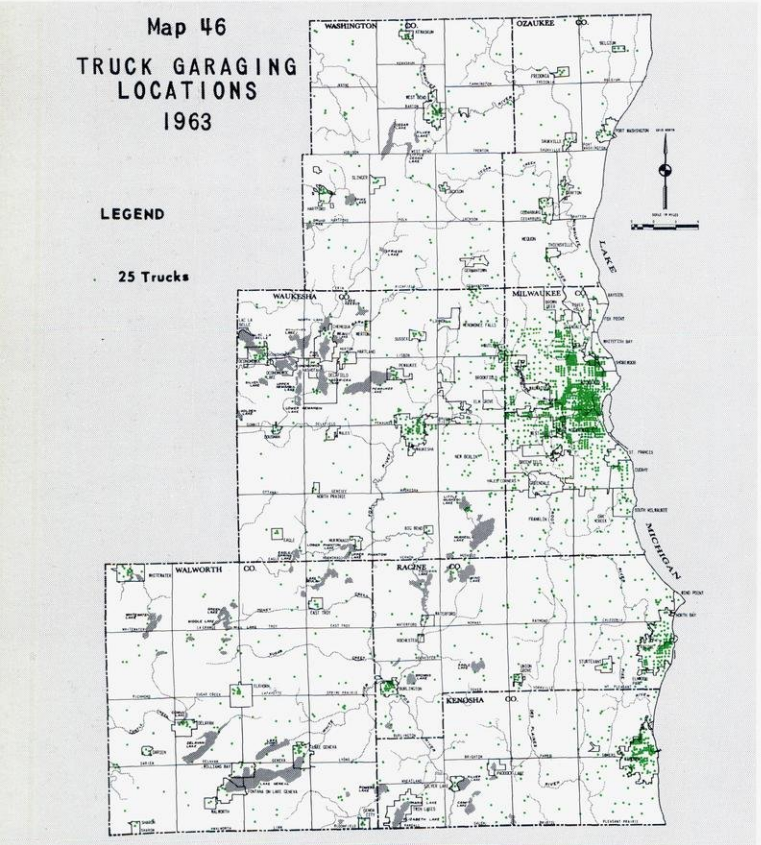
PERCENTAGE DISTRIBUTION OF PARKERS BY DISTANCE WALKED TO DESTINATION IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS - 1963

Blocks Walked	Milwaukee	Racine	Kenosha
Under 1.	87	85	85
1.	4	8	7
2.	4	4	5
3 & over	5	3	3
Total	100	100	100

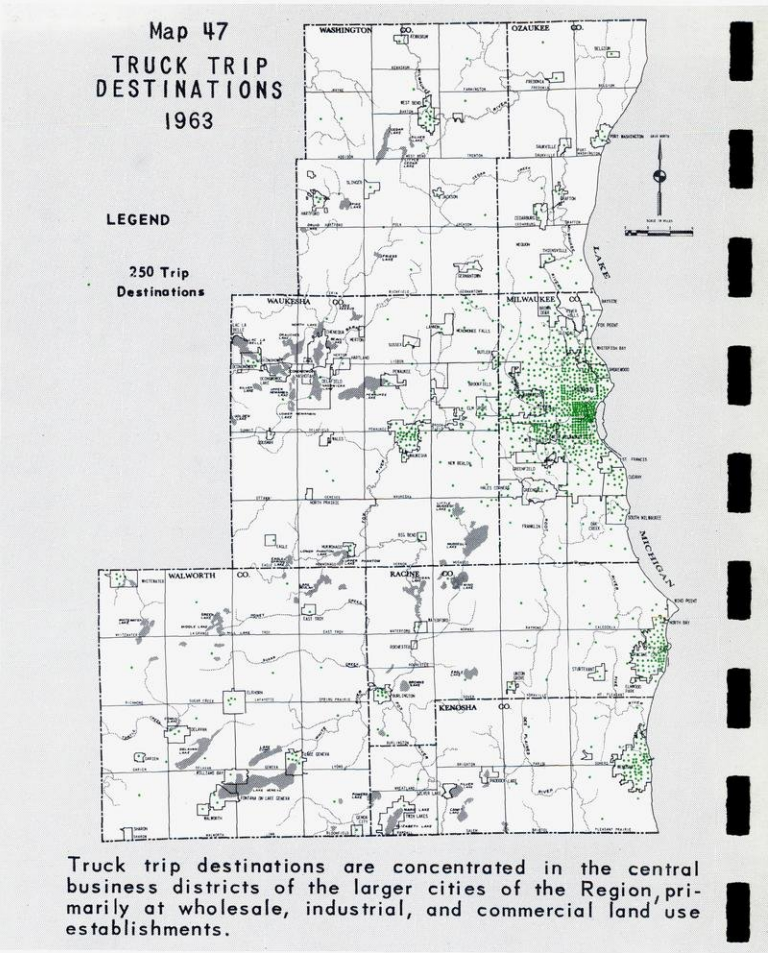
Source: SEWRPC.

60 percent of the parkers in the Milwaukee CBD were there for work as compared to approximately 40 percent in the Racine and Kenosha area.

The number of blocks walked from the parking site to the ultimate trip destination is another measure of the adequacy of parking supply. Table 81 indicates that over 85 percent of all parkers within the Kenosha, Milwaukee, and Racine central business districts were able to park within one block of their final trip destination on an average weekday. Data further shows that of those 7 to 9 percent who parked two or more blocks from their ultimate destination 53 to 60 percent occupied free spaces and that the majority of such parking was in connection with work-related trips.



Operating bases for trucks, although highly concentrated in urban areas, are, nevertheless, nearly ubiquitous within the Region.



Truck trip destinations are concentrated in the central business districts of the larger cities of the Region, primarily at wholesale, industrial, and commercial land use establishments.

Truck Terminal Facilities

Utilizing data collected in the origin and destination survey on garaging address and trip information, an analysis of the spatial distribution of truck terminal facilities within the Region was possible. The spatial distribution of such facilities, as indicated by garaging address, is depicted on Map 46. It is interesting to note that the construction of the interstate highway and Milwaukee County freeway systems within the Region are apparently still so new that truck terminal facilities have not as yet begun to cluster around the interchange areas of these high-type highway facilities to the degree that they have in some other areas of the country.

Further analysis of the inventory data indicated that 41 percent of all trucks within the Region are garaged at commercial land uses; 12 percent are garaged at industrial land uses; and 14 percent are garaged at transportation and public utility

facility land uses, including truck terminals and transfer warehouses; 9 percent are garaged at institutional and governmental land uses; and 24 percent are garaged at other locations; including residential, recreational, and agricultural land uses.

The destinations of approximately 293,000 trips made on an average weekday by trucks garaged within the Region are summarized on Map 47. The resulting pattern further defines truck activity within the Region and may be compared with Map 46, which depicts the location of the primary base of operations of the trucks. Truck-trip destinations are concentrated in the central business districts of the larger cities within the Region and in the larger industrial areas. The inventory information indicated that approximately 36 percent of these destinations were at commercial land uses; 29 percent at residential land uses; 13 percent at industrial land uses; 10 percent at transportation, utility and communication facility land uses; 6 percent at governmental and institutional land uses; and the remaining 6 percent at miscellaneous land uses, including recreational and agricultural. Moreover, 61 percent of these same truck trips were made for the purpose of picking up or delivering goods, 11 percent for service, 11 percent for personal business and other miscellaneous purposes, and the remaining 17 percent to return to the base of operation.

SUMMARY

This chapter has described in summary form the existing transportation system of the Region, including arterial streets and highways, mass transit, automobile parking, and truck terminal facilities. A number of findings having significance for regional land use and transportation planning are evident. These include:

1. As of May 1963, there were approximately 3,200 route miles of arterial streets and highways open to traffic within the Region, of which 42 route miles, or less than 2 percent consisted of freeways. These freeways were, however, carrying 6 percent of the total vehicle-miles of travel over the arterial street and highway network on an average weekday. Milwaukee and Waukesha counties each were found to have approximately one-quarter of the total arterial mileage, while none of the other counties had more than 12 percent of the total mileage.

2. The inventory found that approximately 13 million vehicle-miles of travel occurred within the Region over the arterial system on an average weekday. Most of the arterial utilization occurred within the intensely developed areas of the Region, with Milwaukee County alone accounting for more than 56 percent of the total vehicle-miles of travel and exhibiting by far the most intensive use of the existing arterial system, with over 9,000 vehicle-miles of travel occurring per mile of arterial on an average weekday.

3. Approximately 546 miles, or 17 percent, of the arterials within the Region were operating either at or over design capacity in the spring of 1963. The most congested links in the existing arterial network are located within the intensely urbanized areas, and almost 42 percent of the existing arterial street and highway mileage in Milwaukee County was operating at or over capacity in the spring of 1963. The counties of Kenosha, Racine, and Waukesha each had more than 10 percent of their arterial street and highway mileage operating at or over capacity.

4. Mass transit service within the Region has generally been maintained at a high level, especially when compared to utilization. Approximately 93 percent of the population in Milwaukee County, 70 percent of the population of both Racine and Kenosha counties, and 24 percent of the population of Waukesha County are within one-quarter mile of an existing mass transit line; and the ratio of scheduled seat-miles of service to passenger-miles of travel ranged on an average weekday from a low of 3.3 in Milwaukee County to a high of 5.3 in Kenosha County. As might be expected, the largest number of seat-miles of transit service and of passenger-miles of transit travel on an average weekday occurred in the intensely urbanized areas of the Region, Milwaukee County alone accounting for over 90 percent of the regional totals.

5. No true rapid transit service can be said to exist within the Region. Very limited modified rapid transit service was inaugurated

in 1964 in the form of buses operating over a completed portion of the freeway system. Together all intra-regional rail and modified bus rapid transit service carries less than 1,000 passengers within the Region on an average weekday, or less than 0.04 percent of the total person trips made within the Region on an average weekday.

6. The supply of parking facilities in the central business districts of the three largest urbanized areas within the Region appears quite adequate on the basis of a gross evaluation. Present occupancy during periods of peak accumulations on an average weekday are 86 percent for Milwaukee, 85 percent for Racine, and 72 percent for the Kenosha central business districts. It should be noted that these gross figures do not reflect needs during peak shopping seasons nor do they reflect the adequacy of the existing supply of parking facilities in localized subareas of the respective central business district.

Chapter VIII

TRAVEL CHARACTERISTICS

INTRODUCTION

One of the central concepts underlying the regional land use-transportation study is that travel is an orderly, regular, and measurable occurrence, evidenced by recognizable travel patterns. A complete and accurate inventory of existing travel is necessary to discover these patterns and disclose those aspects which demonstrate a high degree of repetitiveness. Such knowledge is a prerequisite to an understanding of future travel behavior and, therefore, to intelligent planning for future travel requirements. In this respect, the inventory of travel must provide a clear representation of total travel while taking stock of and describing in detail each of its component parts.

Another of the central concepts underlying the regional land use-transportation study, previously noted in connection with the land use inventories, is that land use and transportation are closely interrelated. A complete and accurate inventory of existing travel within the Region is, therefore, also necessary in order to determine the quantitative relationships existing between land use and travel, thereby providing a solid basis for the derivation of future travel demand from existing and proposed land use patterns.

Finally, an accurate inventory of travel is necessary to provide the basis for an understanding of the interactions existing between travel behavior and land use development, an understanding of which is essential to intelligent planning for future land use requirements.

This chapter presents a brief description of the necessary travel inventories, describes existing travel behavior within the Region, and discusses the significant forces shaping the regional travel habits and patterns.

The Travel Inventory

The complete travel inventory consisted of four separate travel surveys, undertaken from May through July 1963, to obtain the necessary information concerning the amount, kind, and distribution of travel occurring throughout the Region on an average weekday. These were the home interview, the truck and taxi, the postal questionnaire, and the external (roadside) surveys.[1] The first three surveys were designed to account for intra-regional travel by residents of the Region, while the external survey was designed to account for inter-regional travel by both residents and nonresidents.

It was clearly impractical from the standpoint of both time and cost to record each trip made by every resident and by every truck and taxi operator in the Region. The best alternative was to conduct personal interviews, at representative sample rates, with those residents and commercial vehicle operators residing in the highly urban ized areas of the Region and to reach all other residents and commercial vehicle operators of the Region by means of postal questionnaires. In order to obtain information on the balance of the weekday travel within the Region, traffic was intercepted on a sample basis at the boundaries of the Region and roadside interviews were conducted with the vehicle drivers.[2]

The home interview survey was the most comprehensive of the four surveys, both in the scope of resident coverage and in the amount of detailed information obtained. Personal interviews were conducted in the home at an approximately 3 percent sample rate in the Milwaukee personal interview area, and at a 10 percent sample rate in both the Racine and Kenosha personal interview areas[3] (see Map 48). Combined, this produced nearly 18,000 samples, representing nearly 440,000 housing units or approximately 86 percent of the total housing units in the Region.

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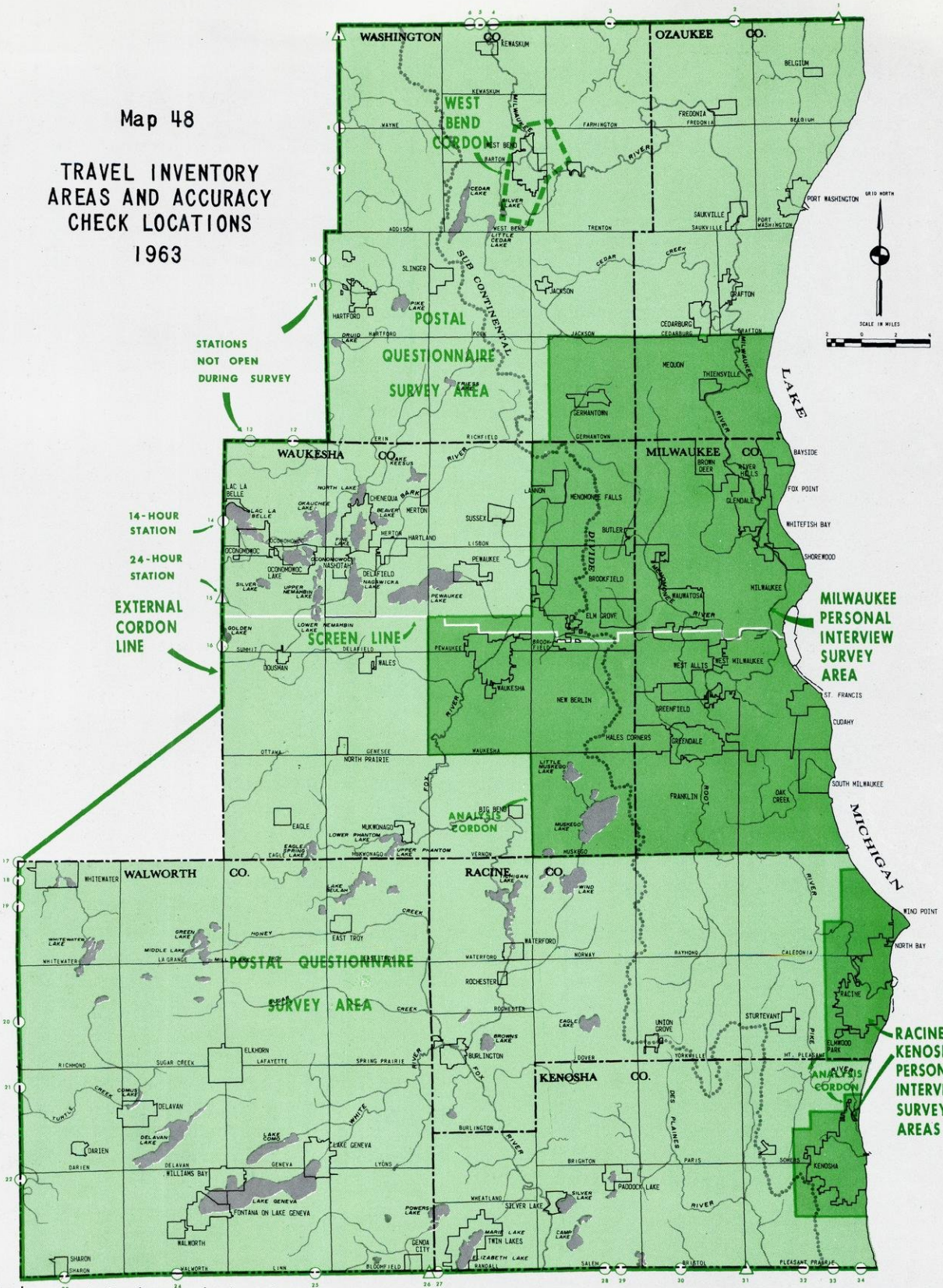
[1] These surveys are described in detail in Technical Record, Vol. 1 – No. 1 and Vol. 1 – No. 2.

[2] Auto and truck trips made by residents of the Region which crossed the boundaries of the Region were recorded in all four surveys. These trips were subsequently deleted from all except the external survey to avoid duplication of data.

[3] The basic source of the sample universe was utility account records.

Map 48

TRAVEL INVENTORY AREAS AND ACCURACY CHECK LOCATIONS 1963



Household characteristic data, vehicle information, and travel data were obtained by personal interviews with 18,000 households and 4,300 truck and taxi operators in the urbanizing areas of the Region and with 74,000 drivers of vehicles crossing the regional boundary. Similar information was obtained, also, by postal questionnaire from 11,000 households and 3,300 truck and taxi operators located in the more rural areas of the Region.

The information obtained from each sample household in this survey included detailed information on each trip made on a given weekday by each member of the household 5 years of age and over. In addition, certain socio-economic information and a locational history were obtained for each household interviewed. For an approximately 25 percent subsample of the households interviewed, personal opinions concerning preferences in transportation facilities and in housing were requested from each adult member.

The truck and taxi survey conducted at the same time and covering the same areas as the home interview survey, recorded detailed information on each trip made by these commercial vehicles on a given weekday through personal interviews with operators of sampled vehicles. The samples in this survey were drawn primarily from Wisconsin Motor Vehicle Department registration files although it was necessary to sample taxis and federal government vehicles, such as postal and military trucks, from independently compiled lists. A sample rate of 8.5 percent was used in the Milwaukee personal interview area, and a sample rate of 25 percent was used in both the Racine and Kenosha personal interview areas, resulting in a combined total of approximately 4,300 samples. In addition to the detailed trip information, basic information concerning the sampled vehicle, such as the garaging address, vehicle type, business or industry of the owner, and the principal commodity carried by the vehicle on each trip, was obtained.

The postal questionnaire survey provided travel information and basic data relating both to households and to trucks and taxis having homc bases in the less populated areas of the Region. These areas, still largely rural, account for nearly three-quarters of the total area of the Region but house only approximately 14 percent of the regional population. The postal survey was conducted in two phases. In the first or household phase, information on travel and household characteristics was obtained from residents of the area; and in the second or truck and taxi phase, information on travel and vehicle characteristics was obtained from commercial vehicle operators in the area. The information collected in the postal survey was fully compatible with that obtained in the three personal interview surveys. The amount of detail, however, was somewhat reduced because of space limitations on the postal questionnaires.

The same sample universe sources utilized in the personal interview surveys were also employed in the postal survey. In the household phase, survey questionnaires were mailed to all 69,014 households in the area. Useable returns totaled 11,093 or approximately a 16 percent sample rate. In the commercial vehicle phase, survey questionnaires were mailed to all 18,419 commercial vehicle operators in the area. Useable returns totaled 3,288 or approximately an 18 percent sample rate.

So that all travel within and through the Region would be represented in the inventory, 32 roadside interview stations were established at the periphery of the Region on all principal highways.[4] Of the approximately 101,500 vehicles crossing the cordon at these stations daily during the survey period (see Map 48), nearly 75,000 or approximately 74 percent were stopped and the drivers interviewed. Data recorded in this external survey included the vehicle type, the number of passengers, the garaging location (inside or outside of the Region), the time, date, travel direction, and data on the origin and destination of each trip.

The expanded data obtained in these four surveys provided a complete representation of the total travel occurring within the Region on an average weekday in 1963. In each survey careful attention was given to data collection scheduling to avoid a daily bias in the information. For the purposes of this report, data obtained in the home interview, truck and taxi, and postal surveys is referred to as "internal" information since it represents travel entirely within the Region, and the data obtained at the external cordon is referred to as "external" information since it represents travel into, out of, and through the Region.

An efficient means for relating the travel inventory data on a uniform areawide basis to the geographic area from which it was collected is essential for planning analyses and forecast purposes. Because of the massive amounts of data collected. such an identification system must permit the ready geographic identification and correlation of travel information by machine methods. To provide such a system, the entire Region was divided into traffic analysis zones, the boundaries of these zones being related to the U. S. Public

[4] Roadside interview stations were established on those highways which combined carried in excess of 85 percent of the total traffic that crossed the boundaries of the Region on an average weekday on all highways. The amount of travel on the remaining highways crossing the boundaries was not considered significant for regional planning purposes.

Land Survey section and quarter-section lines. These traffic analysis zones can be combined for analyses purposes into districts, rings, and sectors. For a complete description of the system adopted, see Appendix D.

The Accuracy Checks

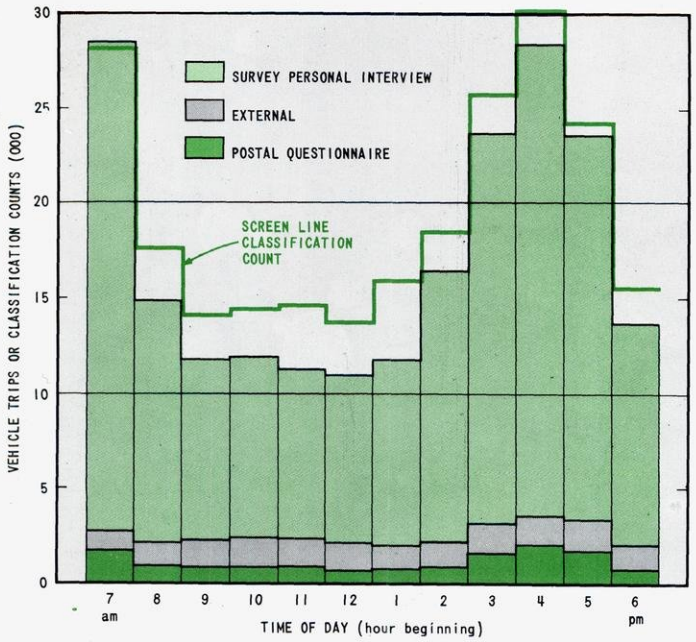
A number of checks were employed to test the completeness and accuracy of the data obtained in the various travel surveys. The principal check consisted of comparing vehicle-trip volumes crossing a screen line as derived from the survey data, with actual vehicle volumes obtained by classification counts made at the screen line. The screen line, extending across the entire Region from Lake Michigan to the western boundary of Waukesha County, was almost ideally located since it paralleled natural and man-made topographic barriers along most of its length, thereby minimizing double crossings and undetected incidental crossings (see Map 48).

Results of the comparisons revealed that for the period between 7 a. m. and 7 p. m. [5] the average daily crossings for auto trips reported in the surveys amounted to approximately 88 percent of the auto crossings recorded at the screen line.

[5] In the external survey, personal interviews were not obtained at all stations on a 24-hour basis; comparisons, therefore, are limited to a 12-hour period.

Figure 43

COMPARISON OF O & D SURVEYS VEHICLE TRIPS AND CLASSIFICATION COUNTS AT THE MILWAUKEE SCREEN LINE



Similarly, the average daily crossings for commercial vehicle trips reported in the surveys amounted to approximately 90 percent of the commercial vehicle crossings recorded at the screen line. Peak-hour comparisons indicated that total-vehicular travel reported in the surveys amounted to approximately 94 percent of the screen line counts during the two-hour morning peak period and the three-hour evening peak period (see Figure 43).

Another major check of survey accuracy consisted of comparing vehicle-miles of travel, derived from the survey data, with actual travel obtained by traffic volume counts. Traffic count information indicated that 13,168,000 vehicle-miles of travel occur within the Region over the approximately 3,200 miles of arterial street and highway system on an average weekday. A comparable figure of 12,410,000 vehicle-miles of travel was obtained in an "unrestrained" traffic assignment employing survey data—providing a 94 percent check of the travel derived from actual traffic counts.

Other accuracy checks[6] included: cordon line comparisons in which average daily volumes of travel crossing "analyses" cordons around each of the three personal interview survey areas, as reported in the surveys, were compared with actual traffic counts on arterial links intercepted by these cordons; [7] a comparison of resident auto and commercial vehicle travel crossing the external cordon with data for similar resident trips reported in the external survey; a similar cordon line comparison for the City of West Bend in the postal questionnaire survey area; a comparison of survey auto ownership data with Wisconsin Motor Vehicle Department auto registrations; and a comparison of survey work trip destinations with average daily work attendance figures provided by six large manufacturing firms (see Table 82).

It is extremely difficult to fix an exact degree of accuracy to the survey data from these comparisons, since in many instances the measurements being compared are both subject to sampling variability. The checks, however, provide strong evidence that the information collected in the travel inventory possesses a very high level of accuracy and completeness.

[6] See "O & D Surveys Accuracy Checks," SEWRPC, Technical Record, Vol. 2 – No. 2.

[7] Screenline checks were originally provided in both the Racine and Kenosha personal interview areas, but both screenline locations were found to be unsatisfactory, and the more accurate cordon checks were applied.

Table 82

SUMMARY OF THE RESULTS OF THE TRAVEL INVENTORY ACCURACY CHECKS

Data Checked	Time Period	Control Source	Percent of* Comparability
Milwaukee Screenline			
Auto Trips	7 a.m.-7 p.m.	SEWRPC Classification Counts	88
Truck & Taxi Trips	7 a.m.-7 p.m.	SEWRPC Classification Counts	90
Total Vehicle Trips	7 a.m.-7 p.m.	SEWRPC Classification Counts	88
Analysis Cordon			
Milwaukee Interview Area	Weekday	SEWRPC Traffic Counts	102
Racine Interview Area	Weekday	SEWRPC Traffic Counts	89
Kenosha Interview Area	Weekday	SEWRPC Traffic Counts	89
External Cordon			
Residents Auto Trips	6 a.m.-8 p.m.	SEWRPC External Survey	96
Residents Truck Trips	6 a.m.-8 p.m.	SEWRPC External Survey	112
Total Vehicle Trips	6 a.m.-8 p.m.	SEWRPC External Survey	98
West Bend Cordon			
Auto Trips	6 a.m.-8 p.m.	SHCW 1963 O & D Survey	88
Truck & Taxi Trips	6 a.m.-8 p.m.	SHCW 1963 O & D Survey	123
Total Vehicles	6 a.m.-8 p.m.	SHCW 1963 O & D Survey	94
Other Checks			
Total Vehicle-Miles of Travel	Weekday	SEWRPC Arterial Street Inventory	94
Population	Weekday	Three Independent Sources	100.2 to 101.2
Employment	Weekday	Six Major Manufacturers	88.8 to 103.8

* *Percent of comparability derived by dividing the expanded sample data by the control source data. For a comparison of the results of the SEWRPC accuracy checks with those of other major transportation studies see Appendix E, Table A9.*

INVENTORY FINDINGS

Quantity of Travel

In the spring of 1963, approximately 1,654,000 persons resided within the Region.[8] About 86 percent of these residents lived in the three major urbanizing areas of the Region, while the remainder lived in the still largely rural areas. These latter areas, however, contain many smaller cities and villages. Altogether the residents of the Region occupied more than 491,000 housing units, an average of 3.4 persons per occupied housing unit.

The inventory found that on an average weekday there was a total of about 3.5 million person trips[9] made within the Region (see Table 83). More than 97 percent of these trips, about 3.4 million, were made by residents of the Region—an average of 2.0 trips per resident or 6.9 trips per household. Within the Region trip production was subject to

[8] This figure does not include approximately 20,000 persons confined in mental hospitals, prisons, invalid homes, and other such quarters where travel by inmates is restricted. It does include, however, approximately 10,000 persons residing in dormitories, convents, homes for the aged, and in similar group quarters where travel by residents is not restricted. The latter group occupied about 9,000 dwelling places.

Table 83

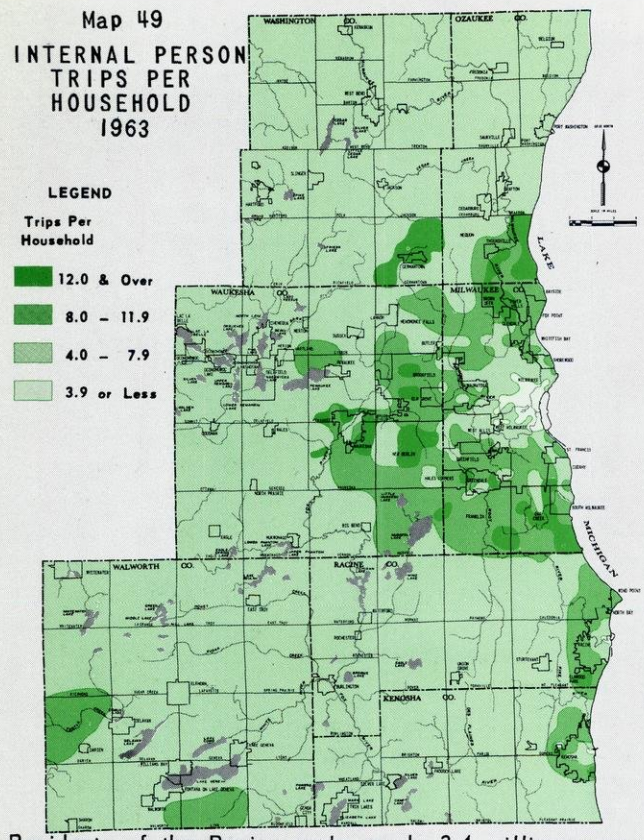
TOTAL PERSON AND VEHICLE TRIPS BY TYPE OF SURVEY

Type of Survey	Person Trips	Vehicle Trips
Personal Interview*		
Milwaukee Area	2,494,333	1,715,877
Racine Area	266,507	192,917
Kenosha Area	179,991	132,107
Sub-total	2,940,831	2,040,901
Postal Questionnaire*	370,467	293,095
Total Internal Trips	3,311,298	2,333,996
External	194,918	101,551
Grand Total	3,506,216	2,435,447

* *Includes trips made to or from the Palmyra area as reported in the internal surveys.*

[9] A person trip is defined here as a one-way journey between a point of origin and a point of destination by a person 5 years of age or over traveling as an auto driver or as a passenger in an auto, taxi, truck, school bus, or other mass transit carrier. To be considered, the trip must have been at least the equivalent of one full city block in length.

The data presented in this report are based on "unlinked" trips unless otherwise specifically noted. Unlinked trips may be defined as a one-way journey between a point of origin and a point of destination, as actually recorded in the travel inventories. All such trips made for purposes of changing the mode of travel or serving passengers were subsequently coded as personal business trips. Linked trips may be defined as a combination of two or more unlinked trips in which incidental intervening trips between a point of origin and the ultimate point of destination are eliminated to preserve the principal travel relationship and purpose of the trip. In a linked trip, a person using more than one mode of travel between a point of origin and a point of destination is considered as having made one continuous trip. The travel mode assigned to such a trip would be the mode having the highest priority in the following list: 1) railroad, 2) school bus, 3) public bus, 4) auto passenger, 5) truck passenger, 6) auto driver, 7) taxi. Also, in a linked trip when an auto driver picked up or dropped off a passenger en route to his main destination, the stop involving the passenger is deleted and the trip between points of origin and primary point of destination considered as one continuous trip.



Residents of the Region made nearly 3.4 million person trips on an average weekday, an average of 6.9 per household. Trip production varied from an average of less than 4 per household in the central areas of the major cities to more than 12 per household in some suburban areas.

wide variations by subareas of the Region as shown by the isoline patterns on Map 49. In the central areas of the larger cities, characterized by relatively small family size, low family income, and low auto availability, the average number of person trips per family was less than four, as compared to averages of more than eight and, in some instances, more than twelve trips per family in the outlying urban and suburban areas around these same cities. In most areas lying between the central areas of these cities and their suburbs, as well as in nearly all of the more rural areas, households averaged between four and eight trips per weekday.

Comparisons with other urban areas, shown in Table 84, indicate that, except for the Minneapolis-St. Paul area, residents of the Milwaukee urbanizing area[10] averaged a greater number of person trips per household than those of all the other areas listed.

One of the most important factors affecting trip production is that of auto ownership. The significance of auto ownership to tripmaking becomes apparent when it is considered that nearly 90 percent of all person trips within the Region were made by auto. The inventory found that residents of the Region owned approximately 512,000 autos and, in addition, that approximately 15,000 autos were owned by industry or government within the Region and garaged at residences.[11] The rate of auto ownership within the Region was 1.04 autos per household, while the rate of auto availability was 1.07 autos per household, or about 319 autos per thousand resident population. Less than 19 percent of the households within the Region did not own an auto; about 58 percent owned one auto; and nearly 24 percent owned two or more autos.

Auto availability within the Region varied widely by area as shown on Map 50. The lowest rates were found in the central areas of the three major cities within the Region, as well as in similar areas of the smaller cities of Waukesha, St. Francis, and Cudahy. In all of these areas, the number of autos available averaged less than one auto per household; and, in and near the core area of the City of Milwaukee, the average was less than 0.5 autos available per household. The highest rates were found in the suburban areas and in many of the rural areas of the Region, where the

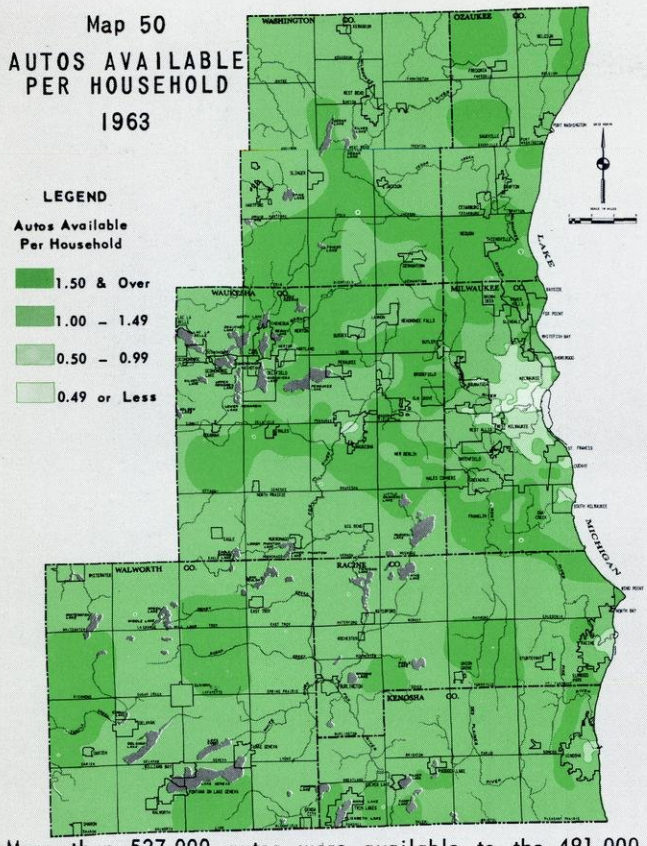
[10] The Milwaukee urbanizing area is used in this and in other similar comparisons in this chapter in order to provide valid comparisons with findings of other transportation studies, which have been generally restricted to the urbanizing areas rather than to an entire region. In this instance, the trip production rates per household for the Region and for the Milwaukee urbanizing area are identical.

