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PLANNING REPORT NO. 25

L.D. Johnson
BSWCD

A REGIONAL LAND USE PLAN AND A REGIONAL TRANSPORTATION PLAN FOR SOUTHEASTERN WISCONSIN--2000

volume one

INVENTORY FINDINGS

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Planning Report Number 25

A REGIONAL LAND USE PLAN AND A REGIONAL TRANSPORTATION PLAN FOR SOUTHEASTERN WISCONSIN—2000

Volume One

INVENTORY FINDINGS

Prepared by the
Southeastern Wisconsin Regional Planning Commission
Continuing Regional Land Use-Transportation Study

P. O. Box 769
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Waukesha, Wisconsin 53186

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April 1975

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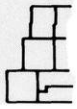

April 10, 1975

STATEMENT OF THE CHAIRMAN

On December 1, 1966, this Commission adopted and thereafter published a regional land use and a regional transportation plan for the design year 1990. Simultaneously, it established a policy of surveillance, reappraisal, and reevaluation of these two important plan elements that was to manifest itself in a "continuing regional land use and transportation planning effort." This effort, including an extensive and exhaustive reinventory of the many factors, including public opinion, affecting land use and transportation system development within the Region, now produces this volume, the first in a two-volume report which presents in summary form the findings of those reinventories.

Double digit inflation that seriously impairs the fiscal capabilities of units of government to implement recommended capital improvements, a substantial reduction in the rate of population growth, a propensity to urban sprawl affecting not only travel characteristics and the need for transportation facilities but the ability of the natural resource base to provide a good environment for life within the Region, rising energy costs, a new and fuller public awareness of the need to protect and preserve the quality of our environment and our natural resource base are but a few of the intervening phenomena that must be considered in any regional plan reappraisal. Given these phenomena, the information contained in this volume should permit definitive evaluation of the factors affecting land use and transportation system development within the Region and determination of needed changes in the adopted regional land use and transportation system plans.

Although this report is limited to a delineation of the striking changes in population, economic activity, public finance, land use development, community plans and zoning, transportation facilities, and travel characteristics that have occurred within the Region over the approximately 10 years since the adoption of the initial regional land use and transportation plans, it is never the less respectfully submitted to the federal, state, and local units of government concerned with land use and transportation system development within the Region for careful consideration since the information contained in this report will provide the basis for amending the adopted regional land use and transportation plans. Any amendment of these two important plan elements, which have served the Region well for almost a decade, holds profound implications for not only the governmental entities operating within the Region but for private concerns as well.

Respectfully submitted,

George C. Berteau

George C. Berteau
Chairman

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Chapter I

INTRODUCTION

The first major work program of the Commission actually directed toward the preparation of a framework of advisory plans for the physical development of the Region was the regional land use-transportation study initiated in January 1963. That study was completed in December 1966 with the adoption by the Commission of a regional land use plan and a regional transportation plan (highway and transit) for southeastern Wisconsin. The findings and recommendations of the study were documented in SEWRPC Planning Report No. 7, The Regional Land Use-Transportation Study, Volume 1, Inventory Findings—1963; Volume 2, Forecasts and Alternative Plans—1990; and Volume 3, Recommended Regional Land Use-Transportation Plans—1990.

Even prior to the completion of the initial regional land use-transportation study, the Commission, its constituent local units of government, and the affected state and federal agencies recognized the need to establish a continuing regional land use-transportation planning program within southeastern Wisconsin, and in October 1965 the Commission approved and published a prospectus for such a continuing planning effort. Based upon this prospectus, the seven constituent county boards agreed to provide the local funds necessary for the conduct of a continuing land use-transportation planning effort within the Region. The State Highway Commission of Wisconsin; the U. S. Department of Housing and Urban Development; the U. S. Department of Transportation, Federal Highway Administration; and later the U. S. Department of Transportation, Urban Mass Transportation Administration agreed to provide funds in partial support of the continuing study based upon this prospectus and subsequent study designs published by the Commission in December 1969 and December 1971. The study designs called for a complete reappraisal of the adopted regional land use and transportation plans by 1975 based upon the findings of major surveillance efforts related primarily to changes in population as revealed by the 1970 U. S. Census of Population and Housing, changes in land use as revealed by a new regional land use inventory based on 1970 aerial photography, and changes in travel habits and patterns as revealed in a 1972 major reinventory of travel. This report is intended to set forth, in two volumes, the findings and recommendations of that plan reappraisal. It contains much new information pertinent to land use and transportation system planning and development within the Region, and presents revised regional land use and transportation plans for a new design year based upon that new information. Importantly, this report presents definitive data on the changes over time in the factors affecting land use and transportation system development within the Region. Thus, this report updates and brings forward the findings and recommendations contained in SEWRPC Planning Report No. 7. Although this report supercedes Planning Report No. 7, that report will continue to have value as a source of historical data about land use and transportation system development within the Region.

Because the initial and continuing land use-transportation studies comprised integral parts of a broader regional planning program, an understanding of the need for, and objectives of, regional planning and the manner in which these needs are being met in southeastern Wisconsin is necessary for a full understanding of the plan reappraisal program and of its findings and recommendations as presented herein. To that end, a discussion of the need for, and status of, the regional planning effort within the Southeastern Wisconsin Region follows.

NEED FOR REGIONAL PLANNING

Regional planning may be defined as comprehensive planning for a geographic area larger than a county but smaller than a state, united by economic interests, geography, and common areawide developmental and environmental problems. The need for such planning has been brought about by certain important social and economic changes which, while national phenomena, have had far-reaching impacts on the problems facing local government. These changes include population growth, redistribution, and urbanization; increasing agricultural and industrial productivity, income levels, and leisure time; generation of mass recreational needs and pursuits; intensive use and consumption of natural resources; development of private water supply and sewage disposal systems; development of extensive electric power and communications networks; and development of limited-access highways and mass automotive transportation. Through the effects of these changes, entire regions like southeastern Wisconsin are being subjected to massive internal migration and attendant urban diffusion and are thereby becoming a single, large, mixed rural and urban socioeconomic complex. This urban diffusion is, in turn, creating areawide developmental and environmental problems of an unprecedented scale and complexity.

The areawide problems which necessitate a regional planning effort in southeastern Wisconsin all have their source in the changes in population size and composition and in the attendant urban diffusion occurring within the Region. These areawide problems include, among others: flooding; air and water pollution; overcrowded park and outdoor recreation facilities; inadequate sewerage and water supply facilities; inadequate housing; declining transit utilization; traffic congestion; and, underlying all of the foregoing problems, rapidly chang-

ing land use development. These problems are all truly regional in scope, transcending both the geographic boundaries and fiscal capabilities of the local municipal units of government comprising the Region, and can only be resolved within the context of a continuing, cooperative, areawide, comprehensive regional planning effort.

THE REGIONAL PLANNING COMMISSION

The Southeastern Wisconsin Regional Planning Commission was created in August 1960, pursuant to the provisions of Section 66.945 of the Wisconsin Statutes, to serve and assist the local, state, and federal units of government in solving areawide problems and in planning for the more orderly and more economic development of southeastern Wisconsin. The Commission's role is entirely advisory, and participation by local units of government in its work is on a voluntary, cooperative basis. The Commission is composed of 21 citizen members, three from each county in the Region, who serve without pay. One Commissioner from each county is appointed to the Commission by the county board, one by the Governor from a list certified to him by the county board, and one by the Governor on his own motion.

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 a staff and to appoint advisory committees to assist it in the execution of its responsibilities. Basic funds necessary to support Commission operations are provided by the member counties, with the budget apportioned among the seven counties on the basis of relative equalized property valuation. The Commission is authorized to request and accept aid in any form from all levels and agencies of government to accomplish its objectives, and is authorized to deal directly with the state and federal governments for this purpose. The organizational structure of the Commission and its relationship to the constituent units and agencies of government comprising or operating within the Region is shown in Figure 1.

THE REGIONAL PLANNING CONCEPT IN SOUTHEASTERN WISCONSIN

Regional planning, as conceived by the Commission, is not a substitute for, but a supplement to, local, state, and federal planning. Its objective is to assist the various levels and units of government in finding cooperative solutions to areawide developmental and environmental problems which cannot be properly resolved within the framework of a single municipality or county. As such, regional planning has three principal functions:

1. Inventory—the collection, analysis, and dissemination of basic planning and engineering data on a uniform, areawide basis so that, in light of such data, the various levels and agencies of government and private investors operating within the Region can better make decisions concerning community development.

2. Plan Design—the preparation of a framework of long-range plans for the physical development of the Region, these plans being limited to 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, extend to all phases of regional development, implicitly emphasizing preparation of alternative spatial designs for land use and for supporting transportation and utility facilities.

3. Plan Implementation—promotion of plan implementation through provision of a center to coordinate the planning and plan implementation activities of the various levels and agencies of government in the Region and through the introduction of information on areawide problems, recommended solutions to these problems, and alternative thereto into the existing decision-making process.

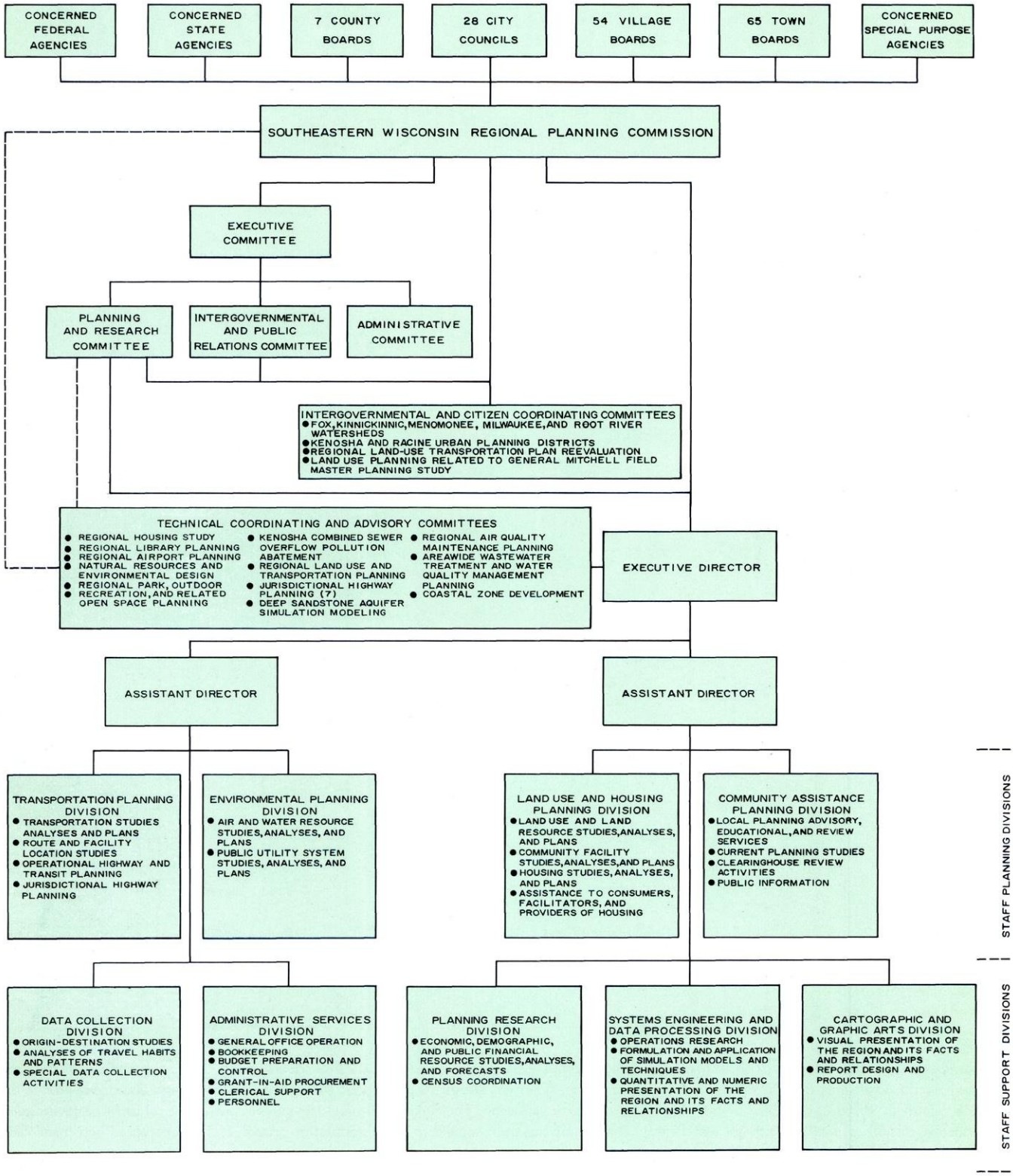
The work of the Commission, therefore, is seen as a continuing planning process providing outputs of value to the making of development decisions by public and private agencies and to the preparation of plans and plan implementation programs at the local, state, and federal levels. It emphasizes close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

THE REGION

The Southeastern Wisconsin Planning Region, as shown on Map 1, is comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties. Exclusive of Lake Michigan, these seven counties have a total area of 2,689 square miles, or about 5 percent of the total land and inland water area of Wisconsin, and a total resident population of about 1.8 million people. About 40 percent of the state population lives in these seven counties, which contain three of the seven and one-half standard metropolitan statistical areas in Wisconsin. The Region contains about half the tangible wealth in Wisconsin, as measured by equalized assessed property valuation, and represents the greatest wealth producing area of the state, with about 38 percent of the state's labor force being employed within the Region. The Region contains 154 local units of government, exclusive of school and other special-purpose districts, and encompasses all or parts of 11 major watersheds. It

Figure 1

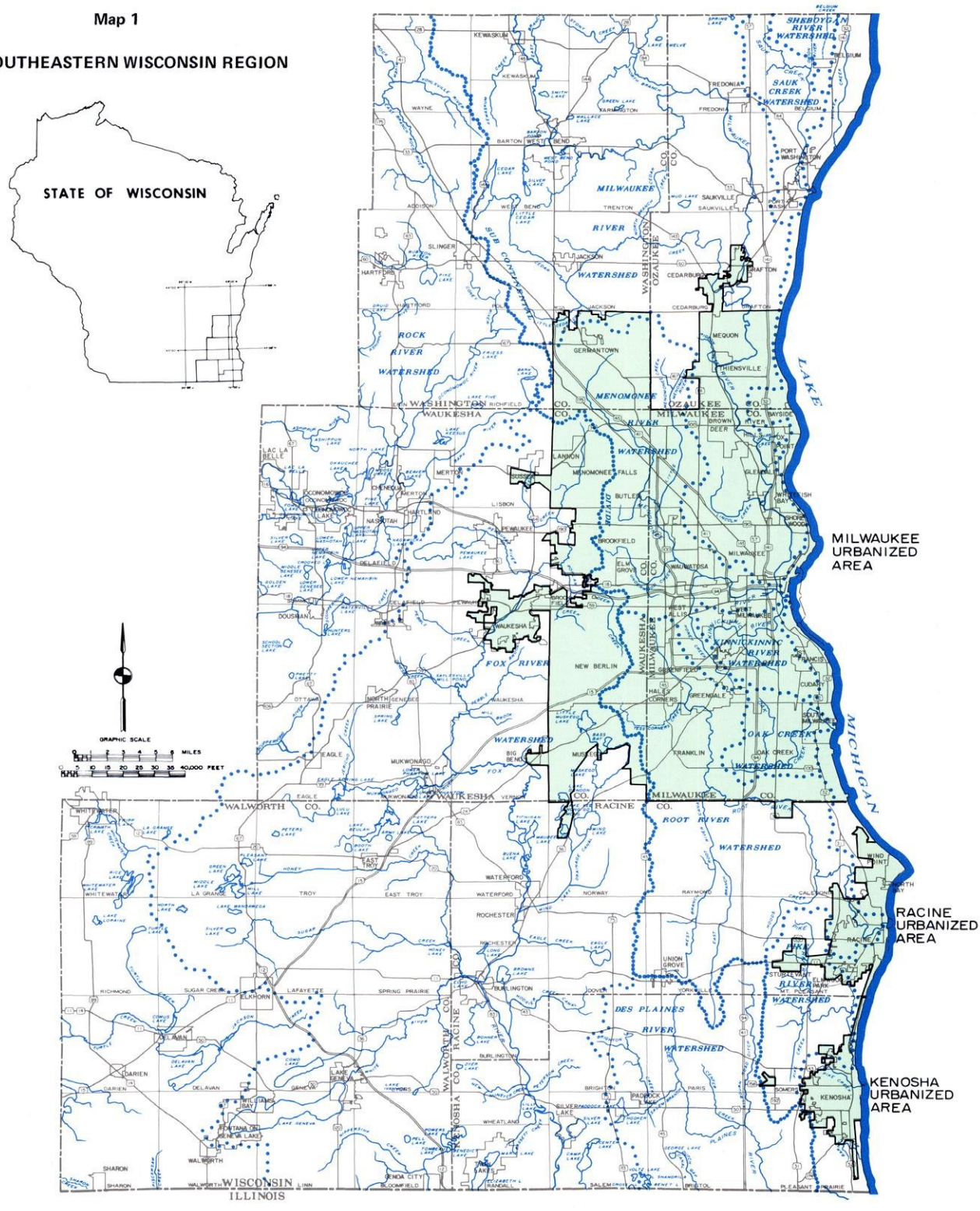
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION: ORGANIZATIONAL STRUCTURE



Source: SEWRPC.

Map 1

THE SOUTHEASTERN WISCONSIN REGION



The seven-county southeastern Wisconsin planning Region comprises a total area of about 2,689 square miles, or about 5 percent of the total land and inland water area of Wisconsin. The Region contains, however, about 40 percent of the state's population and about one-half of the tangible wealth in Wisconsin, as measured by equalized property valuation. The Region contains 154 general purpose local units of government and encompasses all or part of 11 major watersheds. The Region has been subject to rapid population growth and urbanization, and from 1960 to 1972 accounted for about 47 percent of the population increase in the state.

Source: SEWRPC.

has been subject to rapid population growth and urbanization, and from 1960 to 1972 accounted for approximately 47 percent of the population increase in the 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 33 million people reside within this radius.

COMMISSION WORK PROGRAMS TO DATE

Since its creation in 1960, the Regional Planning Commission has diligently pursued its three basic functions of areawide inventory, plan design, and the promotion of plan implementation through intergovernmental cooperation and coordination, although the relative emphasis placed upon these functions has changed somewhat over time. Initially, major emphasis in the Commission's work program was on the inventory function, with increasing attention being placed over the years on the plan design and on the intergovernmental coordination functions.

With respect to the inventory function, the Commission's planning program, as conducted since 1961, has resulted in the creation of a planning data bank containing in a readily usable form the basic planning and engineering information required for sound, areawide planning. The data assembled in the regional planning data bank include, among others, definitive data on streamflows; floodlands; surface and ground water quality; woodlands, wetlands, and wildlife habitat; sites having scenic, scientific, cultural, and recreational value; soils; existing and proposed land uses; travel habits and patterns; transportation system capacity and utilization; existing and proposed utility service areas; and the demographic and economic base and structure of the Region. The Commission's data base also includes an extensive base mapping and horizontal and vertical survey control file, together with an automated geographic address coding guide. All of the Commission's inventory efforts have been carried out in accordance with a predesigned structure for a planning information system, a structure formulated by the conceptualization of four mathematical models deemed essential to the conduct of a sound areawide planning effort—a socioeconomic simulation model, a land use simulation model, a travel simulation model, and a water resources simulation model.

Some of the data in the regional planning data bank have been assembled through the collation of data collected by other agencies. Data so assembled include data on highway and transit facility capacity, use, and service levels; transportation terminal facility capacity; automobile and truck availability; population and economic activity levels; and public financial resources. Much of the data in the regional data bank, however, have been assembled through original inventory efforts conducted by the Commission itself. Such inventory efforts have ranged from aerial photography, base mapping, and control survey programs; through extensive land use, woodland, wetland, wildlife habitat, potential park site, and public utility system inventories; to massive travel inventory, detailed operational soil survey, and streamflow gaging and water quality monitoring efforts.

The regional planning data bank is supported by an extensive data conversion, filing, and retrieval capability which permits the basic data to be readily manipulated and tabulated by various geographic areas, ranging in size from the Region as a whole down through natural watersheds, counties, and minor civil divisions to planning analysis areas, census enumeration districts and tracts, traffic analysis zones, U. S. Public Land Survey sections and quarter-sections, and, for certain data, urban blocks and block faces. The Commission's planning data bank and simulation modeling capabilities provide valuable points of departure for all Commission work efforts. Indeed, without these capabilities, the land use-transportation plan reevaluation effort reported on herein would have been virtually impossible.

With respect to the plan design function, the Commission has placed great emphasis upon the development of a comprehensive plan for the physical development of the Region in the belief that such a plan is essential if land use development is to be properly coordinated with development of supporting transportation, utility, and community facility systems; if the development of each of these individual functional systems is to be coordinated with the development of each of the others; and if serious and costly developmental and environmental problems are to be avoided and a safer, more healthful and attractive, as well as more efficient regional settlement pattern is to be evolved. Under the Commission's approach, the preparation, adoption, and use of the comprehensive plan are considered to be the primary objective of the planning process; and all planning and plan implementation efforts are related to the comprehensive plan.

The comprehensive plan not only provides an official framework for coordinating and guiding growth and development within a multijurisdictional urbanizing region, but also provides a good conceptual basis for the application of systems engineering skills to the growing problems of such a region. The comprehensive regional plan also provides the essential framework for more detailed physical development planning at the county, community, and neighborhood planning levels.

The Commission has to date (July 1975) completed and adopted five key elements of a comprehensive plan for the physical development of the Region: a regional land use plan, a regional transportation plan (highway and transit),

Map 2

THE REGIONAL SETTING IN THE MIDWEST

Many of the most important industrial areas and largest population and employment concentrations in the midwest are located within 250 miles of the Southeastern Wisconsin Region. About 33 million people, or nearly one-sixth of the entire population of the United States, live within the 250-mile radius.

Source: SEWRPC.

a regional sanitary sewerage system plan,[1] a regional library facilities and services plan,[2] and a regional housing plan.[3] Jurisdictional highway system plans have also been completed and adopted for Milwaukee,[4] Walworth,[5] Ozaukee,[6] and Waukesha[7] Counties and have been completed and are pending adoption for Kenosha, Racine, and Washington Counties. These jurisdictional highway system plans refine and detail the adopted regional transportation plan with respect to arterial street and highway facilities, setting forth detailed recommendations with respect to the cross section and right-of-way required, type of improvement required, and level of service to be provided by each link in the total arterial street and highway system. More importantly, however, these jurisdictional highway system plans provide specific recommendations for the realignment of the state and county trunk highway systems and the underlying federal aid routes as necessary to bring about full implementation of the adopted regional transportation plan; set forth a recommended staging or programming for the development of the state and county trunk systems; and correct certain long-standing inequities in the financing of arterial street and highway facility improvements within the Region. The plans provide a firm basis for the designation of the newly established federal aid urban system and for the making of day-to-day development decisions concerning highway system development within the Region and its constituent counties. The plans also provide the basis for the establishment of a short-range priority improvement program required for each urbanized area by the Federal Highway Administration.

The Commission also cooperated with the Milwaukee County Expressway and Transportation Commission in the preparation of a long-range transit plan for the Milwaukee urbanized area. This plan serves to refine and detail the recommendations concerning transit development contained in the adopted regional transportation plan and provides recommendations concerning both ordinary surface and rapid transit system development within the Milwaukee urbanized area. The studies supporting this plan validated the conclusion originally reached in the regional transportation planning effort that the ordinary modified rapid transit and rapid transit systems for the Milwaukee area should be designed to utilize the motor bus as the vehicle; reconfirmed the need for the development of an exclusive busway in the principal east-west travel corridor of the Milwaukee area; and contained specific recommendations for the provision of access to the rapid transit system, for the development of a distribution system serving the central business district of Milwaukee, for the level and quality of both rapid and ordinary transit service, and for the staging, financing, and administration of the transit system required to serve the Milwaukee urbanized area.[8] In addition, the Commission, in cooperation with the local units of government concerned, is preparing transit development programs for the Milwaukee, Kenosha, and Racine urbanized areas as required by the Federal Urban Mass Transportation Administration for each urbanized area.[9]

The Commission has also completed and adopted development plans for certain subareas of the Region, including urban planning districts and natural watersheds. The Commission has completed and adopted detailed urban development plans for the Kenosha[10] and Racine[11] Urban Planning Districts. These plans carry the adopted regional land use and transportation plan elements into greater depth and detail and provide supporting utility and community facility elements in areas expected to undergo particularly rapid urbanization within the near future. The district plans are prepared for rational planning subareas of the Region without regard to corporate

[1] *See SEWRPC Planning Report No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin; formally adopted by the Commission on May 13, 1974.*

[2] *See SEWRPC Planning Report No. 19, A Library Facilities and Services Plan for Southeastern Wisconsin; formally adopted by the Commission on September 12, 1974.*

[3] *See SEWRPC Planning Report No. 20, A Regional Housing Plan for Southeastern Wisconsin; formally adopted by the Commission on June 5, 1975.*

[4] *See SEWRPC Planning Report No. 11, A Jurisdictional Highway System Plan for Milwaukee County; formally adopted by the Commission on June 4, 1970.*

[5] *See SEWRPC Planning Report No. 15, A Jurisdictional Highway System Plan for Walworth County; formally adopted by the Commission on March 1, 1974.*

[6] *See SEWRPC Planning Report No. 17, A Jurisdictional Highway System Plan for Ozaukee County; formally adopted by the Commission on March 7, 1974.*

[7] *See SEWRPC Planning Report No. 18, A Jurisdictional Highway System Plan for Waukesha County; formally adopted by the Commission on June 5, 1975.*

[8] *See Milwaukee Area Transit Plan, prepared by the Milwaukee County Expressway and Transportation Commission in cooperation with the Southeastern Wisconsin Regional Planning Commission, and formally adopted by the Commission on March 2, 1972.*

[9] *The first of the short-range transit development programs, that for the Racine urbanized area, was formally adopted by the Commission on September 12, 1974. See SEWRPC Community Assistance Planning Report No. 3, Racine Area Transit Development Program: 1975-1979.*

[10] *See SEWRPC Planning Report No. 10, A Comprehensive Plan for the Kenosha Planning District, Volumes 1 and 2; formally adopted by the Commission on June 1, 1972.*

[11] *See SEWRPC Planning Report No. 14, A Comprehensive Plan for the Racine Urban Planning District, Volume 1, Inventory Findings and Forecasts; Volume 2, The Recommended Comprehensive Plan; and Volume 3, Model Plan Implementation Ordinances; formally adopted by the Commission on June 5, 1975.*

limits, and generally include a central city and the surrounding suburban and rural-urban fringe areas. The Commission has also prepared and adopted comprehensive water quality management, flood control, and natural resource conservation plans for the Root,[12] Fox,[13] and Milwaukee[14] River watersheds, which together encompass about two-thirds of the total area of the Region, and which together with the regional sanitary sewerage system plan provide an areawide water quality management plan for southeastern Wisconsin.

The Commission presently has under preparation additional plan elements, including a comprehensive plan for the Menomonee River watershed; a regional park, outdoor recreation, and related open space plan; and a regional airport system plan. Proposed to be undertaken in the near future are efforts to prepare a regional water supply system plan, a regional air quality maintenance plan, and a Kinnickinnic River watershed study.

The Commission also carries on an active community assistance planning program, in which functional guidance and advice on planning problems are provided to local units of government and regional planning studies are interpreted locally so that the findings and recommendations of these studies may be incorporated into local development plans and plan implementation programs. Six local planning guides have been prepared under this program to provide information helpful in the preparation of local plans and plan implementation ordinances. The subjects of these guides are subdivision control, official mapping, zoning, organization of local planning agencies, floodland and shoreland development, and the use of soils data in development planning and control.

CONTINUING REGIONAL LAND USE-TRANSPORTATION STUDY

There were four principal reasons why the Commission in 1962 chose the transportation problem as the objective of its first large-scale planning effort actually directed toward the preparation of long-range development plans. First, the Commission was aware of the fact that providing for the movement of people and goods in the rapidly urbanizing Region is one of the most complex and difficult problems facing public officials. Transportation has important impacts 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 traffic congestion, accidents, and costs are, therefore, of wide popular as well as official concern. Because of these factors and because of its significant impact on regional development, transportation is and will continue to be one of the principal areas of public policy determination facing public officials, citizen leaders, and technicans within the Region.

Second, the Commission was aware of many local traffic and transportation problems which could only be resolved properly within the framework of an areawide transportation planning effort. Such areawide transportation planning can only be properly conducted upon a foundation of sound transportation planning data, including data about changes in regional development patterns, in the use of the various modes of transportation, and in transportation technology.

Third, federal legislation requires the conduct of continuing, cooperative, comprehensive, areawide transportation planning programs in all of the large urbanizing regions of the United States. The conduct of such planning efforts is a prerequisite to the continued provision of federal assistance for both transit and highway system development. Thus, the Commission would have been remiss in its duties to the constituent state and local units of government had it not acted to carry on the necessary areawide transportation planning effort.

Finally, the Commission knew that a comprehensive approach to the transportation problems would provide much valuable data for the ultimate solution of drainage and flood control, sewerage, water supply 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 single approach to any comprehensive regional planning effort. All of these reasons which compelled the Commission to undertake the initial regional land use-transportation study within southeastern Wisconsin remain valid as reasons for undertaking the continuing land use-transportation planning effort within the Region and the major plan reevaluation program reported on herein.

Study Objectives

As already noted, the primary objective of the initial regional land use-transportation study was 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.

Ancillary objectives of that initial study included:

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

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[12] *See SEWRPC Planning Report No. 9, A Comprehensive Plan for the Root River Watershed; formally adopted by the Commission on September 22, 1966.*

[13] *See SEWRPC Planning Report No. 12, A Comprehensive Plan for the Fox River Watershed, Volume 1, Inventory Findings and Forecasts, and Volume 2, Alternative Plans and Recommended Plan; formally adopted by the Commission on June 4, 1970.*

[14] *See SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volume 1, Inventory Findings and Forecasts, and Volume 2, Alternative Plans and Recommended Plan; formally adopted by the Commission on March 2, 1972.*

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 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 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 system 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.

The original primary and ancillary objectives of the initial regional land use-transportation study remain as sound objectives for the continuing study. Five additional objectives, however, were added to the original objectives and together with those original objectives constitute the objectives of the continuing regional land use-transportation planning effort in southeastern Wisconsin:

1. To meet the planning requirements of the 1962 Federal Aid Highway Act and the 1964 Federal Urban Mass Transportation Act, so as to continue to qualify the constituent state and local units of government concerned for federal aids in partial support of the development of highway and transit facilities within the Region, and to assist in meeting the areawide review requirements of Section 204 of the 1966 Federal Demonstration Cities and Metropolitan Development Act and the U. S. Office of Management and Budget Circular Memorandum A-95 issued pursuant to the 1968 Federal Intergovernmental Cooperation Act.

2. To continuously update the data collected in, and review and revise the forecasts prepared under, the initial regional land use-transportation study so that the full value of these data and forecasts can be realized and development decisions within the Region can be made intelligently upon current factual information.

3. To periodically update, revise, and set forward the plan design year of the land use and transportation plans prepared for the Region.

4. To provide for the continued integration of the land use and transportation planning efforts within the Region with other elements of the comprehensive areawide planning effort, including the preparation of watershed development, sewerage and water supply, air quality, airport, park, and housing plan elements; and with local development plans and programs.

5. Finally, and perhaps most importantly, to convert the plans prepared under the initial study effort into action programs for plan implementation, including the preparation of short-range priority transportation facility improvement programs.

The attainment of the foregoing objectives requires the continuation of the close working relationship established under the initial study between the Commission and those units and agencies of government and private organizations responsible for land use and transportation system development within the Region. It requires monitoring the factors of growth and change as they occur in relation to the conditions forecast and recommended in the approved plans. The Commission has reported annually upon many of these measurable factors, indicating that, although population growth is occurring below that forecast, urban sprawl has spread beyond the areas recommended for urban land use and that travel demands, measured in terms of vehicle miles of travel, are increasing as forecast; that development of major industrial, commercial, and recreational land uses is proceeding largely in accordance with plan recommendations; that although initially transportation facilities were being constructed to keep pace with increasing demand as recommended in the plan, the pace of arterial facility improvements, particularly freeways and rapid transit, has slowed to the point where, for the first time since the adoption of the plan, the number of arterial facility miles operating above capacity increased in 1972 over the mileage reported in the prior year; that the downward trend in transit ridership is continuing; and that automobile and truck availability has exceeded the levels initially forecast.

The attainment of the foregoing objectives also requires a continuing modification and adaptation of the plans and means of implementation to the changing conditions identified under the surveillance activities just described. To this end, the study design for the continuing land use-transportation study recommended that major review and reevaluation of the adopted land use and transportation plans and of the forecasts underlying these plans be undertaken at regular 10-year intervals, and that such plan reappraisal be combined with a setting forward of the design year of the plans in order to maintain an approximately 20-year plan design period. Accordingly, the Commission began in 1970 to undertake the basic demographic, economic, land use, natural resources, travel, and transportation inventories required for the major plan reevaluation reported on herein. These inventories were completed in 1973 so that the plan reappraisal could be initiated in 1974. The plan reappraisal was considered timely in terms of permitting the consideration of the effects on the plans of certain significant changes in regional land use and transportation system development and in public values and attitudes concerning land use and transportation system development that have taken place within the Region since the original adoption of those plans. Further, plan reappraisal at this time will parallel development of an air quality maintenance plan for the Region mandated under federal actions taken pursuant to the Clean Air Act of 1970, thus assuring coordinated efforts to achieve important regional objectives relating to environmental protection.

Public Participation

In the past decade the growing public awareness of, and familiarity with, the public planning function has evoked contrasting, and in some cases highly organized, citizen response. Generally approving of the planning process, although not necessarily of its products, are members of the community who perceive planning to be fulfilling a long-overdue need. Generally disapproving are citizens who seem to perceive planning to be a danger to personal freedom and self-determination. Citizen activism, a formidable force whether reflective of positive or negative attitudes, is an outgrowth of this surge of interest and leads to periodic calls and legislative mandates for more citizen participation in the planning process. In regard to such calls and mandates, the Commission's concern is not so much over whether the proposed participation is offered in agreement or disagreement, but rather whether the participation is constructive, offering practical alternatives which recognize both areawide and local needs and objectives, and is based upon careful study and deliberation.

From the very origin of the Southeastern Wisconsin Regional Planning Commission, and thus long prior to the current popular movement for public participation, it was recognized that interaction with the regional community and its elected and appointed representatives in government service was both a need and a duty. Indeed, the Commission membership itself consists of a combination of elected local governmental officials and citizen members. Thus, by intent, policy, and organizational structure, the Southeastern Wisconsin Regional Planning Commission has tried to be responsive to its constituents. In addition to providing public participation through the conduct of extensive public attitudinal and behavioral surveys, the Commission has developed an intricate plan formulation and review procedure specifically designed to gain the advice and consent of concerned elected officials and citizen leaders. This procedure is structured into the SEWRPC planning operation, chiefly by means of advisory committees, informal public informational meetings, and formal public hearings as described below.

Particularly important in achieving citizen participation in the Commission planning activities are public informational meetings and hearings wherein Commissioners report directly to citizens residing in areas affected by Commission plans. Public initiative, therefore, is not only welcome, but routinely solicited. Problem solving in public planning is by its very nature a particularly methodical and time-consuming process. Deliberation, consultation, and, most importantly, preparation are required for participants to achieve an understanding or, at minimum, an appreciation for all the interrelationships inherent in public planning issues. An exacting work regimen of the kind required for sound regional planning is far more demanding than many citizens first realize, and once discovered, many citizens become unwilling to participate within these terms. Yet if sound planning principles are ignored in the process of citizen participation, planning decisions would soon be based on uninformed opinion, an obviously harmful development. In the future, informed citizens will hopefully continue to want to have a part in shaping regional plans and through such plans regional growth and development. From more experimentation, new and orderly forms of influencing planning directions may evolve in techniques of social participation, but meanwhile the Commission will adhere to the channels it has developed for citizen participation over a period of almost 15 years.

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 and interests that no agency, whatever its function or authority, could "go it alone" in such a planning program. The basic Commission organizational structure, therefore, provides for the extensive use of advisory committees to both promote the necessary intergovernmental and interagency coordination, to broaden the technical knowledge and experience at the disposal of the Commission, and to more actively involve elected and appointed public officials and knowledgeable citizen leaders in the regional planning effort.

Two types of advisory committees are provided under the Commission's basic organizational structure. The first type is the technical coordinating and advisory committee, which is composed primarily of technicians in the employ of private enterprise, as well as of local, state, and federal units and 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 the agencies 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 and citizen advisory committee, which is comprised primarily of elected and appointed officials representing federal, state, and local interests, together with knowledgeable and interested citizen leaders. 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 program and in the formulation, adoption, and implementation of regional plan elements; to familiarize political and citizen leadership with the Commission's research and planning efforts; and to help generate agreement on basic development objectives, service levels, standards, and plan implementation procedures among the political units and concerned citizen groups comprising the Region.

A Technical Coordinating and Advisory Committee on Regional Land Use-Transportation Planning was established on January 14, 1963, under the initial regional land use-transportation planning effort. This Committee made an invaluable contribution to the preparation of the original regional land use and transportation plans. This Committee, with certain changes in membership, was maintained to provide technical policy direction to the continuing regional land use-transportation study and to the major plan reevaluation reported on herein. Membership on this committee includes representatives from the U. S. Department of Transportation, Federal Highway Administration, Urban Mass Transportation Administration, and Federal Aviation Administration; the U. S. Department of Housing and Urban Development; the U. S. Department of Agriculture, Soil Conservation Service; and the U. S. Department of Commerce; from the central and district offices of the Wisconsin Department of Transportation, the Wisconsin Department of Natural Resources, and the Wisconsin Department of Local Affairs and Development; from the Wisconsin Department of Administration and the Wisconsin Department of Business Development; from the university communities within the Region; from municipal and county planning, engineering, highway, and public works departments; from electric, telephone, and gas utilities; and from railroad and transit companies, as well as from other private agencies concerned with land use and transportation planning. A complete membership list is provided in Appendix A.

The Committee has been organized into subcommittees by subject area. These subject areas include land use planning; highway system planning; socioeconomic studies; natural and recreational related resource studies; transit system planning; public utilities planning; and traffic studies, models, and operations. This Committee has continued to be a very active and valuable advisory body to the Commission and its staff since its creation, and through this Committee, federal, state, and local planning and engineering data requirements, development objectives, and supporting technical standards have to date been effectively recognized and incorporated into the Commission's land use-transportation planning efforts.

An Intergovernmental Coordinating Committee on Regional Land Use-Transportation Planning was established in April 1965 under the original regional land use-transportation planning program. That Committee, which was dissolved upon completion of the initial study, consisted of 22 elected and appointed public officials and three citizens from throughout the seven-county Region. The initial regional land use-transportation planning effort in southeastern Wisconsin represented the first phase, or cycle, of an iterative planning process which was envisioned as alternating between system, or areawide planning; and project, or local planning. Because of the broad geographic areas and viewpoints represented by the members of the Intergovernmental Coordinating Committee on Regional Land Use-Transportation Planning, this Committee was well structured to meet the needs of the initial regional land use-transportation effort. The basic functions of this Committee were to familiarize political and citizen leaders in the Region with the findings of the initial regional land use-transportation study; generate understanding on basic land use-transportation system development objectives, on alternative regional development plans, and on the recommended regional development plan together with implementing procedures; and to actively involve elected officials and citizen leaders in the regional plan selection process.

Since adoption of the initial regional land use and transportation plans, significant experience has been gained within the Region in project planning directed at implementation of the system plan, particularly with respect to the regional transportation system. Extensive efforts have been made by various implementing agencies to involve citizens in transportation system development, particularly with respect to the construction of certain recommended freeway and transitway segments. These additional efforts toward citizen participation, however, have been accompanied by an increasing polarization of public opinion concerning freeway and transitway development, with certain organizations and individuals advocating the abandonment of all planning and construction activity with respect to both freeway and transitway proposals, and other organizations and individuals advocating expeditious completion of the recommended regional transportation system. One of the major difficulties in achieving both broad and meaningful citizen participation in transportation system development relates to the need to plan for transportation facilities on a systems, or areawide, basis, while implementing that system on a sector or project level basis. Effective citizen participation at the system level of planning should relate to basic questions concerning travel demand and consequent transportation system need, rather than on questions relating to the more

detailed characteristics of a particular transportation facility. Concomitantly, effective citizen participation at the project level of planning must be focused not on the basic question of transportation facility need, that question having already been decided at the systems level of planning, but rather on the very important considerations relating to the precise alignment and design of a given transportation facility. Frequently, however, attention at the project level of planning is diverted from the questions relating to facility design back to the questions relating to facility need, resulting in pressures to again reopen the basic systems decision. Of necessity, then, the process becomes an iterative one alternating between the system and project levels of planning.

With respect to land use development, the situation with respect to citizen participation is less clear. This is due, in part, to the extreme diffusion of decision making authority concerning land use development, since under Wisconsin law basic land use development authority rests with the individual general purpose local units of government, of which there are 154 in the Southeastern Wisconsin Region. By contrast, major transportation facility development in the Region is the responsibility of a relatively few agencies: the State Highway Commission of Wisconsin, the Milwaukee County Expressway and Transportation Commission, and the seven county boards in the Region. What experience has to date been gained in the Region with respect to citizen participation in land use development has come mainly from public participation in major rezoning hearings held at the county level of government throughout the Region since adoption of the initial regional land use plan. These hearings have tended to indicate growing public support for more stringent local government regulation of land use development, particularly in terms of ensuring that urban development does not destroy the remaining elements of the natural resource base in the Region, including the remaining prime agricultural lands.

Certainly, no universally successful technique for achieving citizen and local government participation in areawide land use and transportation system planning and development has been found to date. After carefully considering this matter, and after receiving comments concerning citizen and local government participation at the first of three planned regional conferences and public hearings dealing with the plan reappraisal, the Commission determined to establish a Citizen Advisory Committee on the Freeway-Transit Element of the Regional Land Use-Transportation Plan Reevaluation. Membership on this Committee, which is set forth in Appendix B, was intentionally structured to include individuals and representatives of organizations generally known to oppose completion of the freeway and transitway system; individuals and representatives of organizations who are generally known to favor completion of the freeway and transitway system as previously planned; and individuals who, while cognizant and aware of the controversies that have developed during implementation of the regional transportation plan, were believed to be neutral as to whether or not the plan as initially adopted should be fully carried out. It was hoped that by establishing a committee of knowledgeable individuals holding widely divergent views and value judgements with respect to the major transportation development issues, and by actively involving that committee in the plan review, the public officials having the responsibility for ultimate decision making will be given appropriate guidance.

While the vehicle of a citizen advisory committee is intended to be an important part of the attempt by the Commission to achieve citizen and community participation in the plan reappraisal process, it is not the only such vehicle to be used. The first of three intended regionwide conferences and public hearings concerning the plan reappraisal was held on October 16, 1974. More than 350 persons, including interested citizens; elected and appointed public officials; and representatives of business, industry, and civic organizations, attended this first conference, which included a public hearing at its conclusion. This first conference primarily dealt with a presentation of the inventory findings as documented in this volume. The second of the three planned conferences will be held for the purpose of presenting and reviewing the new alternative regional land use and transportation plans, while the third conference will be held for the purpose of presenting and reviewing a single recommended new regional land use and transportation plan. It is intended that each conference provide not only the information necessary for the general public and local governmental officials to become familiar with the plan reappraisal process, but also to provide an opportunity for such individuals to affect the decision making process through comments and questions. The results of each of the three major regionwide conferences on the regional land use-transportation plan reappraisal are documented in separate conference proceedings published by the Commission.

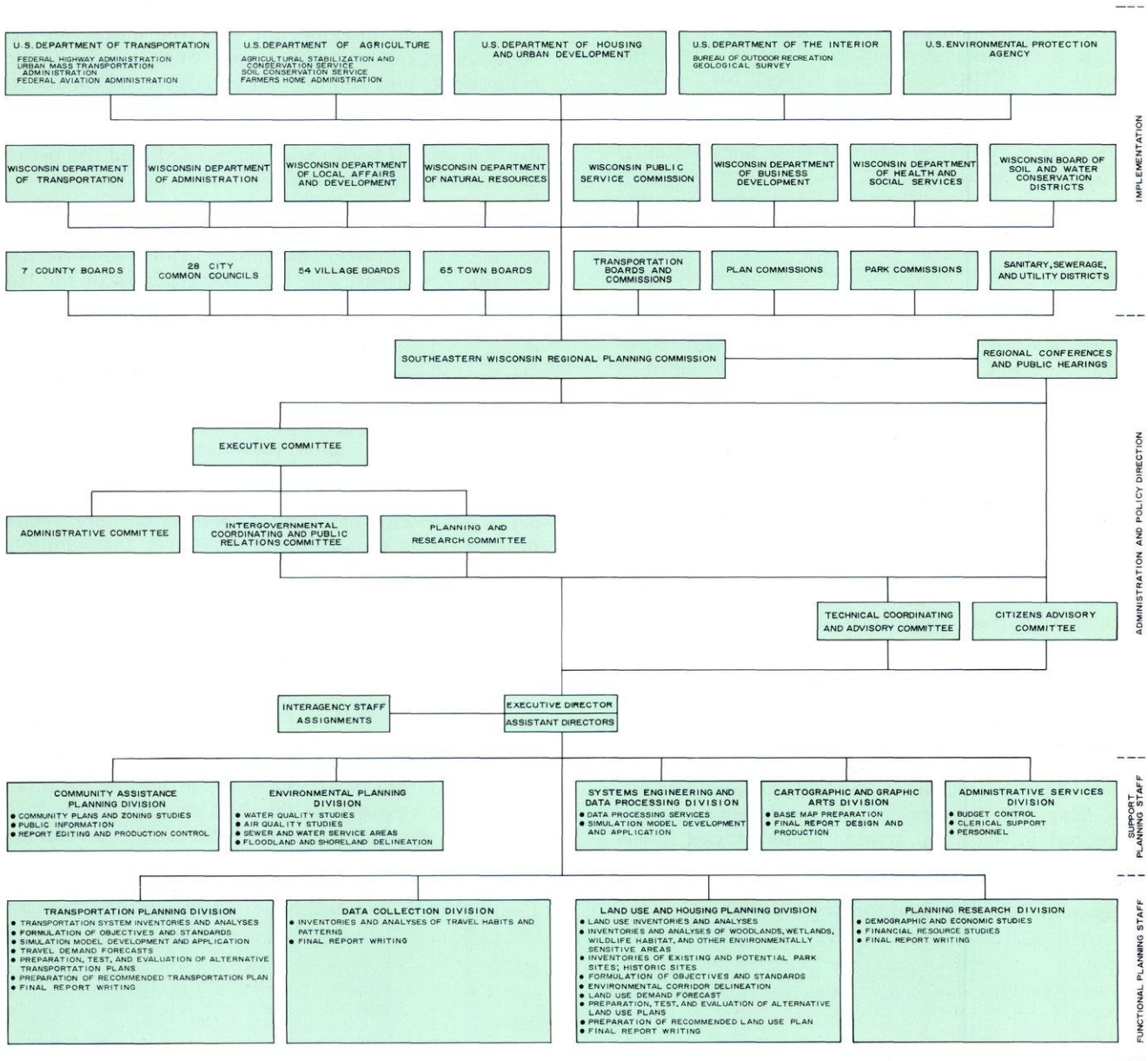
In addition to the regionwide conference, a second series of more informal subregional meetings was also held, with such meetings intending to emphasize the more localized aspect of the alternative plan proposals, and in particular the alternative means for meeting forecast transportation demands in the major transportation corridors of the Region. These meetings were intended in particular to allow for interaction between local governmental officials and their technical staff members with respect to major issues identified in the regional land use-transportation plan reappraisal process, including both land use development issues and, as noted above, transportation facility issues. Documentation with respect to such meetings is set forth in Volume Two of this report.

Advisory committees paralleling the Technical Coordinating Advisory Committee on Regional Land Use-Transportation Planning, but dealing with different functional areas, have also been created by the Commission to assist it in carrying out its overall regional planning program. In all, about 400 public officials and citizen leaders participate in the Commission's total advisory committee structure, which currently consists of 26 committees. The work of many of the other advisory committees has important implications for the Commission's land use and transportation planning programs.

The basic organizational structure for the plan reappraisal, as shown in Figure 2, consists of four functionally organized divisions reporting to the Executive Director of the Commission, who in turn reports to the Commission. These four functional divisions—transportation planning, land use and housing planning, data collection, and planning research—have primary responsibility for the conduct of the continuing regional land use-transportation study and for the major plan reevaluation conducted under the study, and are directly supported by the three service divisions—systems engineering and data processing, cartographic and graphic arts, and administrative services—of the Commission staff, and indirectly supported by the remaining two functional divisions—environmental planning and community assistance planning.

Figure 2

ORGANIZATIONAL STRUCTURE FOR THE REGIONAL LAND USE-TRANSPORTATION PLAN REAPPRAISAL



Source: SEWRPC.

Intergovernmental coordination was broadened through an interagency exchange of technical staff for the plan reevaluation effort. This exchange involved the assignment of staff by the Wisconsin Department of Transportation, Division of Highways; the Wisconsin Department of Natural Resources; the Milwaukee County Expressway and Transportation Commission; and the City of Milwaukee, Department of Public Works and Department of City Development, to the Commission staff during various phases of the plan reevaluation.

SCHEME OF PRESENTATION

The major findings and recommendations of the regional land use-transportation plan reevaluation are to be presented in a two-volume report replacing in effect, the three volume SEWRPC Planning Report No. 7. This, the first volume of the report, sets forth the basic principles and concepts underlying the plan reevaluation and presents in summary form the basic facts pertinent to long-range, areawide land use and transportation system planning in southeastern Wisconsin. Separate chapters present data on the demography, economy, and public financial resource base; the land use pattern; the natural resource and public utility base; the development status and use of the transportation system; travel habits and patterns; and the status of community plans, land use control ordinances, and other plan implementation devices within the Region. Also included in Volume 1 is a brief summary description of the adopted 1990 regional land use and transportation plans, together with a summary of the progress to date in the implementation of those plans.

These data are presented so as to describe the total urban Region at a given point in time as an integrated system for land use and transportation planning and thereby to provide a new "bench mark" of basic data relevant to long-range land use and transportation planning in southeastern Wisconsin for the base year 1972. Chapers comprising this volume also compare the new bench mark data to the original bench mark data assembled in the initial regional land use-transportation planning effort for the base year 1963. This comparison provides a definitive description of both the amount and spatial location of changes of population and economic activity levels, land use development, automobile availability, trip generation, mode of transportation utilized, travel habits and patterns, transportation facility utilization, and land use and transportation system development and the legal constraints on land use development within the Region since the preparation and adoption of the regional land use and transportation plans.

The second volume of the report will be concerned with anticipated growth and change in the Region and will present new forecasts of economic activity, population levels, 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 natural resource base, and generalized alternative plans for future regional land use and transportation system development presented based upon stated regional development objectives and supporting standards. The second volume will thus provide a basis for the selection of final plans from among the alternatives evaluated and will, therefore, describe not only the means for plan comparison, test, and evaluation, but the results of such comparison, test, and evaluation. The second volume will also detail the land use and transportation plans finally recommended for adoption and recommend the staged development of both the recommended land use pattern and transportation system.

This report can only summarize in brief fashion the volume of information assembled in the extensive data collection, analysis, and forecasting phases of the land use-transportation plan reevaluation effort. Although the reproduction of these data 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 general public, upon specific request. In fact, information from these files has been utilized since 1973 by some planning and public works agencies and by certain private organizations for the planning and design of specific public works and transit improvement projects. This report, therefore, serves the additional purpose of indicating the type of data available from the Commission which may be of value in assisting federal, state, and local units and agencies of government and private investors in making better decisions concerning community development within the Region.

This planning report is supplemented by certain other Commission publications. These include the SEWRPC technical reports and technical record series, which deal with certain phases of the work in greater depth and detail than is possible in this final planning report. These additional publications set forth the procedures and findings of major work elements of the plan reevaluation, including particularly the results and findings of the Commission's socioeconomic inventories and forecasts.

Chapter II

BASIC PRINCIPLES AND CONCEPTS

INTRODUCTION

As noted in Chapter I of this report, transportation, because of its important impacts on daily life and on regional development, is, and may be expected to 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 of the 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 the spatial location and capacities of these facilities should be—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 transportation planning process able to objectively scale the changing travel demand against existing and proposed transportation system capacity. Only within such a planning process can the effect of different transportation development proposals be properly evaluated, the best course of action intelligently selected, and the available funds most effectively invested.

Transportation facilities, however, are a part of, and have a major effect upon, the physical, social, and economic development of an area. There can be no effective guidance of desirable regional development patterns without full coordination of transportation plans and development policies with overall regional development plans and policies. Transportation planning must, therefore, be carried out as an integral part of a comprehensive 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 comprehensive regional planning agency charged by state statute with the duty and function of making and adopting an "advisory master plan for the physical development of the Region" provides a good institutional structure for the conduct of the needed areawide transportation planning program. Because of its comprehensive planning responsibilities, the Commission can include land use, as well as transportation, within the system to be planned, producing an objectively determined land use plan capable of cooperative adoption and joint implementation by the units of government concerned as a basis for the preparation of a transportation plan. The transportation planning process can thereby be more purposefully directed and better land use, as well as transportation, plans prepared.

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—planned or unplanned—whether it be a subdivision, shopping center, industrial plant, or institutional building, 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 of areawide concern, not only interacting strongly with the need for regional utility, storm water drainage, recreation, and transportation facilities, but also exerting a heavy 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.

DEFINITION OF TERMS LAND USE AND TRANSPORTATION

The term "land use" is defined for the purposes of the regional land use-transportation planning process as the human activities that, grouped together, form the overall generalized pattern of urban and rural development considered at a regional scale. These include large land consuming uses such as agriculture, regional park and open space reservation, major woodlands and wetlands, and major surface water bodies together with their associated shorelands and floodlands, which all have important implications for the preservation and protection of the natural resource base. These also include major areas of residential use; major concentrations of commercial, industrial, and institutional use; and certain transportation terminal facilities which exert a heavy demand upon public works facilities of areawide concern, such as major trafficways, sanitary trunk sewers, and major storm water drainage channels. All other land uses, such as minor commercial and service uses; local institutional and governmental uses, including elementary and secondary schools, churches, libraries, and police and fire stations; and local park and recreational areas are considered in the regional land use-transportation planning process only as to the aggregate area required and approximate densities and spatial distribution desired,

being incorporated implicitly in the regional land use plan as integral components of urban neighborhood units.

The term "transportation," is defined for the purposes of this regional land use-transportation planning process as the intraregional movement of people by highway and transit facilities and the movement of goods by truck. The term "transportation facilities" is defined as the arterial street and highway, mass transit, and related terminal facilities which are of areawide concern. Such facilities include all streets and highways and public transit facilities required to move traffic between the various land use concentrations, including urban neighborhood units. Such facilities do not include the streets and transit facilities required to move traffic within such land use concentrations, collecting and distributing the traffic from and to the individual land uses and conveying it to and from the arterial streets and highways and major transit facilities. The transportation facilities by definition, therefore, exclude collector and land access streets internal to neighborhood units and special transit facilities for circulation within major land use concentrations such as the central business district of Milwaukee. Such facilities, together with special semipublic forms of mass transit such as school bus systems, are considered in the regional land use-transportation planning process only to the extent that they directly affect arterial street and highway and public mass transit development, and as such are incorporated implicitly in the regional transportation plan.

Airport facilities, which have been separately studied by the Commission under its regional airport system planning program, are considered under the regional land use-transportation planning program only to the extent that they directly affect arterial street and highway and public mass transit system development. Such other transportation facilities as railways and seaports are also considered under the program only to the extent that they directly affect the arterial street and highway and transit system development. Under this definition, the planning for the interregional movement of people and goods, particularly by rail, pipeline, and waterway, becomes primarily the responsibility of the state and federal levels of government, although close coordination of such state and federal transportation planning with regional and local planning is essential and the attainment of such coordination is an important function of regional planning.

BASIC PRINCIPLES

The specific planning process applied in the SEWRPC regional land use-transportation plan reevaluation process 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 surface transportation system, which is composed of freeways, expressways, standard arterial streets and highways, transit lines, and related terminal facilities, 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 and related terminal facilities 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 Regional Planning Commission in 1963 developed a seven-step planning process by which the Region and its principal functional relationships could be accurately described both graphically and numerically, the complex movement of people and vehicles over highway and transit facilities simulated, and the effect of different courses of action with respect to regional land use and transportation system develop-

ment evaluated. The seven steps involved in this planning process were: 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, was considered throughout the process so that realization of the plans could be fostered.

The end results of the above process were not only regional land use and transportation plans scaled to future land use, travel, and resource demands and consistent with regional development objectives, but also the beginning of a continuing planning process that permits modification and adaptation of the plans to changing conditions. Experience at both the national and local levels over the past 10 years has indicated that the regional land use-transportation planning process, as developed and applied by the Regional Planning Commission, was basically sound. The same basic seven-step planning process which was used in the preparation of the adopted regional land use and transportation plans was, therefore, used in the plan reevaluation described herein.

Certain relatively minor modifications in that process were made, and the scope of certain work elements was expanded or contracted somewhat as experience indicated necessary. One major work area—that relating to the adjustment of land use and transportation facility development to the natural resource base—was significantly expanded to include the probable effects of regional land use and transportation system development upon ambient air quality and upon motor fuel consumption.

One of the basic principles underlying the original regional land use-transportation planning process in southeastern Wisconsin which made that process virtually unique in the United States at that time was that 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 in order to assure a pleasant and habitable environment. While this principle was concerned with avoiding misuse of the limited land, water, and air resources of the Region itself, certain broader concerns about natural resource conservation and use have developed at the state and national level since the initiation of the original regional land use-transportation planning program in 1963 which require consideration in the plan reevaluation process. These broader concerns, expressed in the form of federal legislative and administrative actions, relate to air and energy resources.

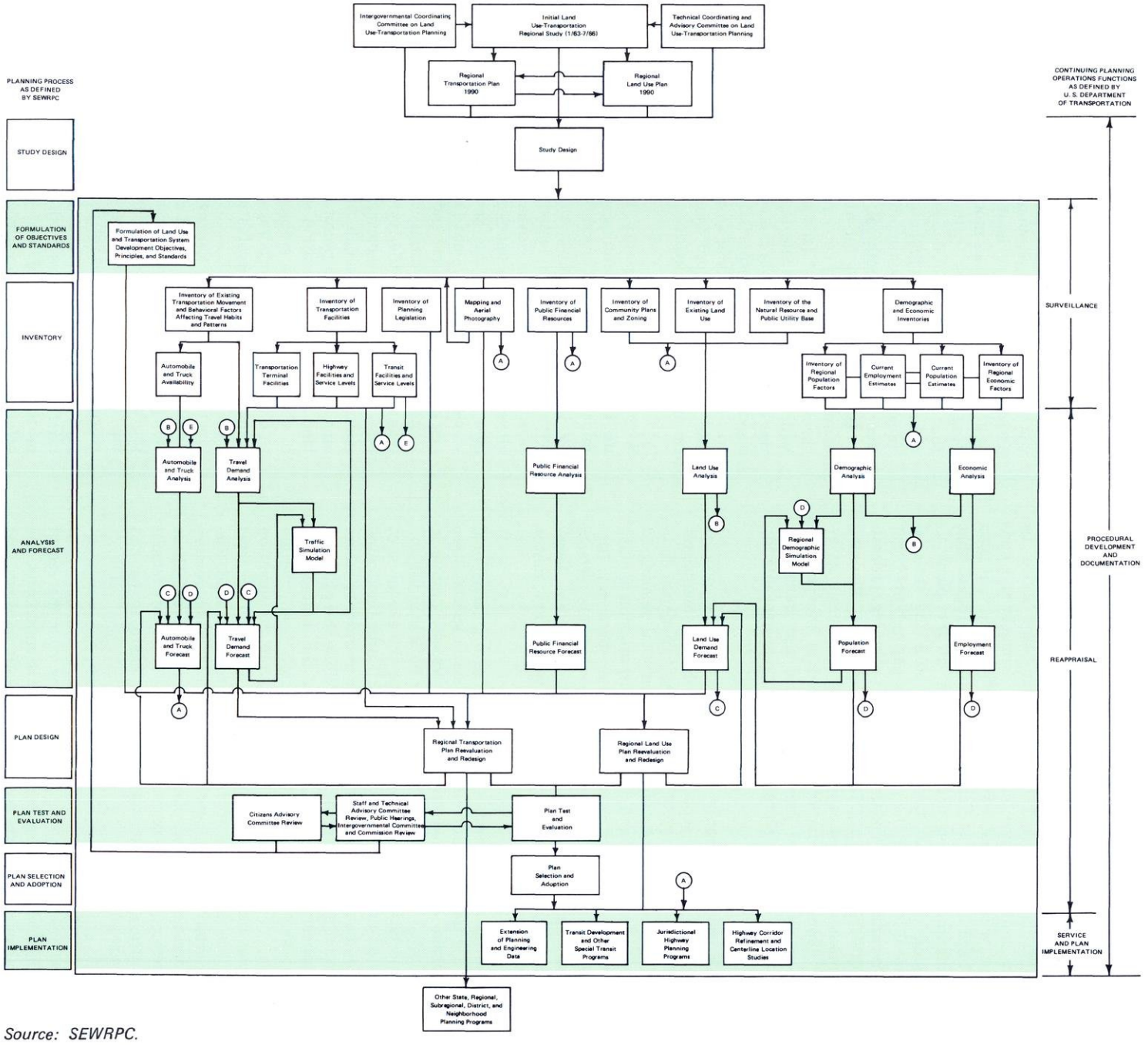
The increasingly intensive use and consumption of natural resources in the United States over the recent past indicates that, except under crisis conditions, the general public appears to react slowly to warnings that the nation's natural resources are limited. By almost any measure, the effectiveness of natural resource conservation programs, both proposed and legislated, in slowing or reversing the tendency of modern society to exploit renewable and nonrenewable natural resources is slight. Actual experiences in the early 1970s with electrical and motor fuel energy shortages, however, may have provided more convincing warnings, since these critical supply shortages imperiled the attainment of certain national goals and impeded the achievement of certain individual goals. Densely populated regions in other areas of the United States have become prone to chronic, seasonal electrical power shortages. More widespread and unexpected, however, was the entire nation's experience with a severe motor fuel shortage, temporarily curtailing the mobility of the population in late 1973 and early 1974 and altering, at least temporarily, travel habits and patterns as well as modal choice. A regional planning agency is neither in the position, nor does it have the responsibility, to determine the degree to which imbalances in motor fuel supply and demand, or imbalances in other key commodities or forms of energy, are due to economic, political, and technical imperatives. It is logical, however, for a regional planning agency to assist in needed energy conservation programs, particularly through the design of land use and transportation plans which can assist in achieving new efficiencies in energy use and particularly in motor fuel use. Accordingly, the regional land use-transportation plan reevaluation process was expanded to include an analysis of the effect of the alternative land use and transportation plans considered on motor fuel consumption.

With respect to air quality, the continuing regional land use-transportation planning program included a determination of the total amount of air pollutants generated by the alternative transportation plans considered, and demonstrated that implementation of the recommended plan would result in lower total emissions than the alternatives. Under recent federal pronouncements, however, regional land use and transportation plans are viewed as important if not the primary tools in attaining and maintaining national and state air quality standards. Consequently, the Commission, in a parallel but separate planning effort from the regional land use-transportation plan reevaluation, is preparing a comprehensive air quality maintenance plan, which will consider not only the amount of the various pollutants generated by alternative land use and transportation systems, but also the effects of those pollutants on ambient air quality. The results of this work will be incorporated into the regional land use-transportation plan reevaluation.

An understanding of the seven-step planning process, as developed under the initial regional land use-transportation planning effort and as applied in the plan reevaluation process, is essential to any appreciation and understanding of the findings and recommendations of the plan reevaluation process as set forth herein. Each step in the process, together with its major component operations, is briefly described below both with respect to application in the initial regional land use-transportation planning effort and in the plan reevaluation effort. Changes in the scope and content of the various steps as between the initial plan preparation and the plan reevaluation process are noted. The process as applied in the continuing regional land use-transportation study is diagrammed in Figure 3.

Figure 3

MAJOR WORK ELEMENT DIAGRAM FOR THE CONTINUING REGIONAL LAND USE-TRANSPORTATION STUDY



Source: SEWRPC.

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 forecasts 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.

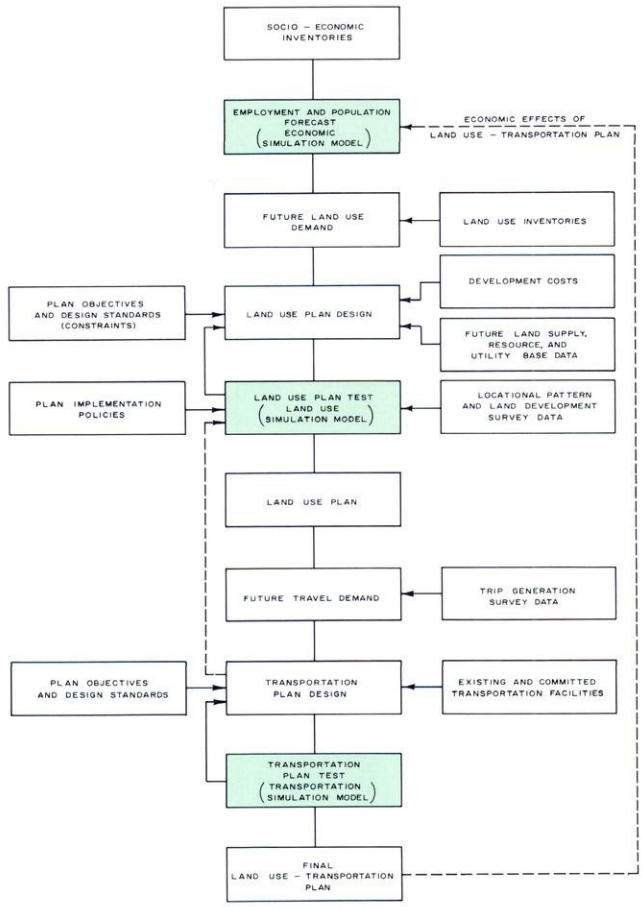
For the initial land use-transportation planning effort, the study design was set forth in the SEWRPC Regional Land Use-Transportation Study Design, August 1963; while for the continuing land use-transportation planning effort, the study design was set forth in Study Design for the Continuing Land Use-Transportation Study, August 1967, Study Design for the Continuing Land Use-Transportation Study—1970-1974, and Study Design for the Continuing Land Use-Transportation Study—1972-1976. The study design for the major land use-transportation plan reevaluation effort was further detailed in a series of staff memoranda and "bench mark" reports submitted to the Technical Coordinating and Advisory Committee for review and approval. Particularly important among these were: Bench Mark Report No. 1, Proposed Survey Procedures and Quality Control Measures for Conduct of the Inventory of Travel in Southeastern Wisconsin-1972, comprised of Staff Memoranda No. 1, "Introduction to Bench Mark Report 1," No. 2, "Home Interview Survey," No. 3, "Truck and Taxi Survey," No. 4, "External Survey," No. 5, "Screenline Survey," No. 6, "Public Transportation Survey (Bus User)," No. 7, "Public Transportation Survey (Nonuser)," No. 8, "Public Transportation Survey (Major Trip Generator)," No. 9, "Intercity Bus and Rail Survey," and No. 10, "Weekend Travel Survey;" Bench Mark Report No. 2, Procedures for Summarizing, Adjusting, and Using Basic Travel Inventory Data; and Bench Mark Report No. 3, Reevaluation and Calibration of Traffic Simulation Models; Trip Generation, Trip Distribution, and Modal Split Models.

In the initial regional land use-transportation planning effort, a dual approach was utilized in which both mathematical models and the more traditional planning techniques were 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,[1] 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 initial regional land use-transportation study is presented in Figure 4.

Because of the experimental nature of the new methods and the high risk associated with complete dependence on their use, however, it was thought necessary to ensure the success of the regional land use-transportation study to provide concurrently for the performance of each of the major planning functions by more conventional and established planning techniques. A parallel diagram illustrating the role of the traditional methods in the initial regional land use-transportation study is summarized in Figure 5. It should be noted that only the forecasting and land use planning functions were affected. The transportation planning functions, which utilized then already well-developed mathematical models for plan test, were the same in both planning sequences.

Figure 4

LAND USE-TRANSPORTATION PLANNING SIMULATION MODEL METHOD



Source: SEWRPC.

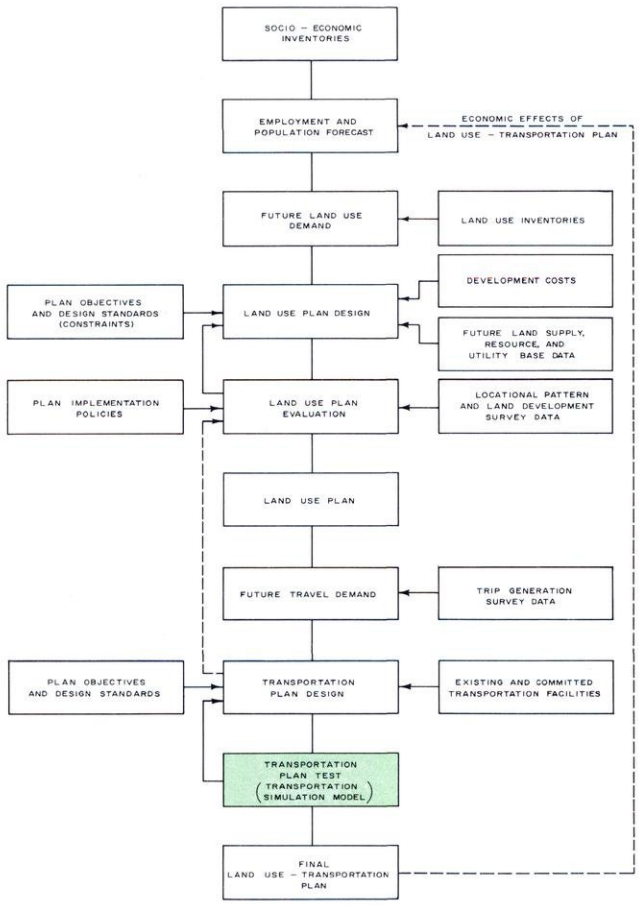
[1] *See SEWRPC Planning Report No. 1, Regional Planning Systems Study, December 1962.*

It should 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 were developed which made 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 could be designed which would serve not only the existing travel patterns but the entirely new travel patterns which will evolve out of regional growth and change.

In the regional land use-transportation plan reevaluation, a single method was applied—the traditional method—as illustrated in Figure 5. The decision to utilize the traditional method—including traffic simulation modeling—was based primarily upon the experience gained in the initial regional land use-transportation planning effort. Such experience has shown that, although the socioeconomic simulation model developed under the initial study effort gave very good results, the conventional techniques used gave results which were almost as good and did so at a much lower cost. The high cost of the socioeconomic simulation model approach was due primarily to the massive original data collection efforts required to formulate the input-output matrix used to describe regional economic activity.

Figure 5

LAND USE-TRANSPORTATION PLANNING TRADITIONAL METHOD



Source: SEWRPC.

Experience in utilizing the land use simulation model, while favorable in the sense that it afforded the only means available for quantitatively integrating the land use and transportation planning efforts with respect to testing the effects of changes in accessibility provided by alternative transportation systems on land use distribution within the Region, only served to underscore the basic conceptual difference between land use simulation and land use planning. The preparation of a regional land use plan is based upon many factors and considerations, of which accessibility is only one. Perhaps more important in the preparation of a regional land use plan is the impact of urban land use development on the natural resource base in the Region, particularly with respect to the identified primary environmental corridor and prime agricultural lands. Even if, for example, it could be shown that a given transportation facility in a system would improve accessibility to a given subarea of the Region, such improved accessibility may not at all influence the plan design process, since overriding environmental and public utility considerations would control the design of the accompanying land use plan. Given the growing concern for environmental preservation, as well as the recent concerns for energy consumption, it has become even more apparent that the traditional method of land use plan design is sound even though in and of itself it is not able to quantitatively test the changes in accessibility provided by transportation systems. Accordingly, it was determined not to exercise the land use simulation model in the land use plan reevaluation process.

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. The objectives chosen guide the preparation of alternative plans and, when converted to standards, provide the criteria for evaluating and selecting from among the alternatives. Since objectives provide the logical basis for plan synthesis, formulation of sound objectives is a crucial step in the planning process. In order to be useful in plan design, the objectives must not only be stated clearly and be sound logically, but must be related in a demonstrable way to alternative physical development proposals. 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.

It is important to recognize that because the formulation of objectives involves a formal definition of a desirable physical system by listing, in effect, the broad needs which the system aims to satisfy, the objectives implicitly reflect an underlying value system. Thus, every physical development plan is accompanied by its own unique value system. The diverse nature of value systems in a complex urban society complicates the process of goal formulation and makes it one of the most difficult tasks of the planning process. This difficulty relates in part to the lack of a clear-cut basis for a choice between value systems and in part to the reluctance of public officials to make an explicit choice of ultimate goals. Yet, it is much more important to choose the "right" objectives than the "right" plan. To choose the wrong objectives is to solve the wrong problem; to choose the wrong plan is merely to choose a less efficient physical system. Although, because of the differing value systems involved, there may be no single argument to support a given choice of objectives, it is possible to state certain planning principles which provide at least some support for the choice; and this was done in both the initial planning effort and in the plan reevaluation effort.

Objectives cannot be intelligently chosen without knowledge of the causal relationships existing between objectives and means. This suggests that the formulation of objectives is best done by people with prior knowledge of the social, economic, and technical means of achieving the objectives, as well as of the underlying value systems. Even so, it must be recognized that the objectives may change as a selection is attempted from among alternative means or plans. In the process of evaluating alternative plans, the various alternative plans are ranked according to ability to meet objectives. If the best plan so identified nevertheless falls short of the chosen objectives, either a better plan must be designed or the objectives must be compromised. The plan evaluation provides the basis for deciding which objectives to compromise. The compromises may take three forms: certain objectives may be dropped because their satisfaction has been proven unrealistic, new objectives may be suggested, or conflicts between inconsistent objectives may be balanced out. Thus, formulation of objectives must proceed with plan design and implementation as a part of a continuing planning process.