[11] In contrast to the 527,000 autos found to be available to residents of the Region in the inventory, there were 566,139 autos registered with the Motor Vehicle Department within the Region in the calendar year 1963, not including certain autos owned by federal, state, and municipal units of government. The difference between the number of autos registered within the Region and the number available to residents, as found by the inventories, is accounted for by registrations made after June 30, 1963, autos owned by industry but not garaged at residences, rental vehicles, autos owned by persons who moved out of the Region during the year, and autos which were scrapped during the year and no replacement purchased.

Table 84

COMPARISONS OF AVERAGE NUMBER OF PERSON TRIPS PER HOUSEHOLD IN SELECTED URBANIZING AREAS

Urbanizing Area	Year	Population (000)	Person Trips Per Household
Chicago.	1956	5,170	5.96
Milwaukee. . . .	1963	1,654	6.93
Baltimore. . . .	1962	1,506	5.73
Pittsburgh . . .	1958	1,472	5.31
Minneapolis-St. Paul. . .	1958	1,376	8.26
St. Louis. . . .	1957	1,275	6.05
Kansas City. . .	1957	860	6.69



More than 527,000 autos were available to the 491,000 households within the Region, an average of 1.07 autos per household. Almost 58 percent of the total households had one auto; nearly 24 percent had two or more autos; and less than 19 percent had none.

number of autos available averaged more than 1.5 autos per household. In the remainder of the Region, the number of autos available averaged between 1.0 and 1.5 autos per household.

In addition to the 527,000 autos, there were also nearly 58,500 trucks[12] and about 500 taxis garaged within the Region. This represents about 35 trucks and 0.3 taxis per thousand resident population. Nearly 60 percent of the total trucks were classified as light trucks, more than 30 percent were classified as medium trucks, and less than 10 percent were classified as heavy trucks.[13]

[12] In contrast to the 58,500 trucks found in the inventory to be garaged within the Region, there were 59,487 trucks registered within the Region in the calendar year 1963, not including certain trucks owned by federal, state, and municipal units of government. The difference between the number of trucks registered and the number garaged within the Region, as found by the inventory, is accounted for by registration made after June 30, 1963, trucks registered within the Region but garaged outside the Region, trucks removed from the Region during the year, and trucks scrapped during the year and no replacement purchased.

[13] A light truck is defined as a single unit, two-axle truck. A medium truck is defined as a single unit, two-axle six-wheel truck or a single unit three-axle truck. A heavy truck is defined as a tractor-trailer unit.

These autos, trucks, and taxis combined made approximately 2,380,000 trips on an average weekday. Autos, averaging 3.9 trips per day per auto, accounted for 87 percent of the total vehicle trips; trucks, averaging 5.1 trips per day per truck, accounted for nearly 13 percent; and taxis, although averaging 14.0 trips per day per taxi, accounted for less than one percent of the total vehicle trips. In addition to these nearly 2.4 million vehicle trips made by autos, trucks, and taxis garaged within the Region, approximately 45,000 auto trips and 9,500 truck trips were made within the Region on an average weekday by vehicles garaged outside of the Region.

From the general measurements of trip production described here, it is evident that the travel patterns existing within the Region are shaped almost exclusively by the travel of residents. A continuation of the rapid population growth experienced within the Region in the last decade and the concomitant increase in households, therefore, will result in large increases in tripmaking. Substantial increases in tripmaking can also be anticipated through higher trip production rates, since, as auto ownership rates increase, as family incomes rise, and as rural and semi-rural areas of the Region are converted to urban use, higher average trip production rates per household should result.

Trip Purpose[14]

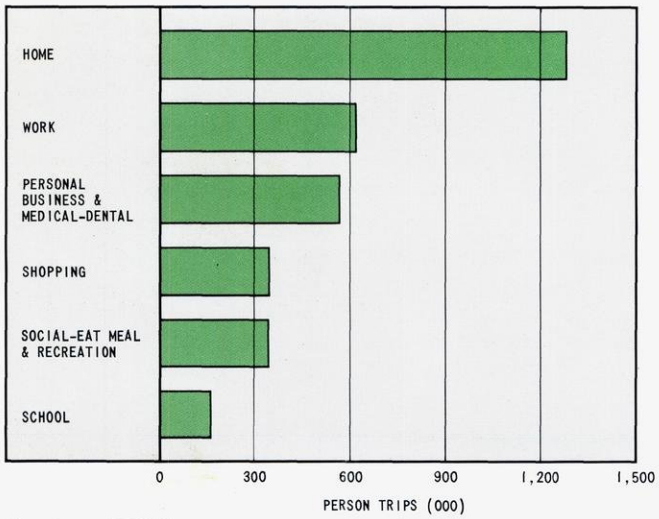
Since the home is the center of family life, it is not surprising that the most common of all trip purposes within the Region is "to go home." On an average weekday, nearly 39 percent of all person trips within the Region had destinations at the place of residence. Next in importance were trips to work, which accounted for 19 percent of the total. Trips for personal business, about one-half of which were for the purpose of serving passengers, amounted to 17 percent. Also included in the personal business category were trips for financial, medical, and legal services and trips to church, club meetings, and even trips to cemeteries. Social-recreational and shopping trips were nearly balanced, each accounting for a little more than 10 percent of the total person trips within the Region. School trips accounted for less than 5 percent of the total (see Figure 44).

The importance of home-oriented travel becomes even more apparent when it is considered that,

[14] Because intra-regional travel comprises an overwhelming proportion of the daily travel within the Region, only internal data will be used in the remainder of this chapter unless otherwise specifically noted.

Figure 44

DISTRIBUTION OF UNLINKED INTERNAL PERSON TRIPS BY TRIP PURPOSE AT DESTINATION



Source: SEWRPC.

in addition to the approximately 39 percent of total person trips within the Region which ended at home on an average weekday, an approximately equal percentage of trips began at home. This means that nearly four-fifths of all resident travel consisted of trips to or from home. It is very clear, then, that the location of future residential development will have a powerful impact upon future travel facility requirements within the Region.

Since trucks are engaged primarily in the movement of goods, truck trips have purposes quite different from person trips. More than 60 percent of the total truck trips made within the Region on an average weekday were concerned with picking up or delivering goods. Unlike persons, who made many reciprocal trips starting from home, such as home to work then work to home again, truck operators usually made a series of trips after leaving their bases of operation before returning to these bases. Truck trips returning to the bases of operation accounted for only 19 percent of total truck trips within the Region on an average weekday, compared to 39 percent of total person trips returning home. Of other truck trips, those connected with service, such as trips made by repairmen, for example, amounted to about 11 percent of the total; personal business trips in which the trucks were actually used as an auto accounted for 5 percent; and all other work connected trips, as for example, trips to obtain gasoline, also amounted to about 5 percent of the total.

More than 90 percent of the total taxi trips within the Region on an average weekday were made to serve passengers, and of the remainder nearly all were to return to the base of operations.

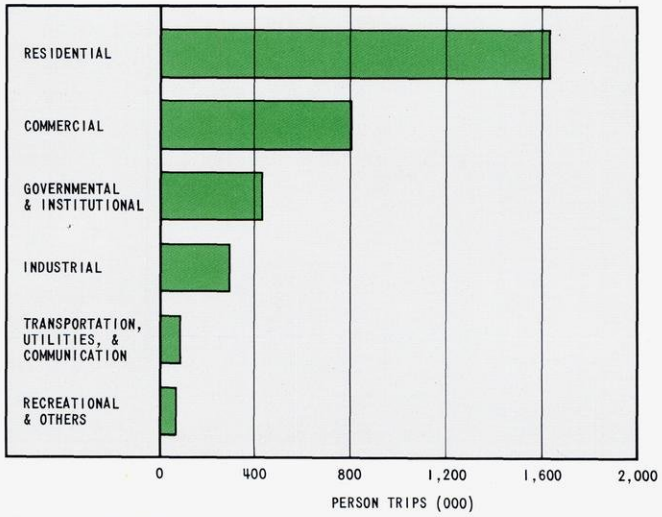
Land Use

Almost 50 percent of all person trips made within the Region on an average weekday had destinations at residential land uses, and most of these (nearly 40 percent of the total person trips) were made by family members returning to their homes. An additional 10 percent of the total person trips within the Region also had destinations at residential land uses but were made by non-family members, such as friends who stopped in to visit or salesmen and repairmen making business calls.

Commercial land uses, including retail stores, professional offices, and service establishments, attracted nearly 25 percent of the total person trips within the Region. About 12 percent were made to governmental and institutional land uses, such as schools, post offices, hospitals, and other public buildings. Industrial land uses comprising durable and nondurable manufacturing, as well as wholesale establishments and storage areas, accounted for about 10 percent of the total. Trips to all other land uses, including: transportation, communication, and utilities; recreational areas; agricultural; other open land areas; and lakes, rivers, streams, and wetlands amounted to only 5 percent of total person trips within the Region on an average weekday (see Figure 45 and Appendix E, Table A6).

Figure 45

DISTRIBUTION OF UNLINKED INTERNAL PERSON TRIPS BY LAND USE AT DESTINATION



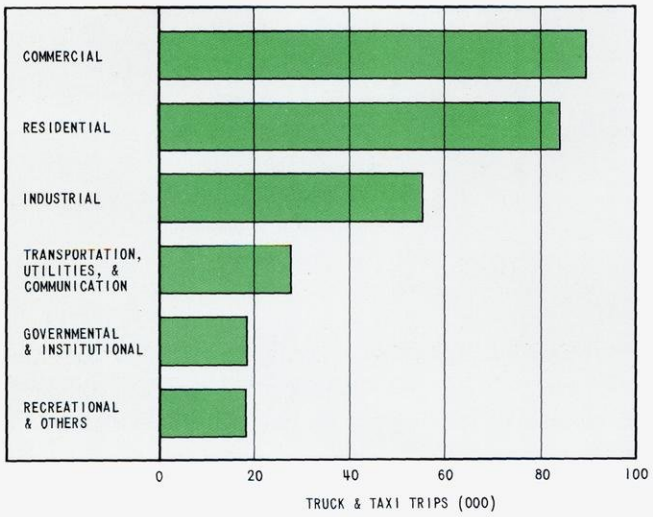
Source: SEWRPC.

Truck trips to various land uses exhibit a significantly different distribution pattern than either total person or total vehicle trips (see Figure 46). Trucks, moving goods rather than persons, were attracted in relatively greater numbers to commercial and industrial land uses and, since many trucks were garaged there, to transportation facilities. Conversely, trucks made relatively fewer trips to residential land, at which nearly all autos, but very few trucks, within the Region were garaged.

Taxi trips were destined, in order of importance, to residential and commercial land uses and to transportation facilities.

Figure 46

DISTRIBUTION OF INTERNAL UNWEIGHTED TRUCK & TAXI TRIPS BY LAND USE AT DESTINATION



Source: SEWRPC.

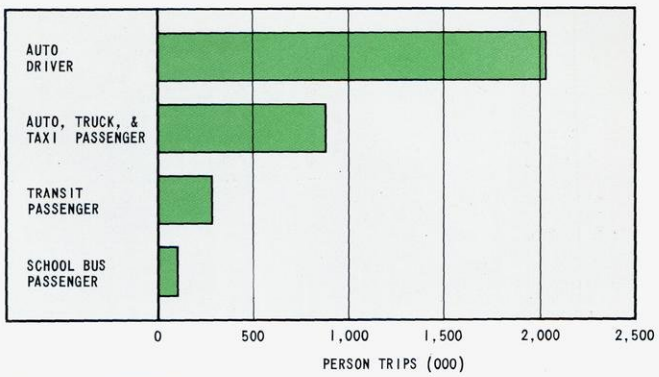
Travel Mode

The predominance of the auto as a mode of travel within the Region in 1963 is shown clearly in Figure 47. Almost nine out of every ten person trips were made by auto, either as an auto driver (61.4 percent) or as an auto passenger (26.8 percent). Of the remaining modes, public buses carried 8.5 percent of the total person trips; school buses carried 3.3 percent; trucks and taxis each carried only about 0.1 percent; and railroads, serving only a few hundred passengers, carried little more than 0.01 percent (see Appendix E, Table A7).

Comparisons in Table 85 show that tripmakers in the Milwaukee urbanizing area relied more heavily upon the auto and less upon transit as a mode of travel than did residents of all but one other urban area (Minneapolis-St. Paul). Milwaukee had the highest percentage of auto driver trips and the second lowest percentage of transit trips of all listed urban areas.

Figure 47

DISTRIBUTION OF UNLINKED INTERNAL PERSON TRIPS BY MODE OF TRAVEL



Source: SEWRPC.

The selection of a particular mode of travel was not always a matter of choice. Many households, for example, were located in areas not served by transit and, therefore, were almost entirely dependent upon autos. On the other hand, many families did not have an auto available and, therefore, were forced to rely almost entirely upon mass transit. The travel inventory revealed that about 91.5 percent of all transit riders could not have made the trip as an auto driver since they either did not possess a license to drive, did not own an auto, or did not have an auto available at the time the trip was made.

Table 86 shows that the majority of auto driver trips made within the Region on an average weekday were made by males; and, conversely, the majority of auto passenger and transit passenger trips were made by females. This table also

Table 85

COMPARISONS OF PERCENTAGE DISTRIBUTION OF TOTAL PERSON TRIPS BY MODE OF TRAVEL FOR SELECTED URBANIZING AREAS

Urbanizing Area	Year	Auto Driver	Passenger		
			Auto, Truck, & Taxi	Mass Transit	School Bus
Milwaukee . .	1963	60.0	26.6	10.5	2.9
Minneapolis-St. Paul .	1958	58.3	29.3	12.4[a]	---
Baltimore . .	1962	54.7	27.8	12.7	4.8
Pittsburgh. .	1958	52.4	27.9	15.9	3.8[b]
Chicago . . .	1956	48.4	27.2	27.2[a]	---

[a] *Includes school bus.*

[b] *Estimated.*

Table 86

SELECTED CHARACTERISTICS OF USERS OF VARIOUS MODES OF TRAVEL WITHIN THE REGION

Selected Characteristics	Percent of Each Modes' Total Trips			
	Auto Driver	Auto Passenger[a]	Transit Passenger	School Bus Passenger
Sex				
Male	70.2	32.3	36.5	49.1
Female	29.8	67.7	63.5	50.9
Total	100.0	100.0	100.0	100.0
Age Group (years)				
5-14	---	30.8	9.6	75.5
15-19	4.1	11.4	19.2	23.9
20-24	8.8	7.6	9.8	---
25-29	11.5	6.7	4.7	---
30-34	12.5	5.9	4.5	---
35-44	28.1	13.8	13.6	---
45-54	20.0	11.3	14.7	---
55-64	10.6	7.4	14.4	---
65 & over	4.4	5.1	9.5	---
Total	100.0	100.0	100.0	99.4[b]
Other				
Licensed Drivers	100.0	39.3	29.6	8.3
Going to and from Work	45.8	18.1	49.7	---
Going to and from School	1.2	11.7	21.1	99.7
Trips in 6 Peak Hours	44.2	38.6	64.5	86.2
Going to and from the Milwaukee CBD	6.2	4.6	31.4	---

[a] *Includes truck and taxi passengers.*

[b] *The 0.6 percent remaining is distributed throughout the other age groups.*

Source: SEWRPC.

shows that approximately 40 percent of total auto passenger trips and nearly 30 percent of total transit trips were made by persons licensed to drive. Of all age groups, persons in the 35-44 age group account for the highest percentage of auto driver trips; children in the 5-14 age group account for the greatest number of auto passenger trips; and young people in the 15-19 age group account for the greatest number of transit trips.

Approximately 50 percent of the total transit trips made within the Region on an average weekday, about 46 percent of the total auto driver trips, and about 18 percent of the total auto passenger trips consisted of trips to and from work. This table shows that while virtually all trips by school buses are either going to or coming from schools, as might be expected, more than one-fifth of the total transit trips and nearly one-eighth of the total auto passenger trips were also to or from school. Such trips, however, comprise only about 1 percent of total auto driver trips.

Nearly two-thirds of the total transit trips and nearly seven-eighths of total school bus trips are made in the morning and afternoon peak periods. In contrast, considerably less than one-half of the total auto driver trips and about three-eighths of the total auto passenger trips were made during these peak periods.

It is significant that approximately 31 percent of the total transit trips within the Region but only about 6 percent of the total auto driver trips and less than 5 percent of the total auto passenger trips had either origins or destinations in the Milwaukee CBD.

The inventory indicates that the average number of persons per auto, including the driver, varied significantly with the trip purpose. The average auto occupancy for social-recreational trips was found to be 1.8 persons; for trips to shop, 1.6 persons; for trips to home, 1.5 persons; for trips for personal business, 1.3 persons; and for trips to work, 1.2 persons. The average auto occupancy within the Region on an average weekday, based upon all internal auto trips, was 1.4 persons per auto.

In order to obtain a full representation of the amount and location of average daily employment

attendance in the urbanizing areas of the Region, as well as to provide complete knowledge of home-to-work travel, information was obtained concerning persons who either walked to work or worked at home.[15] Of total home-to-work trips within each urbanizing area, walk-to-work trips accounted for 5.4 percent in the Milwaukee urbanizing area, for 8.2 percent in the Racine urbanizing area, and for 14.0 percent in the Kenosha urbanizing area. For the combined urbanizing areas, walk-to-work trips accounted for 6.1 percent of the total home-to-work trips. Work-at-home trips amounted to less than 1 percent of total home-to-work trips in each urbanizing area.

Approximately one-half of the total of 23,840 walk-to-work trips were made to industrial land uses, about one-third were made to commercial land uses, and nearly one-sixth to governmental and institutional land uses. Approximately 1,000 walk-to-work trips were distributed among transportation, utilities, and communication; residential; recreational; and agricultural land uses in that order of importance.

Vehicle Type

In addition to the more than 2.0 million internal vehicle trips made by autos within the Region on an average weekday, there were approximately 293,400 trips made by trucks and about 7,000 trips by taxis. Of the total truck trips, light trucks accounted for 57.7 percent; medium trucks accounted for 37.8 percent; and heavy trucks accounted for 4.4 percent (see Figure 48 and Appendix E, Table A8).

HISTORIC TRENDS

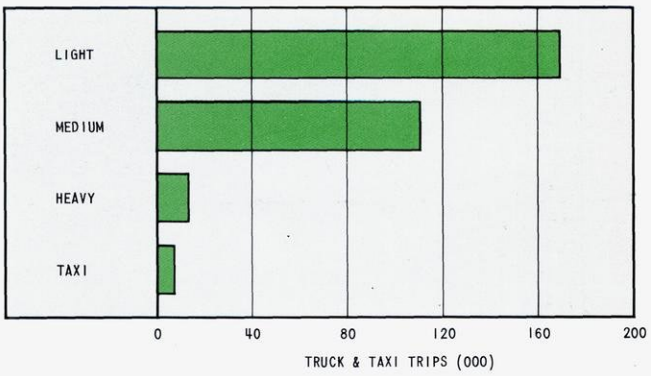
Mass Transit

In the 11-year period from 1953 through 1963, there was a constant annual decline, although at an irregular rate, in the use of mass transit as a mode of travel within the Region.

In the combined Milwaukee, Racine, Kenosha, and Waukesha areas, which accounted for all but a very small part of the total mass transit utilization within the Region, the total number of revenue-passengers carried annually decreased by 45.2 percent, from 171.0 million in 1953 to 93.8 million in 1963 (see Figure 49). During the same period the number of streetcar-[16] and bus-miles of service operated annually decreased by 29.2 percent, from 35.4 million in 1953 to 26.5 million in 1963.

Figure 48

DISTRIBUTION OF INTERNAL UNWEIGHTED TRUCK AND TAXI TRIPS BY VEHICLE TYPE



Source: SEWRPC.

By subarea for the same period, this figure shows that: in the Milwaukee area, revenue-passengers declined by 44.1 percent, from 158.4 million to 88.5 million and streetcar- and bus-miles of service decreased by 29.2 percent, from 34.4 million to 24.4 million; in the Racine area, revenue-passengers declined 56.6 percent, from 6.7 million to 2.9 million, and bus-miles of service decreased by 21.0 percent, from 1.5 million to 1.2 million; in the Kenosha area, revenue-passengers declined by 62.8 percent, from 5.0 million to 1.9 million, and bus-miles of service decreased by 27.5 percent, from 1.1 million to 764,000; and in the Waukesha area, revenue-passengers declined by 48.5 percent, from 876,000 to 451,000, and bus-miles of service decreased by 26.8 percent, from 239,000 to 175,000.

In the Milwaukee area, both revenue-passenger totals and streetcar- and bus-miles of service totals declined in each successive year from 1953 through 1963 (see Figure 50).

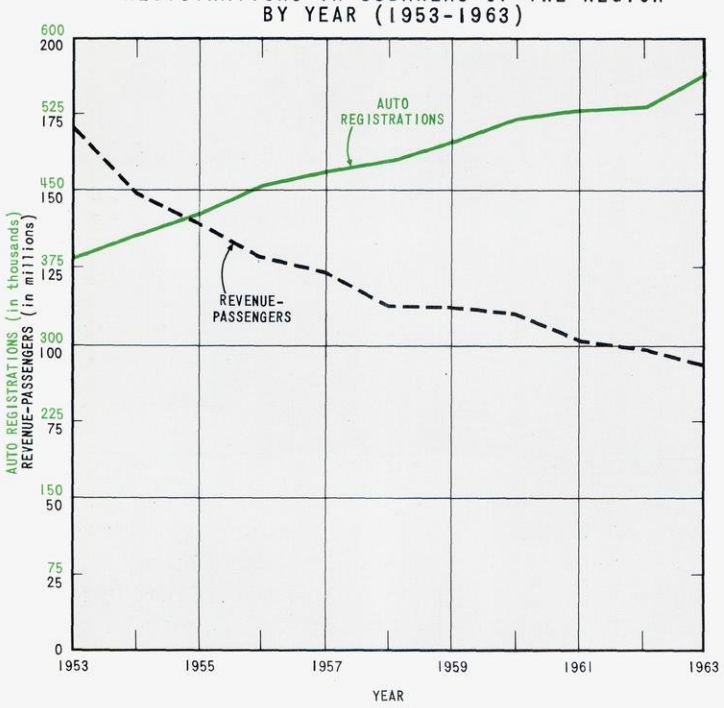
In the Racine area, the downward trend in revenue-passengers was checked in 1959 and again in 1963. In 1959 an increase of 93,000 passengers, about 2.5 percent, was recorded with only a very small

[15] Walk-to-work trips and work-at-home trips, as noted above, were recorded solely for the purpose of obtaining a full representation of home-to-work travel and total employment checks. For this purpose, persons who worked at home, such as a person who had a repair shop in his basement, were said to have made a trip from home to work. The only walking trip recorded in the travel inventory was a walking trip to work; neither the reciprocal of this trip nor any other trip made by walking, therefore, was recorded. Walk-to-work trips and work-at-home trips are not included in any of the person or vehicle trip totals discussed in this chapter.

[16] The last streetcar operated in the Milwaukee area in March 1958.

Figure 49

COMPARISON OF REVENUE-PASSENGERS AND AUTO REGISTRATIONS IN SUBAREAS OF THE REGION BY YEAR (1953-1963)



Source: Milwaukee & Suburban Transport Corp; Lakeshore Transit, Inc; Wisconsin Coach Lines, Inc; and Wisconsin Motor Vehicle Department.

increase in bus-miles; in 1963, however, an increase of 28,000 passengers, about 1 percent, was accompanied by an increase of 184,000 bus-miles of service, about 11.9 percent. In 1957 and 1958 revenue-passengers declined despite sizeable increases in bus-miles of service (see Figure 50).

In the Kenosha area, the decline in revenue-passengers also was reversed in both 1959 and 1963. In 1959 an increase of 54,000 passengers, about 2.4 percent, occurred despite a 2.8 percent decrease in bus-miles. In 1963 a gain of 194,000 passengers, about 11.5 percent, was recorded; but 72,000 bus-miles, about 13.5 percent, were added. In 1960 a small decline in revenue-passengers took place despite a small increase in bus-miles (see Figure 50).

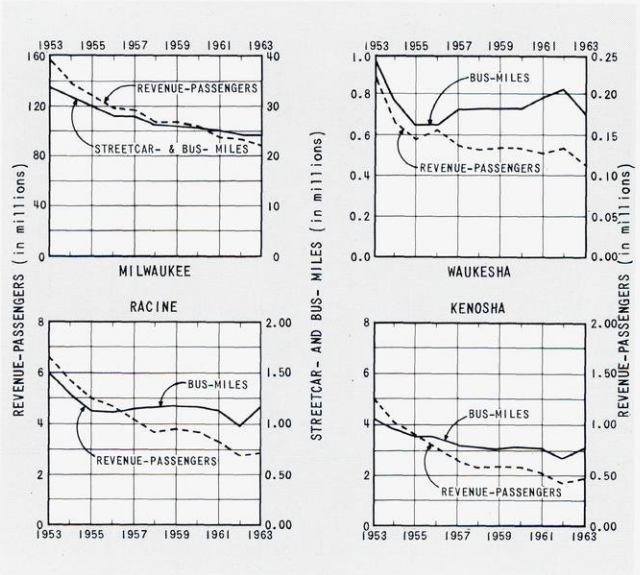
In the Waukesha area, the yearly decline in revenue-passengers was halted in 1956, 1959, and in 1962. In 1956 an increase of 35,000 passengers, about 6.0 percent, took place with virtually no change in bus-miles. In 1959 an increase of 13,000 revenue-passengers, about 2.5 percent, was obtained with no increase in bus-miles; and in 1962 an increase of 21,000 passengers, about 4.0 percent, was reported as 12,000 bus-miles, about 5.7 percent, were added. The number of revenue-passengers decreased in 1957, 1958, 1960, and 1961, despite some increases in the bus-miles operated (see Figure 50).

The increases in revenue-passengers in 1959 in the Racine, Kenosha, and Waukesha areas and the check of the steady annual decline in the Milwaukee area in that same year is probably the result of improved economic conditions in the Region after the recession in 1958. In the latter year, substantial decreases in revenue-passengers occurred in all four subareas.

The general decline in revenue-passengers and in streetcar- and bus-miles of operation in the combined subareas of the Region during the 11-year period from 1953 through 1963 was accompanied by a marked decrease in the size of the operational fleets. The most dramatic decrease occurred in the Milwaukee area where the average fleet size decreased by 33.3 percent from a total of 952 units in 1953 to 635 units in 1963. In the Racine area, the average fleet size decreased by 14.0 percent from a total of 43 units in 1953 to 37 units in 1963. In the Kenosha area, the average fleet size decreased by 5.7 percent from a total of 35 units in 1953 to 33 units in 1963. In the Waukesha area, the average fleet size showed an overall increase of one unit from 1953 to 1963 but a decline of two units from 1956 through 1963. The overall decrease in average fleet size for

Figure 50

MASS TRANSIT REVENUE-PASSENGERS AND STREETCAR- AND BUS- MILES FOR SUBAREAS OF THE REGION BY YEAR (1953-1963)



Source: Milwaukee & Suburban Transport Corp; Lakeshore Transit, Inc; and Wisconsin Coach Lines, Inc.

Table 87

AVERAGE SIZE OF TRANSIT FLEET IN THE FOUR SUB AREAS OF THE REGION (1953 - 1963)

Year	Milwaukee				Racine (Bus)	Kenosha (Bus)	Waukesha (Bus)	Total
	Bus	Trolley Bus	Street-Car	Total				
1953	477	312	163	952	43	35	7	1,037
1954	473	305	98	876	43	35	7	961
1955	472	279	76	827	43	35	7	912
1956	452	294	33	779	41	35	10	865
1957	453	285	22	760	41	35	9	845
1958	463	264	---	727	41	33	9	810
1959	464	246	---	710	39	33	9	791
1960	445	248	---	693	39	33	8	773
1961	424	230	---	654	39	33	8	734
1962	431	217	---	648	37	33	8	726
1963	502	133	---	635	37	33	8	713

Data is for an average day in May of each year.

Source: Milwaukee & Suburban Transit Corp.; Lakeshore Transit, Inc.; and Wisconsin Coach Lines, Inc.

the combined subareas of the Region was 31.2 percent during the 11-year period (see Table 87).

Auto Registrations

Contrasting to the approximately 45 percent decrease in mass transit revenue-passengers within the Region from 1953 through 1963 was the increase of approximately 46 percent in auto registration within the Region, from 387,987 in 1953 to 566,139 in 1963 (see Figure 49). Increases in auto registration were recorded in each successive year in each county within the Region during this period, except in 1962, when decreases of less than 1 percent were recorded in Kenosha and Walworth counties. The largest percentage of increase for the 11-year period was in Waukesha County, where auto registrations increased by approximately 115 percent, from 33,098 in 1953 to 71,064 in 1963. Milwaukee County, although showing the largest increase in the number of registrations, 88,032 over the entire 11-year period, had the lowest percent of increase of all counties, 34.5 percent (see Table 88).

Truck Registrations

Truck registrations within the Region, unlike auto registrations, have remained relatively stable during the 11-year period from 1953 through 1963, varying from the average of that period by a maximum of only 6 percent in any given year (see Table 89). It is somewhat surprising that truck registrations have not shown a rate of growth commensurate with the growth of population and industry in the Region during this period. Better utilization of trucks and a reduction in farm trucks due to the decline in farming within the Region may have been partly responsible for this lag. Despite fluctuations in certain years, probably reflecting short-term changes in the economy of the Region, there appears to be a long-term trend of slowly increasing registrations.

Table 88

AUTO REGISTRATIONS IN THE REGION BY COUNTY (1953 - 1963)

Year	County							Region
	Kenosha	Milwaukee	Ozaukee	Racine	Walworth	Washington	Waukesha	
1953	25,694	255,383	9,080	36,734	15,799	12,199	33,098	387,987
1954	26,046	266,667	9,636	37,865	16,422	12,555	35,611	404,802
1955	28,449	280,612	10,437	40,030	17,317	13,267	39,247	429,359
1956	29,983	295,769	11,495	42,682	18,182	14,025	44,242	456,378
1957	30,545	303,062	12,348	43,753	18,850	14,534	47,243	470,335
1958	32,203	306,683	12,848	44,900	19,427	14,956	50,987	482,004
1959	34,819	313,665	13,648	46,888	19,776	15,501	54,796	499,093
1960	37,332	325,409	14,331	49,329	20,418	16,354	59,901	523,074
1961	37,445	328,074	14,797	50,085	20,641	16,893	63,239	531,174
1962	37,204	328,733	15,105	50,462	20,526	17,116	65,572	534,718
1963	40,154	343,415	16,285	54,604	22,077	18,540	71,064	566,139

Source: Wisconsin Motor Vehicle Department.

Table 89

TRUCK REGISTRATIONS IN THE REGION BY COUNTY (1953 - 1963)

Year	County							Region
	Kenosha	Milwaukee	Ozaukee	Racine	Walworth	Washington	Waukesha	
1953.	4,171	29,172	2,242	5,942	4,257	3,129	6,658	55,571
1954.	4,699	31,515	2,611	6,675	4,796	3,450	7,649	61,395
1955.	4,630	28,502	2,192	5,833	4,271	3,117	6,840	55,385
1956.	4,524	29,029	2,338	6,143	4,513	3,298	7,807	57,652
1957.	4,562	28,851	2,352	6,255	4,668	3,399	7,792	57,879
1958.	4,913	27,702	2,363	6,339	4,710	3,524	8,075	57,626
1959.	5,696	27,985	2,302	6,370	4,634	3,537	8,093	58,617
1960.	5,802	29,104	2,460	6,451	4,840	3,689	8,600	60,946
1961.	4,809	26,735	2,224	6,063	4,360	3,354	8,075	55,620
1962.	4,939	27,522	2,171	6,147	4,186	3,280	8,354	56,599
1963.	5,205	27,001	2,489	6,673	5,021	3,800	9,300	59,489

Source: Wisconsin Motor Vehicle Department.

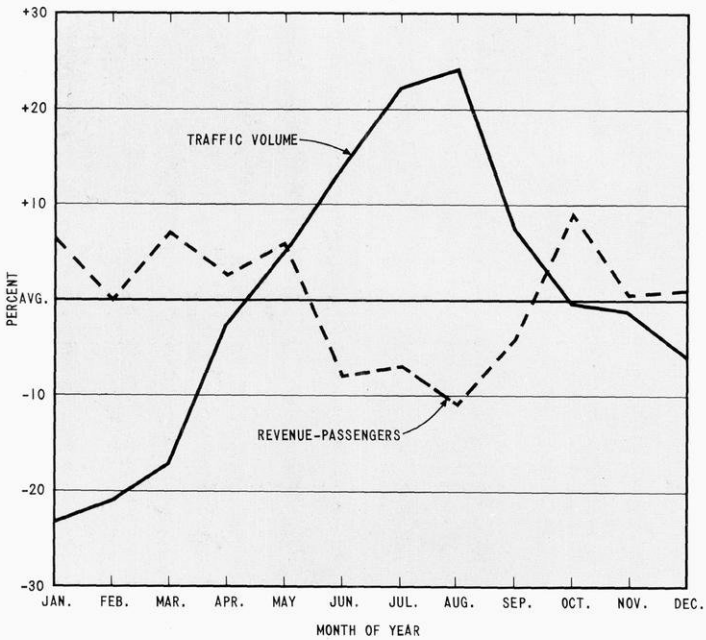
TIME PATTERNS IN TRAVEL

Monthly Pattern in Travel

Vehicle travel within the Region was found to follow a regular seasonal pattern, decreasing during the autumn months to a low in the winter months, and increasing rapidly during the spring months to a peak in the summer months. The pattern of vehicle travel shown in Figure 51 reveals that the maximum monthly variation from the annual average was about 24 percent. These variations are derived from data collected at four permanent traffic counting stations operated within the Region by the State Highway Commission of Wisconsin. Two of these are located on highways which carry a significant amount of transient travel; and, therefore, the monthly variation is probably higher than for the arterial system as a whole.

Figure 51

MONTHLY VARIATION OF REVENUE-PASSENGERS AND VEHICULAR TRAFFIC IN THE MILWAUKEE AREA 1963



Source: Milwaukee & Suburban Transport Corp; State Highway Commission of Wisconsin.