The regional development objectives formulated under the initial land use-transportation planning effort were necessarily conditioned by the then existent knowledge of conditions within the Region, as well as by the then present status of planning at the federal, state, regional, and local levels. With the passage of time, with the attainment of additional knowledge about the Region, and with the fulfillment of certain of the adopted regional development objectives through plan implementation as well as the failure to fulfill others, a major reevaluation of regional development objectives was deemed necessary as an integral part of the overall plan reevaluation process.

Under the initial land use-transportation planning program, the advisory committee structure created for this purpose provided a practical and effective means by which public officials, technicians, and citizen leaders could become involved in the formulation of the regional land use and transportation system development objectives. The continued validity of these basic objectives, as well as the relative priorities which the citizens of the Region may assign to each of these objectives and to other objectives, directly or indirectly related to land use and transportation system development—are all ultimately derived from community values which can probably best be assessed through the process of human interaction which takes place in the established political system as the implementation actions for various plan proposals are advanced over time. A very pragmatic approach was taken, therefore, to the reappraisal of the regional development objectives, namely, assessment by the Commission staff, the advisory committees, and the Commission itself of the community reaction experienced over the past decade to specific plan implementation actions growing out of the adopted regional land use and transportation plans. Under this approach, continued adverse public reaction or response to plan implementation proposals was deemed an indication of a need to reevaluate the specific objectives, principles, and standards involved for continued relevance. Conversely, favorable public reaction was deemed to be expressed through effective plan implementation facilitated by favorable public reaction.

Care must be exercised in this respect to ensure that any reaction to plan implementation proposals—adverse or favorable—truly reflects the values of the citizen body as a whole within the Region and not the values of a small "pressure group," and also that the reaction reflects long-term, stable community values and not ephemeral opinions. To this end, the plan reevaluation process incorporated attitudinal and personal opinion surveys to provide information on public preferences for not only various types and levels of transportation facilities and services but also for various housing types and locations. When considered in relation to the results of accompanying behavioral studies of travel habits and patterns and of housing types and locations, these surveys probably provide the best available measure of not only current public opinion but of underlying attitudes and of changes in these attitudes and opinions over time and, therefore, a sound basis for considering needed revisions in regional development objectives and standards.

Inventory

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, 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 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 be developed on the existing and potential demand for transportation between various points within the Region and outside 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) economic and demographic base, 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 3). These major inventories considered together must be both areawide and comprehensive, encompassing all of the geographic area and all of 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.

4. Testing and evaluating the alternative plans.

After the inventory data have been collected, they must be edited, coded, transferred to electronic data processing media, checked, summarized, and analyzed before they are 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.

Under the continuing regional land use-transportation study, regional development was monitored and analyzed in relation to the adopted land use and transportation plans, the forecasts and basic assumptions underlying those plans, and the techniques used in the preparation and evaluation of those plans, including various mathematical simulation models. Data were collected on an annual, or other periodic, basis on the amount and spatial location of changes in population and economic activity levels, land use development, automobile availability, trip generation, mode of transportation utilized, travel patterns, transportation facility utilization, and on local land use and transportation plan development and plan implementation within the Region. The conduct of these surveillance activities was related directly to the nine major data categories listed above and was deemed to provide an adequate data base for the plan reevaluation in all but one of the categories, that pertaining to existing travel patterns within the Region.

The surveillance activities through 1971 carried out under the continuing land use transportation planning process indicated that a new comprehensive survey of travel within the Region would be required as a basis for plan reevaluation for the following reasons:

1. Major improvements in the regional highway transportation system had been effected since the conduct of the basic travel inventories under the initial regional land use-transportation study in 1963. At the time of the initial inventories, there were only 87 miles of freeway and expressway open to traffic in the entire Region, and this mileage consisted largely of scattered unconnected segments, very little of which served the urban areas of the Region. A decade later there were a total of 196 miles of freeway and expressway open to traffic within the Region. Moreover, this mileage had been developed into a relatively well-integrated system, at least as compared to the disconnected segments in existence in 1963. It was considered vital to measure the effects of this dramatic change in transportation service on such basic travel characteristics as the amount of travel generated, the spatial distribution and mode of that travel, and on the lengths and purposes of that travel, effects undetectable by the traffic count monitoring carried out under the continuing regional land use-transportation planning effort.

2. Major changes in the regional public transit system had also taken place since the conduct of the basic travel inventories under the initial regional land use-transportation study. These changes include inauguration of "freeway flyer" service within the Milwaukee urbanized area, a prototype of the rapid transit and modified rapid transit service recommended in the adopted regional transportation plan; the total abandonment of the original public mass transit systems serving the Racine and Kenosha urbanized areas and their replacement by two totally new and different systems; the continued decline of transit utilization within the Region; and the provision of new public subsidies to the transit operations in the Milwaukee and Racine urbanized areas and public ownership of the transit system in the Kenosha area. Careful in-depth reexamination of transit use and of the factors affecting transit use was, therefore, considered essential.

3. Significant changes had also occurred in the spatial location and density of residential, commercial, industrial, and institutional development within the Region since 1963, including the development of three new regional shopping centers, each of which is larger than any such center existing in 1963; the development of six large new industrial parks in various areas of the Region, namely in the Towns of Pleasant Prairie, Mt. Pleasant, and the Cities of Milwaukee, Oak Creek, Burlington, and New Berlin; a rennaisance of high-rise office building construction in the central business district of Milwaukee, and the appearance of new forms of residential development such as condominiums, all of which were believed to have significantly affected travel habits and patterns. In addition, the vocational school systems within the Region had been reorganized since the 1963 surveys, with resultant shifts in the location and use of vocational and technical training schools in the Waukesha, West Bend, and Elkhorn areas of the Region.

4. A completely new travel survey was believed essential in order to permit correlation of travel data with the data provided by the 1970 U. S. Decennial Census of Population and Housing, including data on the socioeconomic characteristics of the resident population and certain of their travel characteristics. This correlation was considered particularly important since the plan surveillance efforts had revealed certain discrepancies between the results of the 1970 U. S. Census and the results of the surveillance efforts. The U. S. Census reported a decline in the population growth of Milwaukee County. If the U. S. Census was correct, or approximately so, then the amount of travel generated by residents of Milwaukee County may be at variance with the simulation models developed in 1963. This would be so because the number of automobiles actually available to Milwaukee County residents in 1970 very nearly matched the original forecasts, and because traffic volume counts closely matched the original forecasts. Compounding these differences between the U. S. Census and the plan surveillance results was the fact that many thousands of residential structures had been demolished in the Milwaukee area under urban renewal and transportation development programs, together with private development programs, carried out since 1963, altering to a great degree the socioeconomic composition of a large part of the most highly urbanized area of the Region.

5. A growing trend was observed, particularly in informational and public hearings relating to the construction of new transportation facilities within the Region in accordance with the adopted regional transportation plan, on the part of both the private and public sectors to question the validity of mathematical simulation models founded in 1963 survey data and suggesting that the Commission conduct new surveys to validate such models. Importantly, in this respect a new inventory of travel would provide new transportation-related data for a second point in time, a reference point against which the assumptions underlying, as well as the results of, the mathematical models used in the preparation of the recommended transportation plan could be properly reevaluated.

6. Finally, it was considered desirable to expand the travel surveys to provide data not previously collected on weekend travel habits and patterns, and to place greater emphasis through the conduct of special origin-destination surveys on the important subject areas of potential transit trip generation and modal device.

In considering the need for a new survey of travel within the Region, it was also recognized that the use of, and therefore need for, the data from such a survey was a function of the basic principles and concepts underlying the comprehensive areawide transportation planning effort within the Region. That process is not directed exclusively at the development of long-range transportation system plans but is also directed at the development of a comprehensive regional development plan and at securing implementation of such a plan through appropriate short-range and operational, as well as long-range, planning efforts. To this end, the areawide planning agency must be able to meet in a timely and positive manner requests from federal, state, and local officials for information pertinent to the making of day-to-day land use and transportation facility development decisions. These data must provide public officials with a better understanding of the forces shaping the demand for land and supporting transportation facilities and services and the trends in these forces over time. Such an understanding requires complete land use and travel information presented in an orderly time series.

Thus, the reasons for conducting an entirely new travel inventory within the Region related not only to the need to conduct a vigorous and true test of the continued validity of the entire battery of mathematical travel simulation models used in the regional transportation planning effort, but in the need to provide valid travel data in support of short-range, as well as long-range, development planning, operations planning, and day-to-day decision-making concerning land use, as well as transportation system, development. Such data with respect to the other eight categories of inventory data were adequately provided by the Commission's ongoing land use-transportation planning program. To provide comparable travel data required the conduct of a totally new travel survey.

Analyses 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. Analyses of the information provided by

the inventories are required to provide an understanding of the existing situation, the future trends of change in that situation, and the factors influencing these trends. Particularly important among the analytical relationships established are those which link population and economic activity levels to the demand for land and transportation.

Future needs must be estimated from a sequence of interlocking forecasts founded in the results of the planning analyses. Economic activity and population forecasts set the general scale of future growth, which is, in turn, translated into future natural resource, land use, and travel demand. These future demands can then be scaled against the existing supply and plans formulated to meet deficiencies.

Although the preparation of forecasts is not planning, the preparation of all plans must begin with some kind of forecast. In any planning effort, forecasts are required of all future events and conditions which are outside the scope of the plan but which will affect plan design or implementation. For example, the future demand for land, transportation, and natural resources will depend primarily upon the size of the future population and the nature of future economic activity within the Region. Control of changes in population and economic activity levels lies largely outside the scope of governmental activity at the regional and local levels, outside the scope of the physical planning process, and certainly outside the scope of a land use-transportation plan. Future population and economic activity levels must, therefore, be forecast. These levels, in turn, determine the aggregate future land use demand. This is not to say, however, that governmental policies at the regional and local levels cannot influence the course of economic development and consequently of population growth. For example, the provision of efficient regional transportation and utility systems can contribute to favorable industrial location decisions even though the provision of such systems cannot directly generate economic growth.

The preparation of a transportation plan by itself, as has been the practice in some metropolitan areas, requires that the spatial distribution of future land use also be considered outside the scope of the plan and, therefore, as an element to be forecast. In the Commission's regional land use-transportation planning process, however, the spatial distribution of future land use is within the scope of the plan and, therefore, becomes a design rather than a forecast problem. Indeed, the preparation of a forecast of the spatial distribution of land use would be a contradiction of the basic principles and concepts underlying the regional land use-transportation study.

It is, nevertheless, necessary to forecast the future gross regional requirements for each of the major land use categories even though it is not necessary to forecast the spatial distribution of these land uses. This is necessary since the land use plans to be prepared must meet the forecast regional needs. These forecasts of gross land use requirements, along with the forecasts of future levels of population and employment on which they are based, as well as forecasts of income, automobile and truck availability, and public revenues are presented herein.

Two important considerations involved in the preparation of necessary forecasts are the forecast 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. This also permits associated forecasts to be more readily tempered by predictable changes in technology. Although it may be argued that the design year for land use development should be extended further into the future than that for transportation 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.

Surveillance activities conducted under the continuing regional land use-transportation planning program indicate that employment, motor vehicle availability, land use demand, and total travel demand expressed in terms of vehicle miles of travel were increasing within the Region approximately as forecast under the initial regional land use-transportation planning effort. Population growth, however, was occurring below that forecast, while transit utilization continued to decline at a rapid rate at variance with both the original forecast and plan recommendations. It was not clear from the surveillance activities whether the departure of population growth from the forecast was such as to affect only the timing and not the basic structure of the adopted land use and transportation plans. The decrease in the rate of population growth, however, coupled with the need to select a new plan design year, dictated that new basic forecasts of population and employment be prepared as a part of the plan reevaluation process. The year 2000 was selected as the new plan design year in order to continue to provide an approximately 20 to 25 year design period for major transportation facilities as required by federal regulations concerning transportation system planning and as generally dictated by good engineering practice.

Plan Design

Plan synthesis or design forms the heart of the planning process. The most well-conceived objectives; 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 to meet the objectives in light of forecast needs. The outputs of each of the three 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 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.

The task of designing two of the major components of an environment for over two million people is a most complex and difficult problem. Not only is each component in itself a major problem in terms of the sheer size of the system to be designed, but the pattern of interaction between the components is exceedingly complex and constantly changing. The land use pattern must enable people to live in close cooperation and yet freely pursue an enormous variety of interests. It must minimize conflicts between population growth and limited land and water resources; maintain an ecological balance of human, animal, and plant life; and avoid gross public health and welfare problems. The transportation system must not only serve and promote a desirable land use pattern, but do so without creating a demand which aggravates its own congestion. The combined land use-transportation system must be organized so that its construction and reconstruction does not constantly disrupt its performance.

The magnitude of such a design problem approaches an almost insoluble level of complexity, yet no substitute for intuition in plan design has so far been found, much less developed to a practical level. Means do exist, however, for reducing the gap between the necessary intuitive and integrative grasp of the problem and its growing magnitude, and these have been fully applied in the regional land use-transportation study. They center primarily on the application of systems engineering techniques to the quantitative test of both the land use and transportation system plans, as described below under the plan test and evaluation phase. Yet, the quantitative tests involved in these techniques, while powerful aids to the determination of the adequacy of the plan design, are of strictly limited usefulness in actual plan synthesis. Consequently, it is still necessary to develop both the land use and transportation plan by traditional graphic and analytical "cut and try" methods, then to quantitatively test the resulting design by application of simulation model techniques, and then make necessary adjustments in the design until a workable plan has been evolved.

The same mathematical techniques which make quantitative plan test possible may eventually make a more logical and efficient plan synthesis possible. Indeed, such application has been explored by the Commission with promising results for land use plan design application.[2] These techniques are not yet sufficiently developed, however, to be applied practically; and no efforts have been made to apply these techniques in the plan reevaluation.

In order to overcome the limitations of individual intuitive grasp of the design problem, maximum resort was made to team effort in the actual plan synthesis. The knowledge and experience of those state and local planners and engineers most familiar with selected geographic and functional areas was applied to the plan synthesis process through careful committee review and, where necessary, interchange of staff. Finally and most importantly, it should be noted that in both land use and transportation plan synthesis the Commission had at its disposal far more definitive information bearing on the problem than has ever before been available, and this fact alone made the traditional plan synthesis techniques applied far more powerful.

In the initial land use-transportation planning study, a concerted effort was made to prepare and present for public evaluation all of the alternatives that were practically available to the Region with respect to land use and transportation system development. Accordingly, three alternative land use plans were prepared—a satellite city, a corridor, and a controlled existing trend land use plan. In addition, a fourth alternative land use pattern, consisting of the land use pattern which might be expected to exist within the Region if existing land use development trends were assumed to continue to the design year of the plan, was prepared and evaluated. The alternative transportation system plans were then designed to serve each of these four alternative land use patterns.

Because the work conducted under the initial regional land use-transportation planning effort clearly demonstrated that the controlled existing trend plan was the best of the four alternative land use patterns considered; because the surveillance activities conducted since plan adoption revealed that population growth within the Region was less than originally forecast; because the new regional population growth forecast indicated that the total population in the Region for the plan design year 2000 would be less than that initially forecast for the plan design year 1990; and because the controlled existing trend plan was the most energy efficient of the plans previously considered, it was determined that in the land use plan reevaluation process, work efforts would be centered on revisions to the basic controlled existing trend plan that was selected as the adopted regional land use plan for the initial plan target year of 1990.

It was further determined that in the revisions of the controlled existing trend plan as initially prepared, two somewhat different development concepts would be explored, resulting in the preparation of two different alternative controlled existing trend land use plans for the year 2000. In the first such revised plan, the development concept emphasized was one of centralization with virtually all new urban development located in areas served by centralized public sanitary sewer and water supply facilities. Under this development concept, new urban development would occur in planned neighborhood development units. This development concept

[2] *SEWRPC Technical Report No. 3, A Mathematical Approach to Urban Design, January 1966; SEWRPC Technical Report No. 8, A Land Use Plan Design Model, Volume 1, Model Development, Volume 2, Model Test, and Volume 3, Final Report.*

is identical to that utilized in the preparation of the adopted regional land use plan for 1990. In the second such revised plan, the development concept placed less emphasis on centralization and on the planned neighborhood unit, and more emphasis on the permanent reliance on private individual onsite soil absorption sewage disposal systems (septic tanks) and private individual water supply wells. This second such plan was prepared at the specific request of local and state public officials and private individuals who envision the need even within the broad concept of a controlled existing trend land use plan to accommodate low density, unsewered urban development. In each case, the refinements in the plan were to reflect actual land use development that had occurred since adoption of the regional land use plan in 1966, the information and recommendations provided by other regional planning programs completed since 1966, and the new employment, population, and land use demand forecasts.

Studies conducted in the initial regional land use-transportation planning effort clearly established that a fixed rail rapid transit system would be inferior to the more flexible and economical bus rapid transit system, providing a lower level of service at a higher cost. Subsequent plan implementation studies conducted within the Region, and in particular the preparation of the Milwaukee area transit plan, revalidated this initial finding. In addition, recent studies conducted by the U. S. Department of Transportation[3] clearly indicated the superiority of a bus over rail rapid transit system with respect to cost, pollution emission, and energy consumption. For these reasons, the Commission staff recommended, and the Technical Coordinating and Advisory Committee endorsed, that no further consideration be given in the plan reevaluation to forms of rapid transit other than those utilizing the motor coach as the vehicle.

In considering this specific and very important determination, the Citizens Advisory Committee, while agreeing that no further consideration should be given to traditional "heavy" rail rapid transit, requested that flexibility be retained in the plan reevaluation process so that consideration could be given to the evaluation of "light" rail rapid transit systems in certain travel corridors. In response to this request, the study design was accordingly amended to provide for flexibility in the selection of a particular transit mode within specific travel corridors, with such selection to be based upon the analysis of travel demand characteristics within such corridors and an evaluation of the interrelationships among such corridors.

Except as noted above, a complete evaluation of the adopted regional transportation plan was deemed essential, with particularly careful attention being given to the balance to be effected between the transit and highway modes for person trip movements, to alternative means for providing the necessary transportation capacity in the major travel corridors of the Region, and to the "no build" alternative. This reevaluation would have to incorporate, and be based upon, the changes in travel demand and the factors affecting this demand revealed by the reinventory of travel within the Region conducted for the plan reevaluation effort.

Plan Test and Evaluation

If the plans developed in the design stage of the planning process are to be practical and workable, and thereby 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 was applied in four stages:[4]

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

3. 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.

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. Finally, such assignment provides a more precise basis for the application of standards so that the degree to which each alternative transportation plan meets the chosen objectives can be better determined.

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[3] *Evaluation of Rail Rapid Transit and Express Bus Service in the Urban Commuter Market, U. S. Department of Transportation, October 1973.*

[4] *The sequence listed here is that used in the initial regional transportation planning effort. Certain refinements and improvements in the traffic simulation model were made in preparation for the plan reevaluation. These interchange the position of the modal split and trip distribution stages of the model.*

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 were all applied, both in the initial land use-transportation study and in the plan reevaluation effort. In addition, the effects of each alternative land use plan on the natural resource base were both qualitatively and quantitatively evaluated and the financial feasibility of each alternative set of land use-transportation plans 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 original 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 was developed and 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.

Because the original means adopted for plan test and evaluation under the initial regional land use-transportation planning effort proved sound, no basic changes in this procedure with respect to the transportation plan were made under the plan reevaluation. As noted earlier, however, the land use simulation model was not reapplied in the plan reevaluation. The transportation simulation models utilized in the test and evaluation were recalibrated, revalidated, and somewhat refined based upon the new information base available from the reinventory of travel demand within the Region. This revalidation, recalibration, and refinement included a redelineation of the traffic analysis zones, a refinement of the arterial street and highway and transit networks, and certain refinements of submodels of the traffic simulation model to permit such desirable advances as the simulation of peak hourly, as well as average daily, traffic movements.

Plan Selection and Adoption

In the plan reevaluation process, two alternative regional land use patterns, together with a number of supporting transportation system plans, were developed. The general approach contemplated for the selection of a single set of land use and transportation plans from among these alternatives is to proceed through the use of the advisory committee structure and public informational meetings 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 appears to be the most practical and effective procedure 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. No major changes were effected in the plan selection and adoption procedure used in the plan evaluation from those used in the original plan preparation.

The land use and transportation system plans finally recommended for adoption were then staged for the years 1980, 1990, and 2000. This staging was designed to facilitate the development of priority improvement programs for transportation system development. The staging periods were selected to provide the necessary flexibility for state and local programming value providing for the better coordination of land use and transportation system development.

SUMMARY

This chapter has set forth the basic principles and concepts underlying the regional land use and transportation plan reevaluation process in southeastern Wisconsin. These principles and concepts were developed for the initial regional land use-transportation planning effort undertaken within the Region by the Commission in 1963. Experience since 1963 has proven the seven-step planning process developed by the Regional Planning Commission for integrated land use and transportation system planning, together with the five basic principles underlying that process, to be essentially sound. Proven particularly sound over time were the original decisions by the Commission to base the regional transportation plan on a regional land use plan, thus incorporating land use within the scope of the systems to be planned; to plan highway and transit systems together in a coordinated rather than competitive manner; and to recognize in both the land use and transportation planning efforts the existence of a limited natural resource base to which both urban and rural development must be properly adjusted to ensure a pleasant and habitable environment. Consequently, the same basic seven-step planning process used in the preparation of the adopted regional land use

and transportation plans was used in the plan reevaluation described herein.

Certain relatively minor modifications in that process were made, and the scope of certain work elements was expanded or contracted as experience indicated necessary. The more important changes in this respect included a broadening of the basic travel inventories to include intensive public transportation nonuser, as well as user, surveys; weekend, as well as weekday, travel surveys; the adoption of a single approach to plan design, test, and evaluation consisting of the traditional and simulation model methods used in the initial planning effort; a narrowing of the scope of the alternative land use plans to be considered in the plan design, evaluation, and selection process, together with a broadening of the supporting transportation alternatives; and certain technical refinements in the travel simulation models used in the planning work.

The most significant change between the original and the current land use-transportation planning effort involved the expansion of one of the critical work areas. The area relating to the adjustment of land use and transportation facility development to the natural resource base was significantly expanded to include the probable effects of regional land use and transportation system development upon ambient air quality and upon motor fuel utilization. Prior planning efforts only indirectly considered the effects of motor fuel consumption, and while investigating the level of air pollution produced by alternative transportation systems, did not relate that level to ambient air quality. This expansion of work effort was made possible by the Commission's initiation of a regional air quality maintenance planning program in 1974, a program designed to provide a regional air quality maintenance plan as an additional element of the evolving regional development plan.

Chapter III

THE ADOPTED 1990 REGIONAL LAND USE AND TRANSPORTATION PLANS

INTRODUCTION

As noted in Chapter I of this report, the Regional Planning Commission on December 1, 1966, after careful evaluation and intensive public review of the alternatives available, formally adopted a regional land use plan and a regional transportation plan for the seven-county Southeastern Wisconsin Region. These plans, together with the supporting data, analyses, forecasts, and objectives and standards, were fully documented in SEWRPC Planning Report No. 7. The Commission action was taken pursuant to Section 66.945(9) and (10) of the Wisconsin Statutes, and the plans were certified to the concerned federal and state agencies of government and to the constituent local units of government on March 31, 1967, for consideration, adoption, and implementation.

The regional land use and transportation plans had been transmitted to the Commission by the Technical Coordinating and Advisory Committee on Regional Land Use-Transportation Planning and the Intergovernmental Coordinating Committee on Regional Land Use-Transportation Planning with unanimous recommendations from both Committees that the plans be adopted as prepared. The Commission plan adoption action was preceded by a series of extensive public informational meetings and public hearings held throughout the Region. Intelligent and constructive public participation in the meetings and hearings was facilitated by the publication of the recommended plans and the alternatives thereto in two full color supplements to the Sunday, April 17, 1966, and the Friday, February 24, 1967, issues of the Milwaukee Journal, a newspaper reaching about 500,000 households within the Region.

A brief description of the adopted regional land use and transportation plans, together with federal, state, and local plan adoption and implementation actions to date, follows. A description of these plans, together with the status of their implementation, is important to this report because these plans constitute the object of the plan reevaluation process. The basic purpose of that process is to determine the continued validity of the adopted land use and transportation plans; identify any major shortcomings of, as well as significant progress in, plan implementation; and to thereby serve as a basis for the refinement and revision of the adopted regional land use and transportation plans and of the development objectives and standards on which these plans are based.

PLAN DESCRIPTION—LAND USE[1]

Eight specific land use development objectives were formulated under the initial regional land use-transportation planning effort, and three alternative land use plans were prepared and evaluated to meet these objectives through basically different land use development patterns: a corridor plan, a satellite city plan, and a controlled existing trend plan. In addition, a fourth alternative land use pattern was explored—that which could be expected to result from a continuation of existing development trends within the Region in the absence of any attempt to guide land use development in the public interest on an areawide basis.

After careful evaluation and public review of the various alternatives, the controlled existing trend alternative was adopted as the regional land use plan. This plan, which is shown on Map 3, seeks to encourage urban development to occur in concentric rings outward from the existing urban centers of the Region. Although the plan envisions a continued reliance on the urban land market as the major determinant of the location, density, and character of future land use development within the Region, it does propose to regulate the effect of this market on land use development in order to promote a more orderly and economic regional development pattern and avoid intensification of already severe areawide developmental and environmental problems.

Because the plan seeks to continue to rely basically on the urban land market in determining the location, density, and character of future land use development within the Region, the allocation of future land uses to each county within the Region under the adopted regional land use plan is such as to approximate the forecast population and employment levels for each county and, to the extent possible, the proposals contained in existing community development plans and zoning ordinances.

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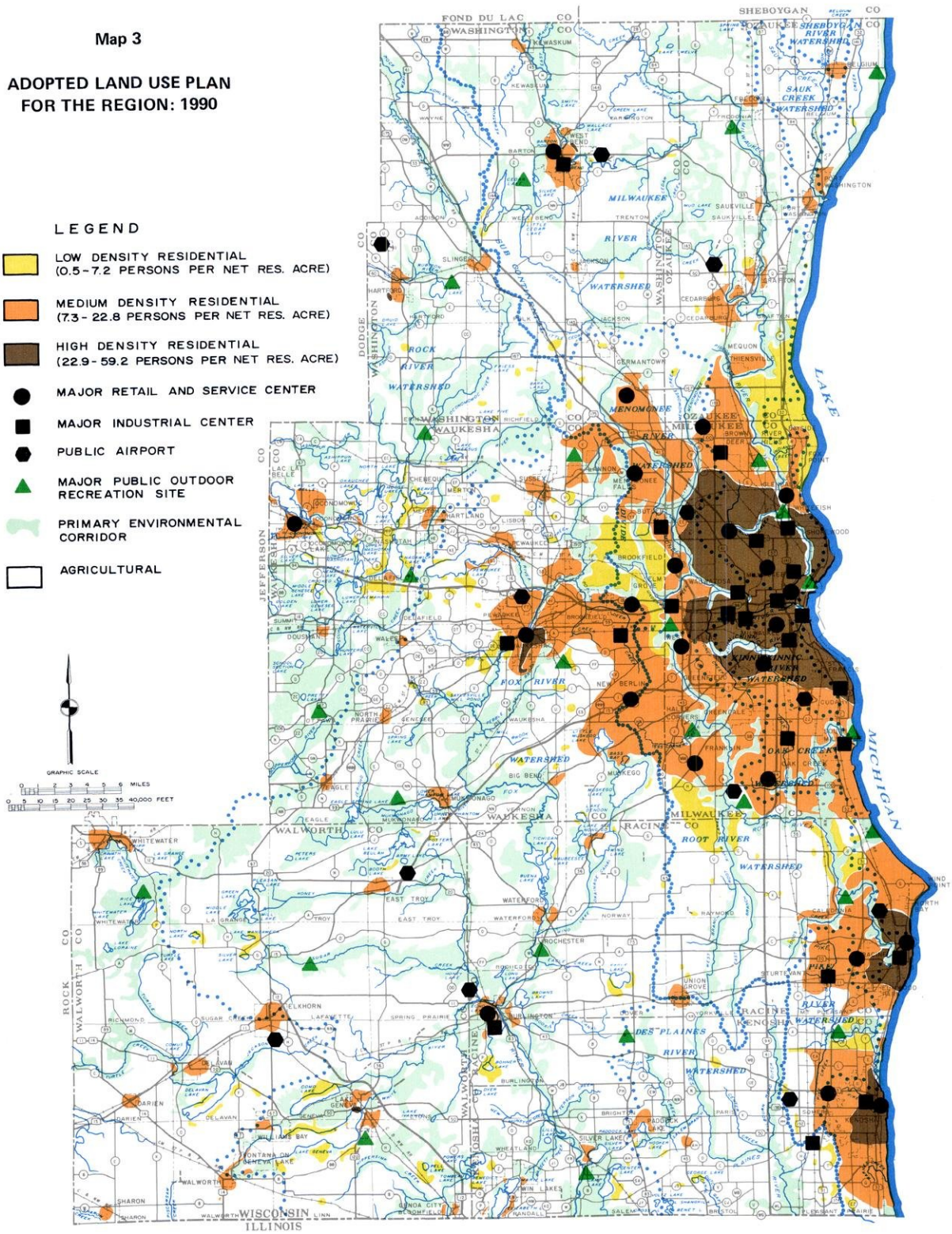
[1] *The land use plan description set forth in this section is based upon the initial regional land use plan, as adopted in 1966, as amended by the Fox River watershed plan adopted in 1970, the Milwaukee River watershed plan adopted in 1972, the comprehensive plan for the Kenosha Planning District adopted in 1972, and the regional sanitary sewerage system plan adopted in 1974.*

Map 3

ADOPTED LAND USE PLAN FOR THE REGION: 1990



The regional land use plan adopted by the Commission in 1966 placed heavy emphasis on the continued effect of the urban land market in determining location, intensity, and character of future development. In so doing, however, it sought to modify the effect of this market on regional development by attempting to guide new urban development into those areas of the Region most suitable for such development. Most importantly, the plan sought to prevent urban development from intruding into prime agricultural areas and into the primary environmental corridors of the Region. The latter encompass all of the lakes and streams and nearly all of the associated undeveloped shorelands and floodlands; the best remaining woodlands, wetlands, and wildlife habitat; and the best remaining potential park and open space sites within the Region, as well as the recharge areas for the deep aquifer underlying the Region.

Source: SEWRPC.

The adopted land use plan, however, recommends that existing development trends be altered in three significant ways in order to achieve a more healthful and attractive, as well as more efficient, regional settlement pattern.

First, the plan recommends that development trends be altered by encouraging intensive urban development to occur only in those areas of the Region which are covered by soils suitable for such development and which can be readily served by essential municipal facilities and services, including centralized public sanitary sewerage and water supply. The adopted land use plan thus seeks to place almost 75 percent of all new urban development within 20 miles of the central business district of the City of Milwaukee, and in this respect, was the most highly centralized of the four alternative regional land use patterns considered. The plan seeks to increase urban population densities by encouraging new residential development to occur primarily at medium densities, defined as development ranging from 3,500 to 10,000 persons per square mile. Implementation of the plan would thus more than double residential land use densities over those which would prevail under a continuation of existing development trends, and the overall densities of the developed urban areas of the Region would be held at about 4,350 persons per square mile by 1990. New residential development, however, would still consist primarily of single-family detached housing located in planned residential development units interspersed with townhouses and garden apartments. The adopted plan would require the conversion of approximately 200 square miles of land from rural to urban use within the Region to accommodate a population increase of about one million persons, or about one-half as much land as would be required under a continuation of existing development trends. The plan provides 23 major industrial centers, six of these being newly established, and 23 major commercial centers, 10 of these being newly established, all within the areas devoted or proposed to be devoted to urban development on the plan.

Second, the plan recommends that existing development trends be altered by protecting all of the remaining primary environmental corridors of the Region from intrusion by incompatible urban development. The preservation of the primary environmental corridors in essentially natural open use to form an integrated system of park and related open spaces within the Region is perhaps the singularly most important recommendation contained in the adopted land use plan. These corridors, while encompassing only 20 percent of the total area of the Region, encompass most of the lakes and streams and associated undeveloped shorelands and floodlands; most of the best remaining woodlands, wetlands, and wildlife habitat areas; the best remaining potential park and outdoor recreation sites; the best remaining sites of scenic, scientific, and historic value; together with the recharge areas of the deep groundwater aquifer underlying the Region. The preservation of these corridors as an integrated system of park and related open space areas is not only essential to the maintenance of the overall quality of the environment for life within the Region, but is essential to give form and structure to the regional settlement pattern. The plan provides 26 major regional parks as integral parts of the environmental corridors, 12 of these park sites being newly established.

Third, the plan recommends that existing development trends be altered by retaining in essentially rural use almost all of the remaining prime agricultural lands comprising most of the remaining highly productive farm lands and units in the Region. Protection and preservation of this prime agricultural land is recommended not only for economic reasons but also to assure the wholesomeness of the future regional environment and to contribute to the preservation of the unique cultural heritage of the Region, as well as of its natural beauty.

Although the adopted regional land use plan contains many other recommendations with respect to guiding land use development within the Region into a better settlement pattern, the three major recommendations summarized above are the most important. These, therefore, warrant particular attention in any surveillance of actual development in relation to the adopted plan and in any determination of the continued validity of that plan.

PLAN DESCRIPTION—TRANSPORTATION[2]

Seven specific transportation development objectives were formulated under the initial regional land use-transportation planning effort, and alternative transportation plans to serve and support the three basically different land use development patterns—the corridor plan, the satellite city plan, and the controlled existing trend plan—were prepared and evaluated to meet these objectives. The alternatives considered ranged from the "no build" alternative through various combinations of surface arterial, expressway, freeway, and transit alternatives in each major traffic corridor, emphasizing, however, a balanced approach with respect to both capacity and modal distribution. At the system level, a rail as well as bus rapid transit system was evaluated.

The regional transportation plan, as finally adopted, proposes a threefold approach to the resolution of the surface transportation problems of the Region. First, it recommends the completion of a fully integrated regional freeway system, consisting of 432[3] route miles of facility, located and designed to remove the heavy volumes of fast, through traffic from the surface arterial

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[2] *The transportation plan description set forth in this section is based upon the initial regional transportation plan, adopted in 1966, as amended by the Milwaukee County jurisdictional highway system plan adopted in 1970, the Milwaukee River watershed plan adopted in 1972, the Milwaukee area transit plan adopted in 1972, the Walworth County jurisdictional highway system plan adopted in 1973, and the Ozaukee County jurisdictional highway system plan adopted in 1974.*

[3] *As of August 1974.*

street and highway system. These freeway facilities are shown on Map 4. Second, it recommends the development of a regional rapid transit and modified rapid transit system, consisting of 107 route miles of line located and designed to supplement the transportation services provided by the highway system, to provide a high level of transit service to the urbanized areas of the Region, and to provide a viable alternative to the automobile as the primary means of urban transportation. These high-speed transit facilities and attendant terminal areas are shown on Map 5. Third, the plan recommends improvements and additions to the surface arterial street and highway system and to the ordinary mass transit system in order to properly relate the surface arterial street and highway and transit systems to the recommended freeway and rapid transit systems. Map scale limitations preclude the graphic display of these recommendations in this report. The arterial street and highway improvements recommended are, however, fully documented in the seven-county jurisdictional highway system plans prepared by the Commission under the continuing regional land use-transportation study. The transit improvements are fully documented in the Milwaukee Area Transit Plan report published by the Milwaukee County Expressway and Transportation Commission and in SEWRPC Community Assistance Planning Report No. 3, Racine Area Transit Development Program: 1975-1979.

The recommended transportation plan was intended to provide the minimal highway system required to meet the forecast travel demands within the Region at a reasonable level of service. As such, the adopted transportation plan did not propose to eliminate traffic congestion on the arterial street and highway system. Indeed, major links in that system were deliberately proposed to be continued to operate under relatively severe traffic congestion in order to encourage the use of transit in the corridors of heaviest travel demand.

The adopted transportation system plan as amended provided for the following major additions to the regional freeway system:

1. Extension of the Lake Freeway from the proposed high level bridge across the entrance of the Milwaukee Harbor southerly through Milwaukee, Racine, and Kenosha Counties to the Wisconsin-Illinois state line, connecting there with a freeway proposed by the State of Illinois.

2. Extension of the Stadium Freeway northerly to USH 141 in the vicinity of STH 57 in Ozaukee County.

3. Construction of a new east-west freeway in northern Milwaukee and Waukesha Counties, extending from the North-South Freeway (USH 141) westerly to the vicinity of the City of Oconomowoc, bypassing the City of Oconomowoc to the north, and connecting to USH 16 at the regional boundary.

4. Construction of a metropolitan Belt Freeway extending from the southerly extension of the Lake Freeway in southeastern Milwaukee County westerly through southern Milwaukee County and northerly through eastern Waukesha County to the Fond du Lac Freeway (USH 41) in Washington County.

5. Construction of a new freeway paralleling USH 45 from the Fond du Lac Freeway (USH 41) northerly to the vicinity of the City of West Bend, bypassing the City of West Bend to the west, and connecting to USH 45 north of the city.

6. The completion of the Rock Freeway (STH 15) southwesterly across Walworth County to the regional boundary.

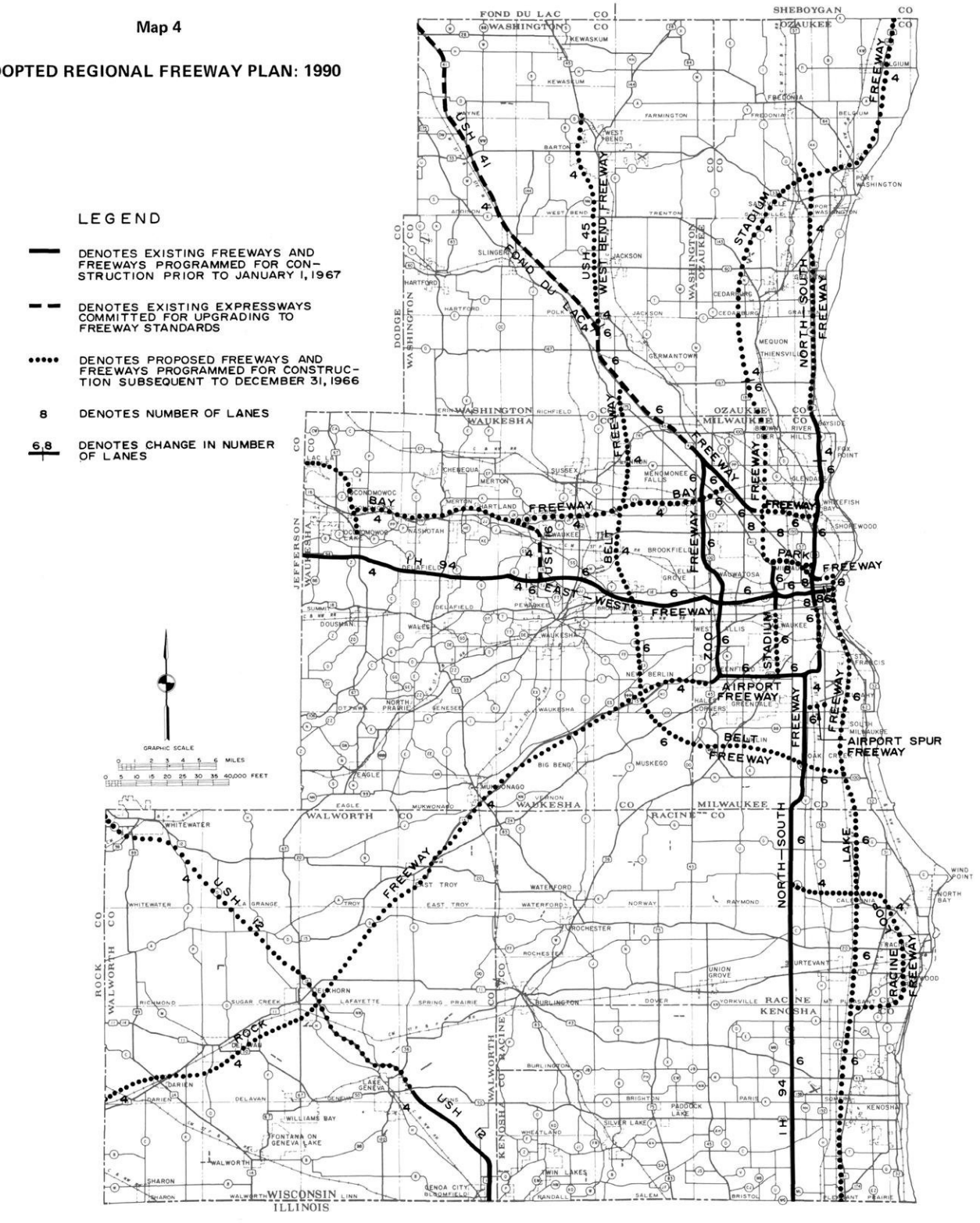
7. The completion of a spur freeway from IH 94 to General Mitchell Field, the air-carrier airport serving the Region.

As already noted, in addition to and complementing the recommended arterial street and highway facilities, the adopted regional transportation plan recommends the development of a modified rapid transit and rapid transit system. After careful consideration of the alternative of fixed guideway vehicles such as rail cars, motor coaches were selected as the vehicle to be used to provide all urban transit service within the Region. This selection was based upon several important advantages of the bus over any then practicable fixed guideway vehicle. Since buses have the unique capability of operating both over public streets and highways and over private rights-of-way, the same transit vehicle can operate in collection and distribution service, picking up and discharging passengers close to their places of residence, work, or recreation; in modified rapid transit service over uncongested portions of the existing and proposed freeway system; and in true rapid transit service over exclusive busways. By using buses, the proposed transit system could thus combine the high-speed and high-capacity characteristics of rail transit operations over exclusive fully grade separated rights-of-way with the adaptability of the motor coach for feeder, collection, and distribution service. The transit system proposed in the adopted regional transportation plan would not only greatly reduce transit travel times within the urbanized portions of the Region, but would actually make those travel times competitive with equivalent automobile travel times. In addition, the proposed system seeks to minimize one of the chief deterrents to mass transit utilization—the transfer.

The bus transit system recommended was also considered better adapted to cross-town and reverse commuter patterns than alternative fixed rail systems. Since the vehicles can leave the busways and freeways and operate over surface arterial streets and highways, potential major traffic generators can be served directly without the need to introduce line haul stops and thereby decrease line haul speeds. Finally, the bus rapid transit was considered more adaptable to the needs of the central city than

Map 4

ADOPTED REGIONAL FREEWAY PLAN: 1990

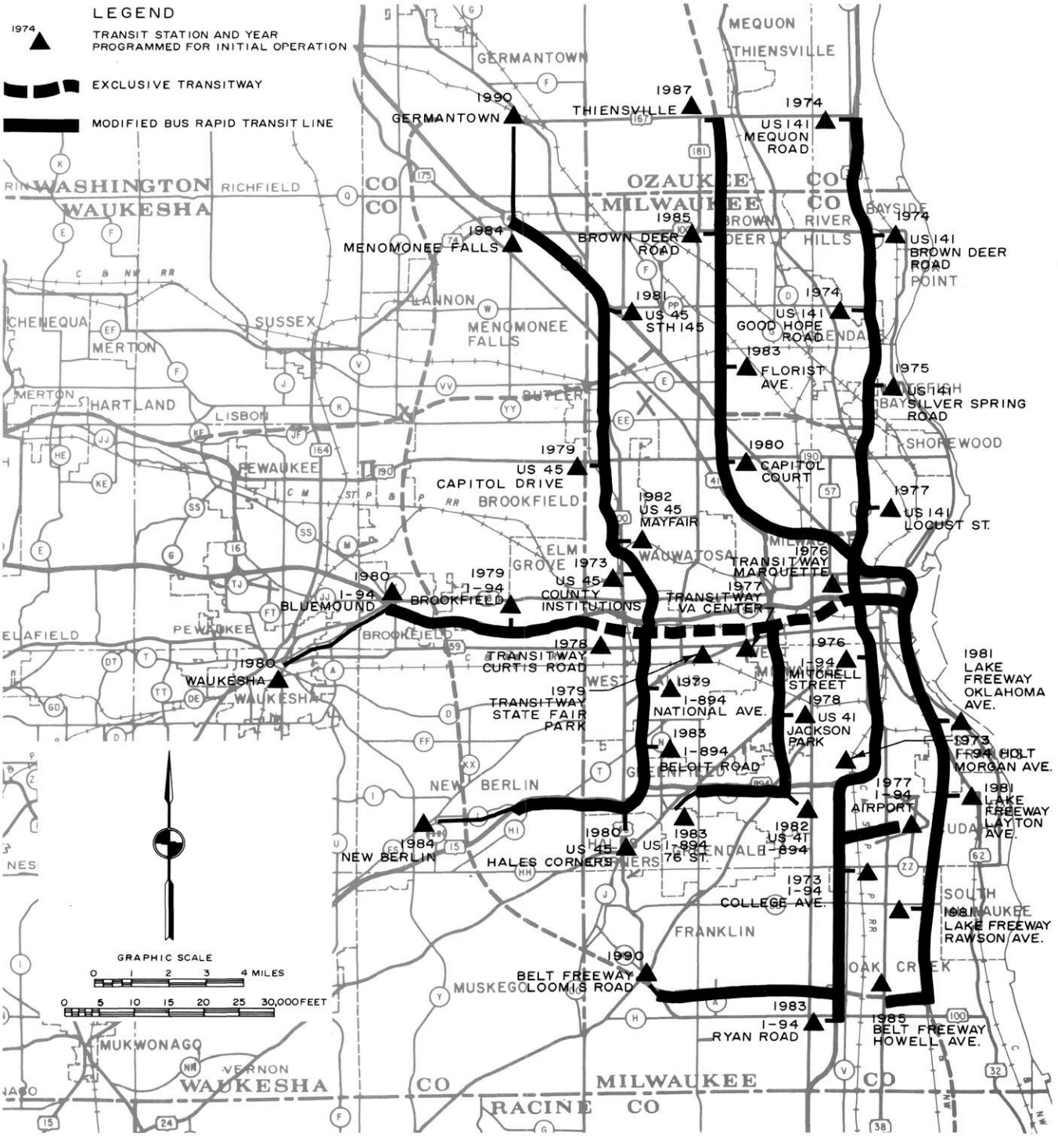


The freeway element of the adopted regional transportation plan, as amended through 1974, recommends the completion of a fully integrated regional freeway system consisting of 432 route miles of facility. Of this total, about 279 miles represent newly proposed freeways. The regional freeway system was designed to remove heavy volumes of fast, through traffic from the surface arterial street and highway system, as well as to facilitate the provision of a high level of transit service within the Region. Together with planned improvements on surface arterial streets and highways, the regional freeway system was intended to provide the minimal highway system required to meet the forecast travel demand within the Region at a reasonable level of service.

Source: SEWRPC.

Map 5

ADOPTED REGIONAL RAPID AND MODIFIED RAPID TRANSIT PLAN: 1990



The transit element of the adopted regional transportation plan, as amended through 1974, recommends the development of a regional rapid transit and modified rapid transit system consisting of about 107 route miles of line designed to supplement the transportation services provided by the highway system. This system, together with the supporting local transit system, was intended to provide a high level of transit service to the urbanized areas of the Region, as well as a viable alternative to the automobile as the primary means of urban transportation. Motor coaches were selected as the vehicle to provide all urban mass transportation in the Region. Since such vehicles have the unique capability of operating over both public streets and highways and private rights-of-way, they can operate in collection and distribution as well as in line haul service, and thus can pick up and discharge passengers close to their places of residence, work, shopping, or recreation, thereby minimizing one of the chief deterrents to mass transit utilization—the transfer. The transit system proposed in the regional transportation plan would not only greatly reduce transit travel times within the urbanized portions of the Region, but would actually make those travel times competitive with automobile travel times.

Source: SEWRPC.

a comparable rail system. In this respect, the recommended regional rapid transit system would provide service to a total of 39 terminal areas within the Region. Of these, 24, or 62 percent, would be located within the central City of Milwaukee and adjacent older suburbs. If the recommended land use and transportation plans were implemented, transit trip production within the Region was forecast to more than double over the 1963 levels.

PLAN ADOPTION

An essential action precedent to implementation of plans is the adoption of those plans by the governmental agencies having plan implementation authority. As of July 1, 1974, the regional surface transportation plan had been adopted by all seven of the constituent county boards, while the regional land use plan has been adopted by all but one of the seven constituent county boards, the single exception being the Ozaukee County Board. Both the regional land use plan and the regional transportation plan have been formally adopted by such important governmental agencies as the Wisconsin Department of Transportation, the Wisconsin Department of Natural Resources, the Wisconsin Board of Soil and Water Conservation Districts, the Milwaukee County Expressway and Transportation Commission, the Milwaukee County Park Commission, the Walworth and Waukesha County Park and Planning Commissions, the Kenosha County Park Commission, the Racine County Highway and Parks Committee, and the Walworth and Waukesha County Soil and Water Conservation Districts. In addition, as of July 1, 1974, 11 of the 28 cities, 12 of the 54 villages, and 14 of the 65 towns within the Region had also formally acted to adopt the plans, thus reinforcing the action of the seven constituent county boards, the concerned state agencies, and the special purpose areawide commissions and districts. The regional land use and transportation plans were also adopted or endorsed by certain federal agencies, including the U. S. Department of Transportation, Federal Highway Administration; the U. S. Department of the Interior, Bureau of Outdoor Recreation and Federal Water Pollution Control Administration (now the U. S. Environmental Protection Agency); the U. S. Department of Housing and Urban Development; and the U. S. Department of Agriculture, Soil Conservation Service.

The completion, adoption, and certification of the regional land use and transportation plans by the Regional Planning Commission, together with the widespread acceptance of the plans by the local, state, and federal units and agencies of government concerned with plan implementation, represented at the time a unique achievement in planning for the development of large urban regions of the United States. The adopted land use plan provided, for the first time in southeastern Wisconsin, a medium through which land use development could be guided and shaped in the public interest on an areawide basis through the coordinated, cooperative actions of all of the concerned units and agencies of government. The land use plan also provided the basic framework for the preparation of additional regional plan elements, such as sanitary sewerage and, importantly, transportation plan elements; for the preparation of additional subregional plan elements, such as comprehensive watershed and comprehensive urban planning district development plans; and for the preparation of detailed neighborhood unit development plans for certain communities within the Region. The adopted regional transportation plan provided a similar medium through which surface transportation system development would be guided and shaped in the public interest on a coordinated basis through the coordinated and cooperative actions of all of the units and agencies of government concerned.

It is important to note that other regional and subregional plan elements prepared subsequent to the regional land use and transportation plans, and based upon those plans, have also received widespread adoption by the concerned implementing federal, state, and local units of government. The jurisdictional highway system plan prepared by the Commission for Milwaukee County, for example, has been adopted or endorsed not only by the U. S. Department of Transportation, Federal Highway Administration; the Wisconsin Department of Transportation; the Milwaukee County Board; and the Milwaukee County Expressway and Transportation Commission, but also by 17 of the 19 municipalities within the county, including the City of Milwaukee.

PLAN IMPLEMENTATION

The changes in population, economic activity, community plans and zoning, land use development, transportation demand, and transportation system development which have occurred within the Region since the initial land use-transportation planning effort was undertaken in 1963 will be described in some detail in subsequent chapters of this report. Emphasis in these subsequent chapters, however, will be directed at describing the existing state of the Region and recent trends of change in that state as these may affect land use and transportation plan design. This chapter is intended to provide a more general description of land use and transportation system development within the Region as such development may have specifically contributed to, or detracted from the implementation of the adopted land use and transportation plans and the continued viability of those plans. The status of plan implementation as presented in this chapter will not include a discussion of the status of land use controls enacted by the local units of government in relation to the plan, but only actual physical development in relation to the plan. Such development must, of course, reflect the legal constraints imposed on development by the community plans and zoning ordinances and, therefore, implicitly indicates the status of those plans and zoning ordinances. The status of community plans and zoning ordinances with respect to the plan is, however, presented in Chapter VII of this report.

Before examining actual land use and transportation system development since regional plan adoption, a review of the basic factors determining the general scale as well as the spatial distribution of land use and

transportation system development within the Region is in order. Changes in economic activity and population levels determine the general scale of regional development by generating the demand for specific types of land uses and for transportation services, while the distribution of population and economic activity determines the spatial distribution of these land uses and transportation services. Preparation of the adopted 1990 regional land use and transportation plans was, therefore, preceeded by the preparation of forecasts of both economic activity and population levels to the year 1990, the design year of the plans. A brief review of recent changes in the size and composition of economic activity and population within the Region thus provides essential background information for any consideration of the status of plan implementation at the regional and county levels. Furthermore, the conformance or departure of the actual levels of economic activity and population from those originally forecast serve as important qualifiers in any evaluation of land use and transportation system development in the Region in relation to the adopted regional land use and transportation plans and of the continued viability of those plans.

The collection of information on the changing size, composition, and distribution of employment[4] within the Region carried out by the Commission under the continuing regional land use-transportation planning program indicates that growth in employment within the Region has generally conformed to the forecasts used in the preparation of the adopted 1990 regional land use and transportation plans. The economic activity information collected indicates that employment within the Region in 1972 totaled 748,800 persons, an increase of 117,900 persons, or 19 percent, over the 1963 employment level of 630,900 persons. This employment increase represents an average annual increment of 13,100 jobs, or 2 percent per year since 1963, the base year for the original land use and transportation plans. The 1972 regional employment level as forecast under the initial regional land use-transportation planning program totaled 728,600 persons. Thus, for the Region as a whole, the original employment forecast was within 3 percent of the actual 1972 employment level, indicating general conformance with the trend in actual regional employment growth. This growth in employment occurred in spite of the significant reduction in the rate of population growth, as described below, and reflects an increasing participation rate of the total population in the labor force. This increasing participation affects transportation demand, and explains, in part, why such measures of such demand as automobile availability, trip generation, and vehicle miles of travel are holding close to the original forecast levels despite a less than anticipated population growth (see Table 1 and Figure 6).

Data regarding 1972 employment levels by county, however, as shown in Table 1, indicate that the actual distribution of employment within the Region is somewhat at variance with the county forecasts used in the preparation of the adopted plans. Analyses of these data indicate that actual 1972 employment levels have increased substantially faster than forecast in the outlying counties of the Region, particularly Ozaukee, Walworth, Washington, and Waukesha Counties, and slightly faster in Racine County, while Kenosha and Milwaukee Counties showed a somewhat slower growth in employment than originally forecast. The differences between the actual and forecast 1972 employment levels by county range from less than 3 percent in Milwaukee County to more than 57 percent in Washington County. Current differences between the actual and forecast employment levels by county are consistent with the trend prevalent throughout the 1960s toward a decentralization of economic activity from the established urban areas

[4] *The measure of employment referred to herein is by place of work and, as such, represents jobs.*

Table 1

COMPARISON OF ACTUAL AND FORECAST EMPLOYMENT LEVELS IN THE REGION BY COUNTY: 1963 and 1972

County	Employment Levels			Difference Between Actual and Forecast 1972 Employment Levels	
	Actual 1963	Actual 1972	Forecast 1972	Number	Percent
Kenosha	41,400	40,600	50,700	- 10,100	- 19.9
Milwaukee	468,600	509,000	523,800	- 14,800	- 2.8
Ozaukee	10,700	19,200	12,400	6,800	54.8
Racine	52,200	63,500	61,500	2,000	3.2
Walworth	12,600	24,000	16,400	7,600	46.3
Washington	12,000	21,100	13,400	7,700	57.5
Waukesha	33,400	71,400	50,400	21,000	41.7
Region	630,900	748,800	728,600	20,200	2.8

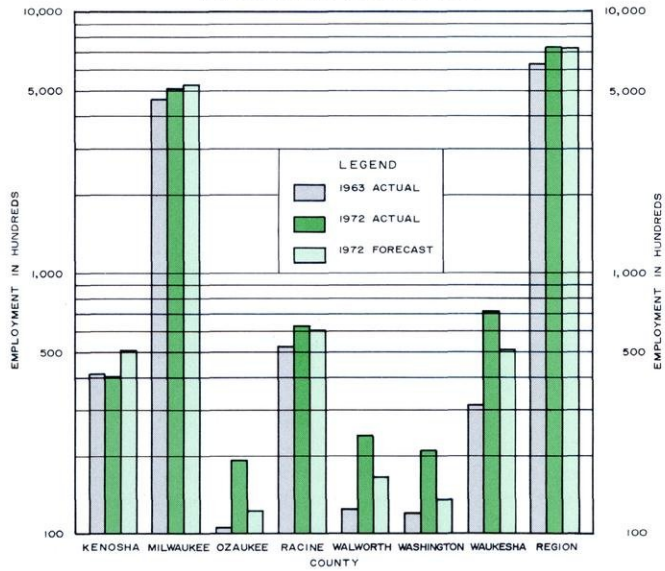
Source: Wisconsin Department of Industry, Labor, and Human Relations and SEWRPC.

to the suburban and rural areas of the Region.[5] This departure of actual employment levels as outlined herein within the counties of the Region from those employment levels forecast under the original land use transportation planning program will affect land use and transportation system development within the Region and thereby plan implementation.

[5] *A more detailed discussion of the decentralization of economic activities within the Region can be found in SEWRPC Technical Report No. 10, The Economy of Southeastern Wisconsin.*

Figure 6

COMPARISON OF ACTUAL AND FORECAST EMPLOYMENT LEVELS IN THE REGION BY COUNTY: 1963 and 1972



Source: Wisconsin Department of Industry, Labor, and Human Relations and SEWRPC.

The collection of information on the changing size, composition, and distribution of population within the Region carried out under the continuing regional land use-transportation planning program has indicated that growth of the total population within the Region has been somewhat less than that forecast and used in the preparation of the adopted 1990 regional land use and transportation plans. The population information collected indicates that the population of the Region stood at approximately 1,810,700[6] persons as of April 1972, an increase of 135,700 persons, or 8 percent, over the 1963 regional population of 1,675,000 persons. This population increase represents an average annual increase of approximately 15,000 persons, or about 1 percent per year since 1963, the base year of the original land use and transportation plans. The forecast of the 1972 regional population level on which the adopted plans were based as proposed in 1963 approximated 1,940,900 persons, 130,200 persons, or 7 percent, above the estimated and forecast 1972 population level (see Table 2 and Figure 7). This variance between the estimated and forecast population levels is principally the result of a reversal of past patterns of migration from a net regional in-migration during the 1950s to a net regional out-migration during the 1960s and to a substantial decline in the birthrates since the late 1960s.

Within the Region, the variances between the estimated and forecast 1972 population levels by county indicate that the population levels have increased substantially faster than forecast in Walworth and Washington Counties and to a lesser extent in Ozaukee County, while Kenosha, Milwaukee, Racine, and Waukesha Counties showed a somewhat slower growth than forecast under the original land use-transportation study. The differences between the estimated and forecast population levels ranged from less than 1 percent in Waukesha County to nearly 17 percent in Washington County.

[6] *The 1972 population levels referred to herein were derived from sample data collected as a part of the Commission's 1972 travel origin and destination survey.*

Table 2

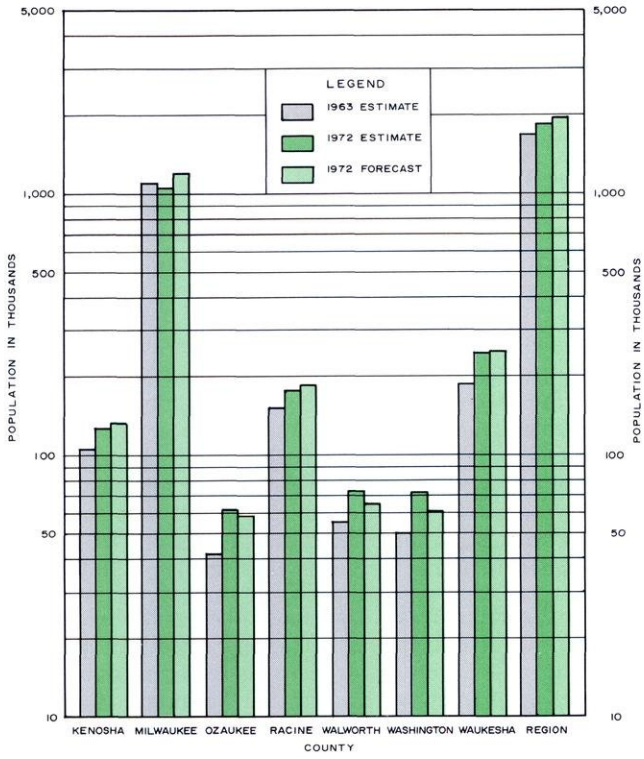
COMPARISON OF ESTIMATED AND FORECAST POPULATION LEVELS IN THE REGION BY COUNTY: 1963 and 1972

County	Population Levels			Difference Between Estimated and Forecast 1972 Population Levels	
	Estimated 1963	Estimated 1972	Forecast 1972	Number	Percent
Kenosha	106,700	122,700	131,300	- 8,600	- 6.5
Milwaukee	1,086,500	1,060,500	1,197,400	- 136,900	- 11.4
Ozaukee	41,600	61,400	58,100	3,300	5.7
Racine	150,700	177,100	181,900	- 4,800	- 2.6
Walworth	55,500	72,300	64,300	8,000	12.4
Washington	49,500	71,400	61,100	10,300	16.8
Waukesha	184,500	245,300	246,800	- 1,500	- 0.6
Region	1,675,000	1,810,700	1,940,900	- 130,200	- 6.7

Source: SEWRPC.

Figure 7

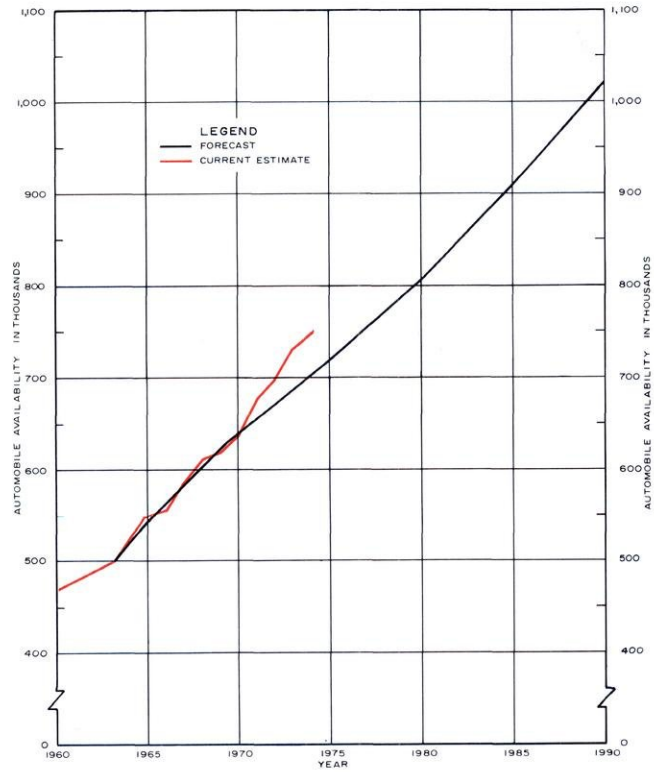
COMPARISON OF ESTIMATED AND FORECAST POPULATION LEVELS IN THE REGION BY COUNTY: 1963 and 1972



Source: SEWRPC.

Figure 8

AUTOMOBILE AVAILABILITY FORECAST AND CURRENT ESTIMATE FOR THE REGION 1960-1990



Source: SEWRPC.

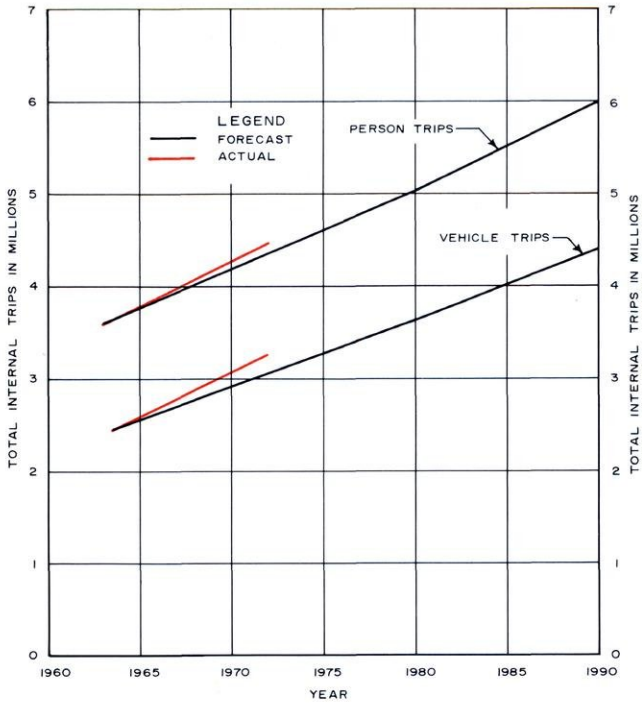
The departure of the estimated from the forecast population levels, as shown in Table 2, is generally consistent with the trend in economic activity, that is, a trend toward decentralization from the highly urbanized areas to the suburban and rural areas of the Region. This departure from the planned population levels and distribution will affect the spatial distribution and scale of urban growth and thereby will affect plan design and plan implementation. In order to assess the effects of changes in the size, composition, and distribution of economic activity and population on plan design and implementation, this report will examine these changes in greater depth in other chapters, and changes in the plan itself will be effected contingent upon this examination as warranted.

Other important forecasts prepared under the initial regional land use-transportation study, such as of automobile availability, person and vehicle trip generation, and vehicle miles of travel, have proven to be either substantially correct or somewhat too low, as shown in Figures 8, 9, and 10. The number of persons per automobile has departed from the forecasts somewhat, as has motor truck availability, as shown in Figures 11 and 12. The proportion of the total arterial street and highway system operating at or over congestion levels—that is, at a volume-to-capacity ratio greater than 1.1—decreased as forecast from 1963 to 1970, while major transportation plan recommendations were being implemented. After 1970, when freeway construction within the Region was virtually brought to a halt in the most intensely urbanized portion of the Region, the proportion of the system operating at congestion levels again began to increase, as shown in Figure 13. A similar departure from forecasts, also due at least in part to a lack of plan implementation, occurred in the area of transit ridership, as shown in Figure 14.

The conformance or departure of actual land use and transportation system development within the Region from the recommendations contained in the adopted regional land use and transportation plans must be viewed in light of the conformance or departure of the basic employment, population, and motor vehicle availability growth within the Region from the forecasts on which the plans were originally based. In this respect, it must be recognized that the overall scale of growth within the Region is established by basic socioeconomic forces which operate beyond the control or influence of at least state and local government in the United States. Departures from the employment, population, and automobile availability forecasts within subareas of the Region, however, may be due in part to changes in the basic urban land market influences on which

Figure 9

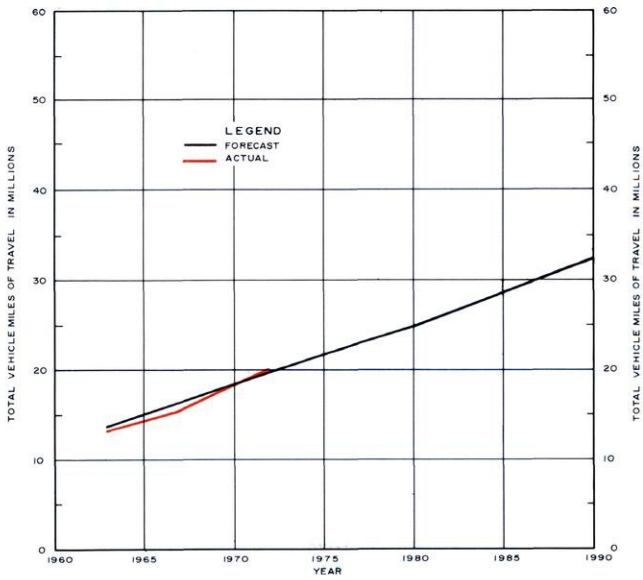
AVERAGE WEEKDAY INTERNAL PERSON AND VEHICLE TRIP FORECASTS AND CURRENT ESTIMATES FOR THE REGION: 1963-1990



Source: SEWRPC.

Figure 10

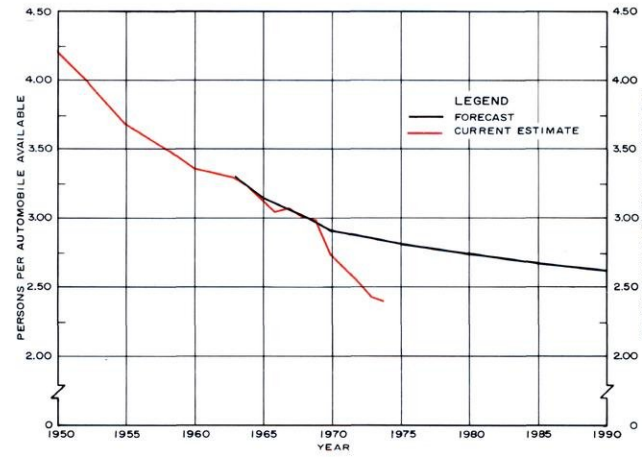
AVERAGE WEEKDAY VEHICLE MILES OF ARTERIAL TRAVEL FORECAST AND CURRENT ESTIMATE FOR THE REGION 1963-1990



Source: SEWRPC.

Figure 11

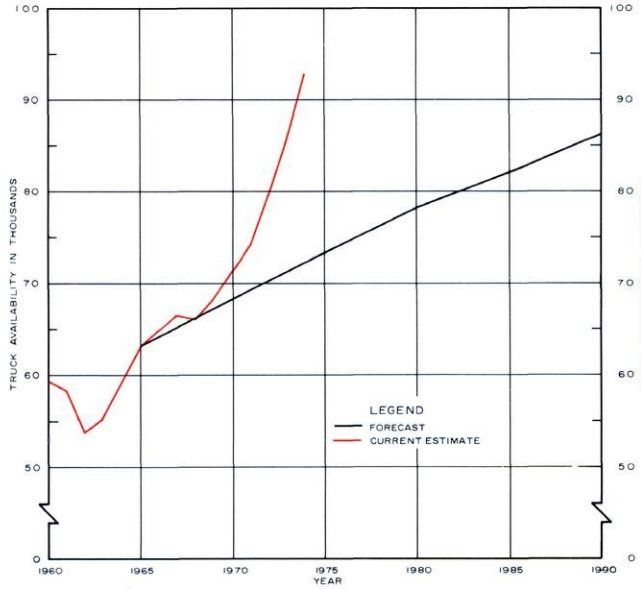
PERSONS PER AUTOMOBILE AVAILABLE FORECAST, AND CURRENT ESTIMATE FOR THE REGION 1950-1990



Source: SEWRPC.

Figure 12

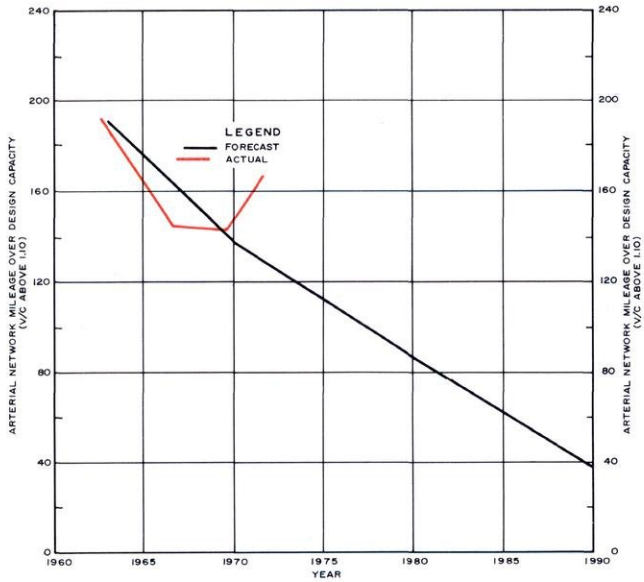
TRUCK AVAILABILITY FORECAST AND CURRENT ESTIMATE FOR THE REGION 1960-1990



Source: SEWRPC.

Figure 13

ARTERIAL STREET AND HIGHWAY SYSTEM MILES CONGESTED FORECAST AND CURRENT ESTIMATE FOR THE REGION: 1963-1990



Source: SEWRPC.

implementation of the adopted land use plan must rely for allocation of growth to each of the constituent counties, and in part to a lack of land use and transportation plan implementation per se. In this respect, failure to construct certain important surface transportation facilities or to provide certain essential municipal services, such as sanitary sewer service, in a timely manner in accordance with the plan may alter the spatial distribution of urban growth within the Region and within each county of the Region.

Status of Land Use Plan Implementation

The actual implementation of the adopted regional land use plan is an extremely difficult process to monitor, both because of the scope and complexity of the plan and because of the dynamic nature of regional development. The time elapsed since adoption of the regional land use plan—only eight years—is short in terms of measuring any ultimate success in guiding regional settlement into a more rational development pattern, especially in view of the great diffusion of decision making power concerning land use development which exists within the Region and the considerable lead times involved in major land use developments.

The adopted land use plan stressed the need to emphasize in plan implementation the most important and essential elements of the plan and those areas of action which will have the greatest impact on guiding and shaping development in accordance with the recommended plan. Because of the complexity of the plan implementation tasks, care must be taken not to become lost in plan implementation details, the effects of which may be meaningless at the regional scale. Consequently, the adopted land use plan advanced two criteria for use in determining which plan elements were truly regional in character or influence and, therefore, most important to the attainment of the regional development objectives:

1. The importance of the plan elements to the wise and judicious use of the underlying and sustaining natural resource base.

2. The importance of the plan elements to the functional relationships existing between land use and the demand for the major utility, recreational, and transportation facilities.

On the basis of these two criteria, it was concluded that the regional land use plan would be largely achieved if prime agricultural lands are preserved; if the primary environmental corridors of the Region are protected from incompatible urban development; if the major regional park and recreation areas are acquired for public use; if future residential development within the Region approximated the density and spatial distribution patterns recommended by the plan; and if the major activity centers—that is, the major shopping and industrial centers—approximate the general scale and spatial location recommended by the plan.