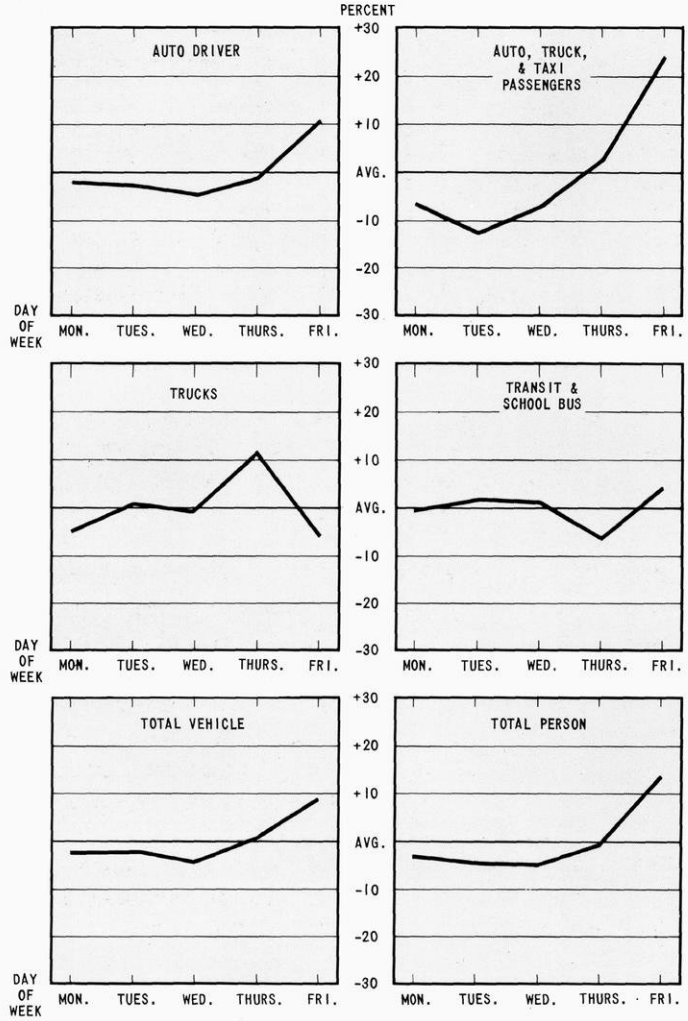
Mass transit travel was much less affected than vehicle travel by seasonal changes, although a measurable drop occurred during the school summer vacation period. Trips to and from work, the most regular of all trip types, accounted for more than one-half of all mass transit trips and, therefore, were a strong factor in stabilizing the monthly pattern of transit travel. The maximum variation from the monthly average, occurring in the school vacation period, was about 11 percent, according to revenue-passenger monthly totals provided by the Milwaukee & Suburban Transport Corp.

Daily Pattern in Travel

The patterns formed by the variations in daily volumes of total person trips, total vehicle trips, and total auto driver trips are very similar, as might be expected, since auto driver trips heavily weigh both person and vehicle trips (see Figure 52). In each of these trip categories, trip volumes remained within 5 percent of the weekday average during the first four days of the week but rose abruptly on Friday. Transit trips, including school bus trips, were, as expected, the most regular, varying only about 6 percent from the weekday average. The greatest variation was found in auto, truck, and taxi passenger trips, which ranged from 12 percent below the weekday average on Tuesday to nearly 24 percent above average on Friday. It is important to point out, however, that, although person trip volumes varied day by day, the percentage of trips carried by each mode remained approximately the same. The maximum deviation from the weekday average by day of

Figure 52

DAILY VARIATION OF UNLINKED INTERNAL PERSON TRIPS BY MODE OF TRAVEL AND INTERNAL VEHICLE TRIPS BY TYPE - 1963



Source: SEWRPC.

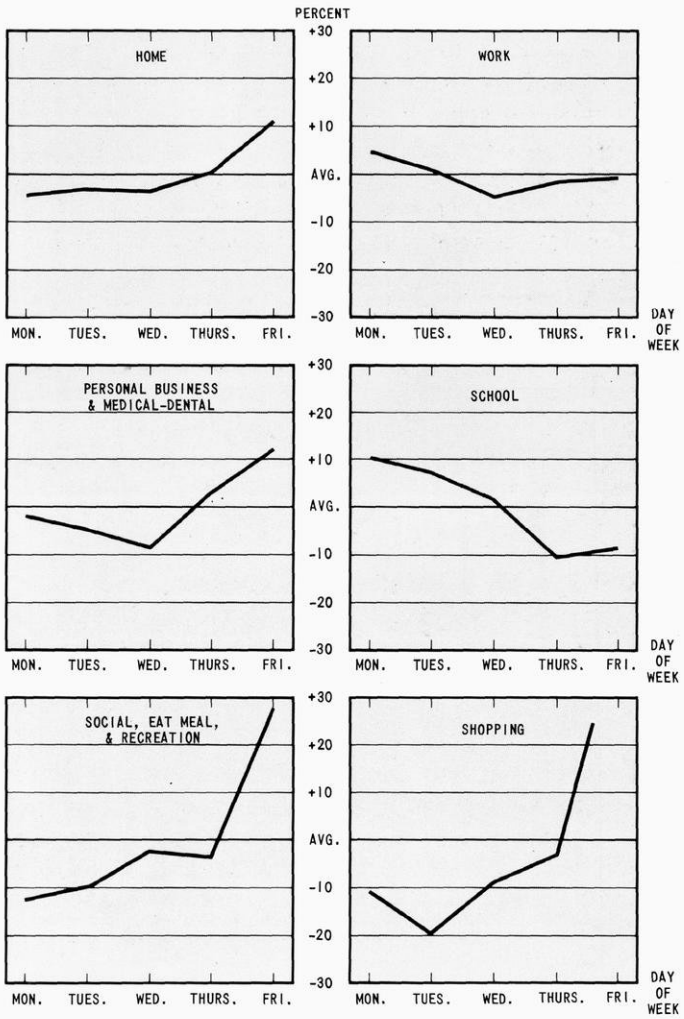
the week for each mode was: for auto drivers, 1.5 percent; for transit passengers, including school bus passengers, 1.0 percent; and for auto, truck, and taxi passengers, 2.5 percent.

The reasons for the daily variations in person trips are revealed in Figure 53, which shows variations by trip purposes. The very large increases in tripmaking on Friday are found to be caused by substantially greater numbers of trips for personal business, social-recreation and especially for shopping. Friday shopping trips were 44 percent above the weekday average, or approximately 153,000 shopping trips above the average weekday and about 220,000 above Tuesday, the low shopping day. Social-recreational trips were about 28 percent above the average weekday on Friday, a difference of about 98,000 trips; personal business trips were 12 percent above the average, an increase of 68,000 trips; and trips to home were 11 percent above the average, an increase of about 142,000 trips, this increase reflecting mostly the increase in trips for other trip purposes.

The pattern of truck trips was unique in contrast to other travel in that trip volumes on Friday were the lowest in the week (see Figure 52). Truck trip volumes were within 6 percent of the weekday average except on Thursday when volumes were approximately 11 percent, or about 35,000 trips above the average weekday. Most of this increase was due to the increase in delivery of merchandise by light trucks, indicating deliveries to stores in preparation for heavy weekend shopping.

Figure 53

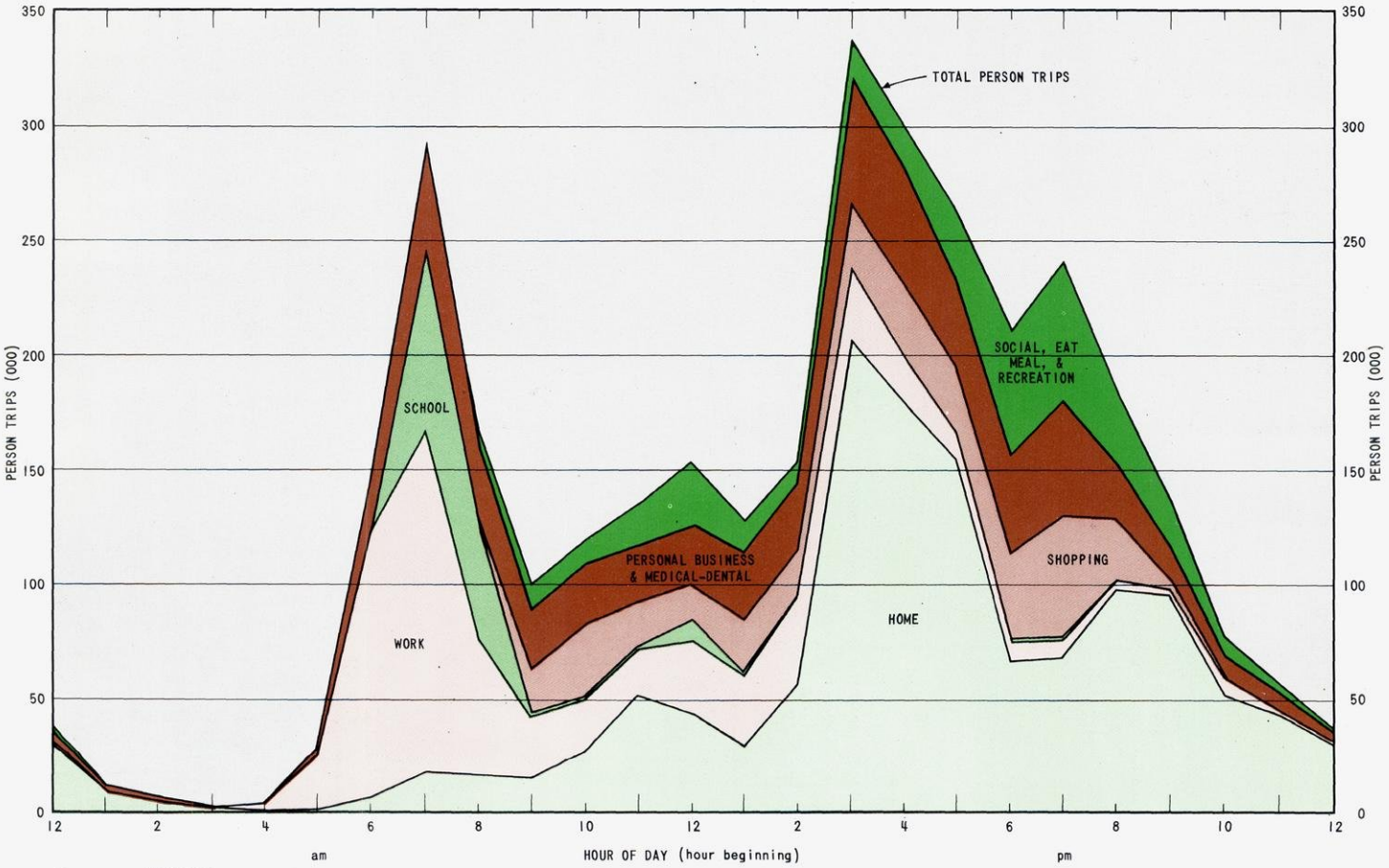
DAILY VARIATION OF UNLINKED INTERNAL PERSON TRIPS BY TRIP PURPOSE AT DESTINATION - 1963



Source: SEWRPC.

Figure 54

HOURLY VARIATION OF UNLINKED INTERNAL PERSON TRIPS BY TRIP PURPOSE AT DESTINATION - 1963



Source: SEWRPC.

Hourly Pattern in Travel

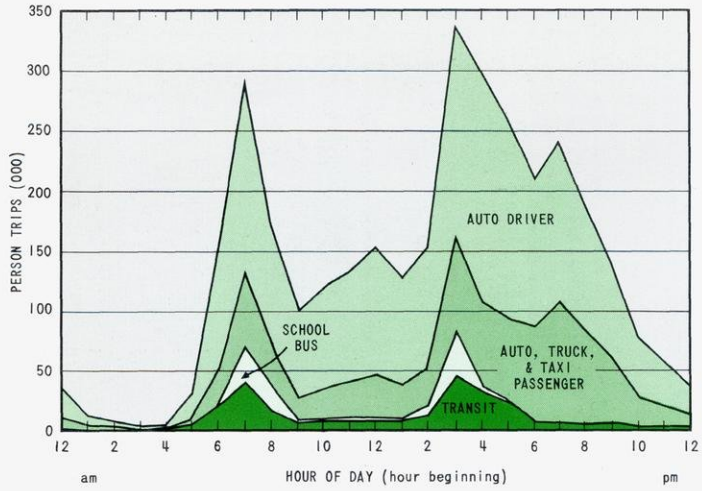
The pattern shaped by the hourly distribution of person trips by trip purpose at destination presents a particularly graphic description of the regular ebb and flood of person travel within the Region throughout an average weekday. This pattern, shown in Figure 54, reveals the relative inactivity of the early hours of the day, followed suddenly by the morning rush to work and to school. During late morning and early afternoon, trips for other purposes began; and this is followed by the afternoon peak travel period, larger and more sustained than the morning peak as the exodus to home from work and school began. In the early evening a smaller peak was formed as shopping and social-recreational trips reached maximum volumes. The two major peak periods reach the maximum for person trips in the hours beginning at 7:00 a.m. and at 3:00 p. m.

In every hour of the day, auto driver trips outnumbered the combined trips by all other modes (see Figure 55). This figure shows that transit trips were highly concentrated during peak-hour periods, while trips by auto drivers, as well as by auto passengers, although contributing very substantially to peak-hour volumes were, nevertheless, more evenly distributed throughout the most active parts of the day. School bus trips, of course, were confined generally to those hours preceding the beginning and following the ending of the school day.

Truck trips were concentrated mainly during those hours of the day in which business is normally conducted. This might be expected since most trucks are operated by commercial or industrial establishments in commerce with other such establishments, most of them operating within usual workday hours (see Figure 56). The impact of truck trip volume on total vehicle travel is attenuated by its hourly and daily distribution patterns (see Figure 57). Truck trips peaked in the hours between 10:00 a. m. and 1:00 p. m. and thus dif-

Figure 55

HOURLY VARIATION OF UNLINKED INTERNAL PERSON TRIPS BY MODE OF TRAVEL - 1963



Source: SEWRPC.

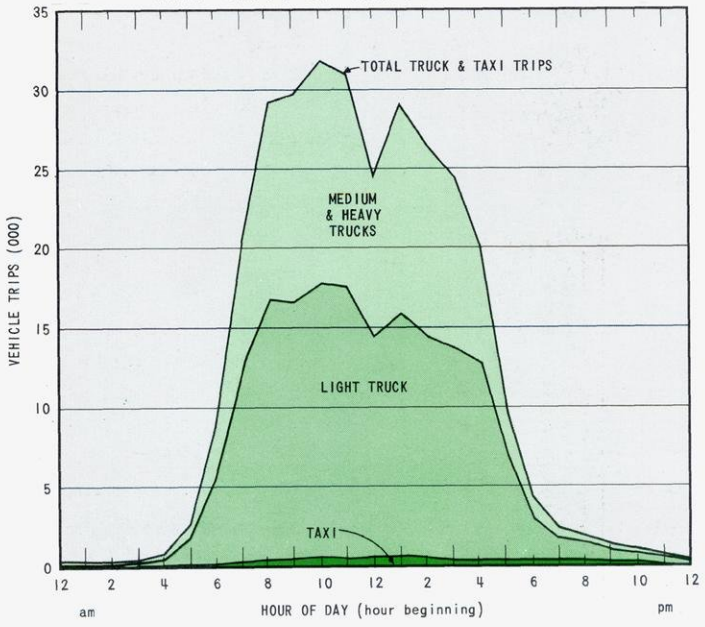
fered from auto driver trip peak hours. Similarly, truck trip volumes on Friday were at the weekly minimum when auto drivers were at a maximum for the week. The relatively small number of trips by taxis was distributed more evenly over most of the day.

SPATIAL PATTERNS

Travel also exhibits certain regularities with respect to spatial distribution. For example, as might be expected, the total number of trips which enter an area during a given 24-hour period will be approximately equal to the total number of trips leaving the area. A comparison of the percentage differences between the total number of vehicles entering an analysis zone and the total number of vehicles leaving that zone during a 24-hour period for 50 randomly selected analysis zones within the Region showed that in 40 zones the difference was less than 2 percent and in only two zones was the difference greater than 4 percent. A corollary travel characteristic to the foregoing is that of directional symmetry. Travel between any two areas will consist of an approximately equal flow in each direction, not necessarily at the same time of day, however.

Figure 56

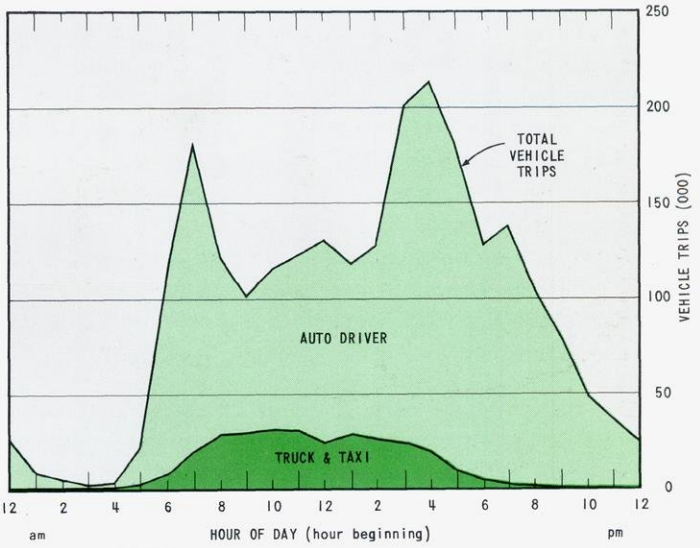
HOURLY VARIATION OF UNWEIGHTED TRUCK AND TAXI TRIPS BY VEHICLE TYPE - 1963



Source: SEWRPC.

Figure 57

HOURLY VARIATION OF VEHICLE TRIPS BY AUTO AND TRUCK AND TAXI - 1963



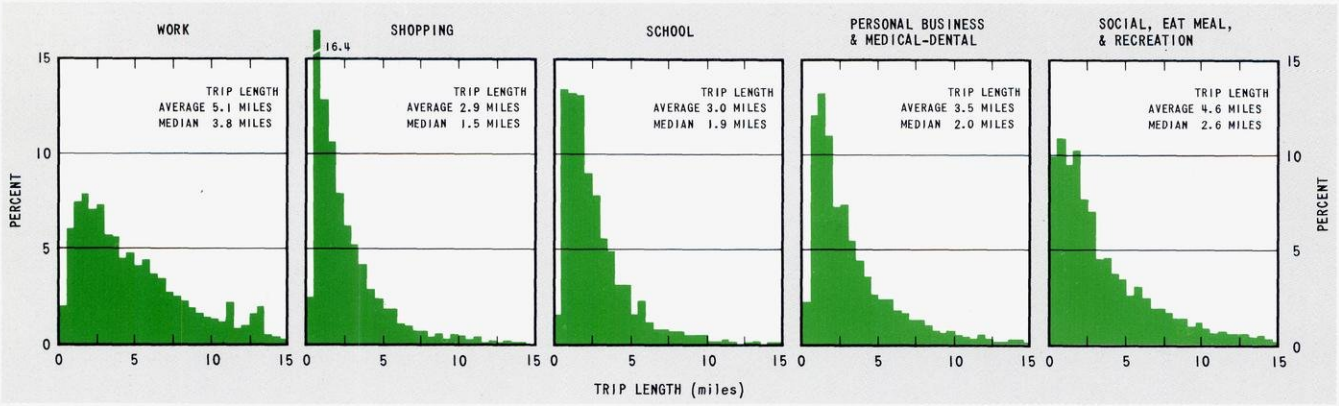
Source: SEWRPC.

A reluctance generally exists to travel farther than necessary to satisfy a given trip purpose. The length of a trip, therefore, depends primarily upon the purpose of the trip and the available opportunities to satisfy this purpose. Figure 58 indicates that a large majority of person trips made by residents of the urbanizing areas of the Region were relatively short in distance. Home-based [17] work trips were the longest of all major trip purposes, averaging slightly more than 5 miles in length, while home-based shopping trips were the shortest, having an average of less than 3 miles. Home-based trips made for all other purposes ranged between these two extremes, suggesting that people are willing to travel farther for work than for any other trip purpose.

[17] A home-based trip is defined as a trip having either origin or destination at the home of the trip maker. A non-home-based trip is defined as a trip having neither origin nor destination at the home of the tripmaker.

Figure 58

PERCENTAGE DISTRIBUTION OF HOME-BASED LINKED INTERNAL PERSON TRIPS IN THE URBANIZING AREAS OF THE REGION BY TRIP LENGTH AND TRIP PURPOSE - 1963



Source: SEWRPC.

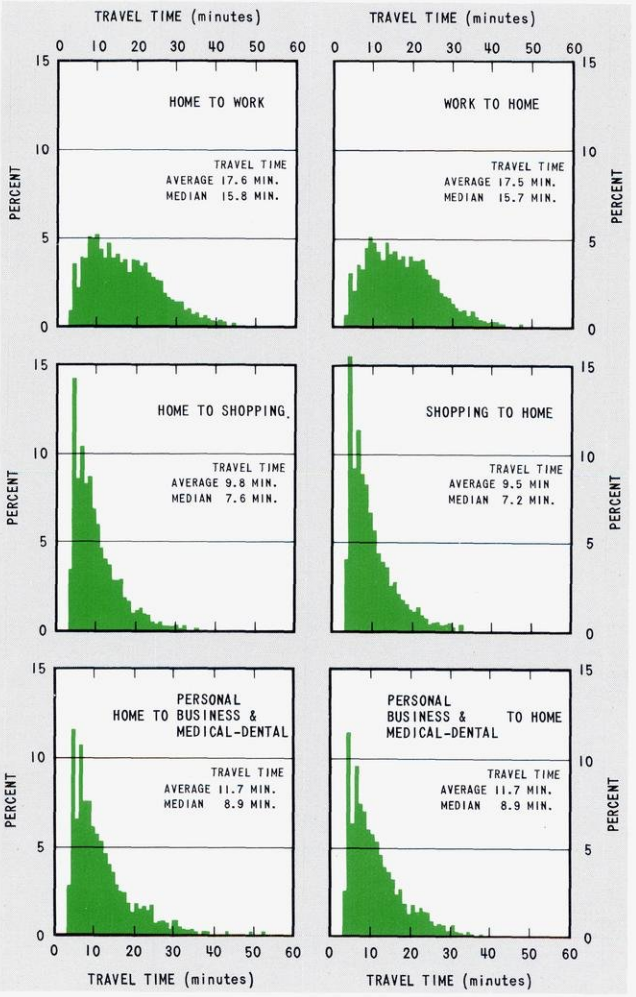
Figure 59 shows that the travel time distribution pattern of trips from home for a particular trip purpose is strikingly similar to the pattern of trips from that trip purpose to home. The travel time distribution pattern of trips from home to shop, for example, although not identical, strongly resembles the corresponding pattern of trips from shopping to home. The regularities shown in these patterns demonstrate that a large proportion of trips from home go directly to their destination and return directly home without intervening stops in either direction.

For the purpose of making generalized comparisons in the difference of travel time by trip purpose, a table of zone-to-zone person trips was compiled for each category of trip purpose at destinations. Trips between each origin and destination zone were multiplied by the calculated travel time through the arterial network for those trips. From a summary of all such travel times, it was determined that trips to work, averaging 16.5 minutes per trip, had the longest average travel time of all trip purposes. Social-recreational trips exhibited the second longest average travel time, 13.8 minutes per trip; followed in order by trips to home, 13.4 minutes per trip; personal business trips, 12.2 minutes per trip; shopping trips, 10.5 minutes per trip; and trips to school, 9.9 minutes per trip (see Figure 60). Travel time of trips by transit and school bus were not reflected in these comparisons and would increase the averages, particularly those trips to school by school bus. Auto driver trips for all purposes averaged 13.4 minutes per trip, and auto passenger trips averaged 12.6 minutes per trip (see Figure 61).

The inventory found that average truck trip lengths within the Region vary significantly by business

Figure 59

PERCENTAGE DISTRIBUTION OF HOME-BASED LINKED INTERNAL PERSON TRIPS IN THE URBANIZING AREAS OF THE REGION BY TRAVEL TIME AND SELECTED TRIP PURPOSES - 1963



Source: SEWRPC.

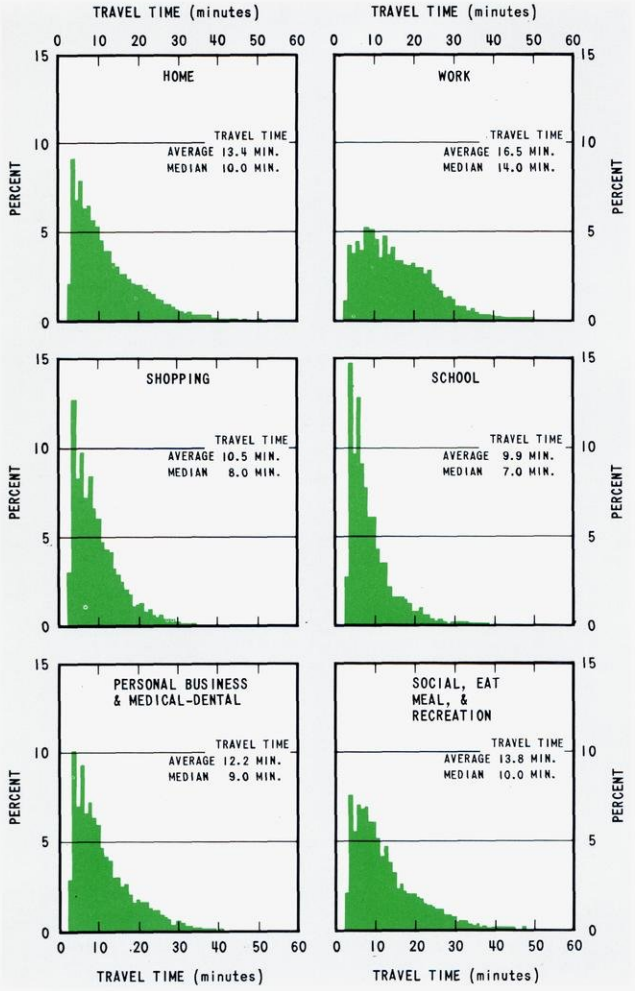
Table 90

SELECTED TRIPMAKING CHARACTERISTICS OF TRUCKS GARAGED IN THE REGION BY THE BUSINESS OR INDUSTRY OF THE OWNER

Business or Industry	Trucks Making Trips		Percent of Trucks in use for each Business or Industry	Percent of Total Region Trucks
	Average Trips Per Truck	Average Miles Traveled Per Trip		
Retail	7.7	5.2	61.3	13.5
Service	12.1	3.3	74.5	5.2
Wholesale	6.6	5.7	73.0	23.1
Durable Manufacturing	17.0	2.5	78.2	6.8
Non-Durable Manufacturing	7.2	8.9	74.6	5.9
Transportation, Utilities, & Communication	8.5	6.5	76.0	12.9
Governmental & Institutional	12.8	2.7	66.2	8.2
Recreational & Public Service	2.9	11.3	46.0	0.4
Agricultural	3.1	6.6	40.3	14.9
Private Use	2.7	7.1	61.9	8.7
Other	5.8	6.9	50.0	0.3
Region	8.0	4.9	65.7	100.0

Figure 60

PERCENTAGE DISTRIBUTION OF TOTAL UNLINKED INTERNAL PERSON TRIPS BY TRAVEL TIME BY TRIP PURPOSE - 1963

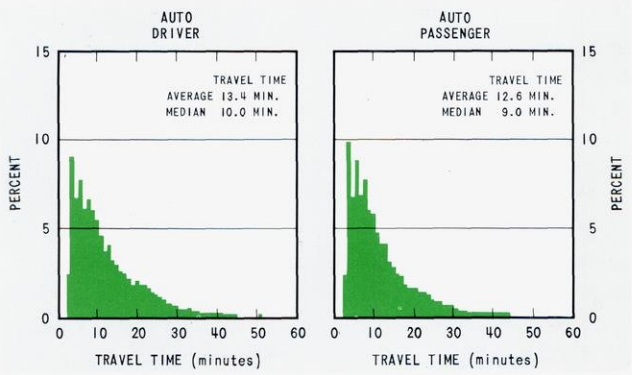


Source: SEWRPC.

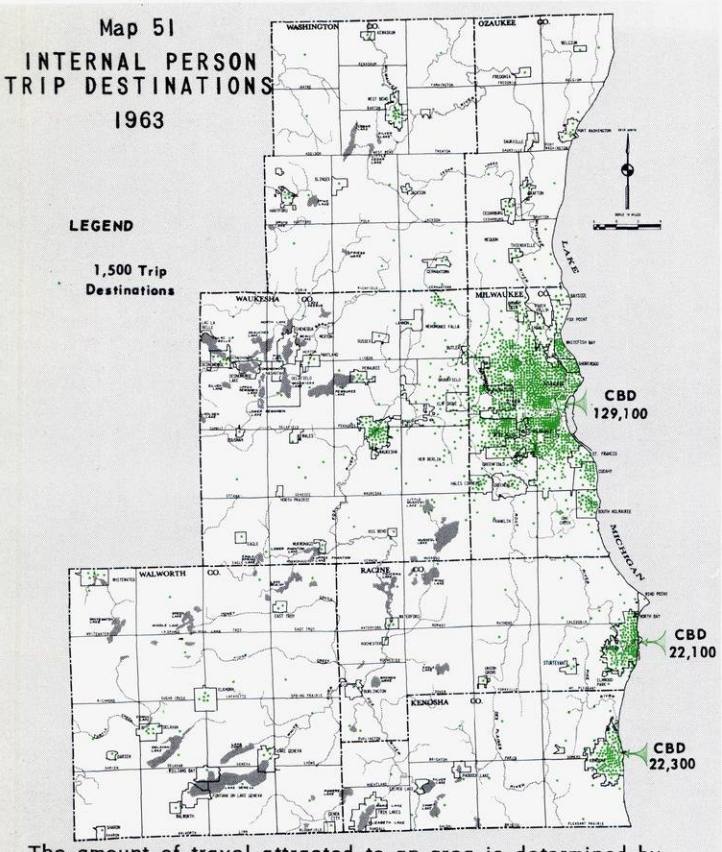
or industry of truck owners. Table 90 indicates that trucks operated by manufacturers of non-durable goods, such as dairies, bakeries, and breweries, averaged about 2.5 miles per trip, while trucks operated by manufacturers of durable and extractive goods averaged 8.9 miles per trip. The average truck trip length, based upon all internal truck trips made within the Region on an average weekday, was about 5 miles per trip. This table also shows that one truck in three did not make a trip on the average weekday and that truck utilization also varied by industry. On an average weekday, for example, nearly four out of five trucks operated by manufacturers of nondurable goods were utilized while only two out of five farm-operated trucks were utilized. The average number of trips made per active truck on a typical weekday also varied by business or industry category (see Table 90). The average number of trips per active truck ranged from 17 trips per weekday

Figure 61

PERCENTAGE DISTRIBUTION OF TOTAL UNLINKED TRIPS BY AUTO DRIVER AND PASSENGER BY TRAVEL TIME - 1963



Source: SEWRPC.



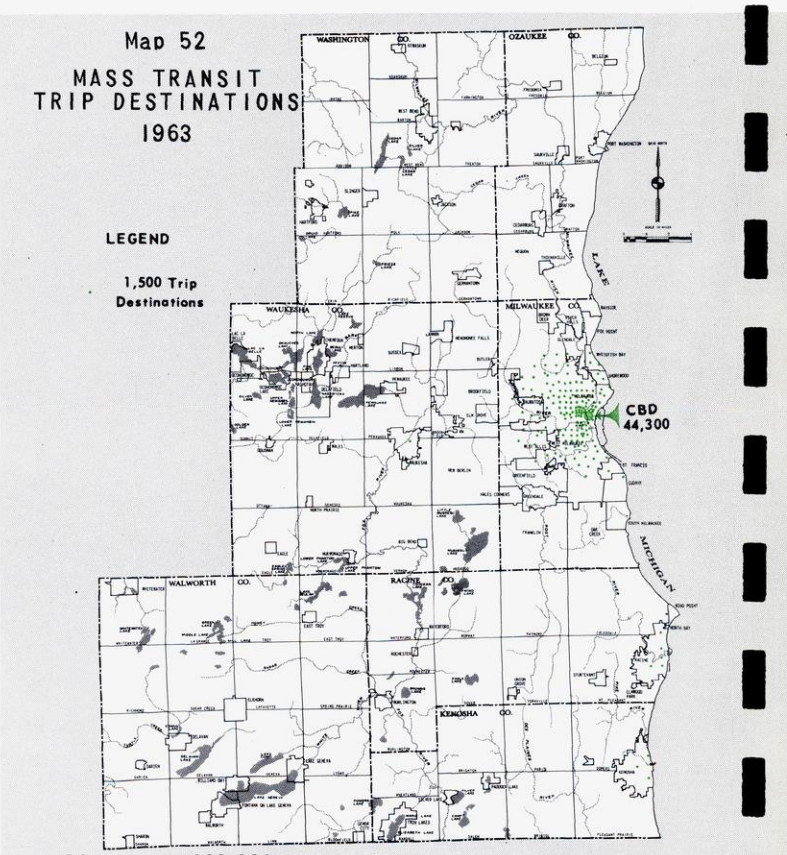
The amount of travel attracted to an area is determined by the kind and intensity of land use development in that area. The pattern produced by internal person trip destinations closely resembles existing urban development within the Region.

by trucks operated by manufacturers of nondurable goods to less than 3 trips per weekday by trucks used for personal reasons only. The average for all business or industries was approximately 8.0 trips per weekday. Trucks used by wholesale establishments; farm trucks; and trucks used by the transportation industry, including trucking companies, communication, and utility trucks, accounted for more than one-half of all the trucks garaged within the Region.

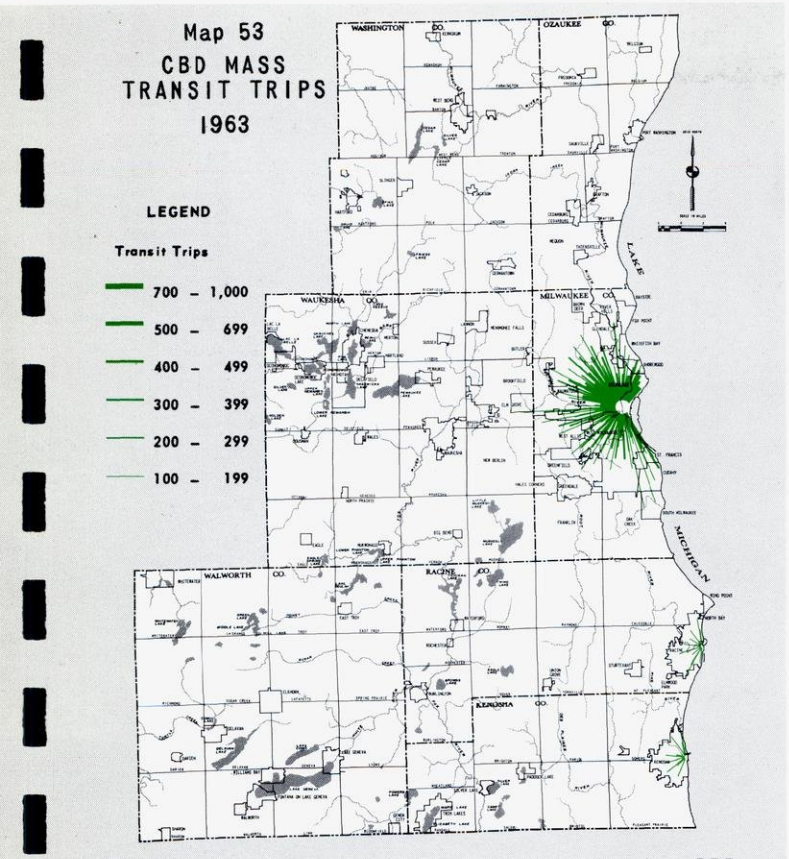
LOCATION OF TRAVEL

The amount of travel attracted to a given area is determined by the amount, kind, and intensity of land use development in that area. Map 51 shows the spatial distribution of person trip destinations within the Region on an average weekday. From the concentrations of destinations, it is possible to identify the central business district (CBD) of each of the largest cities within the Region and many of the other major employment and retail shopping centers as well. Concentrations of person trip destinations are, however, found in even the smallest communities; and these, too, may be readily identified in this manner. The highest concentrations were found in the highly developed central business districts, which serve as major centers, not only of employment and retail shopping, but of governmental, cultural, and recreational activities, as well, within their respective spheres of attraction.

Map 52 shows the spatial distribution of transit trip destinations within the Region on an average weekday. Transit trip destinations are confined almost entirely to the more densely populated areas of the larger cities within the Region, and major concentrations of transit trip destinations are found only in the Milwaukee CBD. The majority of transit trips made to the Milwaukee CBD were found to be relatively short, as indicated on Map 53; and a large proportion of the total originated in areas just north and northwest of the CBD. This map also indicates that the origins of transit trips made to both the Racine and Kenosha CBD show no marked concentrations as in Milwaukee but are more evenly distributed throughout the respective cities.



There were 282,000 trips made by transit within the Region on an average weekday. Nearly all transit facilities and, consequently, nearly all transit trip destinations were found in the most highly developed urban areas of the Region.



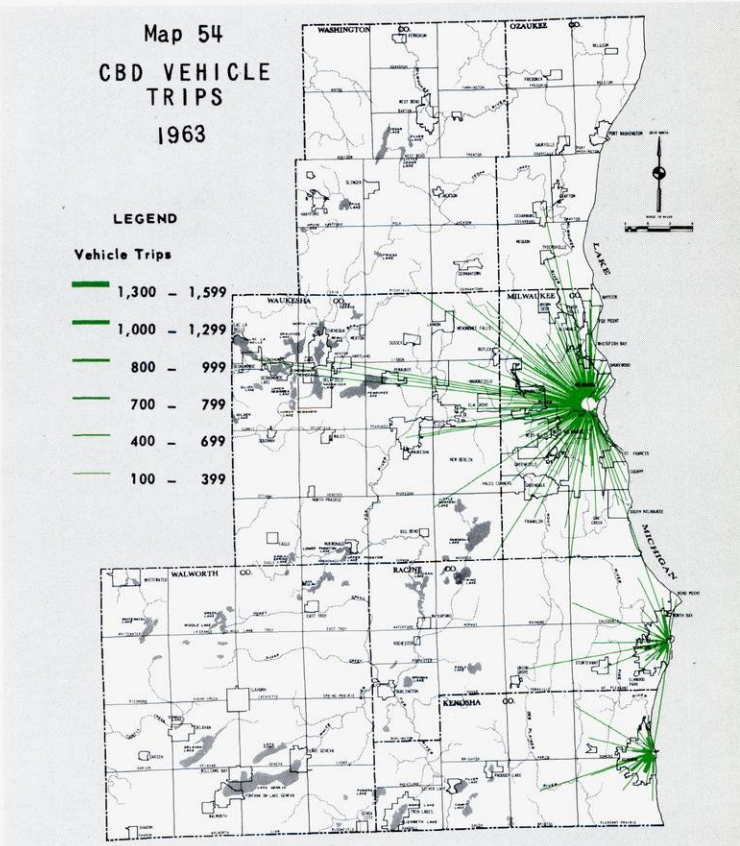
The majority of transit trips made to the Milwaukee CBD were relatively short. Origins of transit trips to the Racine and Kenosha CBD's were fairly well distributed throughout the two respective urbanizing areas.

On an average weekday, there were 129,100 internal person trips made having destinations in the Milwaukee CBD. Auto drivers accounted for about 50 percent of these trips; auto, truck, and transit passengers accounted for about 34 percent. The number of transit trips made to the Milwaukee CBD was equal to about 15.5 percent of the total transit trips made within the Region on an average weekday. Because an approximately equal number of transit trips also departed from this area on an average weekday, the CBD oriented transit trips accounted for approximately 31 percent of total transit trips. (See Appendix D for a description and summary data for the CBD of Milwaukee, Racine, and Kenosha.)

The total number of internal person trips made to the Racine CBD was 22,146. Of this total approximately 66 percent was made by auto drivers; 26 percent by auto, truck, and taxi passengers; and 8 percent by transit passengers. The total number of internal person trips made to the Kenosha CBD was 22,328. Of this total approximately 64 percent was made by auto drivers; 28 percent by auto, truck, and taxi passengers; and 8 percent by transit passengers. It may be observed that the number of person trips made to the Kenosha CBD is slightly greater than similar trips to the Racine CBD, which serves a larger area; but it should also be noted that the area of the Kenosha CBD is 45 percent larger than the area of the Racine CBD.

Two rather significant facts are evident from Map 54, which shows the "desire lines" connecting the points of origin to the points of destination for all vehicle trips to the CBD of the cities of Milwaukee, Racine, and Kenosha. First, the attraction of each CBD is limited primarily to the highly developed portions of its own urbanizing area. Second, no appreciable amount of vehicle travel occurs between any point in one urbanizing area and the CBD of another urbanizing area within the Region.

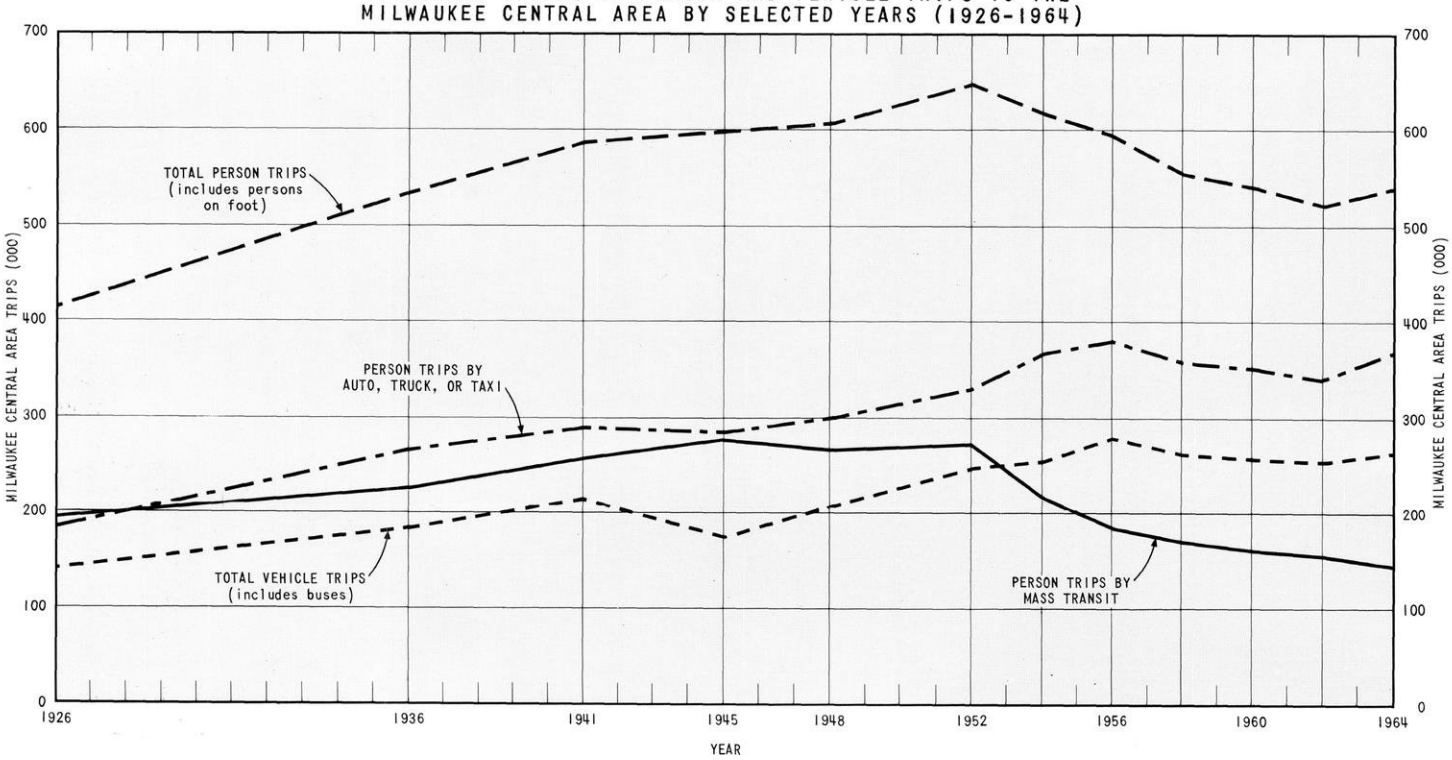
The number of persons and vehicles entering and leaving the Milwaukee central area appears to be increasing after declining steadily over a period of many years. Cordon traffic count information, compiled for the years 1926, 1936, 1941,



It is significant that the majority of vehicle trips made to each of the CBD's of Milwaukee, Racine, and Kenosha were attracted primarily from the highly developed portions of their respective urbanizing areas.

Figure 62

HISTORIC TRENDS OF PERSON AND VEHICLE TRIPS TO THE MILWAUKEE CENTRAL AREA BY SELECTED YEARS (1926-1964)



The "Milwaukee central area" as defined here is bounded by Juneau Avenue on the north, 11th Street on the west, Menomonee Valley on the south, and Lake Michigan shore line on the east.

Source: Milwaukee Bureau of Traffic Engineering and Electrical Services, City of Milwaukee.

1945, 1948, and biennially since 1952,[18] indicates that, after a constant decrease from 1952 to 1962, the total number of persons entering and leaving the Milwaukee CBD during the 12-hour period from 7:00 a.m. to 7:00 p.m. increased by 3.4 percent from 1962 to 1964. Similarly, the total number of vehicles entering and leaving that area increased by 6.6 percent from 1962 to 1964, reversing a downward trend recorded from 1958 to 1962. Total mass transit volumes, however, decreased by 6.4 percent from 1962 to 1964, continuing a decline recorded after 1952 (see Figure 62). The total number of mass transit units and the established total number of pedestrians entering and leaving this area also continued to decline slightly.

Persons and vehicles passing through, as well as those entering and leaving the Milwaukee CBD were included in the historic cordon traffic counts. The data obtained in the travel surveys, however, recorded only person and vehicle trips having origins and destinations in the CBD and, therefore, are not completely comparable. A preliminary examination of the results of an unrestrained assignment of origin and destination survey data indicates, however, that no serious incompatibilities exist between the two sources of data.

[18] Compiled by the Bureau of Traffic Engineering and Electrical Services, City of Milwaukee.

EXTERNAL TRAVEL

In addition to the approximately 2.3 million internal vehicle trips made on an average weekday, approximately 101,500 external vehicle trips are also made within the Region. Table 91 shows that more than 85,000 of these were auto driver trips and that approximately 16,000 were truck trips. Nearly 6,000 auto driver trips and approximately 1,700 truck trips passed entirely through the Region; nearly 40,000 auto driver trips and over 7,000 truck trips had destinations within the Region; and more than 40,000 auto driver trips and 7,200 truck trips left the Region. The majority of both nonresident auto driver trips entering the Region and resident auto driver trips leaving the Region were made for social-recreational or work oriented purposes. The majority of both nonresident auto driver trips leaving the Region and resident auto driver trips entering the Region, as might be expected, were bound for home. The majority of auto driver trips passing through the Region were made for social-recreational purposes or to go home. The average auto occupancy per external trip was 2.2 persons, considerably

Table 91
EXTERNAL PERSON AND VEHICLE TRIPS BY DIRECTION

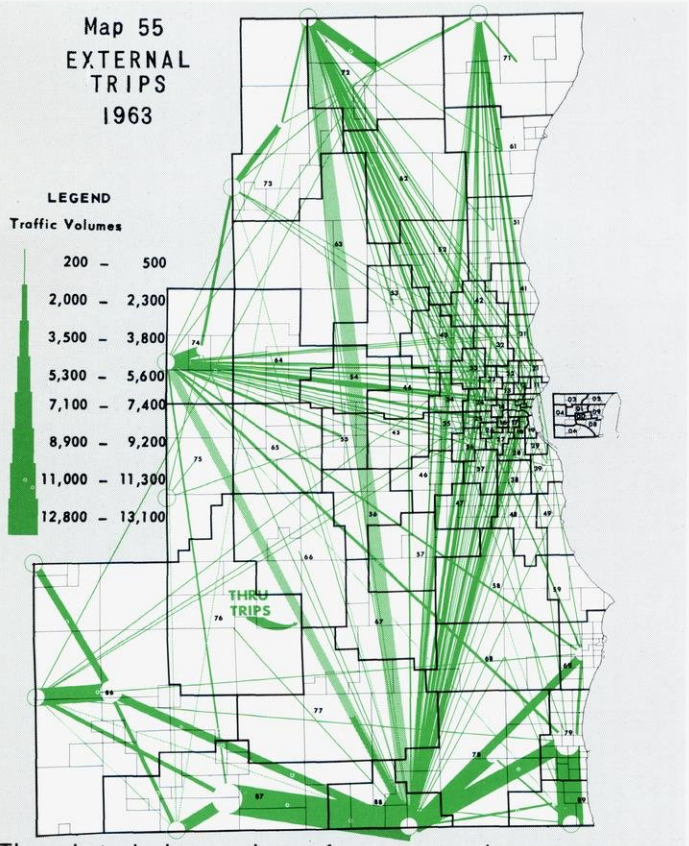
Direction	Auto Driver	Auto Passenger	Truck	Truck Passenger	Total Person Trips	Total Vehicle Trips
External Trips						
Inbound	39,742	47,820	7,063	1,473	89,035	46,805
Outbound	39,996	48,127	7,168	1,607	89,730	47,164
Through	5,869	10,076	1,713	208	16,153	7,582
Total	85,607	106,042	15,944	3,288	194,918	101,551

Source: SEWRPC.

higher than the average of 1.4 persons per internal auto trip.

The majority of both nonresident trucks entering the Region and resident trucks leaving the Region were engaged in either picking up or delivering goods. The majority of both nonresident trucks leaving the Region and resident trucks entering the Region were returning to bases of operations. Trucks passing through the Region were engaged, for the most part, in picking up or delivering goods.

Map 55 shows the person trip "desire" lines connecting the trip origins and destinations of external trips with the points of entry to and exit from the Region. The map shows the through movement of person trips, as well as the external-internal travel interchange. The relatively large concentrations of trips between districts on or near the periphery of the Region may be attributed to reciprocal travel by residents. One exception, however, is the Lake Geneva area, which exhibits a proportionally greater attraction of nonresident trips. As might be expected, relatively large trip volumes existed between the Milwaukee urbanizing area and most major points of entry and exit. No large concentrations of trip ends were revealed, however, in any single portion of the Milwaukee urbanizing area, not even in the CBD. The majority of through trips followed north-south routes, the largest volumes utilizing a combination of IH 94 with either USH 41 or USH 141. Through travel also occurred between points of origins and destinations west and south of the Region. Most of these trips utilized a combination of IH 94 with either STH 30 or USH 16.



The relatively large volume of person trips between many districts on or near the periphery of the Region may be attributed to reciprocal trips by residents. It is significant that no large concentrations of trip ends are found in any single portion of the Milwaukee CBD.

SUMMARY

This chapter has presented in summary form the basic findings of the 1963 travel inventory. Information has been presented on the amounts and characteristics of travel taking place within the Region on an average weekday, and some of the important relationships existing between these travel characteristics and land use have been described. Certain findings have especial significance for regional land use-transportation planning; and these include the following:

1. On an average weekday in 1963, approximately 3.5 million person trips and more than 2.4 million vehicle trips were made within the Region. Almost all of this travel was internal, with over 95 percent of both total person and total vehicle trips being internal and made by residents and resident vehicles. Internal travel patterns, therefore, must be one of the primary determinants of the location and capacity

of future transportation facilities within the Region.

2. Nearly 88 percent of all internal vehicle trips made within the Region on an average weekday was by auto and taxi, and only 12 percent was by truck. Moreover, truck trips did not exhibit the same sharp concentrations of tripmaking during peak periods that auto trips did; and the peaks that were exhibited did not coincide with peak periods of auto travel, either by hour of the day or by day of the week. These facts indicate that the transportation problem within the Region is primarily one of the movement of people rather than goods.

3. Nearly 80 percent of all person trips made within the Region on an average weekday consisted of trips by family members to or from their place of residence. Many by non-family members also begin and end at residences. Clearly, then, the location of future residential development will be one of the strongest factors affecting future travel demand within the Region and, consequently, future transportation facilities as well.

4. Nearly 20 percent of the daily travel within the Region occurred during the two peak hours of the day. Nearly 47 percent of these peak-hour movements consists of trips to and from work. These facts indicate that one of the primary transportation problems within the Region is meeting the peak demand of the journey to work.

5. Trips to and from work accounted for over 37 percent of all person trips made within the Region on an average weekday and were, therefore, next in importance to trips to and from home. The location of future employment centers will, therefore, be another important factor affecting travel demand within the Region.

6. Autos accounted for 88.2 percent of all internal person trips within the Region on an average weekday, compared to 8.5 percent for transit and 3.3 percent for school buses. The overwhelming predominance of the auto as a mode of travel within the Region combined with the continued upward trend in auto registrations and the constant decline in transit utilization poses a threat to the maintenance of a balanced transportation system.

7. The largest single concentration of person trip origins and destinations within the Region is the central business district of the City of Milwaukee. On an average weekday, there were 129,100 person trips made to this area by residents in the Region. Of these, 63,898 trips were made by auto drivers and 20,191 trips were made by auto passengers, for an average auto occupancy of 1.32 persons. There were, in addition, 44,439 transit passenger trips made to this area. The remaining 572 person trips were made as passengers of trucks or taxis. The auto, therefore, accounted for approximately 65 percent of the total person travel to this important area while transit accounted for about 34.4 percent. It is important that at least the current ratio of transit ridership to this area be maintained, especially during peak-hour periods, if the arterial street and highway system is to function efficiently. If no transit service were provided and these riders became auto drivers and auto passengers at the present rates of auto occupancy, approximately 33,600 autos would be added to the traffic entering and leaving this area on an average weekday, an increase of more than 52 percent.

8. The travel inventory revealed that travel follows regular cycles. The changes in travel patterns by season, by day of week, and by hour of day all follow logical and highly repetitive patterns. The peaks and valleys of the hourly distribution of workday travel are likely to remain constant over time since they represent a stable pattern of everyday life. Knowing that travel is logical and regular permits reasonable forecasts of future travel patterns to be made.

Chapter IX

TRIP GENERATION

INTRODUCTION

One of the most important concepts underlying the regional land use-transportation study is that land use and transportation are closely interrelated. The type, intensity, and spatial distribution of land use determine the number and variety of trips generated by each subarea of the Region. Proper application of this concept permits future travel demand to be quantitatively derived from land use instead of from a simple expansion of existing travel patterns, as was necessary in the past. It thereby becomes possible to consider the future distribution of land use as a major factor in predicting travel patterns and to design a transportation system which will serve not only the existing travel patterns but the entirely new travel patterns which will evolve with changing land use.

In order to apply this concept, it is necessary to determine trip generation rates from data provided by the travel and land use inventories. Trip generation is a broad term describing the relationships existing between land use and travel. It quantitatively relates the number of trips that begin or end in any part of a planning area to the socio-economic and land use characteristics of that area.

For planning purposes it is important that the trip generation relationships developed meet three criteria: 1) the relationships must involve socio-economic and land use characteristics which can be adequately determined from a land use plan for small geographic areas, such as traffic analysis zones; 2) the relationships must be reasonably stable over time so that they may be applied with validity to future as well as to existing land uses; and 3) the variables involved in the relationships must exhibit a high degree of correlation. Relationships which do not meet these three criteria are of little practical use in the preparation of long-range land use-transportation plans.

For planning purposes it is necessary to relate tripmaking to the density or intensity, as well as to the kind and amount, of land use. Tripmaking, however, is a behavioral phenomenon and, therefore, is further related to the socio-economic characteristics of people. It can, therefore, be more readily determined as a function of such factors as household characteristics, employment, and school enrollment, rather than as a function of land use alone. This approach relates the volume of trips to human needs and better permits the exploration of the possible existence of a ceiling on travel requirements. It must be understood, however, that such socio-economic characteristics must ultimately be related to variables that can be determined from a land use plan.

Trip generation rates in both person and vehicle trips have been calculated for seven major land use categories and have been further related to such variables as density, family size, family income, auto ownership, type of structure, and distance from the Milwaukee central business district (CBD) in order to develop rates for use in making reliable forecasts of trip generation by small geographic area. Only internal trips were used in the calculation of all person and vehicle trip generation rates herein presented.[1]

Finally, the significant factors which affect choices regarding the mode of travel utilized have been investigated in order to permit an intelligent modal split between the utilization of public and private transportation to be calculated for system planning purposes.

All of the trip generation rates developed and presented in this chapter, when considered individually or in combinations, help to explain the relationships existing between people, the site-related activities—known as land uses—carried on by people, and travel by people and thereby

[1] External person and vehicle trips were not used in developing these preliminary generation rates because: 1) They accounted for less than 5 percent of the total person and vehicle trips in the Region; and 2) All of the trip information could not be directly related to regional population characteristics and land uses as the external survey was primarily a vehicle survey, obtaining information on the vehicle and driver.

help to explain the variation of trip origins and destinations and modes of transport used throughout the Region.

TRIP GENERATION AS A FUNCTION OF HOUSEHOLDS

The total number of trips generated by a household on an average weekday is not the same as the total number of trips with origins and destinations at that household's dwelling place. This is so because trips made by members of the household include, in addition to trips leaving and arriving at the dwelling place, trips made by members of the household completely away from home. Trips to the dwelling place are also made by nonresidents of the household when visiting or performing services there. All person trips by residents of the Region, however, can be accounted for by relating these trips to the household of which the tripmaker is a member. Thus, the total trips generated by each household equals the total number of person trips made by its residents and includes trips to both residential and nonresidential land uses.

Household Characteristics

As might be expected, one factor influencing tripmaking by households is the number of persons comprising the household. Table 92 indicates that the average number of person trips generated per household increases with increasing household (family) size. The number of trips made per person, however, exhibits a decline in households having over three persons, due in part to the larger proportion of children in such larger families who make fewer trips, as defined in the inventory procedure. Table 92 also indicates that 58 percent of the households in the Region contain three or less persons per family but make only 41 percent of the total person trips. The largest increase in trip generation rates occurred between the one- and two-person households, a 160 percent increase. Trip generation rates derived for subareas of the Region will, however, vary significantly from the average rates calculated from regional totals. In order to investigate the variability inherent in such average rates, zonal rates were calculated and graphically analyzed.

Table 92

INTERNAL PERSON TRIPS PER PERSON AND PER HOUSEHOLD BY FAMILY SIZE IN THE REGION - 1963

Family Size (persons)	Households		Person Trips		Trips Per:	
	Number	Percent	Number	Percent	Household	Person
1.....	60,000	12	109,600	3	1.83	1.83
2.	136,300	28	648,100	19	4.75	2.38
3.	87,800	18	633,900	19	7.22	2.41
4.	83,900	17	760,100	22	9.05	2.26
5 or More.	123,334	25	1,243,100	37	10.08	2.01
Region	491,400	100	3,394,800	100	6.91	2.05

Source: SEWRPC.

Table 93

INTERNAL PERSON TRIPS PER HOUSEHOLD BY AUTO AVAILABILITY GROUPS IN THE REGION - 1963

Autos Available	Households		Person Trips		Trips Per Household
	Number	Percent	Number	Percent	
0.	90,700	18	180,700	5	1.99
1.	284,400	58	1,978,200	58	6.98
2.	103,000	21	1,065,200	32	10.34
3 or More	13,100	3	170,700	5	13.00
Region	491,400	100	3,394,800	100	6.91

Source: SEWRPC.

Figure 63 shows, for each of five family size categories, plots of the total number of households in each category per zone versus the total person trips generated by these same households in that zone. Also shown is the straight line which best fits the plotted values on a least squares basis and the coefficient of determination (r^2) for the relationship between the zonal totals of households of a given size and person trips generated.[2] The slope of the best fit line, which represents the trip generation rate, closely approximates the average rates derived from regional totals, as shown in Table 92.

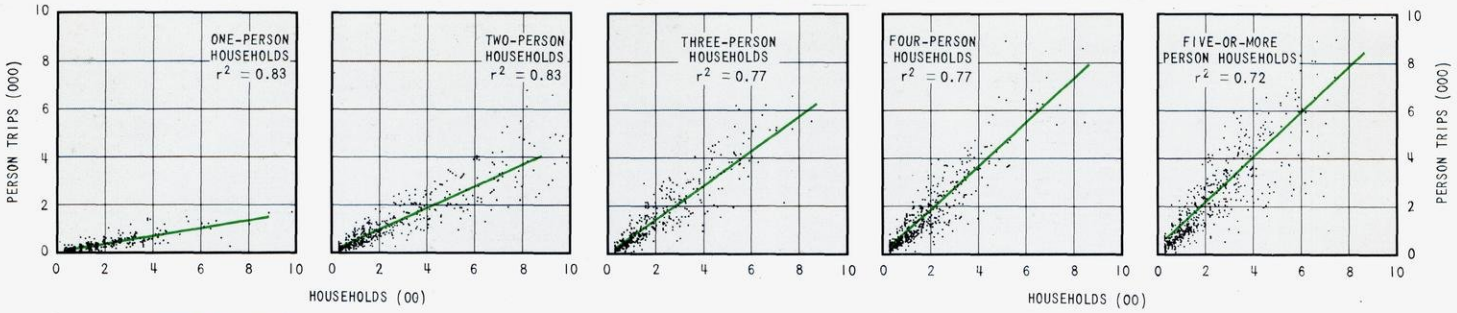
These plots illustrate the manner in which zonal trip generation rates vary from the regional rate as indicated by the vertical distribution of the points about the best fit line. The coefficient of determination for the illustrated plots ranged from 0.72 to 0.83. Similar plots of zonal totals for other variables versus trip generation showed similar patterns.[3] Knowledge of the variance inherent in such data, as depicted graphically in

[2] The coefficient of determination (r^2) is a statistic which measures the relation between two variants thought to be associated through some complex of social, economic, or physical causes but neither of which may be looked upon as the consequence of the other. The coefficient of determination and its square root, the coefficient of correlation (r), measure the degree of relationship existing between the two variants. The closer these two coefficients are to one, absolutely, the greater is the degree of relationship. A coefficient of determination of one (1) would indicate all points fall on a straight line; a coefficient of zero (0) would indicate a random distribution of points with no relationship. A coefficient of determination of 0.72 was taken, for the purpose of this report, as the lower limit of meaningful relationship, indicating that the variable under consideration "explains" at least 72 percent of the variations which occur if the variable was disregarded. This is equivalent to a coefficient of correlation of 0.85.

[3] For coefficients of determination for these and other correlations, see Appendix E, Table A5.

Figure 63

TOTAL PERSON TRIPS COMPARED TO NUMBER OF HOUSEHOLDS FOR FIVE HOUSEHOLD SIZE GROUPS BY ZONE



Source: SEWRPC, 1963.

Figure 63, and as expressed by the coefficient of determination, makes possible a meaningful evaluation of the utility of the various characteristics used to predict trip generation.

Another factor influencing tripmaking by households is auto ownership. Table 93 indicates that the average number of person trips generated per household increases with increasing auto ownership. This table further indicates that 82 percent of the households in the Region own or have at their disposal at least one auto and that these households make 95 percent of the total person trips within the Region on an average weekday. A very large increase in trips generated per household is indicated between households which do not own an auto and households which own one auto. For each of four household auto availability categories, plots were prepared of the total number of households in each category per zone versus the total person trips generated by these same households in that zone. The best fit straight line was also computed for each category. Coefficients of determination for this relationship were found to range from 0.71 to 0.79.

Table 94

INTERNAL PERSON TRIPS PER HOUSEHOLD BY INCOME GROUPS IN THE URBANIZING AREAS OF THE REGION - 1963

Household Income Group (dollars)	Households		Person Trips		Trips Per Household
	Number	Percent	Number	Percent	
Less than 4,000	91,400	24	263,000	10	2.88
4,000 - 7,999	187,200	49	1,403,300	51	7.50
8,000 - 11,999	77,100	20	807,100	29	10.47
12,000 - 15,999	14,300	4	166,700	6	11.65
16,000 & over	9,700	3	119,300	4	12.32
Total Reporting	379,700	100	2,759,400	100	7.27

Urbanizing Areas refers to the Milwaukee, Racine, and Kenosha home interview areas.

Source: SEWRPC.

A third factor influencing tripmaking by households is household income. Table 94 indicates that trip generation rates increase with increasing household income. Households having a yearly income of less than $4,000 generated an average of slightly under three trips per weekday, while those in the next higher income group generated an average of 7.5 trips per weekday, an increase of approximately 160 percent. Thereafter, in each successively higher income level, trip production averages continued to rise but at a decreasing rate. This table also reveals that 73 percent of the households in the urbanizing areas of the Region reported yearly incomes of less than $8,000 and that these same households account for 61 percent of the total person trips made within the Region on an average weekday. For each of four household income categories, plots were prepared of the total number of households in each category per zone versus the total person trips generated by these same households in that zone. The best fit straight line was also computed for each category. Coefficients of determination for this relationship were found to range from 0.72 to 0.86.

A fourth factor influencing tripmaking by households is the type of structure in which the households reside. Table 95 indicates that the trip generation rate per household decreases with an increase in the number of housing units within a structure. Families living in single-family and two-family structures account for 82 percent of the total households in the urbanizing portions of the Region and for 90 percent of the total internal person trips made within the Region on an average weekday. For each of four structure types, plots were prepared of the total number of households in each category per zone versus the total trips generated by these same households in that zone. The best fit straight line was also computed for each category. Coefficients of determination for

Table 95

INTERNAL PERSON TRIPS PER HOUSEHOLD BY STRUCTURE TYPE IN THE URBANIZING AREAS OF THE REGION - 1963

Structure Type	Households		Person Trips		Trips Per Household
	Number	Percent	Number	Percent	
Single-Family	229,700	55	2,004,700	67	8.73
Two-Family. .	115,500	27	677,500	23	5.86
3 & 4 Family.	30,700	7	160,600	5	5.24
Multi-Family.	36,200	9	139,500	5	3.85
Trailer . . .	1,300	---	6,900	---	5.40
Other	9,000	2	10,500	---	1.17
Urbanizing Areas	422,400	100	2,999,700	100	7.10

Urbanizing Areas refers to the Milwaukee, Racine, and Kenosha home interview areas.

Source: SEWRPC.

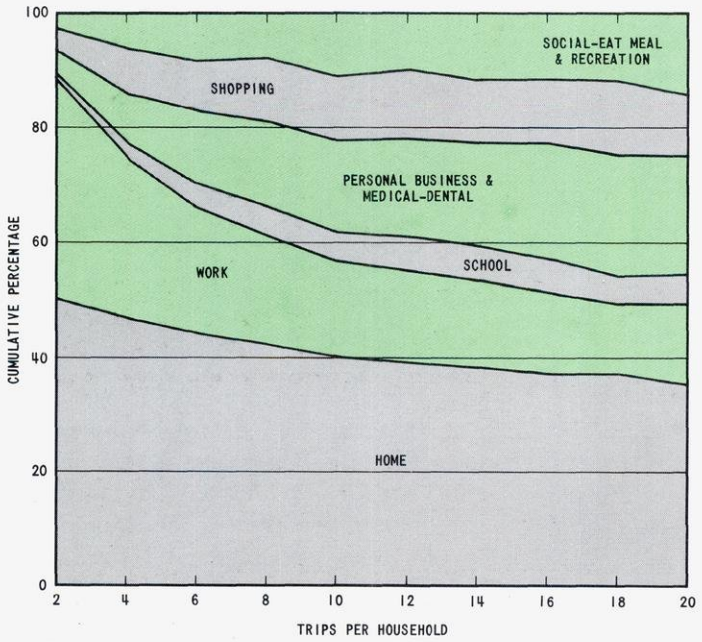
this relationship were found to range from 0.56 to 0.90.

Trip Purpose

As the number of trips per household increases, there is a change in the proportion of trips made for different trip purposes. Figure 64 indicates that the proportion of trips made to work and to home decreases with an increase in the trip generation per household. This figure indicates that, as might be expected, a family which makes only two trips per day will make 50 percent of these trips to home. This proportion drops, however,

Figure 64

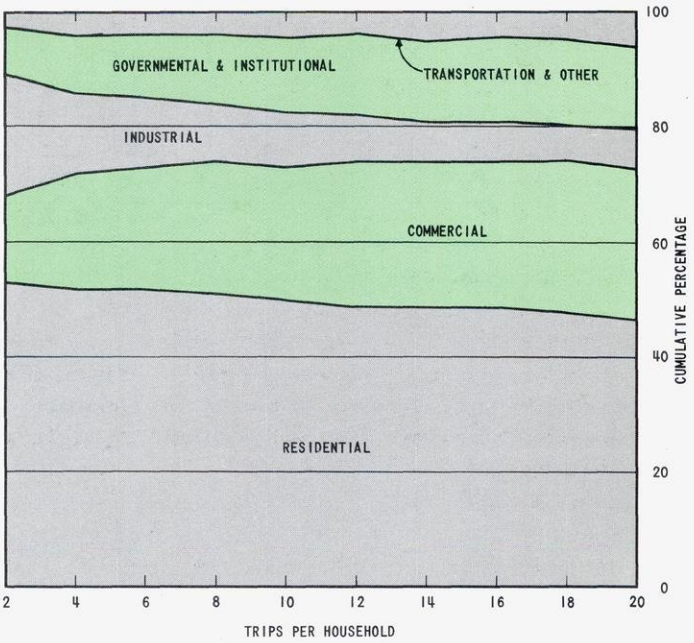
CUMULATIVE PERCENTAGE OF INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION RELATED TO TRIPMAKING PER HOUSEHOLD



Source: SEWRPC, 1963.