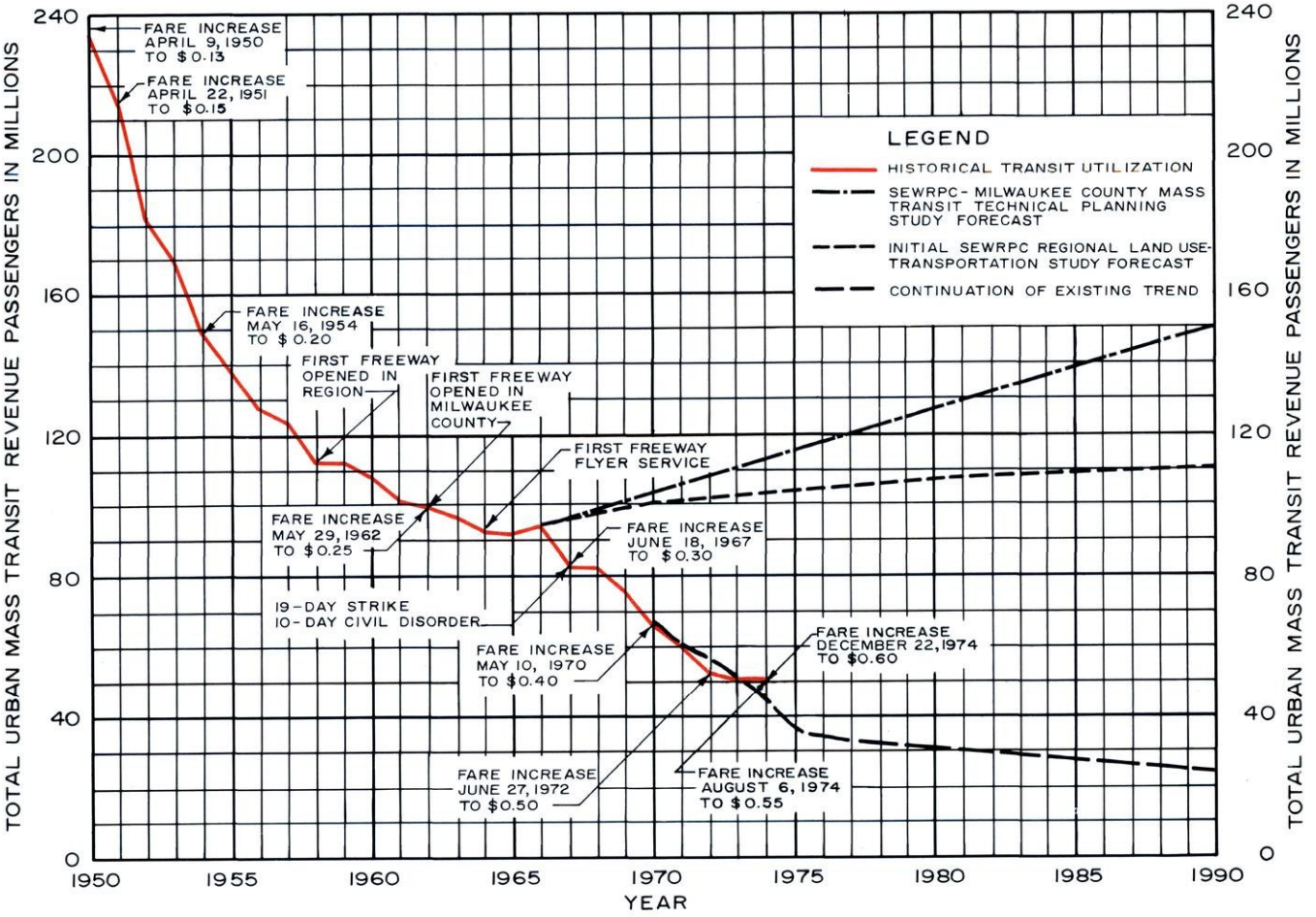
Primary Environmental Corridors: The adopted land use plan recommended that primary environmental corridors within the Region be protected from incompatible urban development. About 4,000 acres, or about 1 percent of the 341,500 acres in primary environmental corridors in the Region, have been lost as a result of urban development within the corridors in the time period 1963-1970. The greatest losses occurred in agricultural land and, to a lesser extent, in the wetland and woodland land use categories. Much of the loss in these natural resource elements was attributable to new residential development in the corridor which increased by almost 3,000 acres in the 1963-1970 time period. However, almost 129,500 acres, or 38 percent of the gross primary environmental corridors, have been permanently protected through public acquisition or long term lease for park, outdoor recreation, or open space areas, or through floodland zoning. Approximately 47,100 acres, or 14 percent of the gross corridors, have been at least temporarily preserved through conservancy zoning, private park or outdoor recreation ownership, public or private park zoning, or through exclusive agricultural or county estate zoning.

Prime Agricultural Land: The adopted land use plan recommends that prime agricultural land be preserved. The plan, however, also recommended that urban growth continue outward from existing urban centers. Losses of prime agricultural land were, therefore, anticipated, especially in those areas where prime agricultural lands are located in close proximity to expanding urban communities. While the 1970 stage of the recommended plan anticipated a loss of about 2,100 acres of prime agricultural lands, almost 8,400 acres of prime agricultural land were actually lost to urban development by 1970, with the majority of these lands being located in areas noncontiguous to existing urban centers.

see p. 42

Figure 14

HISTORICAL TREND AND ALTERNATIVE FORECASTS OF MASS TRANSIT UTILIZATION WITHIN THE REGION: 1950-1990



NOTE: Fare increases shown in this figure refer only to the Milwaukee and Suburban Transport Corporation operation and to the single ride adult cash fare. Adult ticket book fare increases occurred on April 22, 1951; December 2, 1951; December 26, 1954; June 29, 1958; January 11, 1959; May 29, 1962; June 18, 1967; August 17, 1969; January 23, 1970; May 10, 1970 July 27, 1972; August 6, 1974; and December 22, 1974, weekly pass fare increases occurred on April 9, 1950; April 22, 1951; December 2, 1951; November 1, 1953; May 16, 1954; June 29, 1958; December 17, 1961; June 18, 1967; May 25, 1969; August 17, 1969; May 10, 1970; and June 27, 1972; July 27, 1972; August 11, 1974; and December 22, 1974.

Source: SEWRPC.

Major Regional Park and Outdoor Recreation Areas: The adopted land use plan recommends that 26 major public outdoor recreation areas of regional size and significance be provided to serve the needs of the Region through 1990. Fourteen of these areas were already publicly owned at the time the plan was being prepared, were fully or partly developed and to varied extent in use, and were to be retained. Twelve were newly proposed areas requiring public land acquisition and development. Of these 12 sites, nine have been acquired in whole or in part for park purposes.[7] Moreover, the 1970 land use inventory revealed that no urban development had intruded into the three remaining park sites which would render them lost for future public purposes.

Residential Development: Between 1963 and 1970, residential land development occurred at a rate substantially higher than that proposed under the adopted regional land use plan. In this regard, the actual increment in residential land between 1963 and 1970, including residential land under development, was greater by about 16,100 acres than the planned increase of nearly 11,000 acres. This rapid development of residential land is directly related to the continued proliferation of low-density residential development patterns contrary to regional plan recommendations. Low-density residential land comprised more than 60 percent of all residential development in the rapidly urbanizing counties of Ozaukee, Washington, and Waukesha between 1963 and 1970, and about 50 percent of all residential devel-

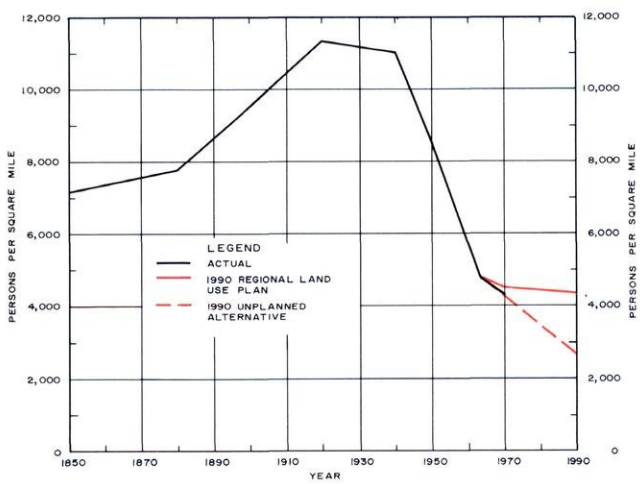
[7] *In addition to the nine sites which were fully or partially acquired for public purposes by 1972, approximately 192 acres of the Monches Park Site in the Town of Merton were acquired by the Waukesha County Park and Planning Commission in 1973. There has been no site development to date.*

opment in Racine County during this period. As a result, the existing (1970) amount of low-density residential land in southeastern Wisconsin is greater by about 8,400 acres than the amount proposed under the adopted land use plan, accounting for more than half of the overall variance between existing and proposed residential development in the Region in 1970. The abundance of low-density residential land developed between 1963 and 1970 is a major cause of the continued decline in the urban population of the Region during this time.

As indicated in Figure 15, the overall urban population density of the Region has decreased substantially over the past several decades, from about 11,400 persons per square mile in 1920 to about 4,800 persons per square mile in 1963. The adopted regional land use plan seeks to stabilize urban population densities by encouraging new residential development to occur primarily at medium densities. Nevertheless, the period from 1963 to 1970 saw a continuation of the trend toward lower urban densities, with the urban population density of the Region declining further to about 4,350 persons per square mile in 1970, somewhat lower than the density of 4,500 persons per square mile proposed under the 1970 stage of the adopted plan. It should be noted that, in addition to the continued proliferation of low-density residential development patterns between 1963 and 1970, the variation between the existing and planned urban population density is also due to the development of other types of urban land uses at a faster rate than anticipated under the plan, despite a dramatic reduction in the rate of population growth in the Region during this period. This continued decline in urban population density has particularly important implications for transportation system planning and development.

Figure 15

URBAN POPULATION DENSITY IN THE REGION ACTUAL 1850-1970, PLANNED 1990, AND UNPLANNED ALTERNATIVE 1990



Source: SEWRPC.

Although much of the residential land developed in southeastern Wisconsin between 1963 and 1970 is located in close proximity to existing urban development as recommended under the adopted plan, a substantial portion of all new residential development occurred in dispersed patterns in outlying areas of the Region to which the extension of public utilities is extremely costly if not totally unrealistic. In this respect, only about 40 percent of all land actually developed for residential purposes between 1963 and 1970 was served by public sanitary sewerage facilities. As could be expected, a large proportion—about 83 percent—of all residential land developed in Milwaukee County between 1963 and 1970 was provided with public sanitary sewer service. However, only about 31 percent of all residential land developed between 1963 and 1970 throughout the rest of the Region was served by public sanitary sewerage facilities at the time of development.

Major Retail and Service Centers: The adopted land use plan recommends that 23 major retail and service centers be provided to serve the needs of the Region through 1990. Thirteen of these centers existed when the plan was being prepared and were to be retained. Ten centers of at least 70 acres each were to be developed by 1990. Three of the 10 sites have actually been developed for commercial use as recommended in the plan; furthermore, five of the remaining sites have been reserved for future commercial use through local zoning since plan adoption. An additional major retail and service center has been developed at a site in the Village of Greendale not identified for such development in the adopted regional land use plan. This center, known as the Southridge Shopping Center, is located approximately three miles from the location recommended for such a center in the City of Franklin. The Greendale center has a service area that overlaps nearby retail and service centers and will, therefore, affect the future development of the proposed Franklin center.

Major Industrial Centers: The plan recommends that 23 major industrial centers be provided to serve the needs of the Region through 1990. Seventeen of these existed when the plan was being prepared and were to be retained. Six of these, each of which would be at least 640 acres in area, were to be newly developed by 1990. All of these six centers were reserved for future industrial development through local zoning, following plan adoption, and all six were under some stage of development by 1972.

Status of Transportation Plan Implementation

The adopted transportation plan indicated that regional plan implementation should focus on those surface transportation facilities having areawide significance; that is, on the major freeway facilities, the interconnected major arterial highways, and the rapid transit and modified rapid transit facilities which combine high-speed service with high passenger carrying ability.

Freeways: The regional transportation plan, as adopted and as amended by the subsequent adoption of county jurisdictional highway system plans, recommended the

development of about 279[8] miles of new freeway facilities within the Region by 1990. As indicated on Map 6 and in Table 3, all but about seven miles of the 279 miles of the proposed freeway were in various stages of implementation, with 63 miles actually open to traffic by September 1974. The Milwaukee County Expressway and Transportation Commission, on December 23, 1969, suspended all planning work for a 6.7 mile section of the proposed Bay Freeway between the Zoo Freeway and the North-South Freeway in Milwaukee County. This action was taken in response to the opposition to the freeway by the residents of the affected area during the series of informational meetings held in neighborhoods to be traversed by the proposed freeway. In suspending the implementation action on this proposed freeway, the Expressway and Transportation Commission requested the Regional Planning Commission to review and reevaluate the proposed freeway within the context of the adopted land use and transportation plans.

In addition to the specific action of Milwaukee County suspending all planning work on the proposed Bay Freeway as noted above, it is important to note that considerable delays have been occasioned in implementing other important components of the recommended regional freeway system, particularly in the Milwaukee metropolitan area. Plan implementation progress has been significantly slowed on the Lake Freeway in Milwaukee County, particularly that section necessary to close the proposed Milwaukee downtown freeway loop; the Park Freeway, both with respect to that section needed to complete the Milwaukee downtown loop and that section extending west from the North-South Freeway to the proposed extension of the Stadium Freeway; the Stadium Freeway, both south and north in Milwaukee and Ozaukee Counties; and, perhaps to a lesser extent, the Milwaukee metropolitan Belt Freeway.

There are several important contributing factors which have led to delays in implementing these recommended freeway plan elements. New federal requirements, particularly in the environmental protection area, have necessitated preparation of environmental impact and parkland taking statements with respect to each of these important freeway links, which statements, because of their complexity, require several years to prepare, evaluate, and approve. These new federal requirements have literally added years of lead time to the construction schedules, and have, consequently, occasioned considerable delays in meeting the plan implementation schedule. In addition, not insignificant opposition has arisen to each of these important metropolitan Milwaukee freeway links on the part of neighborhood groups and on the part of more broadly oriented pressure citizen groups representing diverse interests. In addition to specifically opposing construction of these freeway elements, these groups have served to ensure that each and every legal requirement for action is met, particularly with respect to environmental and parkland taking questions.

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[8] *As of August 1974.*

Despite these considerable delays in freeway plan implementation progress, however, the fact remains that the regional freeway and rapid transit systems, as recommended in the adopted regional transportation plan, remain the officially adopted position of the key implementing agencies involved, particularly the City of Milwaukee; the County Boards of the Counties of Ozaukee, Milwaukee, Washington, and Waukesha; the State Highway Commission of Wisconsin; and the Federal Highway Administration. Until these implementing agencies formally act to change the plan recommendations, therefore, it must be assumed that, in spite of the admittedly difficult circumstances encountered in achieving the initial plan implementation schedule, the plans themselves remain viable long-range intergovernmental policy for the future development of the Southeastern Wisconsin Region.

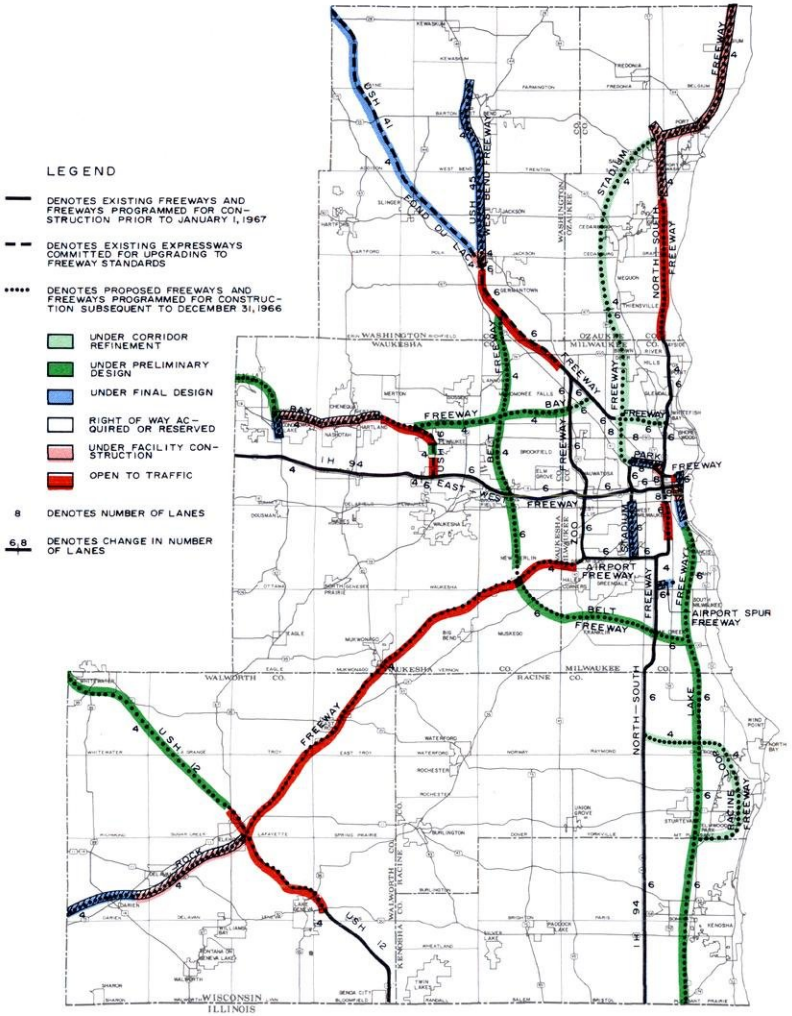
Standard Arterial Streets and Highways: In addition to the system of freeways recommended under the adopted regional transportation plan, as amended by the subsequent adoption of county jurisdictional highway system plans, the plan recommends the improvement for traffic capacity purposes of 696 miles of existing arterial streets and highways. As of September 1975, 182 miles of existing arterials, or 26 percent of the total recommended, had been fully or partially reconstructed in accordance with the plan (see Map 6 and Table 3). Similarly, 35 miles of new arterials, or 18 percent of the 197 miles of new arterials recommended, had been fully or partially constructed in accordance with the plan. The latter includes such important facilities as the Moorland-Pilgrim Road "gap closure" in eastern Waukesha County, the CTH A "bypass" facility around the City of Waukesha, the construction of CTH F south in Waukesha County, the CTH E connection to STH 32 to serve the newly developed University of Wisconsin-Parkside campus in Kenosha County, the extension of Good Hope Road across the Milwaukee River in Milwaukee County, and the construction of STH 36 in Racine County.

Mass Transit: The regional transportation plan, as adopted and as amended by the Milwaukee area transit plan, recommends the development of a rapid transit system operating over eight miles of exclusive busways and a modified rapid transit system operating over 107 miles of freeway facilities, serving 39 transit stations within the Milwaukee urbanized area by 1990. As indicated on Map 7, three stations have been established and are in operation. In addition, nine stations have been functioning on an interim basis until such time as the recommended permanent station location can be constructed and opened to service. In addition, modified rapid transit service was being provided over 43 miles of existing freeway. Implementation of an important element of the transit plan, the proposed busway in the east-west travel corridor, was suspended on May 8, 1973 when the Milwaukee County Board directed the Milwaukee County Expressway and Transportation Commission to explore additional alternatives to the busway, including reservation of exclusive buslanes on the East-West Freeway both in flow and contraflow directions, carpooling, and metered freeway access.

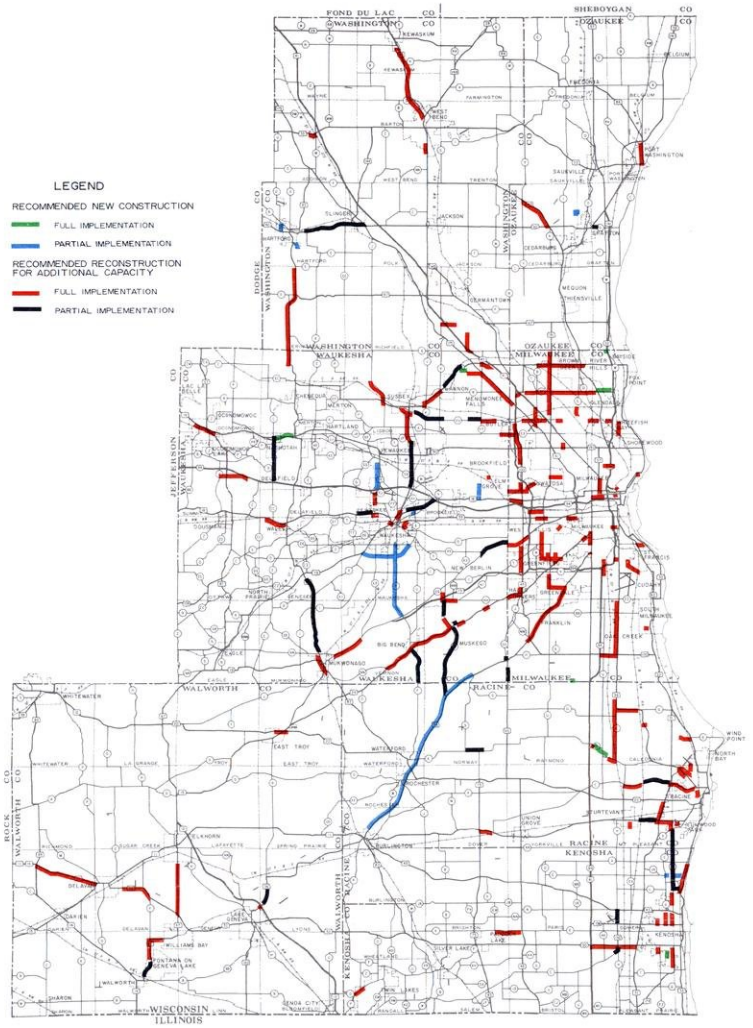
Map 6

REGIONAL FREEWAY AND STANDARD ARTERIAL STREET AND HIGHWAY PLAN IMPLEMENTATION PROGRESS

Freeway Implementation—1974



Standard Arterial Street and Highway Implementation—1975



Of the 279 miles of new freeway recommended in the adopted regional transportation plan as amended, all but about seven miles were in some stage of implementation by the end of 1974, with right-of-way having been reserved for 125 miles, and with 63 miles being actually open to traffic. The seven miles not under current implementation comprise the proposed Bay Freeway from the North-South Freeway to the Zoo Freeway in Milwaukee County. Of the 197 miles of new standard arterial streets and highways recommended in the plan, 35 miles, or 18 percent, have been partially or fully constructed, including such important facilities as the Moorland-Pilgrim Road connection in Waukesha County, the CTH A bypass facility around the City of Waukesha, and the CTH E connection to STH 32 in Kenosha County. Of the 696 miles of existing standard arterial streets and highways recommended in the plan to be reconstructed for additional capacity, 182 miles, or 26 percent, have been fully or partially constructed.

Source: Wisconsin Department of Transportation and SEWRPC.

Table 3

IMPLEMENTATION PROGRESS WITH RESPECT TO PLANNED FREEWAYS AND STANDARD ARTERIAL STREETS AND HIGHWAYS IN THE REGION

Planned Freeways

Planned Freeway Facility	Development Stage—1974 (Miles)						Right-of-Way Acquisition or Reservation[a] (Miles)
	Corridor Refinement	Preliminary Design	Final Design	Facility Construction	Open to Traffic	Total	
Lake	--	35.0	3.2	1.0	--	39.2	3.4
Stadium	26.2[f]	--	4.0	--	--	30.2[e]	4.0
North-South	--	--	--	17.2	13.3	30.5	30.5
Bay	6.7[b]	16.0	0.9	6.4	4.3	34.3	10.7
Park	--	--	2.4	1.6	0.4	4.4	4.4
East-West	--	--	--	0.2	0.9	1.1	1.1
Belt	--	34.4	--	--	--	34.4	--
Rock	--	--	4.6	9.8	33.7	48.1[c]	48.1
Loop	15.7	--	--	--	--	15.7	--
USH 12	--	16.7	--	--	10.0	26.7	10.0
West Bend	--	--	11.6	1.0	--	12.6	12.6
Airport Spur	--	--	1.4	--	--	1.4[d]	0.6
Total	48.6	102.1	28.1	37.2	62.6	278.6	125.4

Planned Standard Arterial Streets and Highways

County	New Construction—1975 (Miles)			Reconstruction for Additional Capacity—1975 (Miles)		
	Total	Implemented		Total	Implemented	
		Full	Partial		Full	Partial
Kenosha	27.0	0.5	1.4	73.4	13.8	5.2
Milwaukee	20.6	1.7	--	240.0	23.5	--
Ozaukee	6.2	--	0.2	65.2	4.6	0.4
Racine	56.2	1.5	12.6	94.4	20.1	7.6
Walworth	24.8	--	--	74.0	14.3	2.7
Washington	17.4	--	1.0	32.0	16.1	4.5
Waukesha	44.8	2.4	13.8	117.4	35.5	33.6
Region	197.0	6.1	29.0	696.4	127.9	54.0

[a] *Includes the right-of-way for facilities in final design, under construction, or open to traffic.*

[b] *On December 23, 1969, the Milwaukee County Expressway and Transportation Commission adopted a resolution terminating corridor refinement work on that portion of the Bay Freeway lying within Milwaukee County and extending from the Zoo Freeway to the North-South Freeway, totaling 6.7 miles, and requested the Regional Planning Commission to review and reevaluate the need for this facility and consider appropriate modifications to the regional transportation plan. The Regional Planning Commission has determined that this reevaluation should follow completion of the major inventory of travel initiated in 1972. The 6.7 mile section of the proposed Belt Freeway is shown in this table under "corridor refinement."*

[c] *Excludes 4.7 miles for the Janesville Spur removed from the proposed freeway system when the Walworth County jurisdictional highway system plan was adopted by the Commission on March 1, 1973, as an amendment to the adopted regional transportation plan.*

[d] *Includes 1.4 miles for the Airport Spur Freeway added to the proposed freeway system when the Milwaukee County jurisdictional highway system plan was adopted by the Commission on June 4, 1970, as an amendment to the adopted regional transportation plan.*

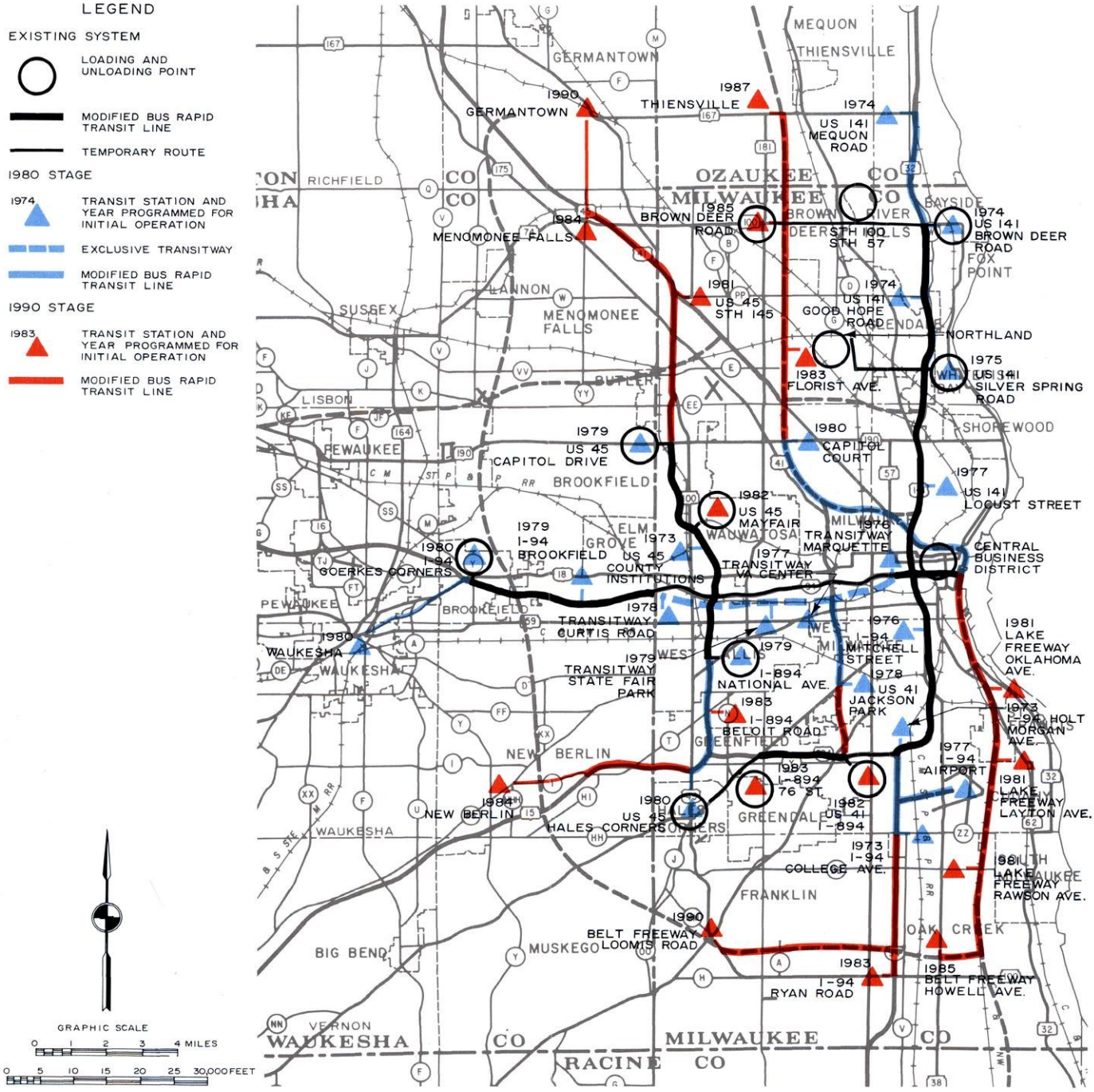
[e] *Excludes 9.1 miles for the Stadium North Freeway removed from the proposed freeway system when the Ozaukee County jurisdictional highway system plan was adopted by the Commission on March 7, 1974, as an amendment to the adopted regional transportation plan.*

[f] *All planning was halted for the approximately 26 miles of Stadium Freeway-North located in Milwaukee and Ozaukee Counties following an agreement between Governor Patrick J. Lucey, Milwaukee County Executive John L. Doyne, and City of Milwaukee Mayor Henry W. Maier entered into on July 28, 1971.*

Source: Wisconsin Department of Transportation and SEWRPC.

Map 7

REGIONAL RAPID AND MODIFIED RAPID TRANSIT PLAN IMPLEMENTATION PROGRESS: 1974



By the end of 1974, three of the 39 transit stations proposed for development in the adopted regional transportation plan had been established and placed into operation. In addition, nine stations have been established and are functioning on an interim basis until such time as the recommended permanent station location can be constructed and placed into service. By 1974, modified rapid transit service was being provided over 43 miles of existing freeway, representing a substantial step toward the establishment of such service over a total of 107 miles of existing and proposed freeway facilities as recommended in the adopted plan.

Source: SEWRPC.

SUMMARY

Actual land use and transportation system development within the Region indicates that such development has proceeded in remarkably close conformance with the plan recommendations, given the diffusion of decision-making authority with respect to such development. Actual development has occurred in general conformance with the forecasts of employment, automobile availability, trip generation, and vehicle miles of travel on which the adopted regional land use and transportation plans were based. In addition, growth and development has occurred in substantial conformance to the population forecasts on which the plans were based in six of the seven counties, the sole exception being Milwaukee County, which has not grown at the rate originally envisioned.

Land use development, with respect to the major activity centers, has proceeded in substantial conformance with the plan recommendations. Nine of 12 new major regional park sites proposed under the adopted plan have been totally or partially acquired for public use, with seven of these nine sites open for use in 1972. Three of 10 recommended new major retail and service centers have been developed and are in operation, with one new center developed at a location not recommended in the plan, and five of the remaining planned retail and service sites have been reserved for future development in local zoning ordinances. Furthermore, significant industrial development has occurred within each of the six new major industrial centers recommended under the adopted plan. Substantial progress has also been made in the preservation of the primary environmental corridors and of the prime agricultural lands within Southeastern Wisconsin. Urban land development, however, has encroached somewhat on these high-value resource areas of the Region.

With respect to surface transportation system development, progress in plan implementation has also been good. Of the nearly 279 miles of major freeway facilities recommended in the adopted regional transportation plan, all but about seven miles were in some stage of implementation, ranging from preliminary design through construction, with 63 miles being actually open to traffic. Similar major plan implementation has occurred in the recommended surface arterial improvements, including the construction of such important facilities as the Moorland-Pilgrim Road "gap closure" in eastern Waukesha County, the CTH A "bypass" around the City of Waukesha, the construction of CTH F south in Waukesha County, the extension of CTH E in Kenosha County, and the construction of STH 36 in Racine County.

With respect to transit development, three of the 39 transit stations recommended for development in the adopted regional transportation plan have been constructed and placed into service, and an additional nine stations are serving an interim function until such time as the recommended station locations can be constructed and placed into service. Transit system development has not, however, proceeded at a pace rapid enough to influence modal choice to a point where the historical decline in transit ridership would be arrested and transit ridership again increase.

An objective analysis of the progress in plan adoption and implementation indicates that plan implementation has been substantial and that, while some adjustments in the land use and transportation plans might be desirable in order to incorporate certain changes in land use development which have occurred since plan adoption, lack of plan implementation cannot be advanced as a reason for making changes in the adopted land use and transportation plans. Such changes must instead, therefore, be founded in more detailed analyses of the changes in public attitudes and opinions with respect to housing and land use development and transportation system utilization as revealed by the reinventories of these factors conducted under the continuing regional land use-transportation planning process.

Chapter IV

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 land use and transportation planning. Since such planning is intended to improve the environment in which people work and live, and since the primary purpose of all public facilities and services is to meet the needs of the resident population, an understanding of the size, composition, and spatial distribution of the population is essential to all planning for future development. The size, composition, and spatial distribution of the population is greatly influenced by the amount of growth and change in regional economic activity levels. Changes in population and economic activity greatly influence the types and amounts of public financial resources available. These available resources must be appraised to determine the public revenues and expenditures for public transportation facilities and services in light of the public revenues and expenditures utilized for other public facilities and services needed to serve the resident population.

This chapter presents a brief description and analysis of the historic and current economic, demographic, and public financial resource trends in the Region, particularly as they relate to land use and transportation planning. The presentation on the demographic base includes descriptions of the population size, spatial distribution, and characteristics, with emphasis on such factors as age, sex, and race composition, household size, educational attainment, income levels, and migration levels and patterns. The presentation on the economic base of the Region includes descriptions of the labor force size, distribution, and participation rates; work force size and distribution; the amount and distribution of economic activity, as measured by the number of available jobs; and the industrial structure of the regional economy, including the characteristics of the principal economic activities that support the regional population. The presentation of the regional public financial resource base includes descriptions of historic and current amounts and types of local governmental revenues and expenditures. Finally, the significant historic and current demographic, economic, and public financial resource characteristics and trends in the Region are summarized and their implications on past and future land use and transportation facility development discussed.

Although this chapter is based on the vast amount of current and historic data collected in the socioeconomic inventories conducted as part of the regional land use-transportation planning program, it is not intended to comprise an in-depth analysis of the socioeconomic base and structure of the Region. More detailed demographic and economic analyses were previously completed by the Commission as an integral part of the continuing regional land use-transportation study, and are presented in SEWRPC Technical Report Number 10, The Economy of Southeastern Wisconsin, and SEWRPC Technical Report Number 11, The Population of Southeastern Wisconsin. These reports analyze changes in the economic and demographic base and structure of the Region since 1963 in light of the findings of the 1970 Census of Population and Housing. As such, they serve to update and reevaluate the information contained in earlier Commission publications dealing with these subjects.[1]

The Commission's 1972 regional inventories of travel, which included several extensive surveys conducted primarily to collect data which identified travel habits and patterns in the Region, also obtained valuable "census type" socioeconomic information pertaining to the households in the Region. Socioeconomic data obtained as part of the Commission's 1963 and 1972 travel inventories pertained to total population; income; age, sex, and racial composition; household size; and migration patterns. These data indicate trends similar to those identified in the 1960-1970 decennial federal census period. Absolute levels and relative changes differ somewhat due to differences in the timing of the censuses and travel surveys and to the sampling variability inherent in all sample surveys.

The 1960 and 1970 decennial U. S. Censuses enumerated 100 percent of the population for basic demographic information and sampled 15 percent of the population to obtain other socioeconomic characteristics of the population. The regional travel inventories conducted by the Commission in 1963 and 1972 sampled about 3 percent of the regional population for basic travel habit and socioeconomic information, with the actual sample size varying among geographic areas in order to provide a statistically valid sample.

The third socioeconomic inventory, the financial resources data collection program, was initiated to provide data necessary to evaluate the fiscal feasibility of the alternative land use and transportation plans. As such, it serves to update the findings of the financial resource analysis conducted by the Commission as part of the initial regional land use and transportation planning effort. The primary data source used for this public financial resource analysis of historic and current sources of

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[1] *SEWRPC Planning Report Number 3, The Economy of Southeastern Wisconsin, and SEWRPC Planning Report Number 4, The Population of Southeastern Wisconsin, both published in June 1963.*

revenues and expenditures and of the current levels of indebtedness by the general units of government and school districts operating in the Region was the fiscal reports filed pursuant to state law with the Wisconsin Department of Revenue, Bureau of Municipal Audit, at the end of each fiscal year.

It should be emphasized, however, that due to the lack of a consistent accounting procedure by the various units of government, these data should be used to identify historic and current revenue and expenditure trends and not absolute monetary levels received or expended therein. Additional information utilized in the analysis of tax levy and taxable property valuation trends and transportation related expenditures and revenues was obtained from the Wisconsin Department of Revenue, Bureau of Property Taxation, and the Wisconsin Department of Transportation.