Figure 65

CUMULATIVE PERCENTAGE OF INTERNAL PERSON TRIPS IN THE REGION BY LAND USE AT DESTINATION RELATED TO TRIPMAKING PER HOUSEHOLD



Source: SEWRPC, 1963.

to 35 percent for households making 20 trips per day. Similarly, the proportion of trips to work decreases from 38 percent to 14 percent. On the other hand, the proportion of the trips made for personal business increases from 4 to 21 percent; for social-recreational purposes, from 4 to 14 percent; and for shopping, from 4 to 11 percent.

Land Use

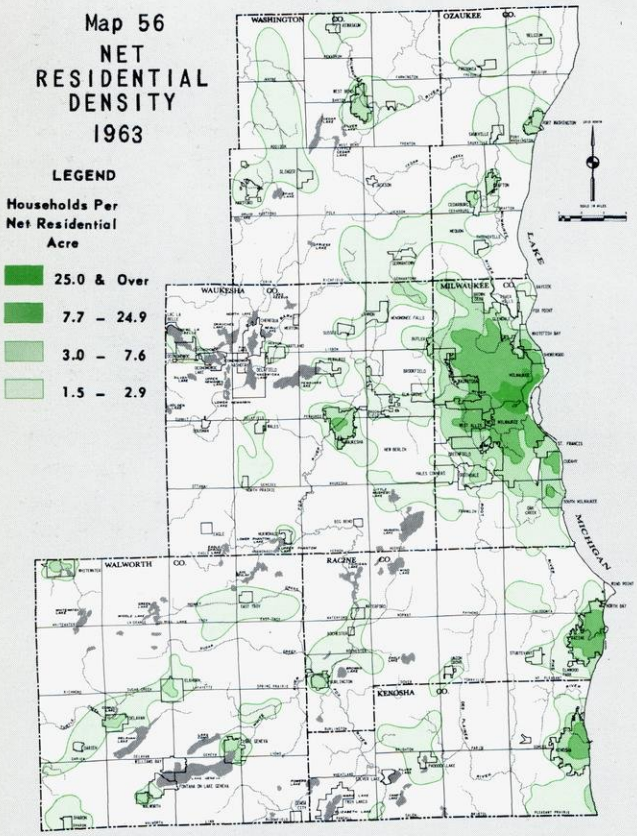
As the number of trips per household increases, there is also a change in the proportion of trips made to the various land uses at the trip destination. Figure 65 indicates that as the number of trips per household increases the percentage of trips to land in residential use remains fairly constant, at approximately 50 percent of the total trips. Significant changes occur, however, in the proportion of trips made to land in commercial use, which increases from 15 to 26 percent; to land in industrial use, which decreases from 21 to 7 percent; and to land in governmental and institutional use, which increases from 8 to 14 percent. It should be noted that Figures 64 and 65 are not inconsistent, in that a segment of the increased number of trips made for personal business and social-recreational purposes are destined to residential land uses.

Residential Density

The amount of tripmaking by a household was also found to be influenced by residential density. The

spatial distribution of residential density, expressed in the number of households per net developed residential acre, is shown on Map 56. The density value ranges on this map have been scaled to the ranges established for low, medium, and high residential densities in preceding chapters of this report. This map indicates that the higher net residential densities are confined to the central areas of the larger cities within the Region. The highest net residential density was found to be 160 households per acre in that part of the City of Milwaukee lying between East Clybourn Street and East Juneau Avenue and between the Milwaukee River and Lake Michigan. Comparison of Map 56 with Map 51 in Chapter VIII reveals the heavy concentration of total person trip destinations corresponding to the areas of high net residential densities, confirming that trip-making is related to intensity as well as to type of use.

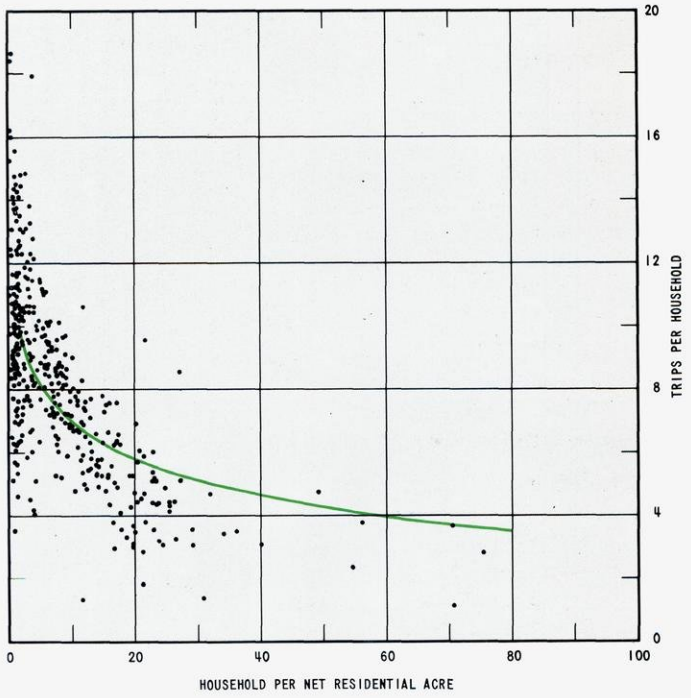
Further analysis of the data obtained in the surveys indicates, however, that, while total person trips generated increase with increasing resi-



High residential densities are found within the Region only in the central portions of the larger cities. Very high densities occur in only two small areas within the cities of Milwaukee and Racine.

Figure 66

TOTAL PERSON TRIPS PER HOUSEHOLD COMPARED TO HOUSEHOLDS PER NET RESIDENTIAL ACRE BY ZONE



Source: SEWRPC, 1963.

dential density, the rate of person trip generation per household decreases with increasing net residential density. Stated another way, the lower the density of dwelling units per net acre of residential land, the greater the trip generation rate per household. Figure 66 shows a plot of net residential density per zone versus person trips generated per household in each zone. The pattern suggests a negative logarithmic function as a best fit curve. The coefficient of determination for such a curve, however, was found to be only 0.46, indicating a relatively weak correlation. Even so, the declining curve indicates some drop in the generation rate of trips per household with increasing residential density. This may be partially attributed to the increased likelihood of trips being made as pedestrians by persons residing in more densely developed residential areas. Such trips were not reported in the survey, except for "walk-to-work" trips.

TRIP GENERATION AS A FUNCTION OF LAND USE

General

Various land uses generate person, auto, transit, and truck trips at significantly different rates. Table 96, derived from regional totals, shows that the commercial land use category, including

Table 96

INTERNAL PERSON AND VEHICLE TRIP DESTINATION RATES FOR SELECTED MAJOR LAND USE CATEGORIES

Major Land Use Category	Trips Per Net Acre		
	Person	Auto	Truck
Developed Residential	14.5	8.8	0.7
Commercial	140.9	92.4	15.7
Industrial[a]	35.6	26.3	6.7
Transportation[b]	0.8	0.6	0.3
Governmental[c]	32.4	15.4	1.4
Average Rate ALL USES	1.9	1.2	0.2

[a] *Includes trips to manufacturing, wholesaling, and storage land uses.*

[b] *Includes trips to utility and communication land uses.*

[c] *Includes trips to institutional land uses.*

Source: SEWRPC, 1963.

all land used for retail sales and services, generates the highest average number of person, auto, and truck trip destinations per net acre of any other major regional land use category. The approximately 141 person trip destinations per net acre of commercial land use are approximately four times that of the second highest rate, the industrial land use category, which includes all manufacturing, wholesaling, and storage uses. The auto and truck trip generation rates for land in commercial use are also higher than the rates of the next highest land use categories by approximately 3.5 and 2.5 times, respectively. This clearly identifies commercial land as having the greatest potential for traffic congestion, parking, and other transportation problems.

The land use categories of transportation, agriculture, and "all other" —the latter being comprised primarily of land in recreational and open-space use—each have an attraction rate of less than one person, auto, or truck trip per net acre. These latter land use categories account for nearly nine-tenths of the total area of the Region; and it is not surprising, therefore, that the trip generation rates for the Region as a whole appear extremely low. The rates at which the various land use categories generate trips, however, vary greatly with the density or intensity and with the spatial location of the land use within the Region. While these average trip generation rates derived from regional averages do not disclose variations and cannot be applied to small geographic areas for predicting future tripmaking, they are useful in establishing a relative order of magnitude for the various land use categories.

Table 97

INTERNAL PERSON AND VEHICLE TRIP DESTINATION RATES FOR SELECTED MAJOR LAND USE CATEGORIES BY DISTANCE FROM THE MILWAUKEE CBD AND FOR THE URBANIZING AREAS OF WAUKESHA, RACINE, AND KENOSHA - 1963

Approximate Miles From Milwaukee CBD (Ring)	Trips Per Net Acre											
	Developed Residential			Commercial			Industrial			Governmental & Institutional		
	Person	Auto	Truck	Person	Auto	Truck	Person	Auto	Truck	Person	Auto	Truck
0.9 or Less 0	73.6	30.6	4.5	402.9	203.9	43.8	83.9	55.5	18.6	307.3	162.2	22.3
0.9 - 2.4 1	57.9	27.3	2.8	244.7	153.6	38.8	66.1	45.0	12.6	125.0	65.8	7.5
2.4 - 4.5 2	40.1	23.6	1.6	262.9	172.4	33.9	60.0	42.6	7.7	45.3	21.9	1.8
4.5 - 7.9 3	24.2	15.1	1.0	236.0	158.7	16.3	32.9	25.4	6.4	26.4	12.6	1.1
7.9 - 12.9 4	9.2	5.6	0.6	63.3	42.6	5.8	22.7	17.4	4.4	27.2	9.7	0.5
12.9 - 18.9[a] 5	6.5	4.0	4.2	61.4	42.9	9.7	8.6	7.5	5.6	16.9	6.1	0.6
18.9 - 25.5[b] 6	4.7	5.1	0.3	26.1	20.8	5.1	7.1	6.0	4.8	18.4	8.3	0.6
25.5 - 36.4[c] 7	5.0	3.3	0.3	47.7	36.9	8.8	7.1	6.2	2.1	18.8	8.3	0.8
36.4 & Over 8	3.8	2.5	0.3	26.4	21.1	5.5	11.5	9.3	3.2	14.1	6.5	0.7
Urbanizing Area of												
Waukesha	19.8	12.6	1.3	187.2	132.0	21.1	32.7	26.8	8.5	47.2	26.9	1.9
Racine	29.3	18.9	1.4	242.9	163.9	20.6	59.9	47.4	9.4	43.2	23.2	2.1
Kenosha	21.7	14.3	1.3	164.6	111.3	15.3	34.2	26.2	4.6	40.0	21.8	1.6
Region	14.5	8.8	0.7	141.1	92.4	15.7	35.6	26.3	6.7	32.7	15.4	1.4

[a] *Waukesha urbanizing area not included.*

[b] *Racine urbanizing area not included.*

[c] *Kenosha urbanizing area not included.*

Source: SEWRPC.

Table 98

INTERNAL TRANSIT TRIP DESTINATION RATES FOR SELECTED MAJOR LAND USE CATEGORIES BY DISTANCE FROM THE MILWAUKEE CBD AND FOR THE URBANIZING AREAS OF WAUKESHA, RACINE, AND KENOSHA - 1963

Approximate Miles From Milwaukee CBD	Trips Per Net Acre			
	Developed Residential	Commercial	Industrial	Governmental*
0.9 or Less	27.2	134.5	18.5	95.7
0.9 - 2.4	12.5	34.1	11.3	30.0
2.4 - 4.5	5.7	12.7	7.2	8.5
4.5 - 7.9	1.8	7.6	2.4	2.3
Urbanizing Area of				
Waukesha	0.3	1.8	0.5	1.7
Racine	0.9	7.1	2.0	2.6
Kenosha	0.7	3.0	0.7	2.9

* *Includes institutional.*

Source: SEWRPC.

Spatial Location

Other major transportation studies have determined that trip generation rates for various land use categories generally decline within an urban area as the distance from the CBD increases. A similar decrease in trip generation rates can be demonstrated to exist within the Region by using the CBD of Milwaukee as the focal point for the analysis and excluding the urbanizing areas of Racine, Kenosha, and Waukesha from the analysis. Trip generation rates for these latter urbanizing areas must be considered independently. Table 97 indicates person, auto, and truck trip generation rates by traffic analysis rings.[4] These rings are centered on the Milwaukee CBD, and the rates shown are for those land use categories exhibiting significant gross trip generation rates for the Region as a whole. The area within ring zero ("downtown" Milwaukee) exhibits the highest trip generation rates found within the Region, the highest individual rate being 402.9 person trips per net acre to the commercial land use category in this ring. This is followed by a rate of 307.3 person trips per net acre to the governmental-institutional land use category in this same ring.

Transit trip generation rates have been similarly calculated for subareas of the Region (see Table 98). Trip generation rates for distances beyond eight miles from the Milwaukee CBD were not calculated because these areas were found to generate only 2 percent of the total transit trips within the Region. This table shows the decrease in transit trip generation rates with an increase in distance from the Milwaukee CBD. The area within ring zero has the highest transit trip generation rates within the Region, with the highest individual rate being 134.5 trips per net acre to the commercial land use category. This is followed by a rate of 95.7 trips per net acre to the governmental-institutional land use category in this same ring. In two land use categories, the transit trip generation rate within one mile of the CBD is more than three times as high as the rate in the next ring, which lies between 0.9 and 2.4 miles of the CBD.

In comparing the trip generation rates set forth in Tables 97 and 98 for the Racine, Kenosha, and Waukesha areas, it can be seen that Racine generally has the highest rates of these three areas in person, auto, truck, and transit trips per acre of land. Racine generation rates, however, do not

[4] See Appendix D.

Table 99

COMPARISON OF SEWRPC PERSON TRIP DESTINATION RATES AT SELECTED LAND USES WITH CHICAGO AND PITTSBURGH

Distance from CBD Center[a]	Land Use											
	Residential			Commercial			Industrial			Governmental & Institutional		
	Milwaukee	Chicago	Pittsburgh	Milwaukee	Chicago	Pittsburgh	Milwaukee	Chicago	Pittsburgh	Milwaukee	Chicago[b]	Pittsburgh[b]
0.0	74	2,229	---	403	2,132	---	84	3,545	---	307	2,014	---
1.5	52	224	37	245	189	225	66	243	33	125	256	150
3.5	40	127	22	263	122	185	34	80	22	45	124	36
6.0	24	106	15	236	143	152	16	87	14	26	101	4
12.0	9	43	---	63	179	---	23	23	---	27	58	---
24.0	5	21	---	26	132	---	7	16	---	18	14	---

[a] *Distances are approximate averages and were selected so that they fell near mid-range for some traffic analysis ring in each of the three transportation studies. Because ring widths vary in each study, a range of distance is not comparable between studies.*

[b] *Public buildings.*

approach those of the area within one mile of the CBD of Milwaukee; in fact, its rates generally correspond to rates found between 2.4 and 7.9 miles from the Milwaukee CBD.

As might be expected, trip generation rates will vary between, as well as within, urban areas. Table 99 sets forth the trip generation rates for selected land uses for the Chicago, Pittsburgh, and Milwaukee areas. It may be seen that while the Milwaukee area is similar to Pittsburgh in person trips generated per net acre of selected land use it is quite different from the Chicago area. In the person trips generated per net acre of commercial land use, the Chicago Loop exhibits 5 times the generation rate of the CBD of Milwaukee; but for a distance of approximately 1.5 to 6 miles from the center of each CBD, the trip generation rate is higher in Milwaukee. As with variations in trip generation within the Region, the differences in generation rates between urban areas may be attributed to differences in the density and intensity of land use, as well as differences in the socio-economic characteristics of the residents.

CBD of Three Largest Urbanizing Areas

A third summary of trip generation rates for the residential, commercial, industrial, and governmental-institutional land use categories was prepared for the central business districts of the Milwaukee, Racine, and Kenosha urbanized areas[5] (see Tables 100 and 101). Again, the commercial land use category generated the highest number of person, auto, and transit trips per acre in each of the central business districts. The Milwaukee CBD attracted the highest number of all such trips per net acre of commercial land use, followed by Racine and Kenosha, respectively. The highest number of trips per acre by trucks to the CBD areas, however, was not to the commercial land use category but rather to the industrial land use category, which in each case includes wholesale activities.

[5] For other trip generation characteristics of these CBD, see Appendix D.

Table 101

INTERNAL TRANSIT TRIP DESTINATION RATES FOR SELECTED MAJOR LAND USE CATEGORIES IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS

Central Business District	Trips Per Net Acre			
	Developed Residential	Commercial	Industrial	Governmental*
Milwaukee	86.0	265.1	49.1	169.0
Racine	12.7	35.5	13.1	12.2
Kenosha	1.7	17.6	0.9	20.7

* *Includes institutional.*

See Appendix D for a description of each of the central business districts.

Source: SEWRPC, 1963.

A comparison of Tables 100 and 101 with Tables 97 and 98 further reveals that the trip generation rates for the central business districts are in every case higher than for the next largest subarea of the Region.

CHOICE OF MODE

One of the important determinations which must be made in planning to meet future transportation needs is an estimate of the proportion of travel which will use transit. While the bulk of personal travel within the Region is presently made by auto, mass transit is, nevertheless, a vital element in providing transportation service, especially to the central business districts of the larger urbanizing areas. Knowledge of the present characteristics of transit travel and of factors influencing the travelers present choice of mode is, therefore, essential to the transportation planning process.

Trip Purpose

As already noted in the preceding chapter, 88 percent of the total internal person trips made within

Table 100

INTERNAL PERSON AND VEHICLE TRIP DESTINATION RATES FOR SELECTED MAJOR LAND USE CATEGORIES IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS

Central Business District	Trips Per Net Acre											
	Developed Residential			Commercial			Industrial			Governmental & Institutional		
	Person	Auto	Truck	Person	Auto	Truck	Person	Auto	Truck	Person	Auto	Truck
Milwaukee	176.8	54.9	8.2	708.7	329.7	70.0	173.9	105.5	105.8	553.1	301.5	52.7
Racine	128.5	80.4	7.2	430.3	282.5	29.8	249.4	177.8	168.3	165.6	110.2	15.6
Kenosha	38.1	25.9	4.7	386.6	253.5	20.5	65.8	52.0	26.3	161.9	91.4	8.3

See Appendix D for a description of each of the central business districts.

Source: SEWRPC, 1963.

Table 102

HOME-BASED AND NON-HOME-BASED PERSON TRIPS IN THE REGION BY TRIP PURPOSE

Trip Purpose	Transit		Auto Driver		Auto Passenger		Total by Auto	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Home-Based								
Work	124,356	44.8	465,451	26.0	116,208	14.8	581,659	22.6
Personal Business	27,358	9.8	409,341	22.9	129,576	16.5	538,917	20.9
Shopping	25,371	9.1	227,337	12.7	131,716	16.7	359,053	13.9
Social	17,057	6.2	133,140	7.4	148,563	18.8	281,703	10.9
School	51,381	18.5	15,219	0.9	71,888	9.1	87,107	3.4
Recreational	3,507	1.3	31,435	1.8	44,983	5.7	76,418	3.0
Sub-Total	249,030	89.7	1,281,923	71.7	642,934	81.6	1,924,857	74.7
Non-Home-Based	28,681	10.3	505,441	28.3	151,830	18.4	657,271	25.3
Total	277,711	100.0	1,787,364	100.0	794,764	100.0	2,582,128	100.0

Source: SEWRPC, 1963.

the Region, on an average weekday in 1963, were made by auto. Approximately two-thirds of those auto trips were made by auto drivers and one-third by auto passengers. Transit (8.5 percent) and school bus (3.3 percent) trips represent the bulk of the remaining travel. Transit trips within the Region are, however, oriented to the more densely developed areas, with 98.4 percent of total transit trips being made by residents of the Milwaukee (92.9 percent), Racine (3.3 percent), and Kenosha (2.2 percent) urbanizing areas.

In these urbanizing areas, 49.3 percent of the auto trips and 47.9 percent of the transit trips were made to land in residential use; 26.2 percent of the auto trips and 20.9 percent of the transit trips were made to land in commercial use; 9.0 percent of the auto trips and 10.6 percent of the transit trips were made to land in industrial use; 10.8 percent of the auto trips and 17.1 percent of the transit trips were made to land in governmental-institutional use; and 4.7 percent of the auto trips and 3.5 percent of the transit trips were made to all other land use categories.

The purposes of the trips made by transit riders are quite different from those of the trips made by auto, as shown in Table 102. Of all transit trips, 90 percent were home based as compared to 75 percent of the auto trips, indicating that transit riders after leaving home will return without making as many intermediate trips. Approximately 45 percent of all transit trips were found to be home-based work trips as compared to approximately 23 percent of the total auto trips. The second largest group of transit trips by trip purpose consisted of home-based school trips, which comprised 18.5 percent of the total. The second largest group of total auto trips by trip purpose consisted of non-home-based trips, followed by home-based personal business trips. The percentage distribution of auto driver trips is also shown to be different from the distribution of auto passenger trips in Table 102. The home-based social trips comprise the largest trip purpose category for auto passengers.

Of all home-based work trips, approximately 18 percent were made by transit. This fact is indicative of the importance of transit in carrying

Table 103

MASS TRANSIT & SCHOOL BUS TRIPS IN THE REGION BY SUBAREA

Subarea	Mass Transit*		School Bus		Total		Percent of Total		
	Trips	Percent of Region	Trips	Percent of Region	Trips	Percent of Region	Mass Transit	School Bus	Total
Urbanizing Area									
Milwaukee	262,525	92.9	71,180	65.5	333,705	85.3	78.7	21.3	100.0
Racine	9,320	3.3	3,126	2.9	12,446	3.2	74.9	25.1	100.0
Kenosha	6,211	2.2	828	0.8	7,039	1.8	88.2	11.8	100.0
Total Urbanizing Areas	278,056	98.4	75,134	69.2	353,190	90.3	78.7	21.3	100.0
Remainder of Region	4,575	1.6	33,390	30.8	37,965	9.7	12.1	87.9	100.0
Region Totals	282,631	100.0	108,524	100.0	391,155	100.0	72.3	27.7	100.0

* *Includes 375 rail trips: Milwaukee-196, Racine-53, Kenosha-96, and 30 in remainder.*

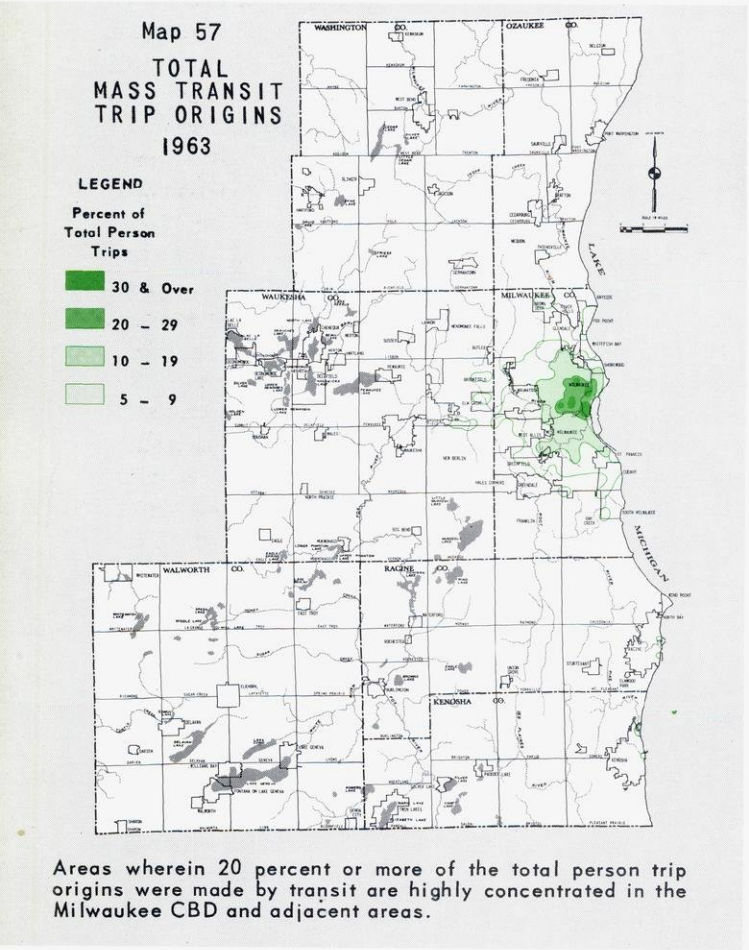
Source: SEWRPC, 1963.

a significant share of peak-hour traffic in the larger cities. In contrast, transit trips as a percentage of total trips for other home-based trip purposes were found to be: shop, 6.6 percent; social-eat meal, 5.8 percent; personal business, 4.8 percent; and recreation, 4.4 percent.

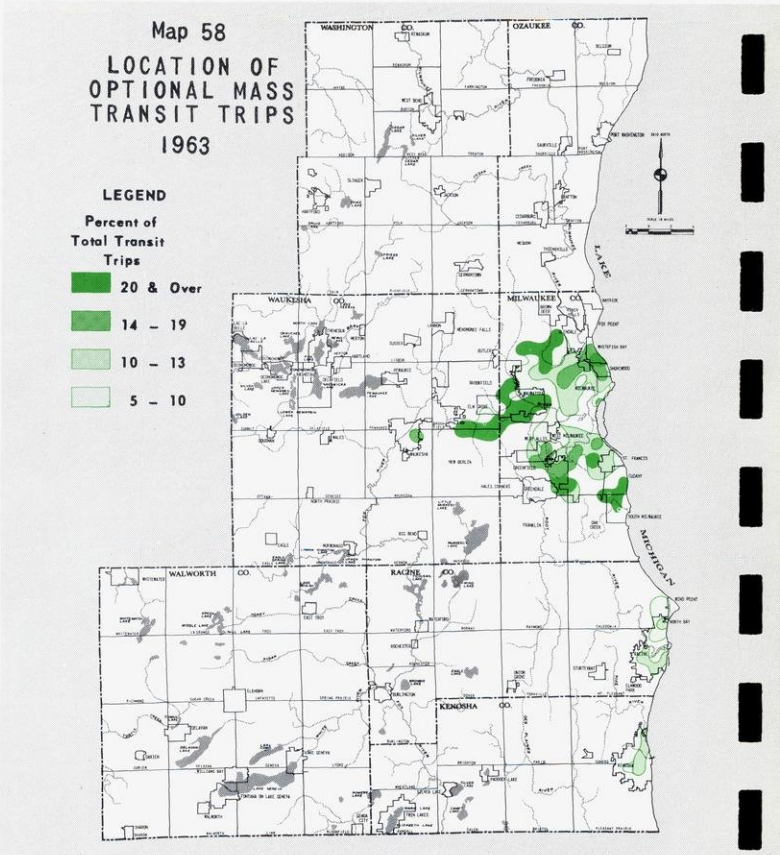
Trips to and from school are made not only by students using the regularly scheduled transit lines, however, but also by students using school bus service. Such trips by school bus are generally a characteristic of the suburban and rural areas of the Region. The number and proportion of school trips made within the Region on an average weekday by transit and school bus are shown in Table 103.

Density of Land Development

Density of land use development is one of the factors influencing the choice of mode. The spatial distribution of transit trip origins as compared to total person trips is shown on Map 57. The areas of the Region wherein more than 30 percent of the total person trips are made by mass transit also correspond to the same areas of the Region which have the higher residential densities and the most intensive use of land for commercial and industrial use.



Areas wherein 20 percent or more of the total person trip origins were made by transit are highly concentrated in the Milwaukee CBD and adjacent areas.



The proportion of "optional" transit trips tends to be higher in the low density residential areas. This may be partially attributed to the high auto availability rates usually found in these areas.

The proportion of "optional" transit trips, that is, trips made by licensed drivers who could have made the trip as an auto driver, tends to be higher generally in the low density residential portions of the urbanizing areas (see Map 58). This may be partially attributed to the fact that the low density areas are those with the higher auto ownership and that the tripmaker is more likely to have had an auto available at the time he made the choice to go by transit.

Transit Rider Characteristics

In the Racine and Kenosha urbanizing areas, over 90 percent of the population lives within one-quarter mile of a transit line, while in the Milwaukee urbanizing area the proportion is over 85 percent. The vast majority of auto drivers in these areas, therefore, have the option of making at least some trips by either transit or auto.

Table 104

OPTIONAL AND DEPENDENT TRANSIT TRIPS IN THE URBANIZING AREAS OF THE REGION

Type of Transit Trip	Milwaukee		Racine		Kenosha		Total	
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent
Optional	22,700	9	570	6	270	4	23,540	9
Dependent	239,820	91	8,750	94	5,940	96	254,510	91
Total	262,520	100	9,320	100	6,210	100	278,050	100

Source: SEWRPC, 1963.

Conversely, some transit riders were licensed drivers and could have chosen to make their trips as auto drivers if an auto was available. Since this latter group is essentially not dependent upon transit as the sole mode of transportation, its proportionate size may be taken as one measure of the relative attractiveness of transit service.

It should be recognized that there are some transit riders who have chosen not to own one or more autos but to utilize transit service instead. For survey purposes these have been included in the "dependent" category.

Special consideration was given in the personal interview surveys to identify these "optional" transit trips. This was accomplished by asking all persons interviewed from auto-owning households to indicate whether or not an auto was available as an optional mode of transportation for all transit trips which started at home and were made by persons licensed to drive. All subsequent transit trips made by these tripmakers until their return home were also identified as "optional" trips. Some transit riders are, in effect, completely dependent upon transit because they are either too young to drive, are physically handicapped, or for some reason do not have a driver's license or an auto available.

Transit trips by persons who had the option of being auto drivers form a relatively small proportion of the total transit trips, especially in the Racine and Kenosha urbanizing areas, as shown in Table 104. Table 105 shows the "dependent" transit trips further classified as to the reason why the trip was dependent upon transit as a mode of travel. It is, of course, possible that some of these "dependent" trips might have had the choice of making the trip as an auto or taxi passenger or as a pedestrian. The groupings, however, generally reflect the primary reasons why transit service is required. Changes in the age composition of the population, such as increases in the school age group, will increase the proportions of riders "dependent" on transit. Continuing increases in auto ownership and driver licensing will have the effect of either increasing the optional group or decreasing overall transit useage.

The hourly variations in regional tripmaking for all modes of travel on an average weekday are shown in Figure 55, Chapter VIII. Transit trips comprise a relatively small proportion of the total person trips and do not show the same increase in activity at noon or during the evening shopping and social-recreational periods as do the auto trips. In addition, transit trips exhibit sharper peaks during the morning and evening rush hours. A similar analysis of optional and dependent transit riders by hour was made for the Milwaukee urbanizing area, which generates 93 percent of all transit trips made within the Region on an average weekday. Figure 67 indicates that the transit trips

Table 105

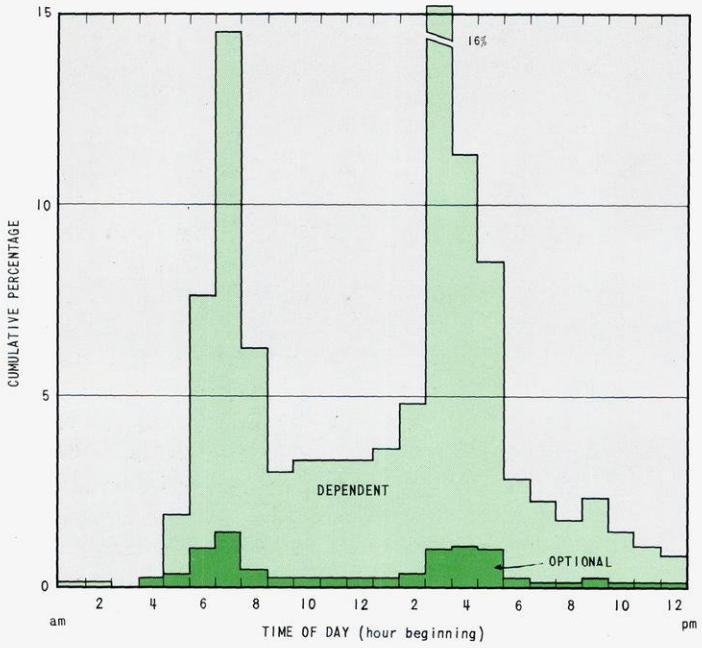
DEPENDENT TRANSIT TRIPS BY RIDERSHIP GROUP IN URBANIZING AREAS OF THE REGION

Urbanizing Areas	Too Young Under 15		No Drivers License				Licensed But No Auto Available		Total	
			15-19 Years of Age		Other					
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Milwaukee	22,330	10	38,770	16	130,110	54	48,610	20	239,820	100
Racine.	1,730	20	1,440	16	3,820	44	1,760	20	8,750	100
Kenosha	1,740	29	1,640	28	1,780	30	780	13	5,940	100
Total	25,800	10	41,850	17	135,710	53	51,150	20	254,510	100

Source: SEWRPC, 1963.

Figure 67

OPTIONAL AND DEPENDENT TRANSIT RIDERS IN THE REGION BY HOUR OF DAY



Source: SEWRPC, 1963.

made by both optional and dependent riders exhibit similar twin major peak periods, as do the captive trips. The relative hourly change in optional trips, however, does not always correspond with the hourly change in dependent trips.

Additional insight into transit tripmaking can be gained by investigating certain other characteristics of transit riders. The Kenosha area has the highest percentage of younger transit riders in the Region, followed by the Racine and then the Milwaukee area. Table 106 shows that 58 percent of the transit riders in the Kenosha area are under 20 years of age. This high percentage is due primarily to the larger proportion of transit trips by students in this area, where 62 percent of the transit riders were students as compared to 36 percent in Racine and 26 percent in Milwaukee. The percentage of choice riders within these various age groups, as shown in Figure 68, indicates that only approximately 10 percent of the transit riders between the ages of 20 and 65 were optional transit riders. The percentage of optional transit riders in all other age groups was less than 10 percent.