THE DEMOGRAPHIC BASE OF THE REGION

Population Size

The 1972 population of the Region is estimated at 1,810,700 persons, or about 1 percent of the total population of the nation and about 40 percent of the population of the state. The largest civil division in the Region—the City of Milwaukee—is the twelfth largest city in the nation.

The federal census first included what is now the Southeastern Wisconsin Region in the 1850 Census of Population. The population of the Region has increased every decade since then. In the late nineteenth and early twentieth centuries, the regional population increased rapidly at rates ranging from 33,000 to over 222,000 persons per decade. Much of the population growth in this early 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 of only about 62,000 persons during the Depression years, the population grew by about 173,000 persons from 1940 to 1950, by about 333,000 persons from 1950 to 1960—a historic peak, and by about 182,000 persons from 1960 to 1970.

The rate of population increase in the Region since 1850 has generally been higher than for the nation as a whole, with the exception of the 1860s, 1870s, 1930s, and 1960s. Similarly, when compared to the population growth rate of the State of Wisconsin, the Region experienced higher rates of growth than the state during seven of the twelve decades since 1850 (see Table 4 and Figure 16). By 1970, the Region population increased to 1,756,086 persons, an increase of 1,642,697 persons over 1850 and more than 14 times greater than the 1850 level. During this same period, the nation's population increased by slightly over seven times its 1850 level, while Wisconsin's population was over 13 times higher than its 1850 level.

Thus, the regional population increase during this 120-year period was nearly twice that of the national increase and only slightly greater than the state's. As a result of this more rapid growth, the regional share of the total national population increased from 0.49 percent in 1850 to 0.86 percent in 1970, and the regional

Table 4

POPULATION TRENDS IN THE UNITED STATES, WISCONSIN, AND THE REGION: SELECTED YEARS 1850-1972

	Region			Wisconsin			United States			Regional Population as a Percent of:	
		Change From Preceeding Time Period			Change From Preceeding Time Period			Change From Preceeding Time Period			
Year	Population	Absolute	Percent	Population	Absolute	Percent	Population	Absolute	Percent	Wisconsin	United States
1850	113,389	--	--	305,391	--	--	23,191,876	--	--	37.1	0.49
1860	190,409	77,020	67.9	775,881	470,498	154.1	31,443,321	8,251,445	35.6	24.5	0.60
1870	223,546	33,137	17.4	1,054,670	278,789	35.9	38,448,371	7,005,050	22.6	21.2	0.58
1880	277,119	53,573	24.0	1,315,497	260,827	24.4	50,155,783	11,707,412	30.1	21.2	0.55
1890	386,774	109,655	39.6	1,693,330	377,833	28.7	62,947,714	12,791,931	25.5	22.8	0.61
1900	501,808	115,034	29.7	2,069,042	375,712	22.2	75,994,575	13,046,861	20.7	24.2	0.66
1910	631,161	129,353	25.8	2,333,860	264,818	12.8	91,972,266	15,977,691	21.0	27.0	0.69
1920	783,681	152,520	24.2	2,632,067	298,207	12.8	105,710,620	13,738,354	14.9	29.8	0.74
1930	1,006,118	222,437	28.4	2,929,006	306,939	11.7	122,775,046	17,064,426	16.1	34.2	0.82
1940	1,067,699	61,581	6.1	3,137,587	198,581	6.8	131,669,587	8,894,541	7.2	34.0	0.81
1950	1,240,618	172,919	16.2	3,434,575	296,988	9.5	151,325,798	19,656,211	14.9	36.1	0.82
1960	1,573,620	333,002	26.8	3,952,771	518,196	15.1	179,323,175	27,997,377	18.5	39.8	0.88
1970	1,756,086	182,466	11.6	4,417,933	465,162	11.8	203,184,772	23,861,597	13.3	39.7	0.86
1963[a]	1,674,000	--	--	4,061,000	--	--	188,616,000	--	--	41.2	0.89
1972[a]	1,810,700	136,700	8.2	4,526,000	465,000	11.4	208,842,000	20,226,000	10.7	40.0	0.87

[a] *Population estimates for the United States and Wisconsin are as of July 1, while the population estimates for the Region are as of April 1.*

Source: U. S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census; and SEWRPC.

share of the state population increased from 37 percent in 1850 to nearly 40 percent in 1970. The regional share of the total national and state population in 1972 is estimated at 0.87 percent and 40 percent, respectively, indicating that the estimated regional population growth rate has continued to be higher than that of the state and the nation.

The rapid increase in regional population since 1940 has been primarily due to natural increase (see Table 5). The period after World War II was characterized by rapidly increasing birthrates and declining death rates. Crude birthrates within the Region increased from 15.5 births per 1,000 persons in 1940 to 26.2 births per 1,000 persons in 1960, while the death rate declined from 9.8 deaths per 1,000 persons to 9.1 deaths per 1,000 persons over the same period. The crude birthrate in the Region has decreased steadily since 1960, from 26.2 births per 1,000 persons in 1960 to 17.7 births per 1,000 persons in 1970. The estimated 1972 crude birthrate in the Region of 14 births per 1,000 persons is lower than that of both the state and the nation, and is lower than crude birthrates during the Depression years of the 1930s.

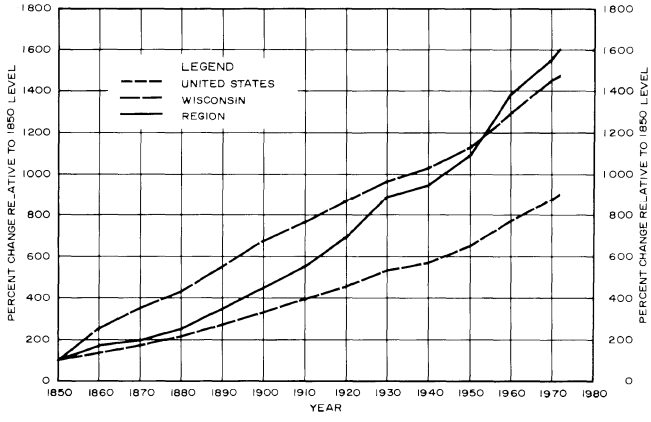
The death rate in the Region has decreased slowly but steadily from 1920 to 1970, from 12.7 deaths per 1,000 persons in 1920 to 8.8 in 1970. The estimated 1972 crude death rate in the Region of 8.7 deaths per 1,000 persons also is below that of both the state and nation, and is consistent with the trend established since 1920.

The rate of natural increase is simply the net balance of births minus deaths. Since the regional crude birthrate has declined much more rapidly since 1960 than the crude death rate, the rate of natural increase has also declined from 1960 to 1970 from a rate of 17.1 persons per 1,000 in 1960 to 8.9 persons per 1,000 in 1970. The estimated 1972 rate of natural increase in the Region of 5.3 persons per 1,000 is higher than that in the state, but lower than that in the nation.

From 1950 to 1960, only three of the fifteen largest standard metropolitan statistical areas of the nation experienced higher rates of growth than the Southeastern Wisconsin Region (see Figure 17). During this period, the regional population increased by 27 percent, from 1,240,618 persons to 1,573,620 persons. From 1960 to 1970, however, eight of the fifteen largest standard metropolitan statistical areas in the nation experienced higher rates of population growth than the regional increase of about 12 percent over the same

Figure 16

RELATIVE INCREASE IN POPULATION IN THE UNITED STATES, WISCONSIN, AND THE REGION 1850-1972



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

Table 5

CRUDE BIRTH AND DEATH RATES AND RATE OF NATURAL INCREASE FOR THE UNITED STATES, WISCONSIN, AND THE REGION: SELECTED YEARS 1920-1972

Area	Year						Change 1920-1970		Year		Change 1963-1972	
	1920	1930	1940	1950	1960	1970	Absolute	Percent	1963	1972	Absolute	Percent
United States												
Crude Birthrate	27.7	21.3	19.4	24.1	23.7	18.2	-9.5	-34.3	23.4	15.6	-7.8	-33.3
Crude Death Rate	13.0	11.3	10.8	9.6	9.5	9.4	-3.6	-27.7	9.5	9.4	-0.1	-1.0
Rate of Natural Increase	14.7	10.0	8.6	14.5	14.2	8.8	-5.9	-40.1	13.9	6.2	-7.7	-55.4
Wisconsin												
Crude Birthrate	22.4	19.2	17.4	24.2	25.2	17.5	-4.9	-21.9	22.6	14.3	-8.3	-36.7
Crude Death Rate	11.3	10.4	10.1	9.8	9.6	9.2	-2.1	-18.6	9.8	9.3	-0.5	-5.1
Rate of Natural Increase	11.1	8.8	7.3	14.4	15.6	8.3	-2.8	-25.2	12.8	5.0	-7.8	-60.9
Region												
Crude Birthrate	22.2	18.6	15.5	23.4	26.2	17.7	-4.5	-20.3	22.5	14.0	-8.5	-37.7
Crude Death Rate	12.7	10.0	9.8	9.6	9.1	8.8	-3.9	-30.7	9.0	8.8	-0.2	-2.2
Rate of Natural Increase	9.5	8.6	5.7	13.8	17.1	8.9	-0.6	-6.3	13.5	5.2	-8.3	-61.5

Source: United States Bureau of the Census; Wisconsin Department of Health, Bureau of Vital Statistics; and SEWRPC.

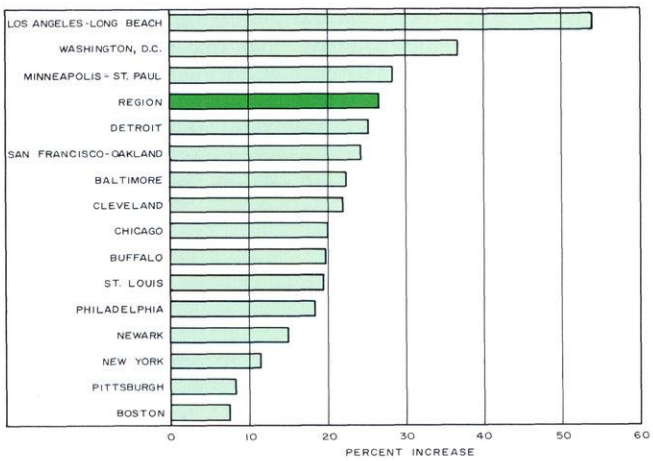
decade, from 1,573,620 persons in 1960 to 1,756,086 in 1970 (see Figure 18). These declining population growth rates in the Region since 1950 are similar to the trends exhibited in many of the large standard metropolitan statistical areas in the northeastern and midwestern United States. In contrast, many of the large standard metropolitan statistical areas located in the south and west sections of the nation have experienced increasing or stable population growth rates since 1950.

Migration has also been a significant factor in regional population growth. In the decade from 1950 to 1960 there was an increase in the regional population due to net in-migration—excess of in-migrants over out-migrants—of over 108,000 persons (see Table 6). From 1960 to 1970, however, the Region experienced a net out-migration of over 20,000 persons. Similarly, from 1963 to 1972 it is estimated that the Region experienced a net out-migration of over 31,000 persons.

The combined effect of these two primary components of population growth—natural increase and migration—has been to increase the regional population by over 333,000 persons from 1950 to 1960 and by over 182,000 persons from 1960 to 1970. During the 1960s natural increase accounted for an increase of over 224,000 persons, or 67 percent of the total regional population growth, while net migration accounted for the remainder of the regional population growth from 1950 to 1960—over 108,000 persons, or 33 percent. From 1960 to 1970, however, the population increase in the Region was entirely accounted for by a natural increase of about

Figure 17

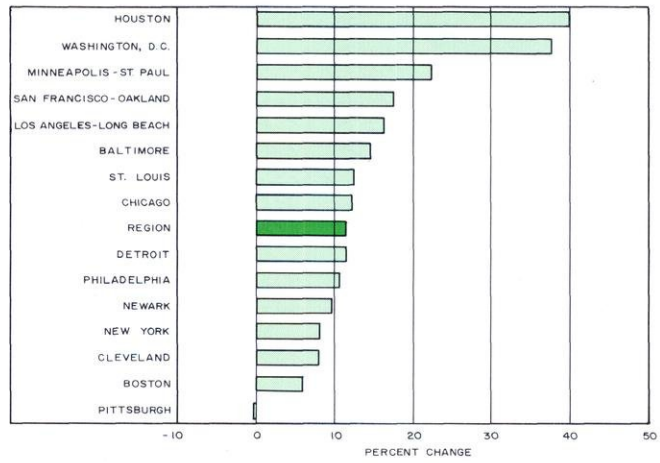
PERCENT INCREASE OF POPULATION IN THE 15 LARGEST STANDARD METROPOLITAN STATISTICAL AREAS IN THE UNITED STATES AND IN THE REGION 1950-1960



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

Figure 18

PERCENT INCREASE OF POPULATION IN THE 15 LARGEST STANDARD METROPOLITAN STATISTICAL AREAS IN THE UNITED STATES AND IN THE REGION 1960-1970



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

Table 6

NATURAL INCREASE AND NET MIGRATION IN THE REGION BY COUNTY: 1950-1972

County	Natural Increase				Net Migration[a]			
	1950 - 1960	1960 - 1970	1950 - 1970	1963 - 1972	1950 - 1960	1960 - 1970	1950 - 1970	1963 - 1972
Kenosha	13,932	15,166	29,098	12,484	11,445	2,136	13,581	3,542
Milwaukee	150,141	122,489	272,630	98,898	14,859	- 104,287	- 89,428	- 124,690
Ozaukee	5,924	6,072	11,996	5,509	9,156	9,948	19,104	14,364
Racine	21,472	20,481	41,953	17,591	10,724	8,576	19,300	8,916
Walworth	5,732	4,685	10,417	3,654	5,052	6,391	11,443	13,144
Washington	7,501	8,136	15,637	7,400	4,716	9,584	14,300	14,478
Waukesha	19,746	25,743	45,489	22,208	52,602	47,346	99,948	38,947
Region	224,448	202,772	427-220	167,744	108,554	- 20,306	88,248	- 31,299

[a] *Net migration is defined to include the excess of in-migrants over out-migrants.*

Source: United States Vital Statistics 1960; Wisconsin State Board of Health; U. S. Bureau of the Census; and SEWRPC.

203,000 persons, which more than offset the net out-migration of over 20,000 persons over this same 10-year period. Similarly, the estimated regional population increase of more than 136,000 persons from 1963 to 1972 was entirely accounted for by a natural increase of about 168,000 persons, which more than offset the estimated net out-migration of over 31,000 persons over the same nine-year period.

This relationship between natural increase and net migration has varied widely with respect to individual counties in the Region. From 1950 to 1960, Ozaukee, Washington, and Waukesha Counties each experienced more growth from net in-migration than from natural increase, while Kenosha, Milwaukee, Racine, and Walworth Counties experienced more growth from natural increase than from net in-migration. The relationship between natural increase and net migration observed during the 1950s remained the same from 1960 to 1970 in each county except Walworth, which, in contrast to its 1950 to 1960 trend, experienced more population increase from net in-migration than from natural increase. Milwaukee County was the only county in the Region to experience a net out-migration of persons from 1960 to 1970. The magnitude of this out-migration was substantial enough to result in a net regional out-migration of over 20,000 persons over this 10-year period. Similarly, Milwaukee County was estimated to be the only county to experience net out-migration from 1963 to 1972, resulting in an estimated net regional out-migration of over 31,000 persons during this period.

Patterns and trends in both population growth components—net migration and natural increase—within the Region generally resemble those in the other large urbanizing regions of the United States. Viewed within the context of a larger historical record, these current patterns and trends, both nationally and regionally, appear to signal the imminent completion of two long-term demographic phenomena. The first is the high natural population growth rate which marked the post-World War II period. The second is the massive rural to urban migration which occurred over a long period of time and contributed to the high concentration of the U. S. population in its metropolitan regions.

In the 1950s, the metropolitan areas of the United States, including the three metropolitan areas within the Region, experienced unprecedented population increases. Nationally, high rates of in-migration coupled with high rates of natural increase came to be the expected trend in metropolitan areas. Some evidence now exists that nationally this trend may be reversing, at least in the short run. Migration trends have been reversed in many of the large older metropolitan areas of the United States from high rates of in-migration during the 1950s to high rates of out-migration during the 1960s. This reversal has also occurred within the Region, particularly within Milwaukee County. Moreoever, birthrates nationally and within the Region have reached the lowest levels since the 1930s. These new trends may be only short term, but in any case they will have long-lasting effects on the future growth and development of the Region.

Although the character of the new growth trends in the United States will probably not be fully discernible until additional census data become available in 1980, the current demographic analyses indicate that the very high metropolitan growth rates of the 1950 to 1960 decade will probably be replaced by more modest growth rates approximating those of the 1940 to 1950 decade. There is, however, no incontrovertable evidence that population growth rates peaked for all time in the 1950s or that metropolitan concentration peaked for all time in the 1960s, never to reoccur.

In earlier phases of the rural-urban transition, relocation of persons both nationally and regionally was due principally to increasing job opportunities in the urban areas and to the increasing economic dominance of large farms in the agricultural industry, and to a lesser extent to the increased mechanization of farming processes. Since the 1950s, however, this rural migration pool has diminished and is no longer a major migration force.

Population movements between metropolitan areas account for some migration observed between states during the 1960s, especially from the mature, industrialized states to the now developing southern and western states. Contributing to this movement are such factors as the out-migration of industry from the mature manufacturing centers of the nation to the now developing southern and southeastern United States; increasing job opportunities in the southern states; retirement to warmer climates and to states with favorable tax treatment of estates and inheritance; and, to a lesser extent, to the interstate sale of land for future second home developments.

The effects on metropolitan population movement of the first two factors noted above may be mitigated somewhat by recently enacted statewide tax changes affecting the state's manufacturing industries. The major thrust of these tax changes is elimination of property taxes on manufacturing machinery and equipment beginning in 1974; the eventual elimination of inventory taxes by 1978; elimination of the sales tax on pollution control equipment; and the granting of tax credits on fuel and electricity used in manufacturing. These tax changes, should they prove to be long-lived, could result in additional statewide industrial (manufacturing) development, particularly in the Southeastern Wisconsin Region, in the form of plant expansions and new plant construction, resulting in new jobs.

Consideration of the population growth and rural-urban transitions briefly presented here provides some insights which should be considered in any analysis of population growth within the Region. Absolute and percentage figures presented here indicate the decline in regional population growth rates, although not in the rates of population redistribution within the Region. The change in migratory movement combined with declining birthrates has greatly reduced the previously high rates of metropolitan growth and urbanization.

The change in direction of regional migration from substantial in-migration in the 1950s to a net out-migration in the 1960s, and the declining birthrates within the Region, indicate a declining rate of growth at least in the short run. These declining rates of growth will have long-term effects on overall regional development, and will necessitate a reevaluation of the forecasts underlying the adopted plans and the preparation of new forecasts in light of these changes.

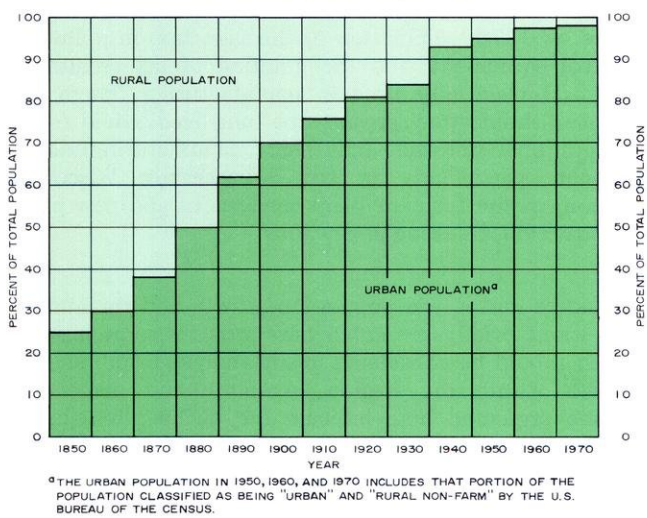
Population Distribution

The total number of inhabitants and their spatial distribution are important factors to be considered in any land use-transportation planning effort. The Southeastern Wisconsin Region, like 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,[2] while by 1900 this relationship had nearly reversed to 30 percent rural and 70 percent urban. By 1960, almost 98 percent of the regional population was urban and only about 2 percent was rural. The rural-urban distribution of the regional population did not change significantly in the 1960s. In 1970, over 98 percent of the regional population was urban (nonfarm), while less than 2 percent was rural (farm). The entire 120-year rural-urban population distribution change is shown graphically in Figure 19. This trend toward continuing urbanization has been one of the most significant distributional changes taking place within the Region, state, and nation since the mid-1800s.

[2] *The urban population is defined as all persons living in incorporated or unincorporated places of 2,500 persons or more, and all persons living in other incorporated or unincorporated territories included within "urbanized areas" as defined by the U. S. Bureau of the Census.*

Figure 19

DISTRIBUTION OF URBAN AND RURAL POPULATION IN THE REGION: 1850-1970



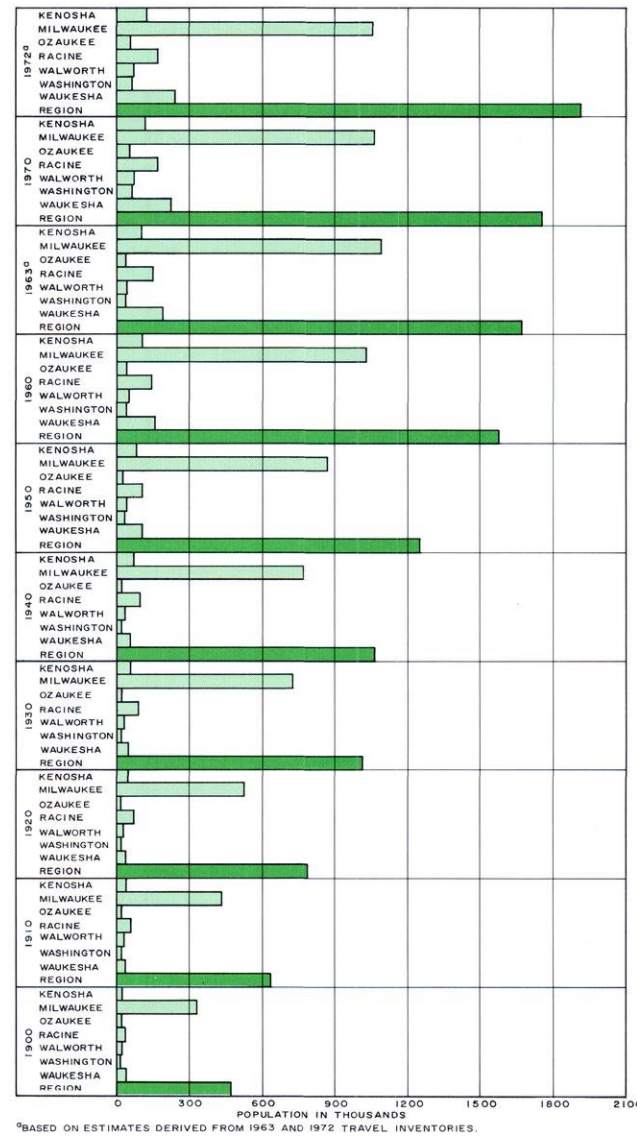
[a] THE URBAN POPULATION IN 1950, 1960, AND 1970 INCLUDES THAT PORTION OF THE POPULATION CLASSIFIED AS BEING "URBAN" AND "RURAL NON-FARM" BY THE U.S. BUREAU OF THE CENSUS.

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

Population growth since 1900 has not been uniform throughout the Region. From 1900 to 1930, the highest rates of population increase occurred in the three urban counties of Milwaukee, Kenosha, and Racine. From 1930 to 1972, dispersion of the urban population and decentralization of urban work and leisure-related activities reversed this trend. Varying rates of change in population growth in the Region have resulted in significant distributional shifts of population among the seven counties. The outlying counties, notably Ozaukee, Washington, and Waukesha, show the highest rates of population increase (see Figures 20 and 21). As shown in Table 7, the most dramatic changes in population distribution from 1900 to 1970 occurred in Milwaukee and

Figure 20

POPULATION DISTRIBUTION IN THE REGION BY COUNTY SELECTED YEARS 1900-1972



[a] BASED ON ESTIMATES DERIVED FROM 1963 AND 1972 TRAVEL INVENTORIES.

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

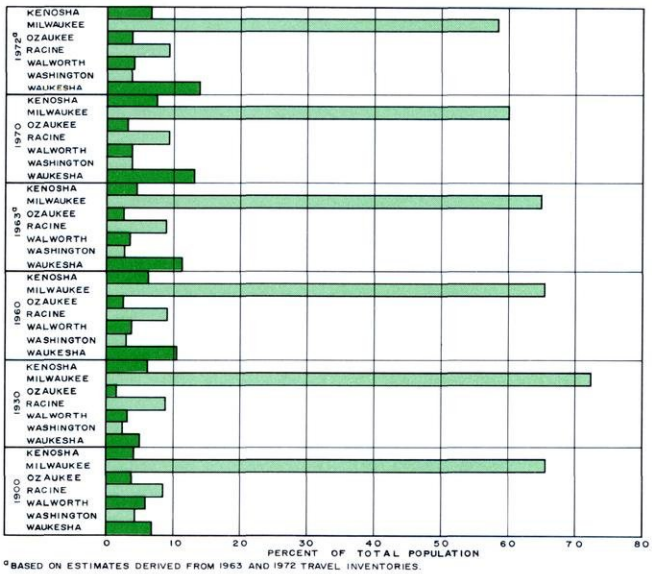
Waukesha Counties. The Milwaukee County proportion of the total regional population increased by about 6 percent from 1900 to 1930, and then decreased by about 12 percent from 1930 to 1970. In contrast, the Waukesha County proportion of the total regional population decreased by approximately 2 percent from 1900 to 1930, and increased by about 8 percent from 1930 to 1970.

The estimated change in population distribution in the Region from 1963 to 1972 indicates a similar trend to that observed from 1960 to 1970. The estimated Milwaukee County proportion of the total regional population decreased from about 65 percent in 1963 to about 59 percent in 1972, while the estimated Waukesha County proportion of the total regional population increased from 11 percent in 1963 to about 14 percent in 1972. The result of recent changes in population distribution has been an areawide spread of population around the three primarily urban counties of Milwaukee, Kenosha, and Racine (see Map 8). From 1960 to 1970, these three counties experienced a decrease in their proportion of the total regional population of about 5 percent, from 81 percent in 1960 to 76 percent in 1970, while Ozaukee, Washington, and Waukesha Counties increased their proportion of the total regional population by 4 percent, from 16 percent in 1960 to 20 percent in 1970.

Similarly, from 1963 to 1972 the proportion of the total regional population made up by Kenosha, Milwaukee, and Racine Counties is estimated to have decreased by about 5 percent, from 80 percent in 1963 to 75 percent in 1972, while the proportion of the total regional population in Ozaukee, Washington, and Waukesha Counties is estimated to have increased by about 5 percent, from 16 percent in 1963 to 21 percent in 1972. This diffusion of population has resulted in many areawide development problems, relating particularly to the changing land use, such as the provision of transportation, sanitary sewerage, water supply, and other public facilities and services.

Figure 21

PERCENTAGE DISTRIBUTION OF POPULATION IN THE REGION BY COUNTY: SELECTED YEARS 1900-1972



[a] BASED ON ESTIMATES DERIVED FROM 1963 AND 1972 TRAVEL INVENTORIES.

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

Population Characteristics

Equally as important as population size and spatial distribution are certain population characteristics having particularly important implications for land use and transportation planning. These characteristics include age and sex composition, race, marital status, household size, educational attainment, and personal income. Some of these characteristics, such as age, sex, and marital status, have indirect implications for land use and transportation planning since they affect the rate of population growth and change through natural increase. These and other population characteristics also have a direct effect on certain important considerations in land use and transportation planning such as travel demand, travel habits, and travel characteristics, including the choice of transportation mode.

Table 7

POPULATION DISTRIBUTION IN THE REGION BY COUNTY: SELECTED YEARS 1900-1972

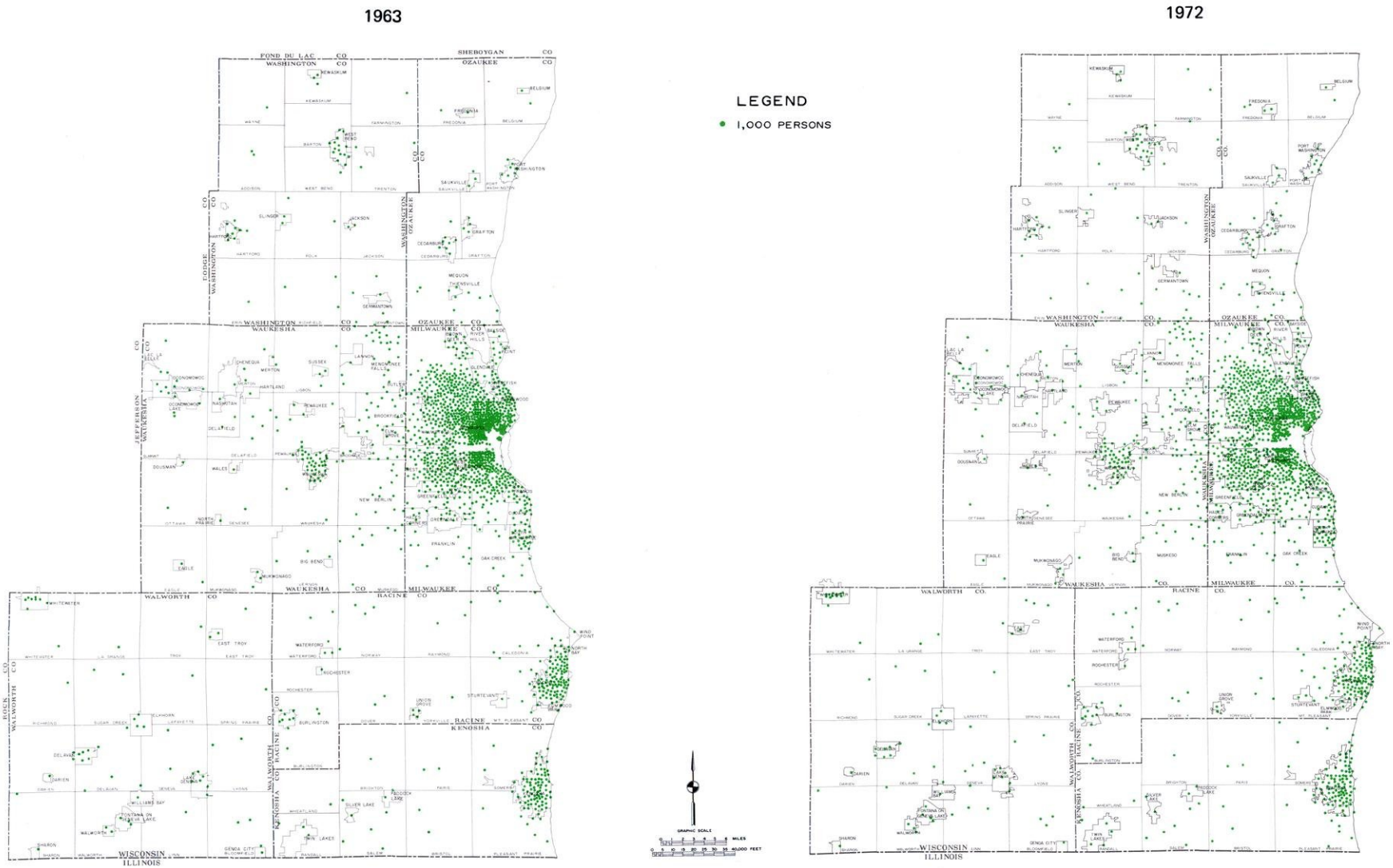
County	1900		1930		1960		1970		Change 1960 - 1970		1963[a]		1972[a]		Change 1963 - 1972	
	Population	Percent of Region	Population	Percent of Region	Population	Percent of Region	Population	Percent of Region	Absolute	Percent	Population	Percent of Region	Population	Percent of Region	Absolute	Percent
Kenosha	21,707	4.3	63,277	6.3	100,615	6.4	117,917	6.7	17,302	17.2	106,665	6.4	122,691	6.8	16,026	15.0
Milwaukee	330,017	65.8	725,263	72.1	1,036,047	65.8	1,054,249	60.1	18,202	1.7	1,086,291	64.9	1,060,499	58.6	- 25,792	- 2.4
Ozaukee	16,363	3.3	17,394	1.7	38,441	2.5	54,461	3.1	16,020	41.7	41,591	2.5	61,464	3.4	19,873	47.8
Racine	45,644	9.1	90,217	9.0	141,781	9.0	170,838	9.7	29,057	20.5	150,562	9.0	177,069	9.8	26,507	17.6
Walworth	29,259	5.8	31,058	3.1	52,368	3.3	63,444	3.6	11,076	21.1	55,506	3.3	72,304	4.0	16,798	30.3
Washington	23,589	4.7	26,430	2.6	46,119	2.9	63,839	3.6	17,720	38.4	49,508	2.9	71,386	3.9	21,878	44.2
Waukesha	35,229	7.0	52,350	5.2	158,249	10.1	231,338	13.2	73,089	46.2	184,166	11.0	245,321	13.5	61,155	33.2
Region	501,808	100.0	1,005,989	100.0	1,573,620	100.0	1,756,086	100.0	182,466	11.6	1,674,289	100.0	1,810,734	100.0	136,445	8.1

[a] *Based on estimates derived from 1963 and 1972 travel inventories.*

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

Map 8

POPULATION DISTRIBUTION IN THE REGION: 1963 and 1972



The 1963 resident population of the Region was estimated at 1,674,000 persons, of which about 80 percent were concentrated in Milwaukee, Racine, and Kenosha Counties. By 1972 the resident population of the Region had grown to about 1,810,700 persons, of which about 75 percent were concentrated in Milwaukee, Racine, and Kenosha Counties. The proportion of the population residing in Ozaukee, Washington, and Waukesha Counties increased from about 16 percent in 1963 to about 21 percent in 1972. This diffusion of urban population has resulted in the creation of certain new developmental and environmental problems, and in the intensification of other such problems of long standing, which problems transcend the geographic limits, as well as the fiscal capabilities, of local units of government, and which require, therefore, the cooperation of all units and agencies of government concerned for sound resolution.

Source: SEWRPC.

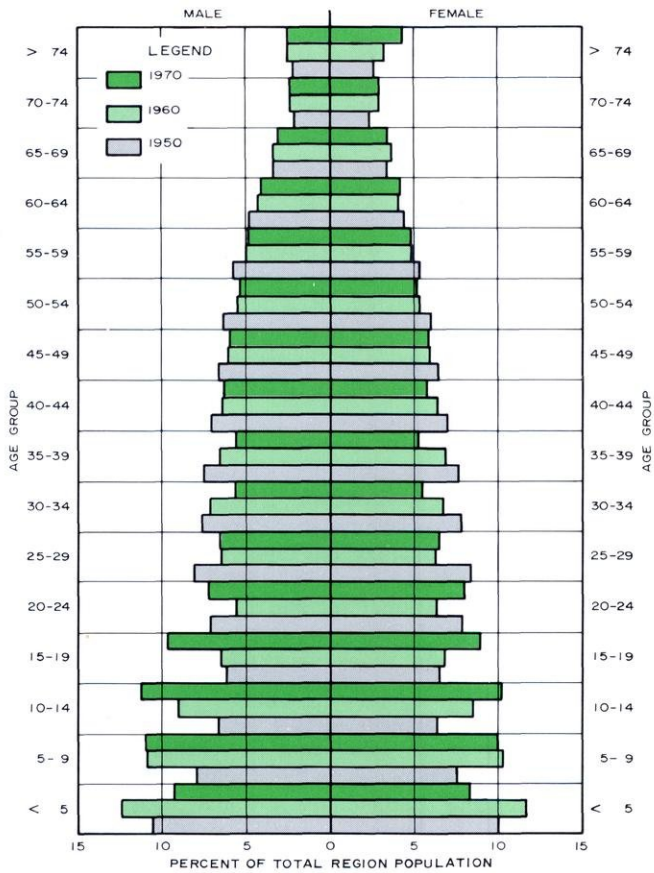
The age composition of the regional population has changed significantly since 1950. The population pyramid shown in Figure 22 shows both the proportion of the population made up by the various age categories and the changes in these proportions from 1950 to 1970. Due to the rising birth and declining death rates from 1950 to 1960, the proportion of the total regional population made up of persons under 20 years of age increased by about 7 percent. The proportion of the regional population made up of persons between 20 and 64 years declined by over 8 percent, and the proportion of the population made up of persons 65 years of age and over increased by about 1 percent.

The declining birth and death rates observed since 1960 have, however, resulted in another significant distributional change in the regional population. As shown in Table 8, from 1960 to 1970 the proportion of the total regional population made up of persons under 10 years of age declined by about 4 percent; the proportion of the total population between 10 and 19 years of age increased by about 5 percent; the proportion of the total population from 20 to 64 years of age declined by about 2 percent; and the proportion of the total population 65 years of age and over increased by about 1 percent. Similarly, the estimated changes in the age composition of the regional population from 1970 to 1972 indicate an overall increase in the proportion of the total population under 20 years of age, a decrease in the proportion of the total population 20 to 64 years of age, and a fairly stable proportion of the population 65 years of age and over.