Table 106

PERCENTAGE DISTRIBUTION OF TRANSIT RIDERS IN THE URBANIZING AREAS OF THE REGION BY AGE GROUPINGS

Age Group	Urbanizing Area		
	Milwaukee	Racine	Kenosha
0-14.	8	18	28
15-19.	19	20	30
20-29.	15	8	6
30-44.	18	16	8
45-64.	30	29	18
65 & Over.	10	9	10
Total	100	100	100

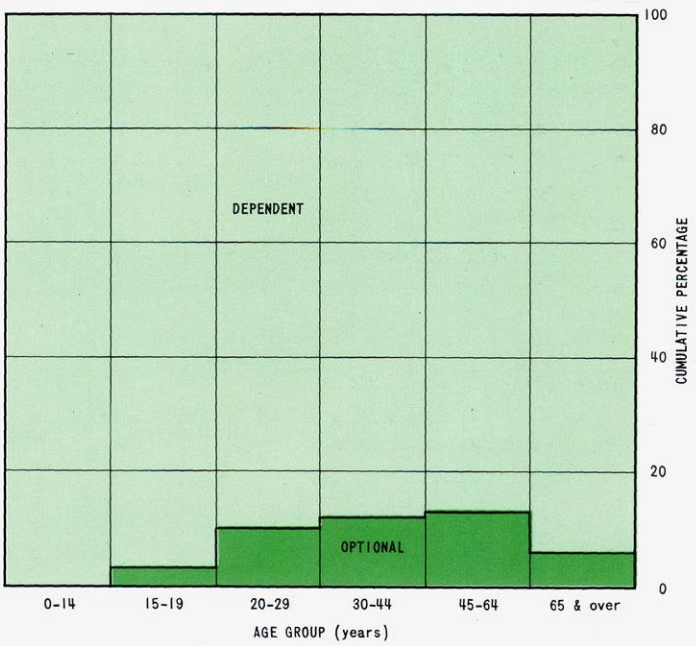
Source: SEWRPC, 1963.

Transit tripmakers within the Region are predominantly female. The survey indicated that 63 percent of the transit passengers in the Milwaukee area and 67 percent in the Racine and Kenosha areas were female. Of these, only 5 percent of the females were optional riders as compared to approximately 15 percent of the males.

The greatest proportion of transit riders in the urbanizing areas of the Region were members of one-auto households, as indicated in Table 107. Households which have no auto available comprise about 20 percent of the total households of the urbanizing areas and made 41 percent of the total transit trips. Households which have one auto available comprised about 58 percent of the total households of the urbanizing areas and made 47 percent of the transit trips. Similar ratios for

Figure 68

OPTIONAL AND DEPENDENT TRANSIT RIDERS IN THE REGION BY AGE GROUP



Source: SEWRPC, 1963.

the two-auto households were 19 and 11 percent, respectively, and for the three or more auto households, 2 and 1 percent, respectively. The number of autos owned per household has no effect on the proportion of optional trips made by auto-owning households.

Table 107

PERCENTAGE DISTRIBUTION OF TRANSIT TRIPS BY AUTO OWNERSHIP CATEGORIES IN THE URBANIZING AREAS OF THE REGION

Autos Owned Per Household	Urbanizing Area			Average
	Milwaukee	Racine	Kenosha	
0	41	28	21	41
1	47	53	56	47
2	11	15	18	11
3 or more .	1	4	5	1
Total	100	100	100	100

Source: SEWRPC, 1963.

The average number of blocks walked at either end of transit trips was 1.2 in the Racine, 1.3 in the Milwaukee, and 1.5 in the Kenosha area, with virtually no difference being exhibited between the optional and dependent trips.

In each of the urbanizing areas, about one-half of the total transit trips were made by persons from households with annual incomes in the $4,000 to $8,000 range. Approximately another one-fourth of the total was made by persons from households with annual incomes of less than $4,000. Only about 4 percent of the total transit trips were made by persons from households with annual incomes of over $12,000. These percentages were quite similar to the proportion of total households in each income range: 44 percent in the $4,000 to $8,000 range, 22 percent in the under $4,000 range, and 6 percent in the over $12,000 range. About 4 percent of the transit trips made by persons from households with incomes under $4,000 were optional riders as compared with about 10 percent of the transit trips in the higher household income groups.

SUMMARY

This chapter has described in summary form some basic trip generation rates developed for various land use categories and household characteristics, together with an initial analysis of factors influencing the choice of mode. The combined effect of these factors will be further analyzed during the course of developing and testing the alternative land use-transportation plans. Certain findings which have significance for regional land use and transportation planning include:

1. The household characteristics of family size, family income, and auto ownership, and the structure type of the household dwelling place exhibit a strong correlation with the total number of trips generated by a household type.

2. Trip generation rates for various land use categories vary significantly with mode of travel, land use density or intensity, and geographic location within the Region. The trip generation rates for the central business district of Milwaukee are the highest in the Region. The generation rates for the Kenosha, Racine, and Waukesha areas generally correspond to rates found in the Milwaukee area between 2.4 and 7.9 miles from the Milwaukee CBD.

3. Transit utilization is an urban characteristic, with over 98 percent of all transit trips being made by residents of the three largest urbanizing areas of the Region: Kenosha, Milwaukee, and Racine. Over 85 percent of the population of these urbanizing areas reside within one-quarter mile of a transit line and, therefore, generally have the choice or option of making at least a portion of their total trips by transit. Only 9 percent of all transit riders, however, made the choice to use transit when they could have driven an auto for the trip.

4. A review of the characteristics of transit riders did not reveal any single characteristic which would permit the identification of "optional" transit riders as opposed to "dependent" riders from the population as a whole. Certain "dependent" transit riders, however, can be identified; for example, those in age groups which are too young to drive.

Chapter X

SUMMARY AND CONCLUSIONS

Because of its important impacts on daily life and on regional development, transportation is, and will increasingly become, one of the principal areas of public policy determination facing public officials, citizen leaders, and technicians within the Region. Although large amounts of public capital are available for improving transportation facilities and services within the Region, there are never enough funds for all projects proposed. Precisely how this capital should be invested—how much should be allocated to highway facilities and how much to transit facilities and what should be the spatial location and capacities of these facilities—involves many important public policy determinations.

Land use is another one of the principal areas of public policy determination facing public officials, citizen leaders, and technicians within the Region. Although much new land use development is financed by private capital, each new increment of urban growth, whether it be a subdivision, shopping center, or industrial plant, inevitably creates a demand for new public facilities and services and requires the investment of public capital in new or improved transportation facilities, utilities, and community facilities and the expenditure of public funds for their operation and maintenance. While detailed land use development problems are primarily of local concern and properly subject to local planning and control, the aggregate effects of changing land use activities are regional in scope and not only interact strongly with the need for regional transportation, utility, and recreational facilities but inevitably exert a demand upon a limited natural resource base. The wise and judicious use of this resource base, together with the functional relationships existing between land use and demand for regional transportation, utility, and recreational facilities, is, therefore, of areawide concern.

In recognition of the foregoing, the Southeastern Wisconsin Regional Planning Commission has undertaken a regional land use-transportation planning program. The planning process employed in this program seeks to accurately describe the Region and its principal functional relationships, both graphically and numerically; to simulate the complex movement of people and vehicles over highway and transit facilities; and to evaluate the effects of different courses of action with respect to regional land use and transportation system development. The end results of this process are not only regional land use and transportation plans scaled to future land use, travel, and resource demands and consistent with regional development objectives but the beginning of a continuing planning process that permits modification and adaptation of the plans and the means of implementation to changing conditions.

Reliable basic planning and engineering data collected on a uniform, areawide basis are absolutely essential to the formulation of workable development plans. Consequently, inventory becomes the first operational step in any planning process. This inventory step is a crucial one since no intelligent forecasts can be made or alternative courses of action selected without knowledge of the current state of the system being planned. Accordingly, the first step in the regional land use-transportation study involved the collection of factual data on the existing land use pattern; on the demand for each of the major land use categories and the major determinants of these demands; on the existing local development objectives and constraints; on the underlying natural resource and public utility base; on the demand for transportation between various points within the Region and outside of the Region; on the relative demand for alternative modes of transportation and on the major determinants of these transportation demands; and on the existing and potential supply of transportation system capacity. These data, when considered together, describe the existing situation in the Region with respect to land use and transportation development and identify existing problems with respect thereto.

The most important findings of the inventories may be summarized as follows:

POPULATION

1) The population of the Region has been increasing at an unprecedented average rate of about 33,000 persons per year since 1950 and as of 1963 is estimated at 1,674,000 persons. This unprecedented population growth has been concentrated primarily in the three large urbanizing areas of the Region, including and surrounding the cities of Milwaukee, Racine, and Kenosha, although there has been appreciable growth in the smaller outlying communities.

2) The unprecedented population growth has been accompanied by marked changes in certain characteristics of the population. The composition of the population is becoming increasingly urban; and at the present time, only 12 percent of the regional population is rural, while 88 percent is urban. Moreover, of the 12 percent classified as rural, 10 percent is classified as rural non-farm and only 2 percent as rural-farm. The very young, the very old, and the female segments have all been increasing as a proportion of the total population. Educational attainment, income levels, and housing values in the Region have all increased substantially since 1950. The number of households in the Region has been increasing faster than the total population resulting in the formation of approximately 10,000 households per year, and as of 1963 it is estimated that there were 482,000 households in the Region.

ECONOMIC ACTIVITY AND
PUBLIC FINANCIAL RESOURCE BASE

3) Growth in economic activity in the Region since 1954 has generally paralleled national economic growth. Employment opportunities have increased at slightly more than 1 percent per year since 1954, and in 1963 there were approximately 630,000 jobs within the Region. A great proportion of these employment opportunities are located in Milwaukee, Racine, and Kenosha counties. The regional labor force has increased at a lesser rate since 1950 than has the population, but at a greater rate than have employment opportunities.

4) Revenues and expenditures of local governments within the Region have been increasing at the rate of about 8 percent per year to a total of about $595.8 million in revenues and $583.1 million in expenditures in 1962. Accelerated highway construction programs have resulted in increased expenditures for highways within the Region, and these expenditures now total more than $100 million per year. Although expenditures for education through the school districts now constitute the largest single local expenditure category, expenditures for highways and related facilities constitute the largest single expenditure category for cities, villages, and towns within the Region. Of the total highway expenditures, 60 percent represents capital outlay; and approximately one-half of this capital outlay is made directly by the state. Urbanization has also caused an increasing proportion of local governmental expenditures to be allocated to such services as police and fire protection; health, sanitation, and welfare facilities and services; and for the construction and operation of sanitary sewerage and water supply systems. Recreation has been a minor expenditure category for most units of government within the Region.

NATURAL RESOURCES AND PUBLIC UTILITY BASE

5) The highly complex soil relationships existing within the Region and the extreme variability and intermingling of soils within very small areas, together with the widespread occurrence of soils having questionable suitability for certain types of urban development, indicate the need for basing regional and local development plans on the results of detailed soil surveys. Approximately 15 percent of the Region is covered by soils which are generally unsuited for any type of urban development and which should be maintained in conservation, recreational, or limited agricultural use. These soils occur primarily on the flood plains of streams and watercourses and in the historic and existing wetland areas of the Region. In addition, prevailing soil types in approximately 30 percent of the Region are generally not suited for intensive urban development without a high level of municipal improvements, including sanitary sewer service and careful attention to drainage.

6) Approximately 369 square miles of presently rural area in the Region have been planned for future sanitary sewer service or are within the gravity drainage area tributary to existing sewage treatment plants. This area is more than 1.5 times the size of the developed area of the Region presently served by sanitary sewer and approximately 10 percent greater than the entire area presently devoted to urban development within the Region.

7) A subcontinental divide traverses the Region in a generally northwesterly-southeasterly direction

and separates the Region into two major drainage areas. This major geographic feature is of great importance to any consideration of water-related public utility systems within the Region. Numerous small streams and rivers which traverse the Region west of this divide all have relatively limited upstream drainage areas and relatively low flows during dry weather. Consequently, the capacities of these streams for liquid waste disposal and assimilation are severely limited. Pollution loads transmitted to these rivers must be carefully adjusted to their dry weather waste assimilation capacities if serious environmental problems are to be avoided and multiple use of the streams permitted. The problem of waste disposal in the area west of the divide is further aggravated by soil conditions in that a relatively high percentage of the area is covered by soils unsuited to utilization of on-site soil absorption sewage disposal systems.

8) The Region is unique with respect to water resources in that there are four principal natural sources of supply: surface water east of the subcontinental divide, including Lake Michigan; surface water west of the subcontinental divide; shallow ground water in the glacial till and connected limestone aquifers; and ground water in the generally deep sandstone aquifers. Urban development east of the subcontinental divide can readily utilize both Lake Michigan and the ground water aquifers as a source of supply, but urban development west of that divide must depend primarily upon the two ground water aquifers.

9) Only a very limited number of high value potential park and related open-space sites remain within the Region, and only eight of these sites are of such size and possess such recreational value as to warrant consideration as future state or regional parks.

10) The most important elements of the regional resource base, including the best remaining forests; wildlife habitat; surface water; wetlands; and historic, scenic, and scientific sites, when combined, are found to occur in linear patterns or corridors. The preservation and protection of these corridors will do much to maintain a good environment within the Region and to preserve its unique cultural and natural heritage, as well as its natural beauty. The failure to properly adjust land use development within the Region to these environmental corridors will inevitably result in the loss of the remaining prime potential park and related open-space sites, the deterioration or destruction of the best remaining wildlife habitat, encroachment of urban development on the natural flood plains of streams and watercourses, loss of water impoundment areas and reduction of ground water recharge, loss of the best remaining commercial and aesthetic forests and continued deterioration of surface water quality within the Region.

HISTORIC DEVELOPMENT AND EXISTING LAND USE

11) Although urban development within the Region has continuously increased since 1850, the character of this development has changed dramatically since 1950. The earlier pattern of compact, concentric urban development has been supplanted by a diffused pattern of areawide sprawl. As a result, in the past 13 years a 35 percent increase in population has been accompanied by a 146 percent increase in land devoted to urban use. The direction and nature of this urban growth support the thesis that a continuous band of urban development is being created within the Region from the state line north to Port Washington and from the Lake Michigan shore west into the Fox River Valley. The areawide spread of urban development within the Region has been accompanied by marked reductions in urban population densities, which declined from over 11,300 persons per square mile in 1950 to slightly more than 4,800 persons per square mile in 1963.

12) The advent of the high-speed, all-weather highway has had a marked influence on the spatial location of urban development within the Region; but this influence has been significantly modified by the location and quality of resource amenities. Continued demands for the conversion of high value resource areas to urban uses, as highway facilities continue to improve, may in the absence of sound planning create severe environmental problems which will be costly, if not impossible, to alleviate.

13) Urban land uses presently occupy approximately 340 square miles, or over 16 percent of the total area of the Region, with the greatest proportion of this urban land being devoted to residential use. Non-urban land uses presently occupy over 83 percent of the total area of the Region, and the greatest proportion of this land is devoted to agricultural use. If regional development trends continue as in the recent past, between 10 and 15 square miles of rural land will be converted to urban use each year.

COMMUNITY PLANS AND ZONING

14) The long-range land use development objectives of the local communities comprising the Region, as reflected in the existing local land use plans and zoning ordinances, indicate an intent to continue the low density urban development pattern prevalent in the Region today. A continuation of such low density areawide development, in accordance with the local plans and zoning ordinances, would hold important implications for transportation and public facilities planning and would present severe problems for the wise use of the natural resource base. The spatial distribution of the land uses proposed in the adopted local land use plans and zoning ordinances, together with the excessive amounts of residential, commercial, and industrial land proposed, would extend or intensify certain areawide problems, such as flooding, traffic congestion, more costly municipal services, destruction of land and water resources, and possible deterioration of certain aspects of the overall community environment.

EXISTING TRANSPORTATION FACILITIES

15) There are presently approximately 3,200 miles of arterial streets and highways open to traffic within the Region, of which, 87 miles, or less than 3 percent, consist of freeways and expressways. These freeways and expressways were, however, carrying approximately 10 percent of the approximately 13 million vehicle-miles of travel which occurred within the Region over the arterial street and highway system on an average weekday. Approximately 17 percent of the arterials within the Region were operating either at or over design capacity, the most congested links being located within the most intensely urbanized areas. Almost 42 percent of the existing arterial street and highway mileage in Milwaukee County was found to be operating at or over design capacity; and over 10 percent of the existing arterial street and highway mileage in the counties of Kenosha, Racine, and Waukesha were operating at or over design capacity.

16) Mass transit service within the Region has been generally maintained at a high level, especially when compared to utilization. Approximately 93 percent of the population of Milwaukee County, 70 percent of the population of both Racine and Kenosha counties, and 24 percent of the population of Waukesha County are within one-quarter mile of an existing mass transit line. No true rapid transit service can, however, be said to exist within the Region, although limited modified rapid transit service was inaugurated in 1964 in the form of buses operating over a completed portion of the freeway system. The response to this service, in direct contrast to the otherwise steady decline in transit utilization throughout the Region, indicates that such modified rapid transit service warrants careful consideration in the plan preparation.

TRAVEL CHARACTERISTICS

17) Approximately 3.5 million person trips and more than 2.4 million vehicle trips are made on an average weekday within the Region. Almost all of this travel is internal, with over 95 percent of both total person and total vehicle trips being made by residents and resident vehicles. Internal travel patterns, therefore, must be one of the primary determinants of the location and capacity of future transportation facilities within the Region.

18) Nearly 88 percent of all internal vehicle trips made within the Region on an average weekday were auto and taxi trips. Only 12 percent were truck trips. Moreover, truck travel did not exhibit the same sharp concentrations of tripmaking during peak traffic movement periods that auto travel did, neither by hour of the day or day of the week. These facts indicate that the transportation problem within the Region is primarily one of movement of people rather than of goods.

19) Nearly 80 percent of all person travel made within the Region on an average weekday consisted of trips by family members to or from their place of residence. Clearly, then, the location of future residential development will be one of the strongest factors affecting future travel demand within the Region and, consequently, future transportation facilities as well.

20) Trips to and from work comprise nearly 34 percent of the total trips within the urban portions of the Region on an average weekday. Moreover, nearly 20 percent of the average weekday travel within the Region occurred during the two peak hours of the day; and nearly 47 percent of this peak hourly movement consisted of trips to and from work. These facts indicate that presently the primary transportation problem within the Region is meeting the peak demand of the journey to and from work. The location of future employment centers will, therefore, be another important factor affecting travel demand and transportation facilities within the Region.

21) Autos accounted for 88 percent of all internal person trips within the Region on an average weekday, compared to 8 percent for transit and 3 percent for school buses. The overwhelming predominance of the auto as a mode of travel within the Region, combined with the continued upward trend in auto registrations and the constant decline in transit utilization, poses a threat to the maintenance of a balanced transportation system.

22) The largest single concentration of person trip origins and destinations within the Region is in the central business district of the City of Milwaukee. The auto accounted for approximately 65 percent of the total personal travel to this important area, while transit accounted for about 34 percent. It is important that at least the current ratio of transit ridership to this area be maintained, especially during peak-hour periods if the arterial street and highway system is to function efficiently.

23) Tripmaking reflects the socio-economic characteristics of the households of the Region as well as the type, intensity, and spatial distribution of land use. The number of trips generated by households shows a tendency to increase with income, with decreasing densities of residential development, and with increasing auto ownership. Commercial land use exhibits the highest trip production rate within the Region, followed by industrial land use, and both rates vary inversely with the distance from the center of the urban area in which the land use is located. The trip generation rates clearly identify commercial and industrial land uses as having the greatest potential for traffic congestion, parking, and other transportation problems.

These inventory findings picture a dynamic and rapidly changing Region, one in which more people are coming to live; one in which more houses, stores, schools, factories, and offices are being built to provide for these people; and one in which great areas of rural land are being converted to urban use. Cities and villages which were once isolated have begun to grow together and to impinge upon one another, thus converting the Region into one large urban area. One direct result of this urban growth will be increasing amounts of personal and vehicular travel and changing patterns of travel. Another direct result of this growth will be increasing pressure upon the underlying and sustaining natural resource base. Such growth cannot continue for long without serious deterioration of this resource base unless an effort is made to adjust future urban development to the ability of the resource base to sustain such development.

The first phase of the regional land use-transportation study, completion of which is marked by the publication of this report, has of absolute necessity been directed to careful research in order to provide knowledge of the existing state of the Region. It should be noted, however, that out of this research will grow definitive plans and very concrete recommendations for both public works facilities and services and for land and water management policies requiring implementation, not only by federal, state, and local levels of government, but through private action as well.

Appendix A

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL LAND USE — TRANSPORTATION PLANNING

SOCIO-ECONOMIC SUBCOMMITTEE

John Doyne
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Kenneth E. Fry
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Waukesha

John D. Hogan
Assistant Director Market Research
Northwestern Mutual Life Insurance
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Henry Kinkade
United Community Services
Milwaukee

Dr. John Malloy - Professor
Industrial Management Department
School of Business Administration
Marquette University - Milwaukee

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David Schuring
Economic Analysis Project Director
Wisconsin Department of Resource Development - Madison

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Oak Creek

Thomas T. Hay
Superintendent, Sewage Disposal Plant
Racine

Ray D. Leary
Chief Engineer - Metropolitan Sewerage Commission of the City of Milwaukee
Milwaukee

John B. Prince
Electrical Systems Engineer
Wisconsin Electric Power Company
Milwaukee

Hampton Waring
Engineer - Wisconsin Telephone Company - Milwaukee

NATURAL RESOURCES SUBCOMMITTEE

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Elkhorn

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West Bend

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Walworth Co. Agricultural Agent
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Elwin G. Leet
Racine Co. Agricultural Agent
Racine

William D. Rogan
Waukesha Co. Agri-Business Agent
Waukesha

Chester A. Schumacher
City Engineer
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URBAN AND RURAL LAND USE SUBCOMMITTEE

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State Highway Commission
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Walter H. Tacke
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John Varda
Executive Secretary
Wisconsin Motor Carriers Association
Madison

Frank Wellstein
City Engineer
Franklin

Henry B. Wildschut
County Highway Commissioner &
Director of Public Works
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RURAL HIGHWAY PLANNING SUBCOMMITTEE

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Julius Ingwersen
Kenosha Co. Highway Commissioner
Kenosha

Lloyd L. Jensen
County Surveyor, Walworth Co.
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Albert P. Rettler
Washington Co. Highway Commissioner
West Bend

Forrest G. Robinson
City Engineer
Brookfield

Earl G. Skagen
Racine Co. Highway Commissioner
Sturtevant

Edward J. Stephan
Waukesha Co. Highway Commissioner
Waukesha

Sylvester N. Weyker
Highway Engineer
Port Washington

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General Superintendent
The Milwaukee Road - Milwaukee

John G. Holcomb
President - Lakeshore Transit-
Kenosha, Inc., Racine

Merle R. Long
Superintendent - Chicago & North
Western Railway Company
Milwaukee

Gilbert R. Loshek
Transportation Superintendent - Central
Greyhound Lines - Milwaukee

Paul Haase, Jr.
General Manager
Wisconsin Coach Lines
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Donald L. Hart
Supervisor - Soo Line Railroad
Company - Stevens Point

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Roland H. Fritsche
Traffic Engineer
Milwaukee Co. Expressway Commission
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Robert H. Paddock
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Madison

John F. Pamperin
Chief, Road Inventory
State Highway Commission of
Wisconsin - Madison

Harvey Shebesta
Traffic & Urban Planning Engineer
State Highway Commission of
Wisconsin - Milwaukee

Appendix B

INTERGOVERNMENTAL COORDINATING COMMITTEE ON REGIONAL LAND USE — TRANSPORTATION PLANNING

George C. Berteau	SEWRPC Commissioner and Chairman
	MILWAUKEE COUNTY
Phillip J. Fox	Wisconsin Bar Association; Advisory Board of Public Safety Committee; Civil Defense Director—Village of Fox Point
Thomas P. Rozga	South Side Businessmen's Club; Wisconsin National Guard
John P. Murphy	County Board Supervisor—City of West Allis; SEWRPC Commissioner
	OZAUKEE COUNTY
Adlai S. Horn	County Board Supervisor—City of Cedarburg; Chairman, County Park Commission; Chairman, County Finance Committee
David F. Egelhoff	County Board Supervisor—Village of Thiensville; Chairman, County Highway Committee
Ray F. Blank	County Board Supervisor; Chairman, County Board; Chairman, County Soil and Water Conservation District; SEWRPC Commissioner
	RACINE COUNTY
Earl G. Skagen	County Highway Commissioner
Willard Savage	County Board Supervisor; Chairman, County Board; Chairman—Town of Yorkvile; County Park Land Acquisition Committee; County Agriculture Committee
Wilfred Patrick	County Board Supervisor—City of Racine; County Planning Committee; County Civil Defense Committee; County Reapportionment Committee; SEWRPC Commissioner
	WALWORTH COUNTY
James Baker	County Board Supervisor; Chairman—Town of Spring Prairie; Chairman, County School Committee; Chairman, County Juvenile Affairs Committee; County Counseling Center
Franklin Walsh	County Board Supervisor; Chairman—Town of Linn; Former County Board Chairman; Chairman, County Agriculture Committee; Chairman, County Finance Committee; Chairman, County Welfare Committee; Chairman, County Counseling Center
Eugene Hollister	County Board Supervisor; Chairman, County Handicapped School Committee; Chairman, County Zoning and Industrial Division Committee; County Park Board; Lakeland Hospital Committee; SEWRPC Commissioner

WASHINGTON COUNTY

Reuben Schmahl	County Board Supervisor; Chairman—Town of Jackson; Chairman, County Highway Committee
Paul Quick	City of Hartford Plan Commission
Joseph A. Schmitz	County Board Supervisor—Village of Germantown; SEWRPC Commissioner and Vice-Chairman

WAUKESHA COUNTY

Jerome Gottfried	Mayor—City of Muskego; Former County Board Supervisor; Chairman, County Health Board; County Mental Health Clinic Board
Reuben Bartelt	County Board Supervisor—Village of Menomonee Falls; County Highway Committee; Chairman, County Board Reorganization Committee
Mervin L. Brandt	County Board Supervisor; President—Village of Pewaukee; Secretary, Waukesha County Park & Planning Commission; SEWRPC Commissioner

KENOSHA COUNTY

Appointments pending approval of County Board

SHCW

Wesley J. Burmeister	State Highway Engineer
James E. Meier	District Highway Engineer—District 60
Stephan J. Banaszak	District Highway Engineer—District 2

Appendix C

STAFF ASSIGNED THROUGH INTERGOVERNMENTAL COOPERATIVE AGREEMENT

Karl B. Holzwarth
Landscape Architect
Wisconsin Conservation Commission

William T. Wambach
District Freeway Design Supervisor
State Highway Commission
of Wisconsin - District 2

Thomas A. Winkel
District Urban Planning Supervisor
State Highway Commission
of Wisconsin - District 60

Ernest R. Vogel
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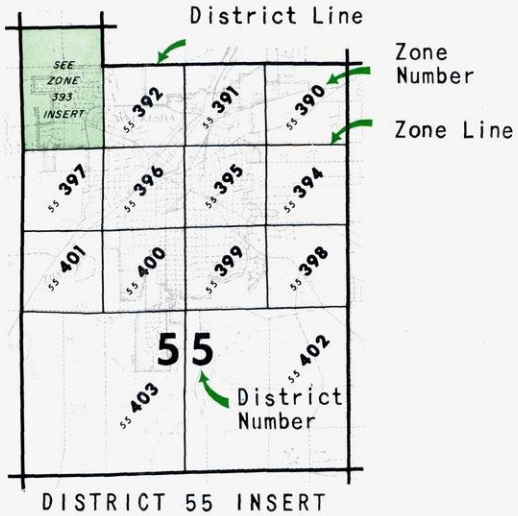

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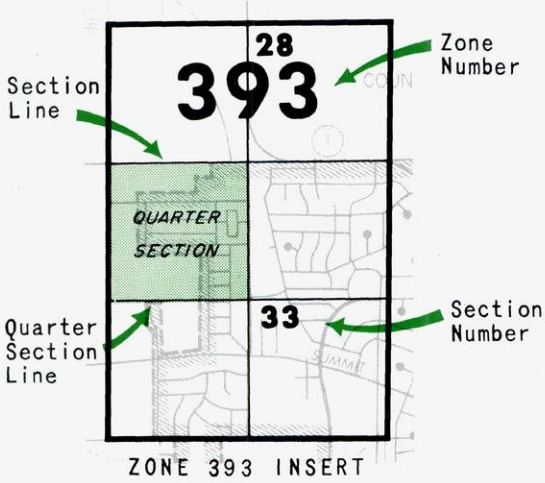

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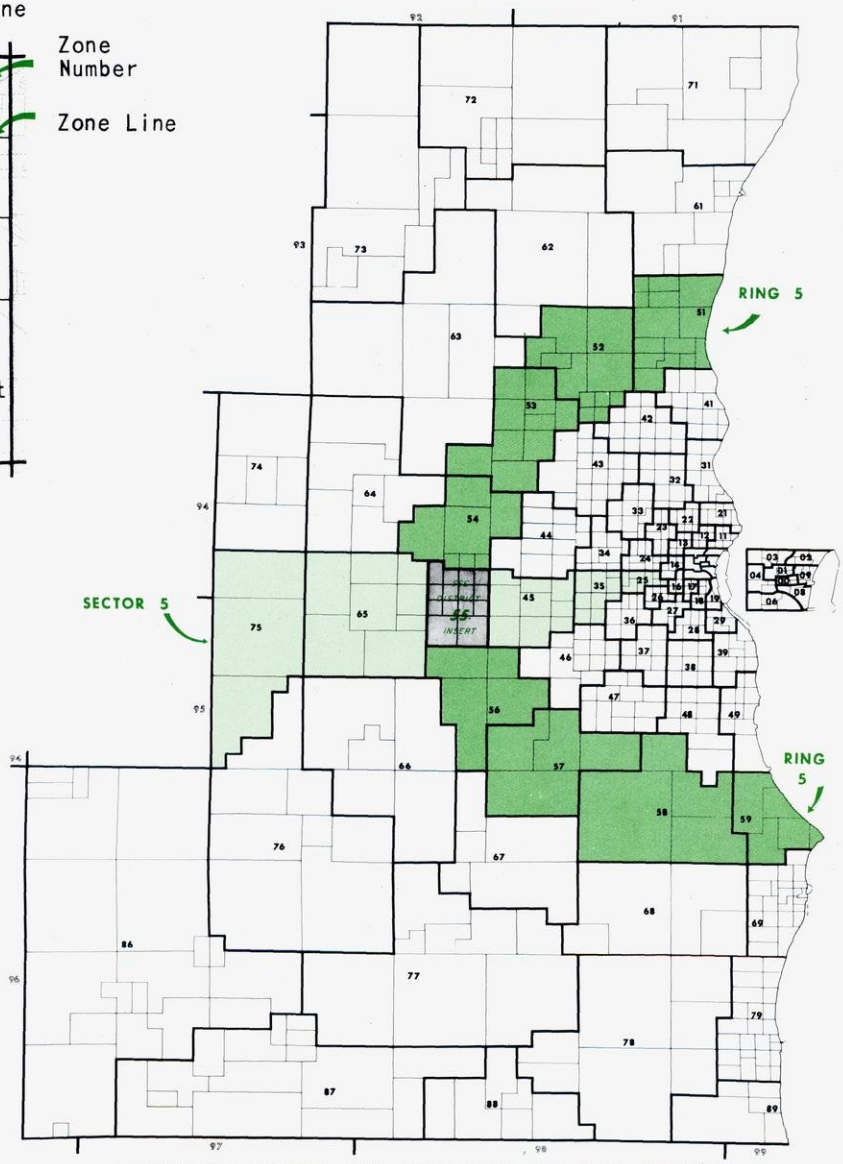
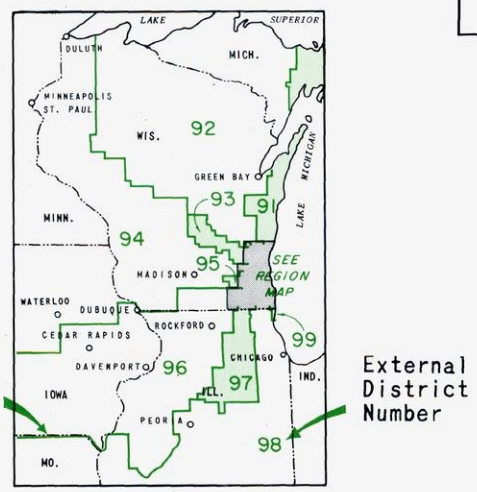
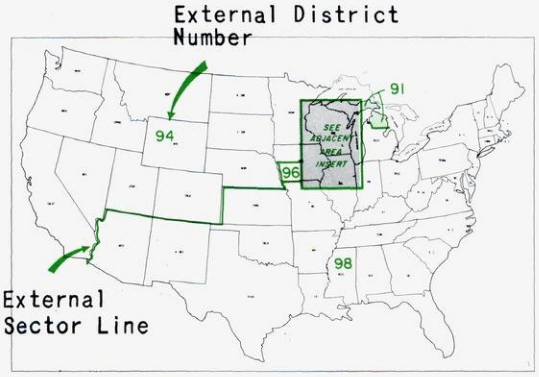


DISTRICT LINES AND NUMBERS IN THE REGION



EXTERNAL DISTRICTS IN ADJACENT STATES



EXTERNAL DISTRICTS IN THE UNITED STATES

Appendix D

GEOGRAPHIC IDENTIFICATION AND CENTRAL BUSINESS DISTRICTS SUMMARY

GEOGRAPHIC IDENTIFICATION

As a necessary prerequisite to the collection of land use-transportation planning data, it was necessary to develop a sound means for relating the inventory data to the geographic area from which it was to be collected. This required the adoption of a basic areal unit which was: 1) uniform throughout the Region; 2) readily adaptable to future planning and engineering studies; 3) suitable for rapid data summarization and plotting by machine methods; 4) useful to other agencies and individuals within the Region without access to special purpose maps; and 5) amenable to convenient periodic updating of planning and engineering data.

A plane coordinate grid is well adapted as a primary unit of geographic identification to automatic data processing methods and if properly devised permits analysis by geographic units of almost any degree of coarseness or refinement. The U. S. Public Land Survey system[1] provides a geographic reference system which both conceptually and actually divides the landscape into one-half mile square grids. The location of the section and quarter-section corners on the state plane coordinate system, moreover, permits the ready assignment of Cartesian coordinate values to this grid system, which has "real" as well as abstract meaning. The U. S. Public Land Survey system when combined with the state plane coordinate system, therefore, provides an almost ideal basis for the geographic identification of planning and engineering data. The combined system permits ready geographic identification to a one-half mile square grid; i. e., the U. S. Public Land Survey quarter section. The quarter section normally contains approximately 160 acres and was selected as the primary unit of geographic identification for the summarization of land use and travel inventory data throughout the Region (see Figure A1).

Where the one-half mile grid, as such, is a unit too large for any desired analysis, the grid can be readily broken down into one-quarter mile grids or, since all real property boundary line descriptions and plats in Wisconsin are referenced to the U. S. Public Land Survey system, to individual parcels, blocks, and lots and readily coded for machine processing. In addition, it is possible with this system to approximate such natural topographic boundaries as rivers and lakeshores, watersheds, or to such planning areas as minor civil divisions.