It is especially important to note the changes in the proportion of the total regional population made up by these age groups, since it is generally assumed that the group 18 to 64 years of age comprises the "productive" segment of the population, while those persons

Figure 22

TOTAL POPULATION BY AGE AND SEX IN THE REGION
1950, 1960, and 1970



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

Table 8

AGE COMPOSITION OF THE POPULATION IN THE REGION: 1950-1972

Age Group	1950 Number	1950 Percent Of Total	1960 Number	1960 Percent Of Total	1970 Number	1970 Percent Of Total	Point Change 1950 to 1960	Point Change 1960 to 1970	1972 Number	1972 Percent Of Total	Point Change 1970 to 1972
Under 5 . . .	127,140	10.2	190,197	12.0	153,243	8.7	1.8	- 3.3	153,133	8.5	- 0.2
5 to 9.	96,595	7.8	166,608	10.6	183,283	10.4	2.8	- 0.2	183,458	10.2	- 0.2
10 to 14 . . .	80,342	6.5	137,896	8.8	186,865	10.6	2.3	1.8	203,293	11.3	0.7
15 to 19 . . .	78,949	6.4	103,817	6.6	163,033	9.3	0.2	2.7	180,574	10.1	0.8
20 to 24 . . .	93,453	7.5	94,011	6.0	132,672	7.6	- 1.5	1.6	139,573	7.8	0.2
25 to 29 . . .	102,038	8.2	100,014	6.4	114,042	6.5	- 1.8	0.1	122,726	6.8	0.3
30 to 34 . . .	96,252	7.8	108,477	6.9	98,001	5.6	- 0.9	- 1.3	101,573	5.7	0.1
35 to 44 . . .	182,450	14.7	208,718	13.3	200,488	11.5	- 1.4	- 1.8	194,988	10.9	- 0.6
45 to 54 . . .	158,804	12.8	180,436	11.4	196,854	11.2	- 1.4	- 0.2	195,502	10.9	- 0.8
55 to 64 . . .	125,094	10.1	142,507	9.0	157,991	9.0	- 1.1	0.0	151,314	8.4	- 0.6
65 and over .	99,501	8.0	140,939	9.0	169,415	9.6	1.0	0.6	167,963	9.4	- 0.2
Total	1,240,618	100.0	1,573,620	100.0	1,755,887	100.0	- -	- -	1,794,097[a]	100.0	- -

[a] *Excludes 16,637 persons who did not report their age in 1972.*

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

under 18 and 65 and over comprise the "dependent" segment. A rough measure of the dependency load that the productive population must bear is the ratio of the population under 18 and 65 and over to the population 18 to 64, multiplied by 100. This dependency ratio purports to measure how many dependents each 100 persons in the productive years must, on the average, support. Table 9 shows the actual 1950, 1960, and 1970 and estimated 1972 dependency ratios for the Region, state, and nation. The dependency ratio increased dramatically from 1950 to 1960 in the Region, state, and nation due largely to population increases in the 0 to 14 year age groups and declines in the age groups from 20 to 64 years of age. From 1960 to 1970, however, the dependency ratio decreased in the state and nation, but increased in the Region. The estimated 1972 dependency ratios indicate a trend similar to that of the 1960 to 1970 time period; a decreasing ratio in the nation, but an increasing ratio in the Region over the 1970 level.

A single measure of the relative difference in age structure between areas or time periods can be obtained by using a median age comparison. The median age is that age above and below which there are an equal number of persons. As indicated in Table 10, the Region in recent years has had a more youthful population than the nation. The national median age level, which rose steadily from 1890, when it was 22 years, to 1950, when it was just over 30 years, has declined the last two decades to nearly 30 years in 1960 and 28 years in 1970. In Wisconsin, the median age declined from 31 years in 1950 to 29 years in 1960 and 27 years in 1970. The decline of the median age in the Region was even more dramatic. In 1950 the median age was 31 years, by 1960 it had declined to 28 years, and in 1970 it was below 28 years. From 1970 to 1972 the national median age level was unchanged from the 1970 level, while the median age of the population of the Region declined below 27 years. The spatial distribution of age throughout the Region in 1963 and 1972 is shown on Map 9.

The sex composition of the regional population has also been changing. The change is generally toward a higher proportion of females, particularly in the older age groups (see Figure 22). This trend is further evidenced by the fact that in 1950, the ratio of males to females in the Region was about 98 males to every 100 females, while in 1970 the ratio was about 94 males to every 100 females (see Table 11). In 1950, 1960, and 1970 males outnumbered females only among the rural population of the Region. Much of this change is due to the fact that women have a longer life expectancy than men.

In addition to changes in the age and sex composition, the racial composition of the regional population has been changing (see Table 12). In the 1970 census, nearly 93 percent of the regional population was reported as white, compared to 95 percent reported as white in 1960. The balance of the population was nonwhite, a category which includes persons reporting their race as black, American Indian, Japanese, Chinese, or another race. In both 1960 and 1970, the overwhelming majority—over 90 percent—of the nonwhite population in the Region was comprised of persons of the black race.

Table 9

DEPENDENCY RATIOS[a] OF THE POPULATION IN THE UNITED STATES, WISCONSIN, AND THE REGION 1950, 1960, 1970, and 1972

Geographic Area	1950	1960	1970	1972
United States. . . .	65.1	81.9	79.0	75.6
Wisconsin	67.3	88.5	87.1	--
Region	56.7	80.4	82.7	84.4

[a] *Defined as the ratio of the population under 18 and 65 and over to the population 18 to 64 multiplied by 100.*

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

Table 10

MEDIAN AGE OF THE POPULATION IN THE UNITED STATES, WISCONSIN, AND THE REGION 1950, 1960, 1970, and 1972

Geographic Area	1950	1960	1970	1972
United States . . .	30.1	29.5	28.1	28.1
Wisconsin.	31.0	29.4	27.2	--
Region	31.4	28.5	27.6	26.9[a]

[a] *Estimated from data obtained in 1972 inventory of travel.*

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

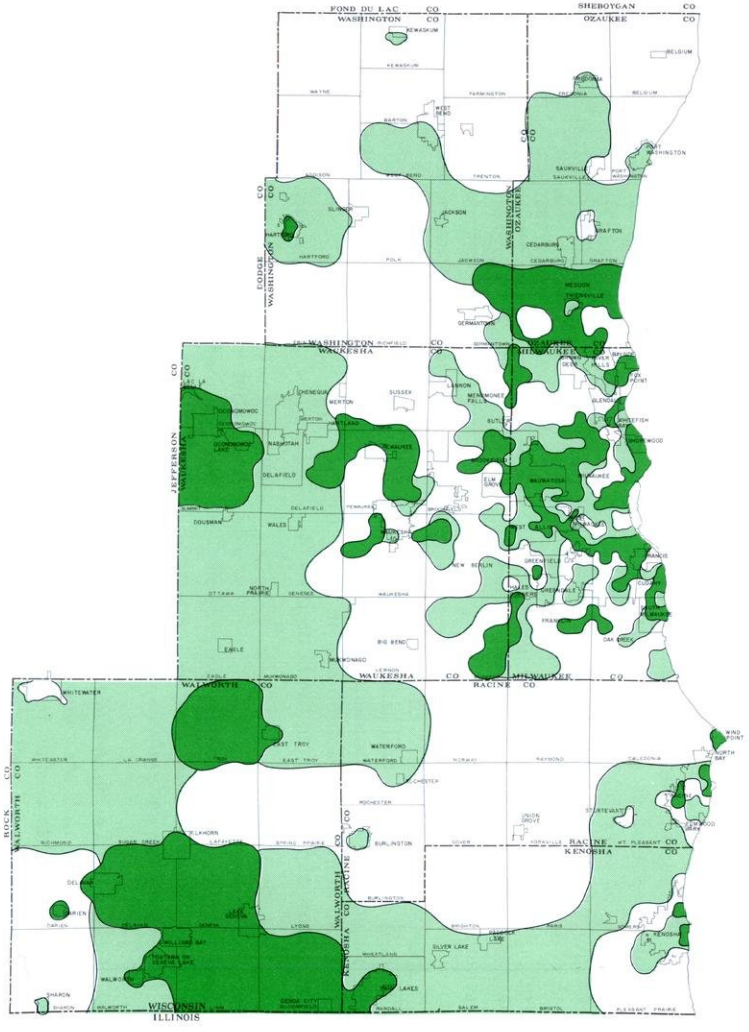
As indicated in Table 13, the nonwhite population comprised about 2 percent of the total population in Kenosha County, nearly 11 percent in Milwaukee County, about 7 percent in Racine County, and less than 1 percent in the other counties in the Region. Furthermore, the nonwhite populations of the Region are concentrated in the central cities of Kenosha, Milwaukee, and Racine. Nearly 96 percent of the nonwhite population in the Region and 98 percent of all blacks in the Region resided in these three cities in 1970.

It should be noted that the Spanish American population is included in the white population in Tables 12 and 13 because Spanish Americans are not defined as a separate race by the U. S. Bureau of the Census. The Census Bureau, however, does enumerate Spanish Americans as a separate ethnic group. One of the three Spanish indicators used is the number of "persons of Spanish language" (see Table 14). In 1970 there were more than 30,000 persons of Spanish language in the Region representing nearly 2 percent of the regional population. For the seven counties, the proportion of Spanish Americans ranged from less than 1 percent in Washington and Ozaukee Counties to about 3 percent in Racine County. As was the case for the nonwhite population, the Spanish American population was heavily concentrated in the large urban areas of the Region. Thus in 1970, 77 percent of the Region's Spanish American population resided in the Cities of Kenosha, Milwaukee, Racine, and Waukesha.

Map 9

MEDIAN AGE DISTRIBUTION IN THE REGION: 1963 and 1972

1963

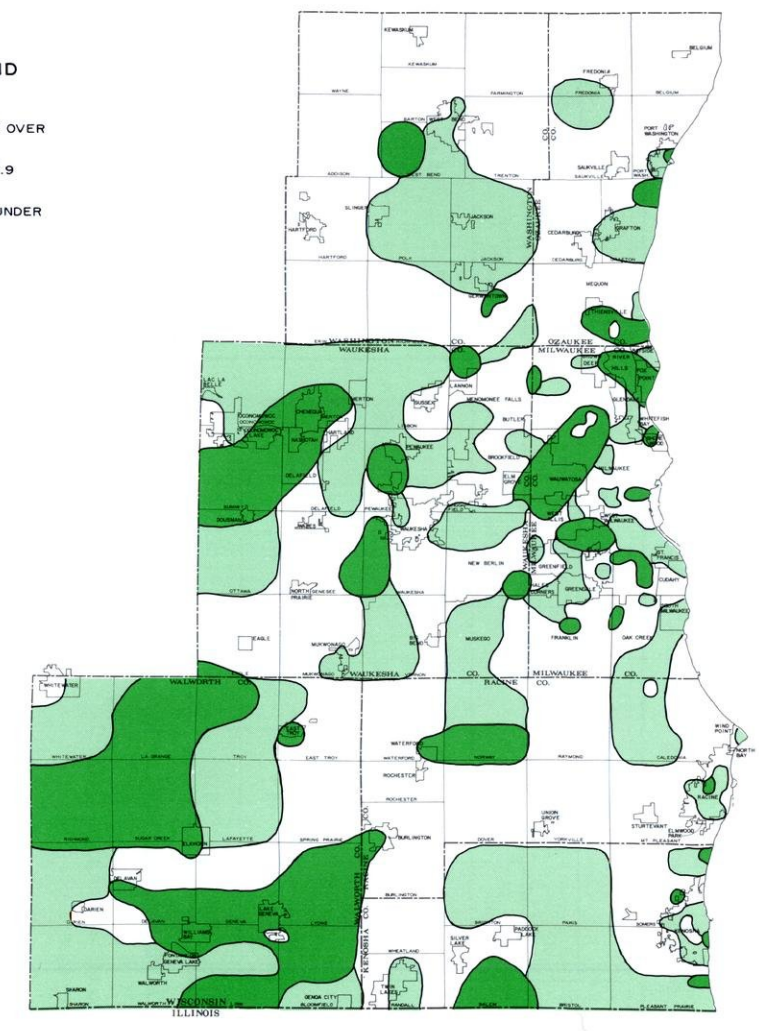


LEGEND

MEDIAN AGE

- 31.0 AND OVER
- 26.0 – 30.9
- 25.9 OR UNDER

1972



The median age of the regional population in 1972 was about 27 years, compared with about 28 years in 1963 and 31 years in 1950. In 1972, as in 1963, older people were concentrated in the central cities of the Region and in scattered enclaves located throughout the rural areas of the Region. Some changes have occurred since 1963, notably a lowering of the median age in those predominantly rural areas that experienced the first influx of urban development over the 1963-1972 period, and a raising of the median age in some of the first and second ring suburbs, evidencing an aging population in those communities.

Source: SEWRPC.

Table 11

SEX RATIOS OF THE POPULATION IN THE REGION BY URBAN-RURAL RESIDENCE BY COUNTY: 1950, 1960, and 1970

County	Number of Males Per 100 Females								
	1950			1960			1970		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Kenosha	101.9	99.7	107.8	102.0	100.3	106.7	95.9	94.2	100.3
Milwaukee	96.5	95.9	106.7	95.7	95.7	-- [a]	92.0	92.0	-- [a]
Ozaukee	104.0	96.7	107.7	100.0	96.7	107.2	99.6	97.9	103.3
Racine	99.8	96.5	109.9	97.6	95.1	104.5	95.6	93.4	103.3
Walworth	100.9	92.2	106.9	99.3	93.3	103.1	98.1	92.3	101.9
Washington	103.6	92.6	109.7	102.3	96.0	105.7	99.9	97.0	102.6
Waukesha	103.0	98.7	105.2	101.7	100.3	104.2	99.2	98.0	104.1
Region	98.0	96.2	107.2	97.3	96.2	104.8	94.3	93.2	102.6

[a] *Since 1960, the U. S. Bureau of the Census has defined all Milwaukee County communities as urban.*

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

One of the most noteworthy changes in the regional population composition has taken place in marital status.[3] Marital status affects population growth directly, since all but a relatively small fraction of childbearing is done by females who are married. Moreover, death rates and migration rates both vary substantially according to marital status, so that marital status affects all aspects of population dynamics. The marital status of the regional population in 1950, 1960, and 1970 is presented in Table 15. While the total population 14 years of age and over in the Region increased by over 316,400, or by about 33 percent, from 1950 to 1970, the reported number of married persons increased by only about 159,400, or about 25 percent. During the same 20-year period, the number of persons reported as single increased by approximately 114,500, or over 50 percent, while the number of persons either widowed or divorced increased by over 42,500, or 46 percent. These trends are similar to recent patterns observed nationally pertaining to marriages occurring at increasingly older ages and higher rates of divorce actions.

One of the most important characteristics of the regional population with respect to land use and transportation planning is the number and size of the households.[4] From 1950 to 1970 the total number of households in the Region increased at a more rapid rate than the household

Table 12

RACIAL COMPOSITION OF THE POPULATION IN THE REGION: 1960 and 1970

Race	Population			
	1960		1970	
	Number	Percent of Total	Number	Percent of Total
White	1,499,662	95.3	1,626,056	92.6
Nonwhite	73,952	4.7	129,831	7.4
Black	69,591	4.4	119,321	6.8
American Indian	2,225	0.1	4,617	0.3
Japanese	748	0.1	1,237	0.1
Chinese	603	0.1	1,234	-- [a]
Filipino	247	-- [a]	693	-- [a]
Other	538	-- [a]	2,729	0.2
Total	1,573,614	100.0	1,755,887	100.0

[a] *The percent of the total population is less than one-tenth of 1 percent.*

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

population (see Table 16). While there was a substantial increase in both the number of households and the household population, the average number of persons per household in the Region declined from 3.36 in 1950 to 3.30 in 1960 and 3.20 in 1970. Similarly, from 1963 to 1972 the estimated number of households in the Region increased by about 16 percent, while the estimated regional population in households increased by only about 9 percent. The estimated average number of persons per household also decreased over this nine-year period, from 3.41 persons per household in 1963

[3] *Marital status as referred to herein includes the proportion of single, married, widowed, and divorced persons in the population 14 years of age and older.*

[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 boardinghouses, or are inmates of institutions.*

Table 13

RACIAL COMPOSITION OF THE POPULATION IN THE REGION BY COUNTY: 1970

County	Population											
	White		Nonwhite								Total	
			Black		American Indian		Other		Subtotal			
	Number	Percent of County Population	Number	Percent of County Population	Number	Percent of County Population	Number	Percent of County Population	Number	Percent of County Population	Number	Percent of County Population
Kenosha	115,623	98.1	1,930	1.6	143	0.1	221	0.2	2,294	1.9	117,917	100.0
Milwaukee	939,989	89.2	106,033	10.1	3,717	0.3	4,324	0.4	114,074	10.8	1,054,063	100.0
Ozaukee	54,197	99.6	92	0.2	61	0.1	71	0.1	224	0.4	54,421	100.0
Racine	159,511	93.4	10,572	6.2	343	0.2	412	0.2	11,327	6.6	170,838	100.0
Walworth	62,879	99.1	287	0.5	56	0.1	222	0.3	565	0.9	63,444	100.0
Washington	63,652	99.7	45	0.1	62	0.1	80	0.1	187	0.3	63,839	100.0
Waukesha	230,205	99.5	362	0.2	235	0.1	563	0.1	1,160	0.5	231,365	100.0
Region	1,626,056	92.6	119,321	6.8	4,617	0.3	5,893	0.3	129,831	7.4	1,755,887	100.0

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

Table 14

SPANISH AMERICAN POPULATION[a] IN THE REGION BY COUNTY: 1970

County	Persons of Spanish Language	
	Number	Percent of Total Population
Kenosha	2,690	2.3
Milwaukee	17,960	1.7
Ozaukee	370	0.7
Racine	5,440	3.2
Walworth	790	1.2
Washington	305	0.5
Waukesha	3,272	1.4
Region	30,827	1.8

[a] *Persons of Spanish language.*

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

to 3.22 in 1972. The overall decline in the number of persons per household since 1950 has occurred primarily as a result of the rapid increase in the number of one-person households, and is indicative of a tendency for unmarried persons to maintain occupancy away from relatives.

The spatial distribution of average household sizes in the Region in 1963 and 1972 is shown on Map 10. The smaller average household sizes generally occur in central cities and outlying rural areas of the Region. The larger average household sizes generally occur in surburban areas of the Region.

The educational attainment level of the population 25 years of age and over in the Region has shown a significant increase since 1950. The median number of school years completed by the regional population increased from 9.5 years in 1950 to 11 years in 1960 to 12.2 years in 1970; an increase of 2.7 years of attained education, or almost 30 percent. The 1970

Table 15

MARITAL STATUS OF THE POPULATION 14 YEARS OF AGE AND OVER IN THE REGION: 1950 to 1970

Marital Status	1950		1960		1970		Change 1950 - 1970	
	Number	Percent Of Total	Number	Percent Of Total	Number	Percent Of Total	Absolute	Percent
Single	227,616	23.9	245,967	22.3	342,122	27.0	114,506	50.3
Married	631,206	66.3	745,619	67.8	790,607	62.3	159,401	25.2
Widowed or Divorced	93,273	9.8	108,824	9.9	135,816	10.7	42,543	45.6
Total	952,095	100.0	1,100,410	100.0	1,268,545	100.0	316,450	33.2

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

level of 12.2 median school years completed within the Region compares favorably with the national median of 12.1 years of school completed. This general increase is further evidenced by the fact that in 1970, over 21 percent of the regional population over 25 years of age had either attended or completed college, compared to only 14 percent in 1950 and 17 percent in 1960 (see Table 17).

Educational attainment levels, in common with many other population characteristics, are not uniform throughout the Region (see Map 11). The highest levels of educational attainment are prevalent in northeastern and western Milwaukee County, in eastern and northwestern Waukesha County, and in southern Ozaukee County. Lower educational attainment levels are generally prevalent in the Cities of Milwaukee, Racine, and Kenosha, and in certain rural areas of the Region.

Personal income in the Region has been increasing at a rapid rate. As shown in Table 18, total regional income increased nearly 73 percent from 1960 to 1970. This rate of increase, however, was less than the national

Table 16

HOUSEHOLD POPULATION TRENDS IN THE REGION: 1950-1972

Household Characteristic	1950	1960	1970	Change 1950 - 1960		Change 1960 - 1970		1963	1972	Change 1963 - 1972	
				Absolute	Percent	Absolute	Percent			Absolute	Percent
Total Number of Households	354,544	465,913	536,486	111,369	31.4	70,573	15.1	482,410	557,259	74,849	15.5
Household Population	1,190,193	1,537,235	1,714,200	347,042	29.1	176,965	11.5	1,643,577	1,793,884	150,307	9.1
Persons Per Household	3.36	3.30	3.20	- 0.6	- 1.8	- .10	- 3.0	3.41	3.22	- .19	- 5.6

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

Table 17

EDUCATIONAL ATTAINMENT LEVELS OF THE POPULATION 25 YEARS OF AGE AND OLDER IN THE REGION: SELECTED YEARS 1950-1970

Education Attainment	1950		1960		1970		Change 1950 to 1970	
	Number	Percent	Number	Percent	Number	Percent	Absolute	Percent
No School Years Completed	8,420	1.1	11,305	1.3	9,830	1.0	1,410	16.7
Some Elementary School	141,490	18.7	131,150	14.9	89,452	9.5	- 52,038	- 36.8
Completed Elementary School	202,820	26.7	191,349	21.7	143,104	15.3	- 59,716	- 29.4
Some High School	116,285	15.4	162,249	18.4	170,115	18.2	53,830	46.3
Completed High School	170,830	22.6	237,848	27.0	325,357	34.7	154,527	90.4
Some College	54,365	7.2	79,033	9.0	99,195	10.6	44,830	82.5
Four or More Years of College	47,660	6.3	68,016	7.7	99,936	10.7	52,276	109.7
Schooling Unknown	15,280[a]	2.0	---	0.0	---	0.0	- 15,280	- 100.0
Total	757,150	100.0	880,950	100.0	936,989	100.0	179,839	23.8
Median School Years Completed	9.5	---	11.0	---	12.2	---	2.7	28.4

[a] *In 1950, 15,280 persons did not report the number of school years completed.*

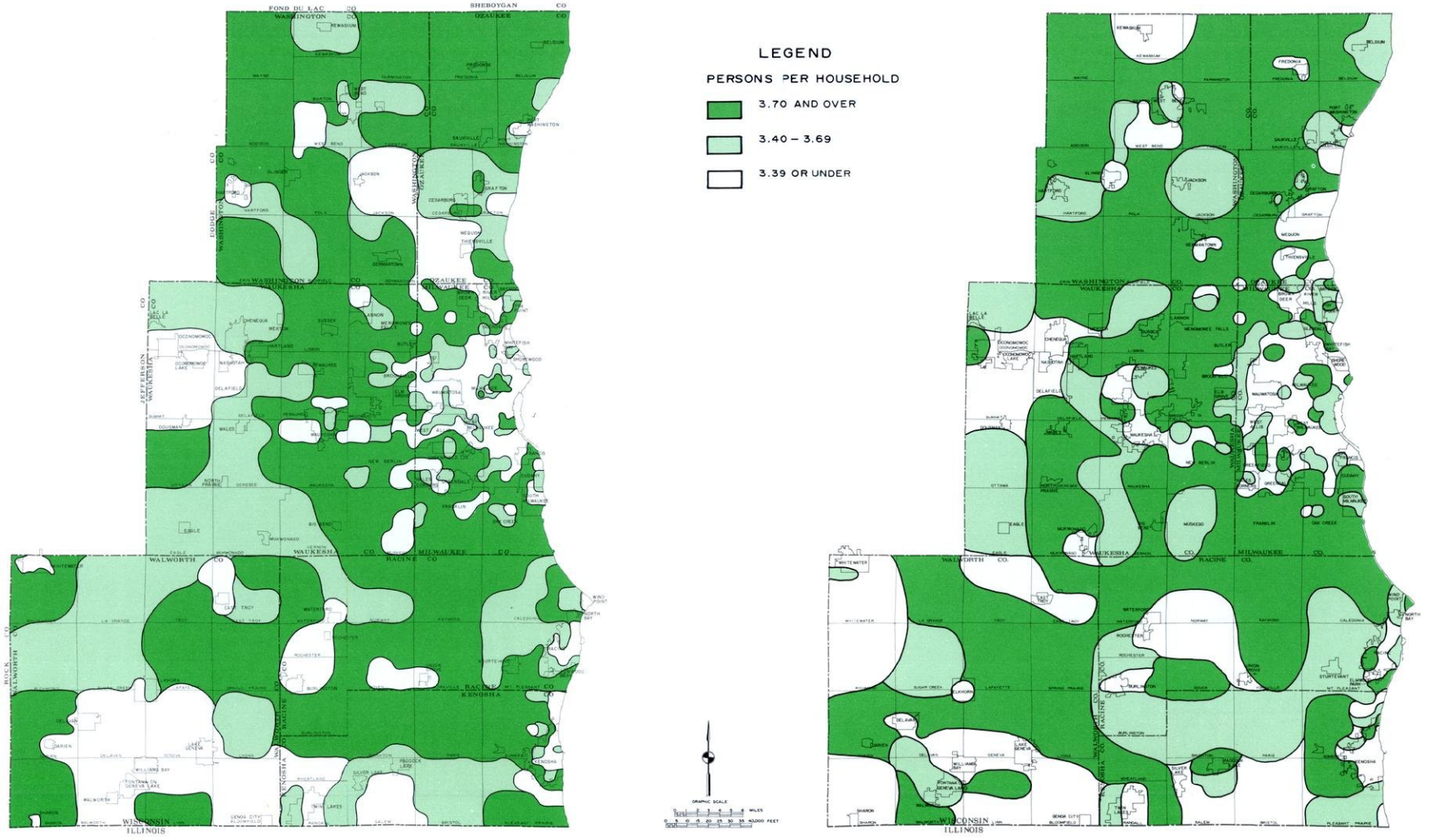
Source: U. S. Bureau of the Census and SEWRPC.

Map 10

AVERAGE HOUSEHOLD SIZE IN THE REGION: 1963 and 1972

1963

1972



There were over one-half million households in the Region in 1972, with an average size of about 3.2 persons per household. In 1963 the average household size was nearly 3.4 persons. The decline in average household size may be attributed to the decline in the birthrate and consequent smaller family sizes, as well as to an increasing tendency for single persons to maintain occupancy away from relatives, resulting in an increase in the number of one-person households. As in 1963, larger average household sizes in 1972 are generally associated with increased distance from the central cities. A comparison of the above maps reveals, however, that a number of rural areas previously exhibiting larger household sizes of at least 3.7 persons now reflect smaller household sizes.

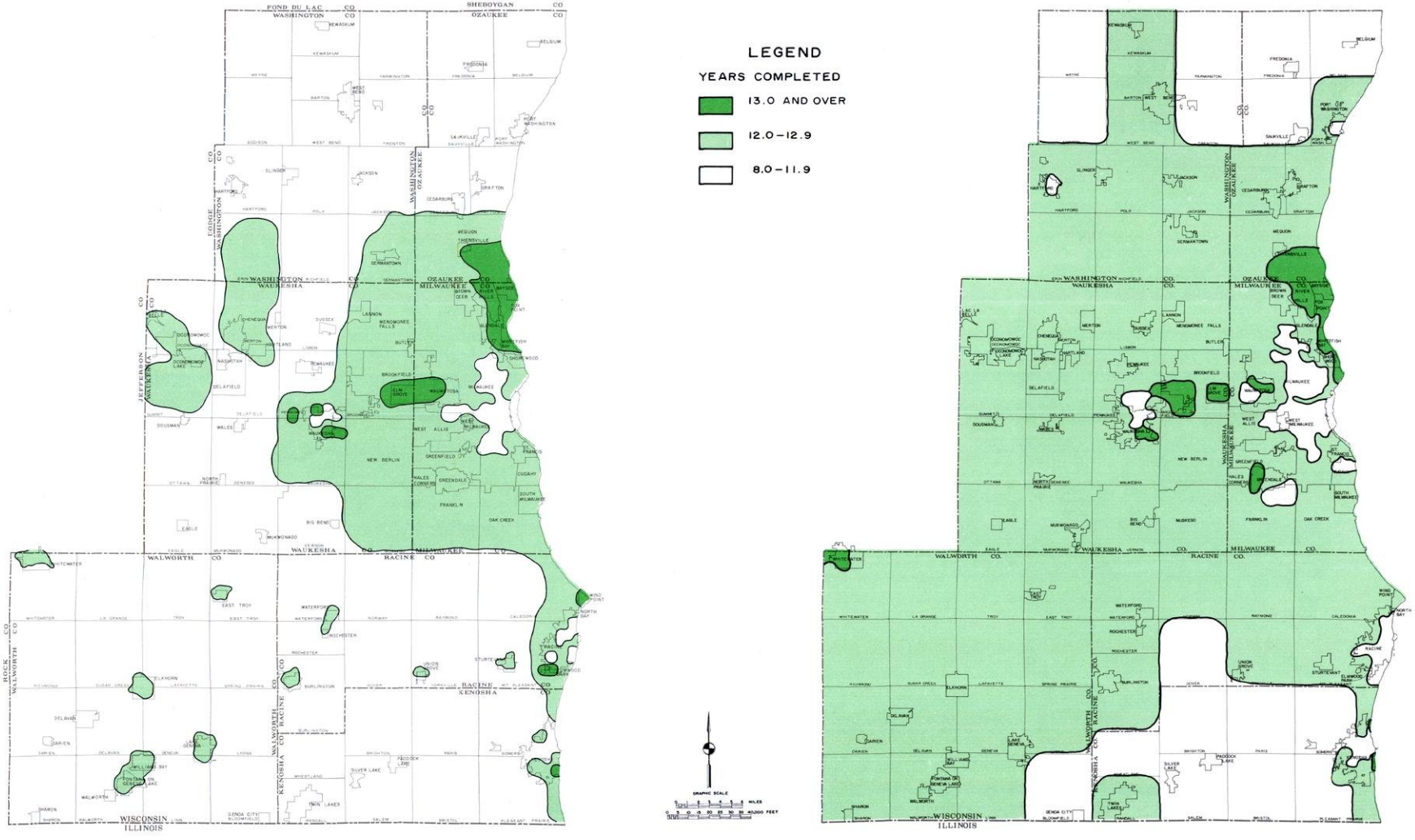
Source: SEWRPC.

Map 11

MEDIAN YEARS OF EDUCATION COMPLETED IN THE REGION: 1960 and 1970

1960

1970



By 1970 about 21 percent of the regional population over 25 years of age had either attended or completed college, compared to about 17 percent in 1960 and 14 percent in 1950, reflecting an increase in the educational attainment level of the regional population. A comparison of the above maps reveals that by 1970 there were only relatively small areas of the Region, including the older central cities, western Kenosha County, and northern Ozaukee and Washington Counties, where the median educational attainment level had not reached 12 years.

Source: SEWRPC.

Table 18

INCOME TRENDS IN THE UNITED STATES, WISCONSIN, AND THE REGION: SELECTED YEARS 1950-1970

Geographic Area And Income Measure	Year			Change 1950 to 1960		Change 1960 to 1970		Year		Change 1963 to 1972	
	1950	1960	1970	Number	Percent	Number	Percent	1963[b]	1972[b]	Number	Percent
United States											
Total Income (In Millions)											
Actual	$165,063	$331,700	$635,563	$166,637	101.0	$303,863	91.6	$378,400	$742,900	$364,500	96.3
Constant[a]	228,612	374,390	546,966	145,778	63.8	172,576	46.1	412,600	588,800	176,200	42.7
Per Capita Income											
Actual	1,070	1,849	3,128	779	72.8	1,279	69.2	2,006	3,564	1,558	77.7
Constant[a]	1,481	2,087	2,692	606	40.9	605	29.0	2,188	2,825	637	29.1
Wisconsin											
Total Income (In Millions)											
Actual	$ 3,581	$ 7,287	$ 13,457	$ 3,706	103.5	$ 6,170	84.7	$ 8,100	$ 14,700	$ 6,600	81.4
Constant[a]	4,960	8,225	11,581	3,265	65.8	3,356	40.8	8,800	11,600	2,800	31.8
Per Capita Income											
Actual	1,043	1,844	3,046	801	76.8	1,202	65.2	1,992	3,327	1,335	67.0
Constant[a]	1,445	2,081	2,621	636	44.0	540	25.9	2,164	2,625	461	21.3
Region											
Total Income (In MIllions)											
Actual	$ 1,660	$ 3,492	$ 6,029	$ 1,832	110.4	$ 2,537	72.7	$ 4,000	$ 6,900	$ 2,900	72.5
Constant[a]	2,299	3,941	5,189	1,642	71.4	1,248	31.7	4,400	5,500	1,100	25.0
Per Capita Income											
Actual	1,338	2,219	3,433	881	65.8	1,214	54.7	2,398	3,836	1,438	60.0
Constant[a]	1,853	2,505	2,954	652	35.2	449	17.9	2,615	3,060	445	17.0

[a] *Adjusted for price change; base year 1967 equals 100.0.*

[b] *Based on estimates derived from 1963 and 1972 inventories of travel.*

Source: U. S. Department of Commerce, Bureau of the Census; U. S. Department of Labor; Wisconsin Department of Administration; and SEWRPC.

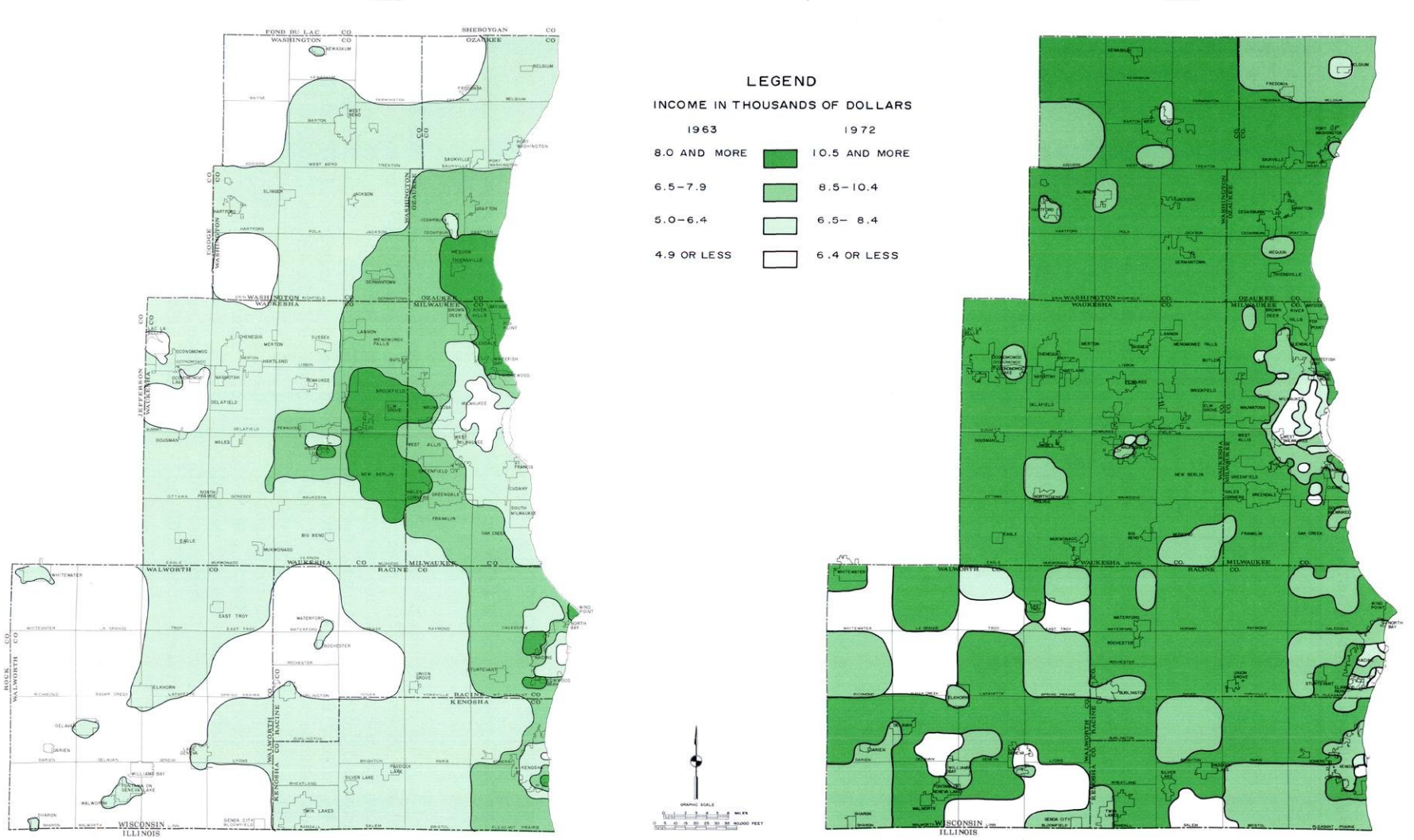
and state rates of increase during this period, and less than the regional rate of increase—110 percent—from 1950 to 1960, when the rate of personal income growth in the Region exceeded both the state and national increases. Similarly, income increases measured in constant 1967 dollars indicate a lesser increase of total income in the Region from 1960 to 1970 than national and state increases. From 1963 to 1972 the estimated rate of personal income growth in the Region was over 72 percent measured in actual dollars, and 25 percent measured in constant 1967 dollars. A comparison of estimated personal income increases from 1963 to 1972 again shows lesser increases in the Region than in the nation and state.