To provide an analysis unit larger than the one-half square mile grid and to decrease the number of geographic units for which data must be handled and forecasts made, traffic analysis zones were delineated comprising aliquot parts of, entire, or combinations of quarter sections (see Figure A1). Within the Region 619 such traffic analysis zones were formed, ranging in area from 0.04 square miles in the core of the Milwaukee CBD to 38.09 square miles in the most sparsely settled portion of the Region. Criteria considered in the delineation of the traffic analysis zones included: 1) Zone boundaries should, wherever possible, follow U. S. Public Land Survey section or quarter-section lines or major topographic barriers, such as rivers or lakeshores; 2) Each zone should contain a suitable loading point on the arterial street and highway network; and 3) Each zone should contain, to the extent possible, homogeneous land uses.

To provide still larger data analysis units, the traffic analysis zones were grouped into traffic analysis districts comprised of one or more traffic analysis zones. The traffic analysis districts were further grouped into rings concentric about the Milwaukee CBD and into sectors radiating from the Milwaukee CBD (see Figure A1). Beyond the boundaries of the Region, sector lines were extended to encompass hypothetical "trafficsheds" in the continental United States, Canada, and Mexico.

[1] The U. S. Public Land Survey was established by an Act of Congress in 1785 as a method for carrying out land surveys over large wilderness areas, thus providing a basic framework upon which the socio-economic development of America could take place. The public land survey of the southeastern Wisconsin territory was completed in a two-year period ending in 1836. The surveys divide the Region into 36-square-mile area (more or less) townships, bounded by town lines run due east and west at approximately 6-mile intervals and range lines run due north at approximately six-mile intervals. The townships are further divided into 36 sections, each approximately one mile square. Each section is further divided into quarter sections approximately one-half mile square.

The U. S. Public Land Survey system is a remarkably simple yet effective and flexible device. To this day the system provides the basis for all property surveys, descriptions, and conveyances in the Region. For these and other reasons, it was considered imperative that the identification of the quarter sections be maintained as a basic building block within the Region for geographic identification of data obtained from the Commission's surveys. For a more detailed description of the U. S. Public Land Survey, see "A Backward Glance," SEWRPC Technical Record; Vol. 1-No. 2.

Figure A2
MILWAUKEE CENTRAL BUSINESS DISTRICT AND CORE AREA

Figure A3
RACINE CENTRAL BUSINESS DISTRICT

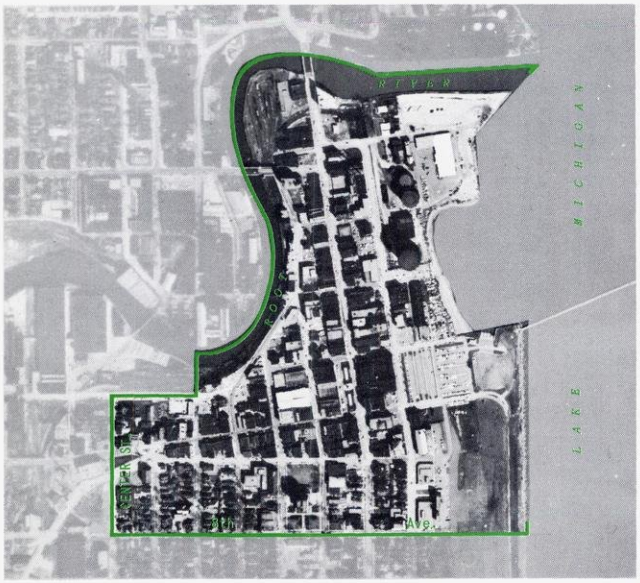


Figure A4
KENOSHA CENTRAL BUSINESS DISTRICT

Milwaukee CBD

For the purpose of this study, the Milwaukee CBD was defined as the area bounded by E. and W. Juneau Avenue on the north, N. 12th Street on the west, the Menomonee River on the south, and the C&NW RR and N. Prospect Avenue on the east. The CBD, as defined, approximates the area to be contained within the proposed Downtown Freeway Loop, has a gross area of 1.25 square miles, and has been divided into seventeen traffic analysis zones (see Figure A2).

A core area was delineated within the CBD for more detailed analysis of land use and travel data. This core area is bounded by E. and W Wells Street on the north, N. 6th Street on the west, E. and W. Michigan Street on the south, and N. Jefferson Street on the east. It includes the main department stores and shops, has an area of 0.21 square miles, and has been subdivided into four traffic analysis zones.

UNLINKED PERSON AND VEHICLE TRIP DESTINATIONS IN THE MILWAUKEE CBD

Type of Trip	CBD Destinations		Core Destinations	
	Trips	Percent	Trips	Percent
Person Trips				
Internal (by mode)				
Auto Driver	63,900	49.0	27,000	43.0
Auto Passenger	20,200	15.5	9,900	15.5
Transit Passenger*	44,300	34.0	24,400	39.0
Truck & Taxi Passenger	600	0.0	300	0.5
Sub-Total	129,000	98.5	61,600	98.0
External (by mode)				
Auto Driver	1,100	1.0	700	1.0
Auto Passenger	800	0.5	600	1.0
Sub-Total	1,900	1.5	1,300	2.0
Grand Total	130,900	100.0	62,900	100.0
Vehicle Trips				
Internal (by type)				
Light Truck 62%	7,100	9.0	2,400	7.5
Medium Truck 33%	3,800	5.0	1,100	3.5
Heavy Truck 5%	600	1.0	200	1.0
Total Truck	11,500	15.0	3,700	12.0
Taxi	1,100	1.5	700	2.0
Auto	63,900	82.0	27,000	84.0
Sub-Total	76,500	98.5	31,400	98.0
External (by type)				
Light Truck 25%	50	0.0	---	0.0
Medium Truck 25%	50	0.0	---	0.0
Heavy Truck 50%	100	0.0	50	0.0
Total Truck	200	0.0	50	0.0
Taxi	---	0.0	---	0.0
Auto	1,100	1.5	650	2.0
Sub-Total	1,300	1.5	700	2.0
Grand Total	77,800	100.0	32,100	100.0

* *Excludes 174 school bus trips.*

Racine CBD

For the purpose of this study, the Racine CBD was defined as the area bounded by the Root River on the north, Center Street on the west, 8th Street on the south, and Lake Michigan on the east. The CBD, as defined, has a gross area of 0.24 square miles and consists of one traffic analysis zone (see Figure A3).

PERSON TRIPS TO THE MILWAUKEE CBD BY SELECTED LAND USE AND MODE OF TRAVEL

Land Use	Auto Passenger		Auto Driver		Transit Passenger	
	Trips	Percent	Trips	Percent	Trips	Percent
Residential	2,100	3	1,300	7	3,400	8
Commercial	32,600	51	10,800	53	26,300	59
Industrial	9,000	14	1,700	8	4,200	10
Governmental & Institutional	16,000	25	4,200	21	9,000	20
Other	4,200	7	2,200	11	1,400	3
Total	63,900	100	20,200	100	44,300	100

Source: SEWRPC, 1963.

GROUND FLOOR LAND USE IN THE MILWAUKEE CBD IN ACRES BY MAJOR LAND USE CATEGORIES

General Land Use	CBD Area		Core Area		Percent of CBD Total
	Acres	Percent	Acres	Percent	
Residential	39.0	5	1.1	1	---
Commercial	99.1	12	41.6	30	42
Industrial	85.9	11	6.2	5	7
Transportation*	445.6	56	76.9	56	17
Institutional & Governmental	53.4	7	1.7	1	3
Recreational	17.2	2	1.1	1	7
Open Lands & Water	56.8	7	8.1	6	14
Total	797.0	100	136.7	100	17

* *Includes communications and utilities. In this category, streets account for 35 percent, parking for 14 percent, and the remaining 7 percent is for other uses, such as rail and utilities.*
Source: SEWRPC, 1963.

UNLINKED PERSON AND VEHICLE TRIP DESTINATIONS IN THE RACINE CBD

Type of Trip	CBD Destinations	
	Trips	Percent
Person Trips		
Internal (by mode)		
Auto Driver	14,660	66.0
Auto Passenger	5,680	25.5
Transit Passenger*	1,750	8.0
Truck & Taxi Passenger	50	0.0
Sub-Total	22,140	99.5
External (by mode)		
Auto Driver	100	0.5
Auto Passenger	40	0.0
Sub-Total	140	0.5
Grand Total	22,280	100.0
Vehicle Trips		
Internal (by type)		
Light Truck 71%	1,160	7.0
Medium Truck 28%	450	3.0
Heavy Truck 1%	10	0.0
Total Truck	1,630	10.0
Taxi	50	0.5
Auto	14,660	89.0
Sub-Total	16,340	99.5
External (by type)		
Light Truck 100%	10	0.0
Medium Truck 0%	---	0.0
Heavy Truck 0%	---	0.0
Total Truck	10	0.0
Taxi	---	0.0
Auto	100	0.5
Sub-Total	110	0.5
Grand Total	16,450	100.0

* *Excludes 11 school bus trips.*
Source: SEWRPC, 1963.

PERSON TRIPS TO THE RACINE CBD BY SELECTED LAND USE AND MODE OF TRAVEL

Land Use	Auto Driver		Auto Passenger		Transit Passenger	
	Trips	Percent	Trips	Percent	Trips	Percent
Residential	600	4	300	5	100	5
Commercial	8,800	60	3,400	61	1,100	63
Industrial	1,000	7	300	6	100	4
Governmental & Institutional	3,500	24	1,400	23	400	23
Other	800	5	300	5	100	5
Total	14,700	100	5,700	100	1,800	100

Source: SEWRPC, 1963.

GROUND FLOOR LAND USE IN THE RACINE CBD IN ACRES BY MAJOR LAND USE CATEGORIES

General Land Use	Acres	Percent
Residential	7.4	5
Commercial	31.1	20
Industrial	5.6	4
Transportation, Communications, & Utilities*	70.9	46
Institutional & Governmental	12.6	8
Recreational	19.4	13
Open Lands & Water	5.6	4
Total	152.6	100

** In this category, streets account for 25 percent, parking for 7 percent, and the remaining 14 percent is for other uses, such as rail and utilities.*
Source: SEWRPC, 1963.

Kenosha CBD

For the purpose of this study, the Kenosha CBD was defined as the area bounded by 52nd Street and Pike Creek on the north, 13th Avenue on the west, 60th Street on the south, and Lake Michigan on the east. The CBD, as defined, has a gross area of 0.34 square miles and consists of one traffic analysis zone (see Figure A4).

PERSON TRIPS TO THE KENOSHA CBD BY SELECTED LAND USE AND MODE OF TRAVEL

Land Use	Auto Driver		Auto Passenger		Transit Passenger	
	Trips	Percent	Trips	Percent	Trips	Percent
Residential	700	5	300	5	100	6
Commercial	7,700	54	3,400	55	500	32
Industrial	1,700	12	400	7	100	6
Governmental & Institutional	3,600	25	1,800	28	800	50
Other	600	4	300	5	100	6
Total	14,300	100	6,200	100	1,600	100

Source: SEWRPC, 1963.

GROUND FLOOR LAND USE IN THE KENOSHA CBD IN ACRES BY MAJOR LAND USE CATEGORIES

General Land Use	Acres	Percent
Residential	27.7	12
Commercial	30.3	14
Industrial	33.0	15
Transportation, Communications, & Utilities*	84.1	38
Institutional & Governmental	17.8	8
Recreational	21.3	10
Open Lands & Water	6.6	3
Total	220.8	100

** In this category, streets account for 25 percent, parking for 11 percent, and the remaining 2 percent is for other uses, such as rail and utilities.*
Source: SEWRPC, 1963.

UNLINKED PERSON AND VEHICLE TRIP DESTINATIONS IN THE KENOSHA CBD

Type of Trip	CBD Destinations	
	Trips	Percent
Person Trips		
Internal (by mode)		
Auto Driver	14,310	62.0
Auto Passenger	6,250	27.0
Transit Passenger*	1,530	7.0
Truck & Taxi Passenger	50	0.0
Sub-Total	22,140	96.0
External (by mode)		
Auto Driver	490	2.0
Auto Passenger	390	2.0
Sub-Total	880	4.0
Grand Total	23,020	100.0
Vehicle Trips		
Internal (by type)		
Light Truck 65%	800	5.0
Medium Truck 28%	350	2.0
Heavy Truck 7%	90	0.5
Total Truck	1,240	7.5
Taxi	50	0.5
Auto	14,310	88.5
Sub-Total	15,600	96.5
External (by type)		
Light Truck 50%	20	0.5
Medium Truck 25%	10	0.0
Heavy Truck 25%	10	0.0
Total Truck	40	0.5
Taxi	---	0.0
Auto	490	3.0
Sub-Total	530	3.5
Grand Total	16,130	100.0

**Excludes 180 school bus trips.*
Source: SEWRPC, 1963.

Table A1

MAJOR LAND USE IN ACRES IN THE REGION BY DISTRICT - 1963

District	Residential			Commercial	Industrial[a]	Transportation[b]	Governmental, Institutional, and Recational	Agriculture	Woodlands	Water and Wetlands	Total All Land
	Developed	Under Developed	Total								
00.	1.1	---	1.1	41.6	6.3	76.9	2.8	---	.1	8.0	136.8
01.	12.1	---	12.1	25.3	19.7	143.4	42.9	---	1.5	10.7	255.4
02.	107.1	.3	107.4	21.3	10.5	131.4	61.4	---	7.1	21.7	360.7
03.	121.9	---	121.9	39.5	62.9	191.3	12.8	---	23.5	9.8	461.6
04.	93.8	.1	93.9	25.3	78.2	187.2	36.7	---	13.8	14.0	449.0
06.	21.1	---	21.1	22.8	230.5	244.7	15.2	---	5.7	73.0	613.0
08.	.2	---	.2	11.9	49.1	155.4	35.6	---	42.3	35.7	330.1
09.	21.2	---	21.2	22.4	12.9	123.0	60.1	---	2.8	3.1	245.7
11.	401.6	.3	401.9	34.4	49.8	407.9	220.6	---	46.6	76.5	1,237.7
12.	535.8	---	535.8	65.7	15.9	400.6	87.0	---	23.2	---	1,128.3
13.	578.5	.1	578.6	77.0	25.2	401.0	37.1	---	12.2	---	1,131.1
14.	260.7	2.6	263.3	49.1	101.1	580.6	80.6	---	25.8	25.2	1,126.1
16.	312.6	.1	312.7	25.3	21.0	280.8	116.0	---	4.7	5.6	766.0
17.	361.7	---	361.7	65.5	10.7	301.0	29.8	.1	6.9	---	775.5
18.	300.3	---	300.3	40.4	143.4	392.8	108.0	---	54.9	52.0	1,091.6
19.	157.5	---	157.5	23.1	127.7	348.3	29.2	---	114.4	76.1	876.4
21.	929.6	.5	930.1	71.3	227.6	726.5	346.8	1.8	100.5	41.1	2,445.8
22.	939.2	---	939.2	59.3	201.3	715.2	141.5	---	44.2	3.9	2,104.8
23.	1,257.6	---	1,257.6	102.7	63.8	935.5	220.2	.5	23.1	11.3	2,614.5
24.	1,190.1	7.5	1,197.6	74.8	124.3	860.4	368.3	.6	105.9	21.8	2,753.9
25.	599.6	---	599.6	76.4	277.9	702.0	517.6	---	46.6	4.2	2,224.5
26.	422.7	.6	423.3	35.3	362.2	403.6	88.5	---	73.5	14.2	1,400.7
27.	667.8	2.5	670.3	55.1	56.1	603.0	562.6	---	122.5	18.3	2,087.8
28.	907.8	.3	908.1	72.9	127.5	843.2	419.7	2.6	305.6	12.1	2,691.8
29.	798.9	1.3	800.2	32.0	48.2	536.2	333.5	---	128.2	1.9	1,880.1
31.	2,455.8	40.6	2,496.4	87.6	119.2	1,109.6	733.9	157.7	378.3	195.6	5,278.4
32.	2,027.3	9.6	2,036.9	101.5	263.7	1,680.6	895.8	271.6	899.6	55.1	6,204.9
33.	2,726.6	13.3	2,739.9	141.6	1.2	1,726.0	777.3	1.4	223.2	4.5	5,615.4
34.	1,510.1	107.0	1,617.1	88.4	109.6	1,179.3	1,190.2	350.0	619.1	51.5	5,205.5
35.	1,896.4	205.0	2,101.4	110.0	187.1	1,389.1	739.0	235.4	974.4	97.5	5,834.0
36.	2,189.6	73.9	2,263.5	79.0	36.5	1,160.6	286.3	176.8	504.1	8.6	4,514.9
37.	1,934.5	245.4	2,179.9	44.8	7.6	1,162.8	614.6	753.1	1,236.1	110.0	6,108.8
38.	1,147.2	34.2	1,181.4	75.7	54.0	1,338.3	260.0	649.7	2,112.1	48.0	5,719.6
39.	1,207.4	118.7	1,326.1	102.6	256.1	1,951.4	709.8	541.2	715.5	68.9	5,671.1
41.	4,027.7	587.1	4,614.8	79.3	4.8	1,019.0	438.0	2,250.4	1,103.8	361.9	9,872.2
42.	1,772.8	324.3	2,097.1	48.0	116.0	1,176.0	1,196.2	5,337.7	890.3	151.8	11,012.7
43.	3,612.7	358.2	3,970.9	219.1	258.6	2,663.0	1,210.7	4,874.0	3,019.4	390.3	16,606.3
44.	4,449.1	1,218.9	5,668.0	197.6	51.9	1,970.7	837.9	3,640.7	2,293.1	747.2	15,406.9
45.	2,525.0	653.6	3,178.6	85.2	25.6	1,247.1	230.5	7,520.9	2,194.4	1,055.9	15,538.6
46.	2,955.1	757.6	3,712.7	108.4	15.4	1,483.4	428.7	6,535.7	1,723.8	338.6	14,346.3
47.	1,053.6	159.4	1,213.0	36.5	26.6	822.9	1,440.4	6,361.8	1,202.3	804.4	11,908.0
48.	1,218.2	312.9	1,531.1	188.9	104.9	1,225.1	196.9	7,295.7	1,281.5	660.2	12,484.5
49.	1,593.5	103.3	1,696.8	82.9	462.0	1,235.0	826.3	2,824.1	1,069.1	330.7	8,526.5
51.	2,998.3	715.1	3,713.4	110.7	102.5	1,584.7	935.9	11,112.4	1,954.6	1,776.6	21,290.9
52.	777.9	240.1	1,018.0	31.4	64.6	1,051.3	188.3	19,044.3	2,857.8	976.4	25,232.0
53.	2,488.9	600.1	3,089.0	85.6	121.8	1,790.4	624.2	14,247.9	2,989.9	2,203.2	25,152.3
54.	1,380.4	428.8	1,809.2	40.7	78.7	1,685.6	296.0	13,034.6	1,745.0	2,538.5	21,228.8
55.	2,261.8	247.9	2,509.7	122.4	229.3	1,391.9	507.3	6,225.2	1,419.1	852.5	13,257.6
56.	1,350.8	440.0	1,790.8	27.5	18.0	1,127.9	438.6	16,100.9	2,545.4	2,465.7	24,514.7
57.	1,391.0	153.1	1,544.1	35.1	53.7	1,530.5	191.7	17,965.7	2,052.1	7,916.8	31,289.7
58.	1,193.5	160.1	1,353.6	43.1	37.5	2,319.3	479.1	34,753.8	2,839.1	1,410.3	43,235.7
59.	1,503.8	333.9	1,837.7	21.5	57.2	1,102.2	475.4	9,103.0	1,404.4	469.1	14,470.2
61.	1,765.8	261.1	2,026.9	86.7	156.6	2,292.6	323.4	22,887.8	2,141.5	6,285.0	36,200.5
62.	918.3	169.5	1,087.8	17.8	30.4	1,876.3	35.1	39,991.1	4,894.7	6,372.6	54,305.8
63.	1,608.6	350.4	1,959.0	33.6	8.5	2,661.0	404.2	58,553.0	10,185.6	8,722.3	82,526.9
64.	3,070.6	488.5	3,559.1	99.2	32.5	1,857.1	1,442.8	24,596.6	4,774.3	6,898.2	43,259.6
65.	1,037.7	315.8	1,353.5	28.0	174.4	1,337.0	316.3	29,283.9	4,687.1	3,473.9	40,654.1
66.	1,233.6	152.0	1,385.6	32.4	24.0	1,661.7	1,016.6	39,165.9	5,789.9	10,524.8	59,601.0
67.	959.3	186.5	1,145.8	151.8	10.8	1,082.7	163.7	26,955.4	3,730.8	3,319.3	36,560.6
68.	1,543.2	154.4	1,697.6	46.6	103.1	2,257.7	256.6	36,887.2	1,421.3	1,055.3	43,725.4
69.	4,177.0	635.3	4,812.3	280.2	442.5	2,772.9	1,558.5	3,617.1	718.3	206.9	14,408.6
71.	1,058.2	108.2	1,166.4	35.3	51.2	2,124.1	680.2	51,227.4	4,399.4	4,908.6	64,592.7
72.	2,019.7	316.0	2,335.7	100.3	219.2	2,913.3	775.5	45,448.6	8,520.8	9,500.7	69,814.3
73.	1,904.1	124.3	2,028.4	74.3	109.3	3,255.2	659.4	56,215.5	7,579.6	12,538.7	82,460.4
74.	2,898.2	324.1	3,222.3	69.2	51.0	1,770.3	688.0	21,988.6	3,312.0	7,855.6	38,956.7
75.	746.1	47.0	793.1	16.0	27.3	963.8	411.2	24,236.2	9,293.8	8,174.5	43,916.0
76.	1,193.6	54.7	1,248.3	31.5	56.6	2,169.5	381.7	70,348.3	10,959.2	8,830.8	94,025.7
77.	2,113.7	200.3	2,314.0	106.3	453.5	2,987.0	805.7	60,692.5	14,591.4	11,326.5	93,277.3
78.	1,771.6	328.9	2,100.5	46.6	55.6	3,217.4	496.4	58,510.1	3,812.1	5,884.5	74,123.4
79.	4,065.2	552.4	4,617.6	268.0	592.8	2,395.6	1,517.2	7,764.1	1,025.1	422.5	18,603.4
86.	4,512.0	1,089.0	5,601.0	239.2	191.1	5,336.2	1,737.3	138,307.8	17,435.7	14,249.1	183,097.8
87.	4,700.2	871.5	5,571.7	255.1	104.5	3,338.7	1,672.6	52,462.9	8,416.4	14,664.6	86,486.8
88.	1,704.7	254.7	1,959.4	56.7	15.7	1,061.3	796.2	14,709.1	3,296.2	5,153.9	27,048.6
89.	1,252.1	811.3	2,063.4	66.6	18.4	906.1	161.0	9,930.1	1,450.7	2,061.4	16,657.8
Total	112,903.0	16,454.2	129,357.2	5,706.9	8,246.9	100,053.1	37,423.1	1,085,150.5	176,019.0	179,059.7	1,721,018.8

[a] *Includes all manufacturing, storage, and wholesale uses.*

[b] *Includes communication and utilities uses.*

Source: SEWRPC, 1963.

Table A2

DETAILED LAND USE IN ACRES IN THE REGION BY COUNTY - 1963

Detailed Land Use	County							Region
	Kenosha	Milwaukee	Ozaukee	Racine	Walworth	Washington	Waukesha	
Residential								
Single Family	9,297	33,074	7,501	11,267	9,946	6,442	27,341	104,868
Two Family	283	4,735	38	308	18	46	135	5,563
Multi-Family, High Rise	---	61	---	4	2	---	13	80
Multi-Family, Low Rise	71	1,691	23	84	38	44	131	2,082
Mobile Home	97	94	6	21	35	17	39	309
Residential under development	2,165	2,329	1,769	1,687	1,816	880	5,809	16,455
Commercial								
Commercial Retail and Service[a]	453	2,582	307	641	523	244	956	5,706
Wholesale								
Wholesale (open area)	321	670	49	131	132	60	251	1,614
Wholesale (enclosed area)	76	981	48	83	128	50	132	1,498
Manufacturing								
Manufacturing[b]	288	2,777	216	535	470	274	574	5,134
Quarries and Mining	567	315	469	1,148	476	944	2,424	6,343
Transportation, Communication and Utilities								
Rail, Bus, and Ship Terminals	13	106	9	11	6	1	20	166
Railroad Right-of-Way	972	1,819	683	1,259	1,059	967	1,814	8,573
Railroad Yards	65	776	2	43	7	5	14	912
Airports	174	1,899	111	557	145	238	307	3,431
Local and Collector Streets	3,135	13,665	2,611	4,668	5,669	4,217	7,061	41,026
Arterial Streets and Highways	2,910	8,131	1,977	2,511	3,052	3,617	5,761	27,959
Freeways and Expressways	343	1,647	2	328	100	5	1,165	3,590
Truck Terminals	15	210	12	15	1	3	16	272
Off-Street Parking	333	2,337	113	308	154	157	534	3,936
Communication and Utilities	838	1,793	1,679	1,857	689	1,323	2,009	10,188
Governmental and Institutional								
Local Institutions	264	1,365	243	507	260	258	814	3,711
Regional Institutions	662	4,133	425	798	665	295	1,194	8,172
Local Governmental	20	208	33	16	19	55	55	406
Regional Governmental	10	607	17	32	40	79	212	997
Recreational								
Local Public (open area)	14	6	5	4	10	2	37	78
Local Public (enclosed area)	362	1,973	220	346	223	256	578	3,958
Regional Public (open area)	21	338	27	7	---	---	---	393
Regional Public (enclosed area)	609	5,903	341	843	582	107	1,374	9,759
Private and Other (natural area)	466	31	180	468	1,158	252	964	3,519
Private and Other (artificial area)	762	856	613	505	927	600	2,168	6,431
Agricultural								
Croplands and Pasturelands	115,832	33,915	104,001	153,039	265,961	191,945	214,977	1,079,670
Orchards and Nurseries	447	800	531	463	214	212	910	3,577
Fowl and Fur Farms	77	34	603	113	56	39	110	1,032
Other Agricultural Uses	35	372	64	21	20	75	278	865
Water and Wetlands								
Lakes, Rivers, and Streams	4,447	1,172	1,674	4,805	14,076	4,133	16,009	46,316
Swamps, Marshes, and Wetlands	15,203	3,085	13,382	12,254	24,248	31,006	33,564	132,742
Unused or Open Land	6,782	14,892	1,655	1,967	3,569	1,790	6,144	36,799
Land Fill and Dumps	82	522	42	129	164	163	402	1,504
General Woodlands	9,584	3,090	8,332	13,763	33,322	27,931	35,350	131,372
Total	178,095	154,994	150,013	217,546	369,980	278,732	371,646	1,721,006

[a] *The original inventory specified two commercial categories: local and regional. Both categories are combined because regional commercial uses could not be identified by aerial photograph interpretation.*

[b] *The original inventory specified 17 manufacturing categories in two groups: durable and nondurable. All 17 categories are combined into one here because absolute identification of product output was not possible from aerial photograph interpretation. Identification through such means as company name and product line listings or on-site inspection was also infeasible.*

Source: SEWRPC, 1963.

Table A3

RAPID TRANSIT STATUS IN TWENTY URBANIZED AREAS OF GREATEST POPULATION PLUS RACINE AND KENOSHA IN RANK ORDER BY 1960 POPULATION DENSITY IN THE CENTRAL CITY OF THE URBANIZED AREA

Urbanized Area	Central City[a]			Urbanized Area				
	Population	Area	Persons Per Square Mile	Population	Area	Persons Per Square Mile	National Rank (by population)	Rail Rapid Transit Status[b] (1965)
New York-N.E. New Jersey	7,781,984	315.1	24,697	14,114,927	1,891.5	7462	1	In Operation
Chicago-N.W. Indiana	3,550,404	224.2	15,836	5,959,213	959.8	6209	3	In Operation
Philadelphia-N.J.	2,002,512	127.2	15,743	3,635,228	596.7	6092	4	In Operation
San Francisco-Oakland	1,107,864	100.6	15,553	2,430,663	571.5	4253	6	Under Construction
Boston	697,197	47.8	14,586	2,413,236	515.8	4679	7	In Operation
Buffalo-Niagara Falls	532,759	39.4	13,522	1,054,370	160.2	6582	16	None
Wash., D.C.-Md-Va.	763,956	61.4	12,442	1,808,423	340.7	5308	8	Plans Under Consideration
St. Louis Mo.-Ill.	750,026	45.0	12,296	1,667,693	323.2	5160	11	None
Detroit	1,670,144	139.6	11,964	3,537,709	731.9	4834	5	None
Baltimore	939,024	79.0	11,886	1,418,948	220.3	6441	12	None
Pittsburgh	604,332	54.1	11,171	1,804,400	525.0	3437	9	Test Track (under construction)
Cleveland	876,050	81.2	10,789	1,784,991	586.7	3042	10	In Operation
Minneapolis-St. Paul	482,872	56.5	8,546	1,377,143	657.3	2095	13	None
Milwaukee	741,324	91.1	8,137	1,149,997	392.0	2934	14	None
Racine	89,144	11.2	7,959	95,862	14.6	6566	160	None
Kenosha	67,899	10.1	6,723	72,852	13.2	5519	185	None
Cincinnati-Ohio-Kentucky	502,550	77.3	6,501	993,568	242.3	4101	17	None
Seattle	557,087	88.5	6,295	864,109	238.3	3626	20	Under Litigation (worlds fair)
Los Angeles-Long Beach	2,479,015	448.8	5,451	6,488,791	1,370.0	4736	2	Plan; no Financing
Kansas City	475,539	129.8	3,664	921,121	282.4	3262	19	None
Houston	938,219	328.1	2,860	1,139,678	430.5	2647	15	None
Dallas	679,684	279.9	2,428	932,349	647.0	1441	18	None

[a] *When more than one large city was within the urbanized area, the city having the most population was used.*

[b] *Metropolitan Transportation and Planning, May 1964.*

Source: The U. S. Bureau of the Census, except for rapid transit status.

Table A4

REGIONAL LAND USE AND ZONING DISTRICT CLASSIFICATION SYSTEM FOR CONVERSION OF COMMUNITY PLANS AND ZONING ORDINANCES TO A COMMON AREAWIDE BASIS

Classification	Code	Description
Residential		
Low Density	R-1	Lot area of 20,000 square feet or more per dwelling unit: less than 3,500 persons per square mile.
Medium Density	R-2	Lot area of 6,000 to 19,999 square feet per dwelling unit; 3,500 to 9,999 persons per square mile.
High Density	R-3	Lot area of less than 6,000 square feet per dwelling unit: over 10,000 persons per square mile.
Commercial		
General and Local	B-1	Includes such classifications as: general, local, neighborhood, and restricted commercial; retail business; and shopping districts.
Regional	B-2	Includes downtown, CBD, and regional business.
Industrial		
Manufacturing and Related	M-1	Includes light and heavy manufacturing and warehousing.
Transportation, Communications, and Utilities	T-1	Includes streets and highways, airports, and railroads.
Recreational		
Private	P-1	Includes privately owned and operated recreation facilities and areas.
Public	P-2	Includes publicly owned and operated recreation facilities and areas.
Agricultural		
Agricultural and Related	A-1	Includes all agricultural areas.
Other Uses		
Conservancy	C-1	Includes areas such as floodways, flood plains, woodlands, wetlands, and other related open lands.
Water	W-1	Includes all rivers, lakes, and streams.
Unrestricted		Includes areas where a zoning ordinance existed but specified no particular use, found in many cases around expressway interchanges.
Unplanned and unzoned		Includes all those for which no adopted land use plan or comprehension zoning ordinance was in effect at the time of the inventory.

Source: SEWRPC, 1963.

Table A5

CORRELATION OF TOTAL TRIPS MADE BY RESIDENTS WITH VARIOUS PARAMETERS USED TO ESTIMATE TRIPMAKING

Area	Estimating Parameter	Regression Equation	Coefficient of Determination(r^2)
Region	Family Size		
	1 Person per household	$y = 42.68 + 1.61x$	0.83
	2 Persons per household	$y = 126.36 + 4.54x$	0.83
	3 Persons per household	$y = 83.32 + 7.16x$	0.77
	4 Persons per household	$y = 60.11 + 9.22x$	0.77
	5 or more persons per household	$y = 322.00 + 9.35x$	0.72
	Auto Availability		
	0 Autos	$y = 36.42 + 1.92x$	0.79
	1 Auto	$y = -205.45 + 7.33x$	0.90
	2 Autos	$y = -215.53 + 11.35x$	0.86
	3 or more Autos	$y = -115.66 + 14.82x$	0.71
Urbanizing Areas	Family Income		
	Under 4,000	$y = 248.76 + 2.10x$	0.72
	4,000 - 7,999	$y = 223.84 + 7.04x$	0.85
	8,000 - 11,999	$y = 1.01 + 10.47x$	0.86
	12,000 & Over	$y = -8.30 + 11.90x$	0.83
	Structure Type		
	Single Family	$y = -62.53 + 8.82x$	0.90
	Two Family	$y = 125.57 + 5.58x$	0.85
	3 or 4 Family	$y = 54.86 + 4.84x$	0.56
	5 or more Families	$y = 410.18 + 2.44x$	0.77

Source: SEWRPC, 1963.

Table A6

TOTAL INTERNAL PERSON TRIP DESTINATIONS IN THE REGION BY LAND USE BY DISTRICT

District	Residential		Commercial		Industrial[a]		Transportation[b]		Institutional[c]		Recreational & Other[d]		Total Person Trips
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	
00	676	1.1	50,250	81.5	2,846	4.6	4,908	8.0	2,847	4.6	139	0.2	61,663
01	1,488	4.9	7,905	26.2	4,733	15.7	261	0.8	15,671	51.9	162	0.5	30,219
02	7,460	46.7	3,646	22.8	1,707	10.7	242	1.5	2,809	17.6	113	0.7	15,974
03	4,937	26.9	4,037	22.0	7,539	41.1	478	2.6	1,333	7.3	6	0.1	18,329
04	8,968	27.5	5,603	17.2	4,456	13.6	1,012	3.1	12,575	38.5	10	0.1	32,623
06	820	5.8	1,447	10.1	9,464	66.3	533	3.7	1,993	14.0	14	0.1	14,270
08	31	0.3	2,482	21.3	7,092	60.9	584	5.0	1,415	12.2	35	0.3	11,639
09	3,503	14.3	9,282	38.1	1,622	6.6	1,720	7.1	8,155	33.5	95	0.4	24,374
11	17,859	47.3	7,487	19.8	4,840	12.8	503	1.3	5,422	14.3	1,687	2.4	37,797
12	23,840	52.1	13,701	30.0	3,517	7.7	963	2.2	3,357	7.3	333	0.7	45,712
13	31,890	55.2	18,175	31.4	2,485	4.3	1,037	1.8	4,175	7.2	76	0.1	57,833
14	15,908	38.0	10,674	25.5	3,484	8.3	4,475	10.7	7,104	17.0	194	0.5	41,838
16	15,560	59.7	5,360	20.6	742	2.9	754	2.9	3,024	11.6	591	2.3	26,033
17	19,679	38.7	26,069	51.3	1,437	2.8	1,080	2.1	2,477	4.9	112	0.2	50,856
18	17,951	42.4	6,210	14.6	12,510	29.5	2,445	5.8	2,781	6.6	484	1.1	42,380
19	8,379	40.7	5,439	26.4	3,686	17.9	1,037	5.1	1,701	8.3	330	1.6	20,572
21	33,832	37.3	16,749	18.5	23,628	26.0	2,312	2.6	12,833	14.2	1,255	1.4	90,606
22	40,297	59.5	9,115	13.5	11,350	16.7	1,709	2.5	5,175	7.6	113	0.2	67,758
23	59,173	51.1	30,848	26.6	6,767	5.8	4,634	4.1	12,785	11.0	1,633	1.4	115,838
24	37,411	51.1	17,851	24.4	4,825	6.6	1,642	2.2	10,848	14.8	676	0.9	73,252
25	23,068	31.5	17,904	24.5	18,996	25.9	1,770	2.4	8,239	11.3	3,228	4.4	73,205
26	17,860	45.8	5,972	15.3	12,271	31.4	1,079	2.8	1,109	2.8	737	1.9	39,026
27	26,747	37.8	28,691	40.5	2,705	3.8	2,387	3.4	9,273	13.1	963	1.4	70,767
28	37,287	51.9	16,317	22.7	7,493	10.4	2,305	3.2	7,191	10.0	1,287	1.8	71,879
29	33,915	65.0	8,958	17.1	1,257	2.4	1,118	2.1	5,338	10.2	1,690	3.2	52,275
31	40,486	50.8	24,012	30.1	2,420	3.1	1,061	1.3	10,453	13.1	1,285	1.6	79,714
32	68,124	52.9	32,498	25.3	12,743	10.0	2,759	2.1	10,995	8.6	1,420	1.1	128,538
33	88,863	53.8	53,012	32.2	921	0.6	3,729	2.3	17,125	10.4	1,137	0.7	164,787
34	35,674	46.1	22,523	29.1	2,584	3.3	1,270	1.6	13,878	17.9	1,540	2.0	77,471
35	34,934	55.2	15,982	25.2	4,324	6.8	1,664	2.6	5,014	7.9	1,453	2.3	63,370
36	61,518	67.6	16,723	18.3	1,281	1.4	1,642	1.8	9,233	10.1	741	0.8	91,141
37	31,928	68.5	7,440	15.9	299	0.6	1,030	2.2	5,707	12.2	274	0.6	46,676
38	22,753	58.5	8,682	22.3	550	1.4	4,490	11.5	1,703	4.4	754	1.9	38,929
39	31,866	51.0	15,297	24.5	8,963	14.3	1,400	2.2	3,606	5.8	1,346	2.2	62,475
41	16,600	69.0	2,374	10.0	97	0.4	900	3.7	3,670	15.2	413	1.7	24,056
42	24,671	56.7	6,959	16.0	2,702	6.2	667	1.5	6,951	16.0	1,567	3.6	43,515
43	51,117	61.0	15,059	18.0	5,380	6.5	1,425	1.7	9,223	11.0	1,530	1.8	83,731
44	30,482	52.3	12,618	21.7	3,692	6.3	817	1.4	9,586	16.5	1,037	1.8	58,231
45	18,647	62.9	3,997	13.5	437	1.5	605	2.0	5,625	19.0	329	1.1	29,639
46	20,565	53.3	12,093	31.4	291	0.8	1,151	3.0	3,561	9.2	897	2.3	38,558
47	7,750	54.6	1,029	7.3	150	1.1	117	0.8	4,312	30.4	830	5.8	14,187
48	10,405	41.4	3,404	13.5	5,675	22.6	373	1.5	4,851	19.3	419	1.7	25,124
49	33,917	55.7	8,704	14.3	5,752	9.5	1,395	2.2	9,574	15.7	1,579	2.6	60,918
51	16,468	54.2	6,257	20.6	1,512	5.0	394	1.3	4,288	14.1	1,460	4.8	30,376
52	6,107	72.7	663	7.9	195	2.3	16	0.2	997	11.9	420	5.0	8,396
53	22,453	52.4	10,428	24.3	1,285	3.0	418	1.0	7,846	18.3	446	1.0	42,876
54	9,034	57.3	2,628	16.6	1,060	6.7	453	2.8	1,767	11.2	852	5.4	15,794
55	44,759	47.3	22,837	24.1	7,506	8.0	1,742	1.8	16,526	17.4	1,358	1.4	94,727
56	9,715	63.9	1,776	11.7	71	0.5	270	1.8	2,492	16.3	890	5.8	15,213
57	5,785	64.3	404	4.5	49	0.5	64	0.7	1,939	21.5	760	8.5	9,000
58	6,543	64.6	1,155	11.4	90	0.9	63	0.6	1,603	15.8	679	6.7	10,130
59	8,772	67.0	1,008	7.7	313	2.4	205	1.6	1,883	14.4	906	6.9	13,089
61	11,739	51.0	3,741	16.3	2,043	8.9	543	2.4	4,084	17.7	865	3.7	23,015
62	4,627	70.0	555	8.4	204	3.1	41	0.6	800	12.1	383	5.8	6,607
63	6,488	69.9	684	7.4	121	1.3	103	1.1	1,582	17.0	304	3.3	9,281
64	10,062	58.2	2,565	14.9	433	2.5	218	1.3	3,218	18.6	786	4.5	17,282
65	5,799	71.2	627	7.7	182	2.2	145	1.8	962	11.8	434	5.3	8,149
66	5,204	61.0	1,357	15.9	21	0.2	132	1.5	1,406	16.5	416	4.9	8,537
67	4,733	55.4	1,204	14.1	125	1.5	27	0.3	1,909	22.4	537	6.3	8,536
68	8,745	58.0	2,163	14.4	713	4.7	259	1.7	2,304	15.3	884	5.9	15,068
69	122,432	47.9	68,066	26.7	26,500	10.4	4,662	1.8	28,850	11.3	4,727	1.9	255,237
71	3,610	63.3	550	9.6	241	4.2	13	0.2	848	14.9	441	7.8	5,701
72	16,730	47.7	6,091	17.4	3,362	9.6	449	1.3	6,902	19.7	1,539	4.4	35,069
73	9,850	51.5	3,536	18.5	1,115	5.8	236	1.2	3,479	18.2	928	4.8	19,142
74	12,192	51.8	5,114	21.7	848	3.6	366	1.6	4,304	18.3	696	3.0	23,519
75	2,564	63.4	425	10.5	71	1.8	29	0.7	667	16.5	288	7.1	4,043
76	5,470	61.7	746	8.4	560	6.3	58	0.7	1,488	16.8	545	6.1	8,867
77	11,826	49.7	4,930	20.7	1,055	4.4	301	1.3	4,222	17.7	1,461	6.2	23,792
78	7,085	55.9	1,448	11.4	268	2.1	434	3.4	2,427	19.2	1,007	8.0	12,666
79	88,094	48.2	44,115	24.2	20,258	11.1	4,189	2.3	22,438	12.3	2,838	1.9	182,568
86	21,348	50.3	8,094	19.1	2,808	6.6	344	0.8	7,710	18.2	2,140	5.0	43,444
87	14,033	51.9	5,430	20.1	887	3.3	482	1.8	4,742	17.5	1,486	5.4	27,059
88	4,017	48.9	1,919	23.3	52	0.6	85	1.0	1,485	18.1	660	8.1	8,219
89	6,388	72.8	844	9.6	29	0.3	236	2.7	1,135	12.9	147	1.7	8,777
95	91	25.4	116	32.4	12	3.4	29	8.1	50	13.9	60	16.8	358
Total	1,631,582	49.2	804,038	24.3	293,693	8.9	84,472	2.6	431,037	13.0	66,624	2.0	3,311,298

[a] *Includes all manufacturing, wholesale, storage, and quarring uses.*

[b] *Includes utilities and communication uses.*

[c] *Includes governmental services uses.*

[d] *Includes open land and agricultural uses.*

Source: SEWRPC, 1963.

Table A7

TOTAL INTERNAL PERSON TRIP DESTINATIONS IN THE REGION BY MODE OF TRAVEL - 1963

District	Mode of Travel										Total Person Trips
	Auto Driver		Auto Passenger		Truck or Taxi Passenger		Bus or Rail Passenger		School Bus Passenger		
	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	Trips	Percent	
00	26,960	43.7	9,937	16.1	283	0.4	24,483	39.7	---	0.0	61,663
01	16,790	55.6	4,343	14.4	69	0.2	9,006	29.8	11	0.0	30,219
02	9,053	56.7	2,947	18.4	174	1.1	3,795	23.8	5	0.0	15,974
03	11,881	64.8	2,303	12.6	31	0.2	3,754	20.5	360	1.9	18,329
04	17,745	54.4	5,678	17.4	68	0.2	8,960	27.5	172	0.5	32,623
06	8,800	61.7	2,055	14.4	10	0.0	3,405	23.9	---	0.0	14,270
08	6,654	57.2	1,228	10.5	123	1.1	3,634	31.2	---	0.0	11,639
09	13,326	54.7	4,110	16.8	104	0.4	6,802	27.9	32	0.1	24,374
11	22,303	59.0	8,015	21.2	111	0.3	7,368	19.5	---	0.0	37,797
12	24,897	54.5	8,478	18.5	100	0.2	12,237	26.8	---	0.0	45,712
13	32,243	55.7	13,719	23.7	103	0.2	11,378	19.7	390	0.7	57,833
14	23,543	56.3	8,351	20.0	142	0.3	9,764	23.3	38	0.1	41,838
16	15,515	59.7	6,233	23.9	33	0.1	4,218	16.2	34	0.1	26,033
17	29,334	57.7	12,329	24.2	71	0.1	9,122	18.0	---	0.0	50,856
18	25,555	60.3	9,449	22.3	68	0.2	7,308	17.2	---	0.0	42,380
19	12,869	62.5	5,353	26.0	---	0.0	2,315	11.3	35	0.2	20,572
21	57,150	63.1	22,842	25.2	68	0.1	10,371	11.4	175	0.2	90,606
22	39,789	58.7	15,647	23.1	133	0.2	12,092	17.8	97	0.2	67,758
23	69,199	59.8	30,385	26.2	169	0.1	15,723	13.6	362	0.3	115,838
24	46,266	63.2	18,617	25.4	256	0.4	7,636	10.4	477	0.6	73,252
25	46,866	64.0	18,186	24.8	116	0.2	7,716	10.6	321	0.4	73,205
26	25,384	65.0	9,729	24.9	47	0.1	3,866	10.0	---	0.0	39,026
27	39,354	55.6	21,876	30.9	41	0.1	9,125	12.9	371	0.5	70,767
28	44,253	61.6	19,889	27.7	67	0.0	7,414	10.3	256	0.4	71,879
29	30,972	59.2	15,751	30.1	33	0.1	5,484	10.5	35	0.1	52,275
31	51,145	64.2	21,908	27.4	37	0.1	3,735	4.7	2,889	3.6	79,714
32	80,210	62.4	36,803	28.6	237	0.2	9,943	7.7	1,345	1.1	128,538
33	102,363	62.1	47,380	28.7	261	0.2	13,169	8.0	1,614	1.0	164,787
34	47,705	61.5	21,098	27.2	230	0.3	5,448	7.0	2,990	4.0	77,471
35	40,686	64.3	18,764	29.6	82	0.1	2,734	4.3	1,104	1.7	63,370
36	57,925	63.5	26,340	29.0	70	0.1	5,143	5.6	1,663	1.8	91,141
37	28,108	60.2	14,197	30.4	---	0.0	1,868	4.0	2,503	5.4	46,676
38	23,807	61.2	12,280	31.6	73	0.2	2,017	5.1	752	1.9	38,929
39	39,904	63.9	18,492	29.6	8	0.0	3,671	5.9	400	0.6	62,475
41	13,867	57.7	6,400	26.6	33	0.1	877	3.6	2,879	12.0	24,056
42	24,124	55.4	12,307	28.3	36	0.1	811	1.9	6,237	14.3	43,515
43	51,306	61.2	24,676	29.5	41	0.1	1,804	2.1	5,904	7.1	83,731
44	34,772	59.7	15,269	26.2	36	0.1	825	1.4	7,329	12.6	58,231
45	16,821	56.8	6,935	23.4	36	0.1	278	0.9	5,569	18.8	29,639
46	23,733	61.5	10,951	28.4	34	0.1	159	0.4	3,681	9.6	38,558
47	6,671	47.0	3,725	26.3	34	0.2	64	0.5	3,693	26.0	14,187
48	13,544	53.9	6,437	25.6	6	0.0	44	0.2	5,093	20.3	25,124
49	37,820	62.1	20,644	33.9	32	0.1	1,056	1.7	1,366	2.2	60,918
51	19,114	62.9	8,556	28.2	40	0.1	336	1.1	2,330	7.7	30,376
52	4,930	58.6	3,028	36.1	4	0.1	4	0.1	430	5.1	8,396
53	25,473	59.4	13,029	30.4	16	0.0	208	0.5	4,150	9.7	42,876
54	10,022	63.5	4,351	27.5	44	0.3	265	1.7	1,112	7.0	15,794
55	62,487	65.9	28,406	30.0	643	0.7	1,761	1.9	1,430	1.5	94,727
56	8,402	55.2	4,018	26.4	145	1.0	239	1.6	2,409	15.8	15,213
57	4,363	48.5	2,291	25.5	15	0.2	57	0.6	2,274	25.2	9,000
58	5,850	57.8	2,515	24.8	30	0.3	73	0.7	1,662	16.4	10,130
59	7,494	57.3	3,668	28.0	31	0.2	350	2.7	1,546	11.8	13,089
61	15,874	68.9	5,665	24.6	44	0.2	196	0.9	1,236	5.4	23,015
62	4,215	63.8	1,398	21.2	15	0.2	151	2.3	828	12.5	6,607
63	5,393	58.1	2,694	29.0	35	0.4	49	0.5	1,110	12.0	9,281
64	10,974	63.6	4,476	25.9	40	0.2	318	1.8	1,474	8.5	17,282
65	5,376	66.0	2,303	28.2	55	0.7	95	1.2	320	3.9	8,149
66	5,054	59.2	2,307	27.0	17	0.2	97	1.1	1,062	12.5	8,537
67	5,367	62.9	2,050	24.0	13	0.2	100	1.2	1,006	11.7	8,536
68	10,275	68.2	3,754	24.9	61	0.4	64	0.4	914	6.1	15,068
69	167,346	65.5	75,704	29.7	702	0.3	8,999	3.5	2,486	1.0	255,237
71	3,430	60.2	1,616	28.3	53	1.0	41	0.7	561	9.8	5,701
72	23,957	68.3	8,662	24.7	172	0.5	115	0.3	2,163	6.2	35,069
73	12,206	63.7	5,296	27.7	87	0.5	98	0.5	1,455	7.6	19,142
74	16,105	68.5	5,403	22.9	69	0.3	272	1.2	1,670	7.1	23,519
75	2,486	61.5	1,132	28.0	22	0.5	51	1.3	352	8.7	4,043
76	5,217	58.8	2,348	26.5	101	1.1	209	2.4	992	11.2	8,867
77	15,883	66.7	6,069	25.5	159	0.7	164	0.7	1,517	6.4	23,792
78	7,381	58.3	2,839	22.4	30	0.2	288	2.3	2,128	16.8	12,666
79	120,414	65.9	54,464	29.8	473	0.3	6,080	3.4	1,137	0.6	182,568
86	28,940	68.1	9,156	21.6	225	0.5	466	1.2	3,657	8.6	42,444
87	17,940	66.3	5,381	19.9	162	0.6	374	1.4	3,202	11.8	27,059
88	5,270	64.1	2,011	24.5	18	0.2	228	2.8	692	8.4	8,219
89	4,936	56.2	2,526	28.8	35	0.4	251	2.9	1,029	11.7	8,777
Total	2,033,414	61.4	879,173	26.6	7,259	0.2	282,615	8.5	108,511	3.3	3,310,972

Source: SEWRPC, 1963.

Table A8

TOTAL INTERNAL VEHICLE TRIP DESTINATIONS IN THE REGION BY VEHICLE TYPE - 1963

District	Vehicle Type									Total Vehicle Trips
	Auto		Truck Trips (by type)					Taxi		
	Trips	Percent	Light	Medium	Heavy	Total	Percent	Trips	Percent*	
00	26,960	86.0	2,417	1,053	216	3,686	11.8	696	2.2	31,342
01	16,790	83.7	2,019	976	105	3,100	15.5	168	0.8	20,058
02	9,053	78.4	1,262	781	31	2,074	18.0	420	3.6	11,547
03	11,881	73.6	2,028	1,826	340	4,194	26.0	60	0.4	16,135
04	17,745	83.0	1,602	1,673	74	3,349	15.7	276	1.3	21,370
06	8,800	67.7	1,544	2,193	411	4,148	32.0	36	0.3	12,984
08	6,654	70.4	992	1,496	301	2,789	29.5	12	0.1	9,455
09	13,326	81.8	1,861	847	---	2,708	16.6	252	1.6	16,286
11	22,303	82.0	2,647	1,985	82	4,714	17.3	180	0.7	27,197
12	24,897	84.7	2,117	2,132	51	4,300	14.6	192	0.7	29,389
13	32,243	82.0	3,685	3,056	77	6,818	17.3	288	0.7	39,349
14	23,543	85.3	2,394	1,207	206	3,807	13.8	240	0.9	27,590
16	15,515	86.5	1,230	1,108	57	2,395	13.4	24	0.1	17,934
17	29,334	84.8	3,266	1,681	127	5,074	14.7	168	0.5	34,576
18	25,555	83.2	2,490	1,741	857	5,088	16.6	60	0.2	30,703
19	12,869	82.7	1,432	1,082	153	2,667	17.1	24	0.2	15,560
21	57,150	86.6	4,694	3,473	459	8,626	13.1	204	0.3	65,980
22	39,789	85.3	3,490	3,123	123	6,736	14.4	156	0.3	46,681
23	69,199	90.1	4,983	2,323	134	7,440	9.7	156	0.2	76,795
24	46,266	87.5	3,546	2,591	442	6,579	12.4	72	0.1	52,917
25	46,866	86.3	4,342	2,772	262	7,376	13.6	48	0.1	54,290
26	25,384	87.5	2,090	1,295	228	3,613	12.5	---	0.0	28,997
27	39,354	89.4	2,528	1,668	446	4,642	10.5	36	0.1	44,032
28	44,253	91.2	2,109	1,675	478	4,262	8.8	12	0.0	48,527
29	30,972	90.9	2,041	992	54	3,087	9.1	---	0.0	34,059
31	51,145	88.5	3,725	2,801	47	6,573	11.4	60	0.1	57,778
32	80,210	88.0	5,247	4,739	781	10,767	11.8	156	0.2	91,133
33	102,363	93.7	4,510	2,059	187	6,756	6.2	144	0.1	109,263
34	47,705	88.5	4,111	1,713	258	6,082	11.3	96	0.2	53,883
35	40,686	89.0	2,631	1,778	634	5,043	11.0	12	0.0	45,741
36	57,925	93.2	2,830	1,302	104	4,236	6.8	12	0.0	62,173
37	28,108	92.9	1,365	700	87	2,152	7.1	---	0.0	30,260
38	23,807	87.1	1,777	1,296	337	3,410	12.5	100	0.4	27,317
39	39,904	90.3	1,819	2,318	137	4,274	9.7	12	0.0	44,190
41	13,867	88.9	941	755	8	1,704	10.9	36	0.2	15,607
42	24,124	85.6	2,124	1,793	110	4,027	14.3	36	0.1	28,187
43	51,306	89.0	3,573	2,223	519	6,315	11.0	24	0.0	57,645
44	34,772	86.7	3,868	1,332	156	5,356	13.3	---	0.0	40,128
45	16,821	87.6	1,611	607	160	2,378	12.4	---	0.0	19,199
46	23,733	86.6	2,107	1,450	100	3,657	13.4	---	0.0	27,390
47	6,671	82.6	732	554	124	1,410	17.4	---	0.0	8,081
48	13,544	92.8	616	354	60	1,030	7.1	12	0.1	14,586
49	37,820	92.1	1,248	1,769	218	3,235	7.9	---	0.0	41,055
51	19,114	84.8	2,093	1,272	68	3,433	15.2	---	0.0	22,547
52	4,930	78.1	840	435	111	1,386	21.9	---	0.0	6,316
53	25,473	87.7	1,880	1,604	98	3,582	12.3	---	0.0	29,055
54	10,022	82.6	852	1,139	57	2,048	16.9	60	0.5	12,130
55	62,487	86.1	6,016	2,762	294	9,072	12.5	1,044	1.4	72,603
56	8,402	81.2	803	1,128	15	1,946	18.8	---	0.0	10,348
57	4,363	87.8	249	354	5	608	12.2	---	0.0	4,971
58	5,850	75.8	1,063	748	57	1,868	24.2	---	0.0	7,718
59	7,494	84.1	837	580	5	1,422	15.9	---	0.0	8,916
61	15,874	85.8	1,615	865	38	2,518	13.6	104	0.6	18,496
62	4,215	78.9	512	578	13	1,103	20.7	23	0.4	5,341
63	5,393	74.9	675	867	263	1,805	25.1	---	0.0	7,198
64	10,974	86.6	932	593	172	1,697	13.4	1	0.0	12,672
65	5,376	80.9	629	584	56	1,269	19.1	---	0.0	6,645
66	5,054	82.8	730	290	29	1,049	17.2	---	0.0	6,103
67	5,367	86.8	544	261	8	813	13.2	---	0.0	6,180
68	10,275	83.6	1,270	657	95	2,022	16.4	---	0.0	12,297
69	167,346	89.5	11,559	7,192	431	19,182	10.3	360	0.2	186,888
71	3,430	75.9	618	437	36	1,091	24.1	---	0.0	4,521
72	23,957	85.4	2,399	1,439	130	3,968	14.1	131	0.5	28,056
73	12,206	84.8	1,446	594	62	2,102	14.6	83	0.6	14,391
74	16,105	88.1	1,361	565	82	2,008	11.0	156	0.9	18,269
75	2,486	79.3	361	222	65	648	20.7	1	0.0	3,135
76	5,217	79.4	705	564	81	1,350	20.6	1	0.0	6,568
77	15,883	80.8	2,310	1,315	45	3,670	18.7	97	0.5	19,650
78	7,381	76.4	1,228	909	141	2,278	23.6	---	0.0	9,659
79	120,414	88.8	9,117	5,056	789	14,962	11.0	260	0.2	135,636
86	28,940	81.5	4,738	1,717	47	6,502	18.3	62	0.2	35,504
87	17,940	79.3	3,255	1,296	27	4,578	20.2	115	0.5	22,633
88	5,270	86.4	503	327	---	830	13.6	---	0.0	6,100
89	4,936	83.9	697	233	14	944	16.0	4	0.1	5,884
Total*	2,033,414	87.1	169,475	110,861	13,069	293,405	12.5	6,982	0.2	2,333,996

* *Totals may not add due to rounding.*

Source: SEWRPC.

Table A9

COMPARISON OF SEWRPC ACCURACY CHECK RESULTS WITH THOSE OF OTHER TRANSPORTATION STUDIES

Accuracy Check	SEWRPC	Chicago (CATS)	Pittsburgh (PATS)	Penn-Jersey (P-J)	Baltimore (BMATS)	Detroit (DATS)	St. Louis	Twin Cities (TCATS)
Total Population	100.8*	96.3	98.9	99.5	102.0	---	---	---
Automobile Registrations	95.8	---	99.0	100.2	102.0	---	---	---
Employment Centers	94.3	95.6	94.4	95.0	108.9	90.4	---	---
Screenline-Automobiles	88.1	85.6	90.3	77.5	---	---	82.8	84.1
Screenline-Total Vehicles	88.4	---	89.3	78.5	86.2	81.8	84.4	88.2
Cordon Crossings-Total Vehicles	98.2	---	---	---	87.5	84.0	---	95.9

* *Average of three different figures.*

Source: SEWRPC, 1963.

Table A10 - DISTRICT TO DISTRICT TOTAL PERSON TRIPS

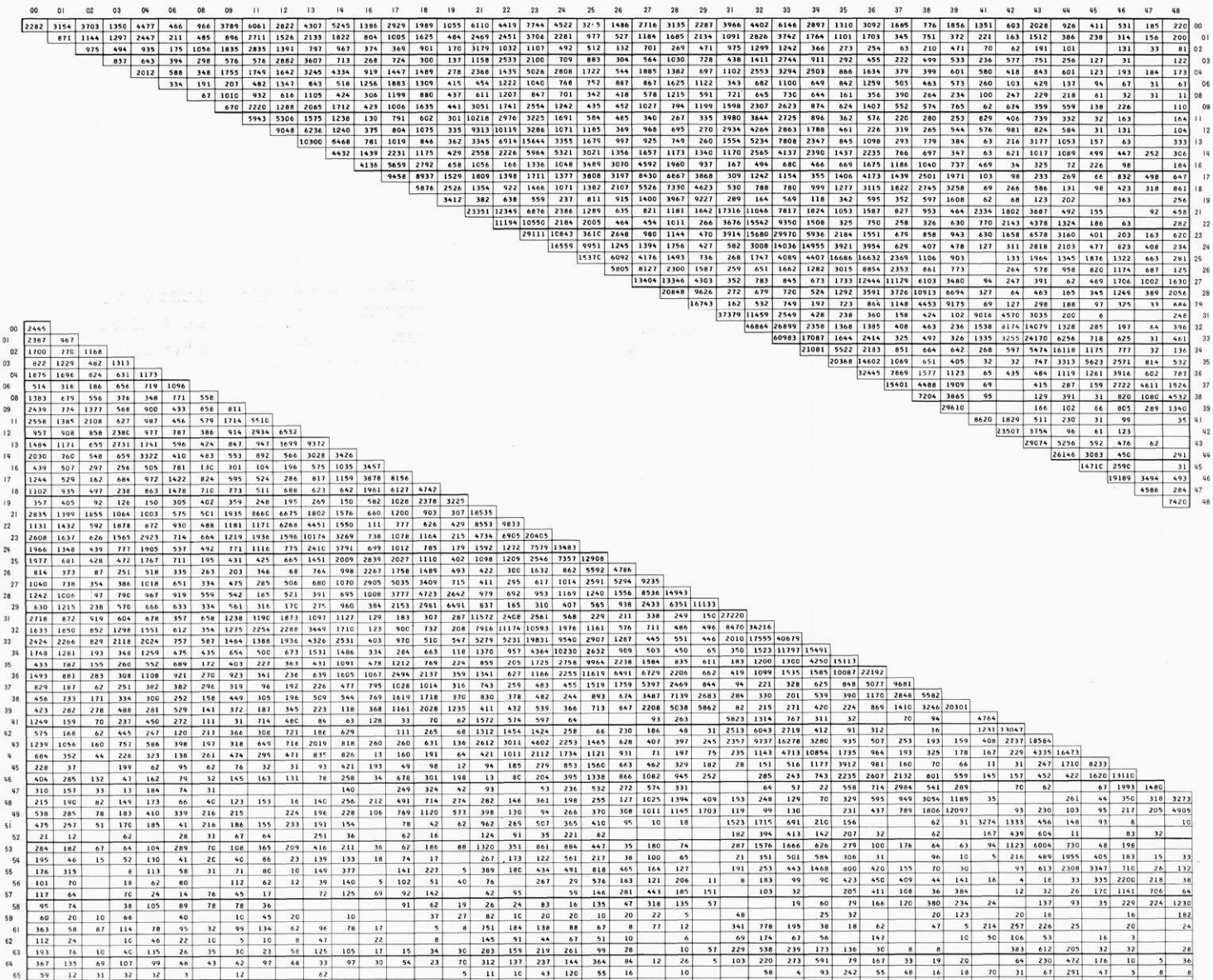


Table A11 - DISTRICT TO DISTRICT TOTAL VEHICLE TRIPS

Table A10 - DISTRICT TO DISTRICT TOTAL PERSON TRIPS

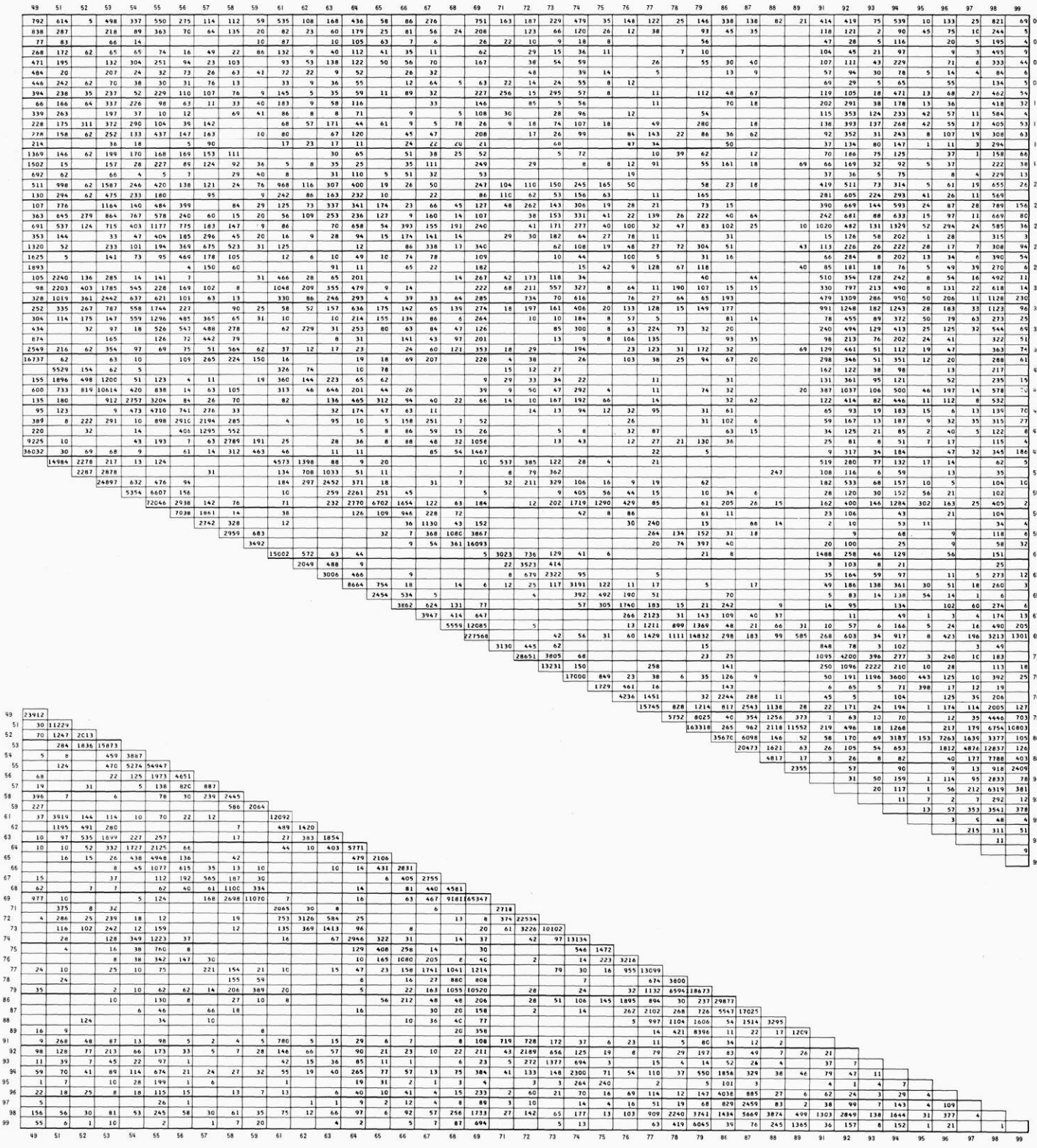


Table A11 - DISTRICT TO DISTRICT TOTAL VEHICLE TRIPS

Appendix F

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION STAFF

Kurt W. Bauer, P.E.
Executive Director

Bernadette T. Van Altena
Secretary

Land Use Transportation Study Office

J. Robert Doughty, P.E.
Study Director

Elizabeth A. Doherty
Secretary

SYSTEMS ENGINEERING DIVISION

Kenneth J. Schlager
Chief Systems Engineer

Ned F. Reiter
Systems Analyst

DATA PROCESSING DIVISION

James E. Bradley
Data Processing Manager

Walter Henry
Data Processing Supervisor

William L. Schauder
Systems Analyst

Karen M. Jensen
Computer Operator—Programmer

Roy R. Newcomer
Computer Operator

Penny L. Hales
Records Clerk—Computer Operator

Kathleen J. Gruenwald
Records Clerk

Sandra L. Frederickson
Keypunch Supervisor

Joan D. Hargis
Ella M. Vatne
Keypunch Operators

ADMINISTRATION DIVISION

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May 1965

Errata Sheet

Chapter III
Page 22, left column, 2nd paragraph, line 6 should read: "...22.5 births...."
Page 24, Map 3: one dot equals 1000 persons.
Page 27, Footnote 5: Insurance payments include monies in the form of annuities but exclude lump-sum insurance payments.
Page 30, left column, 2nd paragraph, line 3 should read: "...those noninstitutionalized persons...."
Page 33, left column, 1st paragraph, line 3 should read: "...to 74.3 percent...."
Map 9: one dot equals 1000 jobs.

Chapter IV
Page 77, Item 1, line 10 should read: "Approximately 17 percent...."

Chapter V
Page 87, Map 24 title should read: "Housing Unit Density."
Page 88, left column, 1st paragraph, line 1 should read: "...densities in the Region...."
Page 91, left column, 2nd paragraph, line 7 should read: "...employee travel patterns...."

Chapter VII
Page 124, right column, 3rd paragraph, line 5 should read: "...the 13 central...."

Chapter VIII
Page 136, Table 84, the population for the Milwaukee urbanizing area should be: "1,221,000."
Page 139, Table 85, the percent of mass transit passengers in the Chicago area should be "24.4."

Chapter IX
Page 164, Map 58 title should read: "Home Locations of Optional Mass Transit Trips 1963."
Legend should read: "Percent of Total Home-Based Transit Trips."
Page 166, left column, 1st paragraph, line 3 should read: "...peak periods. The relative...."

Appendix
Page 178 should be marked: "Figure A1."
Page 183 should be marked: "Appendix E Summary Tables."
Page 183, Table A1, 2nd column heading under "Residential" should read: "Being Developed."
"Woodlands" land use category includes open lands, pits, and quarries.
Page 186, Table A6, the line total for district 86 should be: "42,444."