The rates of increase in per capita income since 1960 have also been slightly less in the Region than in the state or nation. Per capita income levels in the Region increased by about 55 percent from 1960 to 1970, compared to increases in Wisconsin and the United States of 65 and 69 percent, respectively. Similarly, estimated per capita income level changes from 1963 to 1972 indicate a 60 percent increase in the Region, compared to increases of 67 and 78 percent for Wisconsin and the United States, respectively. The levels of per capita income measured in constant 1967 dollars show the same trends as those indicated by the actual dollar figures. The level of per capita income in the Region, however, has been consistently higher than the state and national levels. In 1972, the estimated average income per person in the Region was approximately $3,836 in actual dollars and $3,060 in constant 1967 dollars. The spatial distribution of regional income on a household basis for 1963 and 1972 is shown on Map 12.

Single-family housing values in the Region since 1950 have followed trends similar to those of per capita

Map 12

MEDIAN HOUSEHOLD INCOME IN THE REGION: 1963 and 1972



The above maps indicate the distribution of median household income in the Region for 1963 and 1972. The income ranges shown for each year, while different in actual dollar value, are equivalent in constant dollar value. A household income of $8,000 in 1963, for example, is equivalent to a household income of $10,500 in 1972. It is evident that household income levels have risen substantially over the 1963-1972 period, with large areas of the Region exhibiting median household incomes in excess of $10,500. As in 1963, the lowest household incomes are found in portions of the older central cities and in scattered rural areas.

Source: SEWRPC.

incomes. Changes in both the actual or market value and the constant[5] 1967 dollar value of single-family housing units in the Region, however, have not been as great as changes in per capita income levels. From 1950 to 1960, the market value of single-family housing units in the Region increased by about $4,600, or 41 percent, and the constant 1967 dollar value increased by about $2,300, or 16 percent, while per capita income levels increased by about $900, or 66 percent in actual dollars, and by $650, or 35 percent, in constant 1967 dollars (see Tables 18 and 19).

From 1960 to 1970, per capita income levels in the Region increased by over $1,200, or 55 percent in actual dollars, and by about $450, or 18 percent in constant 1967 dollars, while the market value of single-family housing units increased by about $4,700, or by 30 percent, measured in actual dollars. Over this same 10-year period, however, the constant 1967 dollar value of single-family housing units did not change appreciably, indicating that the entire increase in single-family housing unit market value was offset by the rate of price inflation for consumer goods and services and, as such, there was no real increase in the value of homes in the Region from 1960 to 1970.

The spatial distribution of housing values throughout the Region for 1960 and 1970 is shown on Map 13. As shown on this map, geographic concentrations of housing values in the Region are somewhat similar to those of educational attainment and per capita income. Concentrations of higher median single-family housing unit values are located primarily in the suburban areas of the Region, while significant concentrations of lower median single family housing unit values are found primarily in the older areas of the central city portions of Kenosha, Milwaukee, and Racine, and to a lesser extent in outlying rural areas.

[5] *In order to permit comparison free of price distortions, all housing market values were adjusted to, and expressed in terms of, 1967 dollars, using the consumer price index published by the U. S. Department of Labor.*

THE ECONOMIC BASE OF THE REGION

Changes in the population of an area are generally closely related to changes in the amount of economic activity in that area. As shown in Figure 23, historic population and employment trends have followed quite similar patterns in the Region. 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 historic growth of population in the Region may, therefore, be basically attributed to increasing economic activity in the Region.

Labor Force Size and Composition

The segment of the population which can be most closely related to the economy is the labor force. The labor force of an area is defined as those residents 14 years of age and older enumerated at their place of residence who are either employed at one or more jobs or are actively seeking employment. It is this employed portion of the labor force which provides the economic support of the total population. The size of the labor force, while indicative of the availability of labor in the Region, cannot be

Table 19

TRENDS IN SINGLE-FAMILY HOUSING VALUES IN THE REGION: SELECTED YEARS 1960-1970

Market Value	1950		1960		1970		Percent Change 1950 - 1960	Percent Change 1960 - 1970	Percent Change 1950 - 1970
	Number[a]	Percent of Total	Number[a]	Percent of Total	Number[a]	Percent of Total			
Less than $10,000 . . .	50,423	42.1	28,760	12.7	14,536	5.4	- 43.0	- 49.4	- 71.2
$10,000-14,999	45,369	37.8	72,371	31.9	42,822	15.8	59.5	- 40.8	- 5.6
15,000-19,999	14,876	12.4	73,697	32.5	72,767	26.9	395.4	- 1.3	389.2
20,000 or More	9,295	7.7	51,825	22.9	140,201	51.9	457.6	170.5	408.3
Total	119,963	100.0	226,653	100.0	270,326	100.0	88.9	19.3	125.3
Median Market Value	$11,100	--	$15,700	--	$20,400	--	41.4	29.9	83.8
Median Value in Constant 1967 Dollars	15,300	--	17,800	--	17,800	--	16.3	0.0	16.3

[a] *Includes only those single-family housing units for which value is tabulated.*

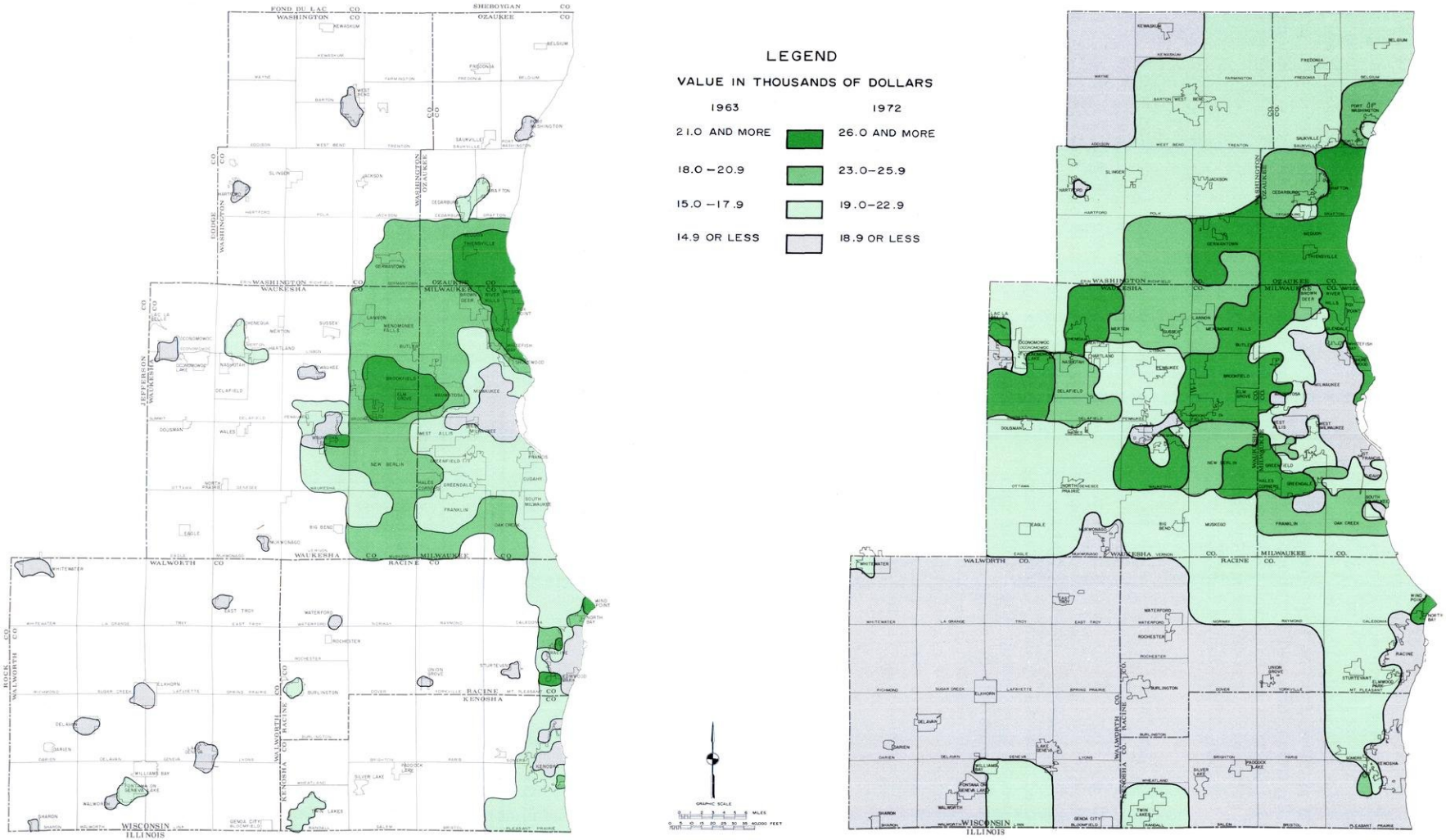
Source: U. S. Bureau of the Census and SEWRPC.

Map 13

MEDIAN SINGLE-FAMILY HOUSING VALUE IN THE REGION: 1960 and 1970

1960

1970



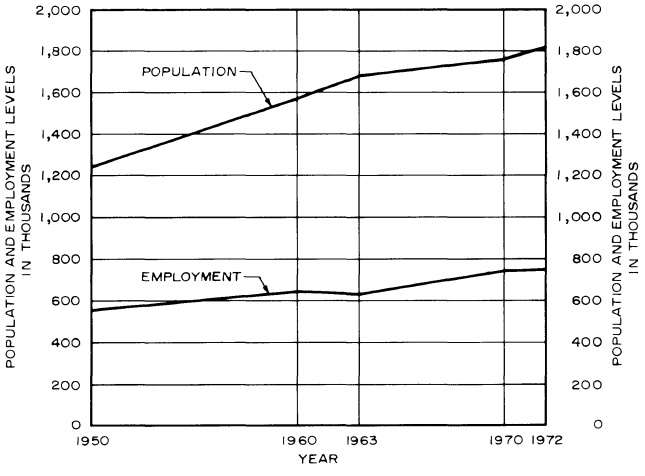
The above maps reflect the distribution of single-family housing values in the Region for 1960 and 1970. The housing value ranges shown for each year, while different in actual dollar value, are equivalent in constant dollar value. A single-family home worth $18,000 in 1960, for example, is equivalent to a single-family home worth $23,000 in 1970. Single-family housing value data were availble in 1960 only for the more urban portions of the Region, but were available for the entire Region in 1970. It is evident from a comparison of the above maps that single-family housing values are generally rising throughout the Region. The lowest value single-family housing is located in the central cities of the Region and in the rural portions of Kenosha, Racine, Walworth, and Washington Counties.

Source: U. S. Bureau of the Census.

equated with the number of available jobs in the Region, since some resident labor force members are employed at jobs located outside of the Region, and some nonresidents will be employed within the Region. Some members of the regional labor force will also be employed at two or more places, while other members may be unemployed but actively seeking employment.

Figure 23

POPULATION AND EMPLOYMENT TRENDS IN THE REGION: 1950-1972



Source: U. S. Bureau of the Census; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

Data collected in the Commission's travel inventories indicate that in both 1963 and 1972, the number of regional residents employed outside of the Region exceeded the number of nonresidents employed within the Region (see Table 20). Moreover, these data indicate that from 1963 to 1972 the number of nonresidents employed within the Region decreased slightly, while the number of regional residents employed outside the Region increased slightly.

Table 21 shows the changes in the labor force in the United States, Wisconsin, and the Region from 1950 to 1970. During this 20-year period, the labor force in the Region increased from about 540,100 persons in 1950 to about 638,700 in 1960 and about 744,500 in 1970, an overall increase of 204,400 persons, or 38 percent. This increase was greater than that for Wisconsin and less than that for the United States during the same period. These labor force trends indicate that during this period, the Region experienced difficulty in competing for economic growth with other parts of the United States. Within the Region, the labor force in both Ozaukee and Waukesha Counties more than doubled from 1950 to 1970. Only in the three urban counties of Kenosha, Milwaukee, and Racine did the labor force increase less than 50 percent from 1950 to 1970. It should also be noted that since labor force is enumerated at place of residence, the size of the labor force in individual counties 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 the suburban areas of Ozaukee, Washington, and Waukesha Counties work at jobs in Milwaukee County.

Table 20

DISTRIBUTION OF FIRST WORK RELATED TRIPS BY PLACE OF RESIDENCE AND PLACE OF WORK: 1963 and 1972

Place of Residence	Place of Work: In Region: Kenosha County		Milwaukee County		Ozaukee County		Racine County		Walworth County		Washington County		Waukesha County		Outside Region[a]		Total	
	1963	1972	1963	1972	1963	1972	1963	1972	1963	1972	1963	1972	1963	1972	1963	1972	1963	1972
Kenosha County	24,878	27,623	168	354	0	0	1,546	2,315	109	519	0	0	12	26	4,170	4,703	30,883	35,540
Milwaukee County	632	511	320,927	313,359	1,195	1,628	1,210	1,308	288	104	365	886	4,759	13,340	2,548	2,423	331,924	333,559
Ozaukee County	5	0	4,820	7,216	4,537	11,631	10	0	4	18	112	575	95	500	190	350	9,773	20,230
Racine County	2,995	3,036	3,183	5,036	0	0	34,780	42,061	216	655	0	0	211	602	506	832	41,891	52,222
Walworth County	275	218	574	460	0	0	397	746	8,574	15,521	12	0	231	352	1,913	1,437	11,976	18,734
Washington County	8	16	2,592	3,928	572	1,312	20	38	0	0	6,449	14,820	615	1,508	339	462	10,595	22,084
Waukesha County	75	72	23,462	32,658	155	363	262	334	175	264	363	556	20,423	42,830	1,062	1,402	45,977	78,479
Outside Region[b]	2,264	1,209	2,551	2,360	632	401	501	318	1,574	1,294	1,131	1,462	1,259	1,574	--	--	9,912	8,618
Total	31,132	32,685	358,277	365,371	7,091	15,335	38,726	47,120	10,940	18,375	8,432	18,239	27,605	60,372	10,728	11,609	492,931	569,466

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

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

Source: SEWRPC.

Table 21

LABOR FORCE TRENDS IN THE UNITED STATES, WISCONSIN, AND THE REGION BY COUNTY: SELECTED YEARS 1950-1970

Area	Labor Force			Change 1950 - 1960		Change 1960 - 1970		Change 1950 - 1970	
	1950	1960	1970	Absolute	Percent	Absolute	Percent	Absolute	Percent
Kenosha County	32,600	39,800	47,700	7,200	22.1	7,900	19.8	15,100	46.3
Milwaukee County	386,500	433,100	458,600	46,600	12.1	25,500	5.9	72,100	18.6
Ozaukee County	9,600	14,400	22,400	4,800	50.0	8,000	55.5	12,800	133.3
Racine County	46,800	55,000	69,300	8,200	17.5	14,300	26.0	22,500	4.8
Walworth County	16,500	20,500	26,800	4,000	24.2	6,300	30.7	10,300	62.4
Washington County ...	14,300	17,400	26,100	3,100	21.7	8,700	50.0	11,800	82.5
Waukesha County	33,800	58,500	93,600	24,700	73.1	35,100	60.0	59,800	176.9
Region	540,100	638,700	744,500	98,600	18.3	105,800	16.6	204,400	37.8
Wisconsin	1,396,400	1,533,000	1,799,300	136,600	9.8	266,300	17.4	402,900	28.8
United States	59,304,000	68,144,000	82,897,000	8,840,000	14.9	14,753,000	21.6	23,593,000	39.8

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

The 1970 Census of Population indicated that 49 percent of the workers living in Waukesha County, 44 percent of the workers living in Ozaukee County, and 35 percent of the workers living in Washington County work outside of their county of residence. Data identified in the Commission's 1972 travel inventories indicate that these percentages are 43, 41, and 31, respectively. These travel inventory data further indicate that about 33,000 first work trips, or 41 percent of the more than 78,000 average weekday first work trips originating from residences in Waukesha County, have work destinations in Milwaukee County; that over 7,000 first work trips, or 36 percent of the more than 20,000 average weekday first work trips originating from residences in Ozaukee County, have work destinations in Milwaukee County; and that over 3,900 first work trips, or 18 percent of the more than 22,000 average weekday first work trips originating from residences in Washington County, have work destinations in Milwaukee County (see Table 20).

The labor force participation rate is the relationship between the labor force and the total population. This rate is a useful analytical tool for identifying trends and fluctuations in the population which may indicate changing economic or social conditions. The labor force participation rate is defined as the proportion of the total population 14 years of age and over who are 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 57 percent in 1950 to 58 percent in 1960 and 59 percent in 1970 (see Table 22).

This increase in labor force participation is due largely to the increase in the proportion of females in the working age population who have either obtained a job or are actively seeking employment. From 1950 to 1970, female labor force participation increased from 32 percent to 36 percent, while in contrast, male participation decreased from 82 percent to 76 percent. While male participation rates have continued to decline, the labor force participation rate was still much greater for males than for females in 1970. The observed 1950 to 1970 trends in labor force participation may be anticipated to continue due to the following factors: increasing emphasis on formal education or training especially among the male population; retirement from the labor force at younger ages; the decision of young adults to have families at later ages; the decision of young adults to have smaller families; the desire of older women to help meet family financial needs or simply return to work; and the increasing number of females who choose to pursue a career other than that of homemaker.

Work Force Size and Composition

Another important measure of economic activity in the Region is the size and composition of the Region's work force. Included within the work force are all employed persons 14 years of age and over enumerated at their place of work, together with those residents currently unemployed but actively seeking work, enumerated at their place of residence. Work force tabulations reflect changes in the number of jobs available to residents of the Region. It should be noted that work force tabulations will double count persons holding two or more jobs, and will include those persons who live outside the Region but work within the Region, while excluding those persons living within the Region who are working outside the Region. In contrast, labor force tabulations include all persons of working age residing within the Region regardless of their place of work. Work force and labor force trends closely parallel one another, but absolute values will vary somewhat because of the different means of enumeration.

Changes in the size of the work force in the United States, Wisconsin, and the Region are presented in Table 23. The regional work force increased by about

Table 22

PARTICIPATION OF THE POPULATION IN THE LABOR FORCE IN THE REGION: SELECTED YEARS 1950-1970

Population 14 Years and Over	1950	1960	1970	Change 1950 - 1960 Absolute	Change 1950 - 1960 Percent	Change 1960 - 1970 Absolute	Change 1960 - 1970 Percent	Change 1950 - 1970 Absolute	Change 1950 - 1970 Percent
Male	466,938	534,824	604,341	67,886	14.5	69,517	13.0	137,403	29.4
Female	485,157	565,703	664,204	80,546	16.6	98,501	17.4	179,047	36.9
Total	952,095	1,100,527	1,268,545	148,432	15.6	168,018	15.3	316,450	33.2
Labor Force									
Male	384,946	432,433	456,918	47,487	12.3	24,485	5.7	71,972	18.7
Female	155,111	206,300	287,596	51,189	33.0	81,296	39.4	132,485	85.4
Total	540,057	638,733	744,514	98,676	18.3	105,781	16.6	204,457	37.9
Participation Rate				Change 1950 - 1960		Change 1960 - 1970		Change 1950 - 1970	
Male	82.4	80.0	75.6	- 1.6		- 5.2		- 6.8	
Female	32.0	36.5	43.3	4.5		6.8		11.3	
Total	56.7	58.0	59.2	1.3		1.2		2.5	

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

Table 23

EMPLOYMENT STATUS OF THE WORK FORCE IN THE UNITED STATES, WISCONSIN, AND THE REGION: SELECTED YEARS 1950-1972

Area	Year 1950	1960	1970	1972	Percent Change 1950-1960	1960-1970	1970-1972	1950-1972
United States								
Work Force	62,208,000	69,628,000	82,715,000	86,524,000	11.9	18.8	4.6	39.1
Percent Unemployed	5.3	5.5	4.9	5.6	--	--	--	--
Employed	58,911,000	65,798,500	78,662,000	81,702,000	11.7	19.5	3.9	38.7
Wisconsin								
Work Force	1,401,400	1,647,000	1,932,100	1,973,400	17.5	17.3	2.1	40.8
Percent Unemployed	3.8	3.9	4.6	5.0	--	--	--	--
Employed	1,348,100	1,582,800	1,842,400	1,872,900	17.6	16.4	1.6	38.9
Region								
Work Force	572,200	673,200	776,200	785,400	17.6	15.3	1.2	37.2
Percent Unemployed	3.4	3.8	4.5	4.7	--	--	--	--
Employed	552,700	647,900	741,600	748,800	17.2	14.5	1.0	35.5

Source: Wisconsin Department of Industry, Labor, and Human Relations; U. S. Department of Labor; and SEWRPC.

18 percent from 1950 to 1960, a more rapid increase than that experienced by both the state and the nation. From 1950 to 1972 the Region's work force increased by about 17 percent, compared to work force increases of 24 and 20 percent in the United States and Wisconsin, respectively.

Rates of unemployment for the United States, Wisconsin, and the Region are also shown in Table 23. The Region's unemployment rates since 1950 have been significantly below those of the United States and slightly below those of Wisconsin. Thus, although the Region has experienced recent difficulties in competing for economic growth and development with other areas of the state and nation, it has maintained a high rate of employment among the active work force.

Size of the Economy

For planning purposes, perhaps the best measure of economic activity is the number of employment oppor-

tunities, or jobs, available to the residents of a planning area. The number of jobs within the Region consists, by definition, of the employed portion of the work force and, as such, includes all employed persons 14 years of age and older enumerated at their location of work. Table 23 and Figure 24 show the absolute and relative changes in the number of job opportunities within the United States, Wisconsin, and the Region from 1950 to 1972.

The amount of economic activity in the Region, as measured by the number of available jobs, has changed at varying rates since 1950. There was a rapid increase in the number of available jobs in the Region from 1950 to 1957, followed in 1958 by a sharp decline corresponding to a national economic recession. From 1950 to 1960 another rapid increase in the number of jobs available was observed, followed by another sharp decline in 1961 which again corresponded to a national economic recession. From 1962 to 1972, job growth within the Region proceeded at a steady rate except for a slight economic slowdown from 1966 to 1967 and a decline in 1971 as a result of the 1970 economic recession.

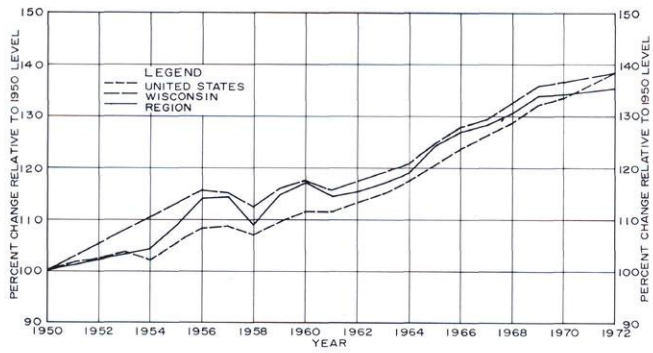
The recent trend in regional economic activity has generally paralleled the trend in national economic activity. Fluctuations in periods of economic expansion and recession are much greater for the Region, however, than for the nation, due to the high concentration of regional economic activity in the production of capital goods. Capital goods production, as a derived demand, is highly responsive to lesser fluctuations in general consumer demand for goods and services. In addition, from 1954 to 1970, the relative rate of growth in economic activity in the Region, as measured by the number of available jobs, was consistently higher than that of the nation. The national rate of growth since 1970, however, has increased more rapidly than that of the Region, further illustrating the fact that the Region has experienced increased difficulty in competing for economic growth with other areas in the nation and, to a lesser extent, with other areas in the state.

In 1972, growth in economic activity in the Region resulted in the creation of approximately 748,800 jobs. It is estimated from income data that the economy of the Region in 1972 was producing nearly 1 percent of the total gross national product of the United States. Stated another way, the economy of the Region was generating nearly $7 billion of income in the form of gross wages and salaries, proprietary income, corporate profits, rental income, and interest income.

As shown in Table 23, unemployment in the Region has increased at a steady rate since 1950. The relatively rapid change in unemployment from 1970 to 1972 reflects the national economic recession. It should be noted that while unemployment in the Region has been increasing since 1950, the unemployment rates in the Region have been consistently lower than those of the state and the nation. 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 (see Figure 25). There was also a higher

Figure 24

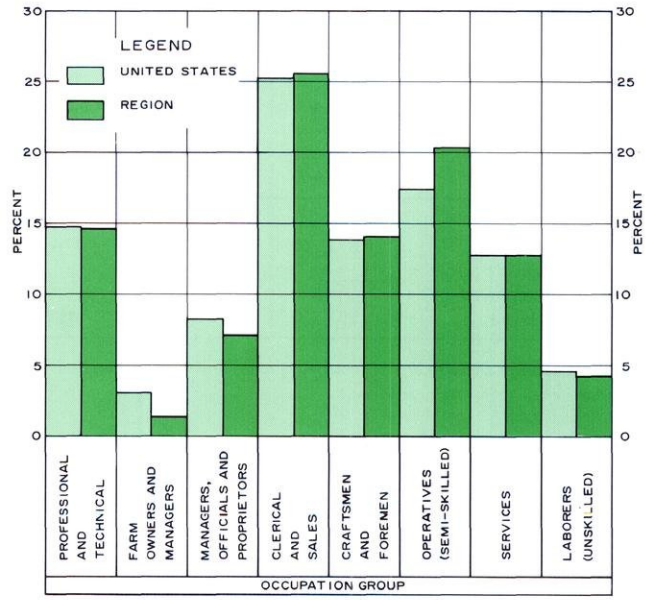
RELATIVE JOB GROWTH IN THE UNITED STATES, WISCONSIN, AND THE REGION: 1950-1972



Source: U. S. Department of Labor; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

Figure 25

PERCENTAGE DISTRIBUTION OF THE EMPLOYED PORTION OF THE LABOR FORCE 16 YEARS OF AGE AND OVER BY OCCUPATION GROUP IN THE UNITED STATES AND THE REGION: 1970



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

proportion of white collar clerical and sales workers in the regional labor force than in the national labor force in 1970. 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 high technology research industries as are the economies in other areas of the United States, such as the Pacific states.

Distribution of Economic Activity

Significant changes in the distribution of economic activity within the Region have occurred during the past 22 years. As shown in Table 24, the number of jobs increased by about 196,000, or about 36 percent, from 552,700 jobs in 1950 to 647,900 jobs in 1960, and to 741,600 jobs in 1970 and 748,800 jobs in 1972. Since 1950 the largest estimated increase in the number of jobs available in the Region occurred from 1963 to 1972. Over this nine-year period the number of jobs within the Region increased by about 118,000, or 19 percent.

In 1963, nearly 75 percent of the economic activity of the Region, as measured by jobs, was located in Milwaukee County. An additional 14 percent was located in Kenosha and Racine Counties combined. Therefore, approximately 89 percent of the regional economic activity in 1963 was located in these three urban counties. By 1972, the proportion of the economic activity of the Region located in Milwaukee County had declined to 68 percent, while the proportion of the regional economic activity concentrated in the three urban counties of Kenosha, Milwaukee, and Racine combined had decreased to about 82 percent. Over the last nine years, therefore, the trend in the intraregional distribution of jobs has been toward a decreasing concentration of jobs in these three urban counties and an increasing concentration of jobs in three of the four outlying counties.

Waukesha County experienced the largest increase in the proportion of regional jobs, from 5 percent in 1963 to 9 percent in 1972. During the same nine-year period, Washington County increased its proportion of the regional economic activity, as measured by jobs, from 2 percent in 1963 to 3 percent in 1972, and Ozaukee County increased its proportion of the total number of jobs available in the Region from nearly 2 percent in 1963 to nearly 3 percent in 1972. These trends reflect a continuation of the decentralization of manufacturing and service oriented activities from the highly urban areas to the more suburban and rural-urban fringe areas of the Region. The detailed geographic distribution of jobs in the Region in 1972 is presented on Map 14. As shown, there is a heavy concentration of jobs in the Cities of Milwaukee, Kenosha, and Racine. While the remaining employment is generally dispersed, there is a notable concentration of jobs in certain outlying cities and villages in the Region.

Structure of the Economy

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

As shown in Figure 26, economic activity within the Region is heavily concentrated in manufacturing. In 1972 about 34 percent of the total jobs in the Region were in manufacturing, compared to only about 23 percent nationally (see Table 25). With the exception of wholesale and retail trade and private services, the proportion of economic activity in all other industry groups within the Region, as measured by number of jobs, was less than the national averages. The regional economy is, however, becoming less oriented toward manufacturing and more oriented toward other industry groups, especially the private and government services groups. From 1963 to 1972, these service groups combined increased their proportion of the total regional employment from about 20 percent to 30 percent.

During the same period, the proportion of total regional employment made up by manufacturing decreased from

Table 24

DISTRIBUTION OF JOBS IN THE REGION BY COUNTY: SELECTED YEARS 1950-1972

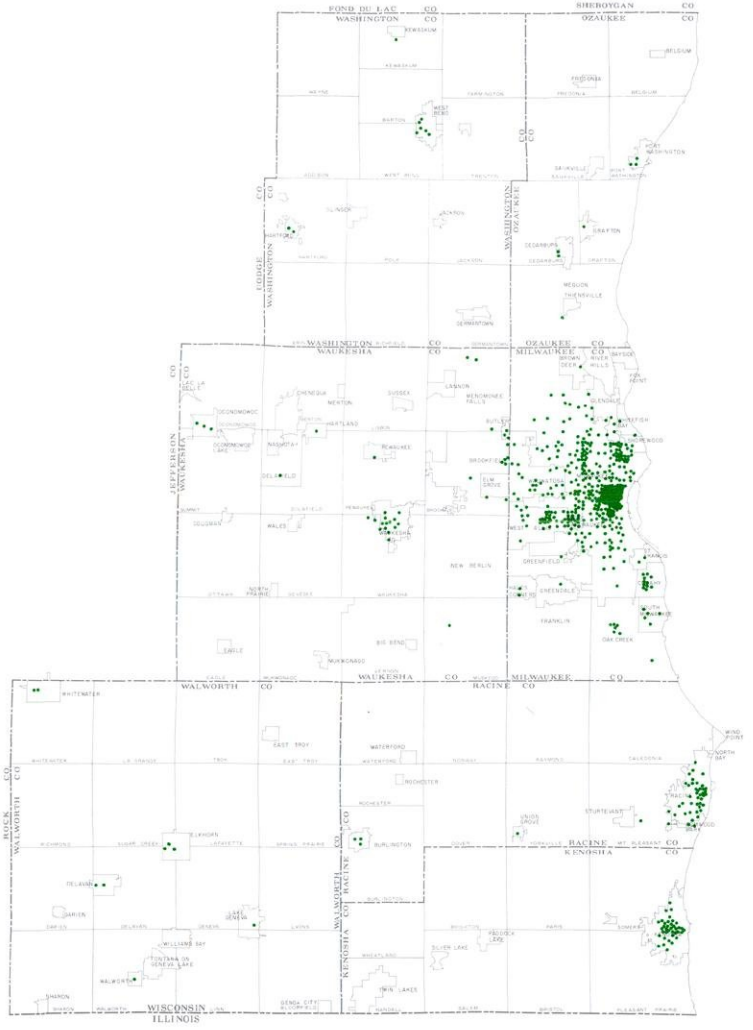
County	1950		1960		1963		1970		1972		Change 1950 - 1960		Change 1960 - 1970		Change 1963 - 1972	
	Jobs	Percent	Jobs	Percent	Jobs	Percent	Jobs	Percent	Jobs	Percent	Jobs	Percent	Jobs	Percent	Jobs	Percent
Kenosha	27,700	5.0	40,100	6.2	41,400	6.6	39,200	5.3	40,600	5.4	12,400	44.8	- 900	- 2.2	- 800	- 1.9
Milwaukee	438,100	79.3	486,200	75.0	468,600	74.3	510,900	68.9	509,000	68.0	48,100	11.0	24,700	5.1	40,400	8.6
Ozaukee	6,200	1.1	9,500	1.5	10,700	1.7	17,900	2.5	19,200	2.6	3,300	53.2	8,400	88.4	8,500	79.4
Racine	43,200	7.8	48,500	7.5	52,200	8.3	61,900	8.2	63,500	8.5	5,300	12.3	13,400	27.6	11,300	21.6
Walworth	12,300	2.2	18,300	2.8	12,600	2.0	24,200	3.3	24,000	3.2	6,000	48.8	5,900	32.2	11,400	90.5
Washington	9,700	1.8	14,500	2.2	12,000	1.9	20,300	2.7	21,100	2.8	4,800	49.5	5,800	40.0	9,100	75.8
Waukesha	15,500	2.8	30,800	4.8	33,400	5.3	67,200	9.1	71,400	9.5	15,300	98.7	36,400	118.2	38,000	113.8
Region	552,700	100.0	647,900	100.0	630,900	100.0	741,600	100.0	748,800	100.0	95,200	17.2	93,700	14.5	117,900	18.7

Source: U. S. Bureau of the Census; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

Map 14

JOB DISTRIBUTION IN THE REGION: 1963 and 1972

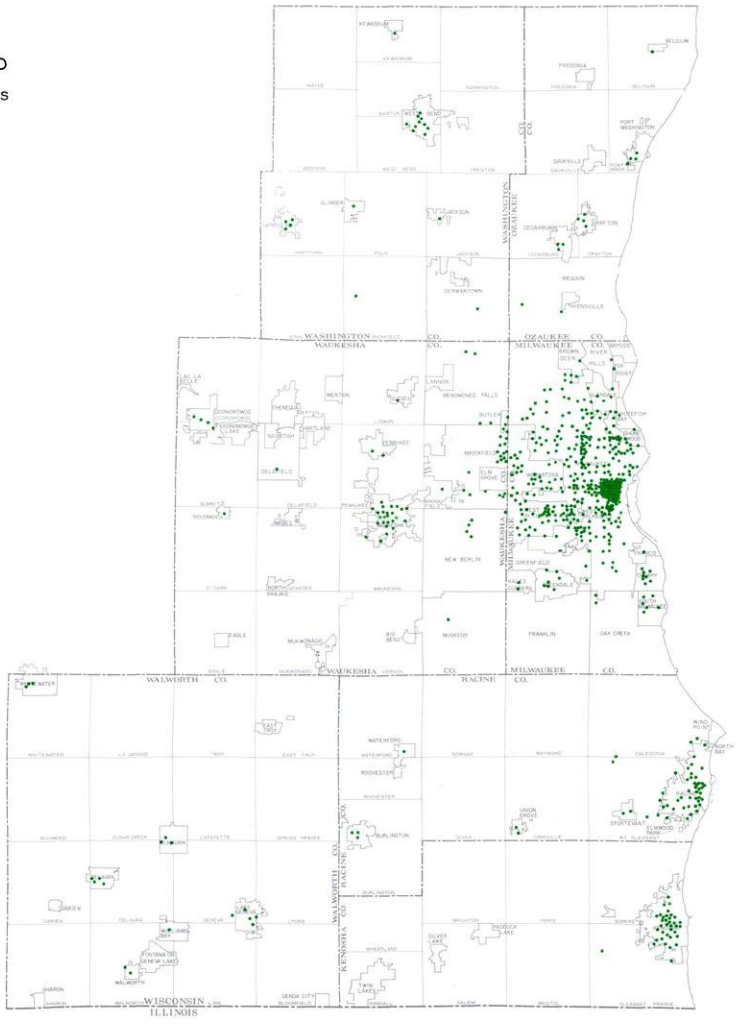
1963



LEGEND

● 1,000 JOBS

1972

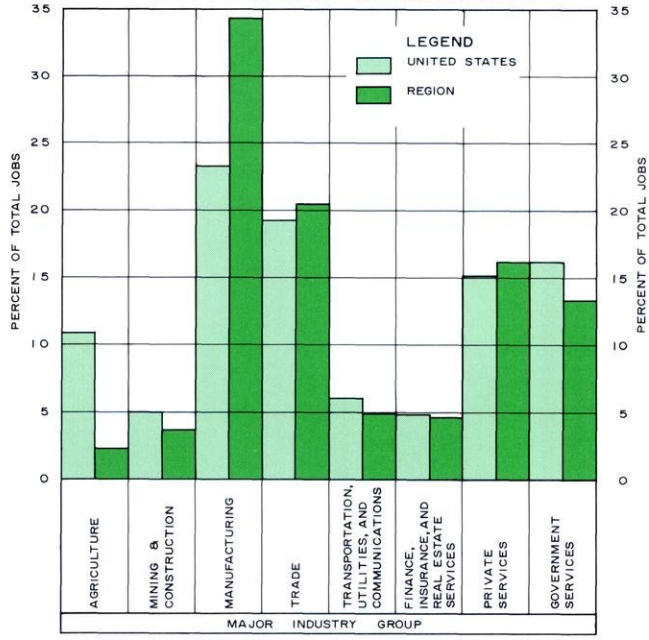


In 1963 there were about 631,000 jobs in the Region. By 1972 the number of jobs available had risen to about 749,000, an increase of about 19 percent. In 1963 nearly 90 percent of the jobs were located in the three largely urban counties—Kenosha, Milwaukee, and Racine. By 1972 the proportion of jobs in these three counties had declined to about 80 percent, reflecting the trend toward rapid decentralization of employment throughout the Region. Waukesha County experienced the largest increase in the proportion of regional jobs over the nine-year period, increasing from about 5 percent in 1963 to about 9 percent in 1972.

Source: SEWRPC.

Figure 26

PERCENTAGE DISTRIBUTION OF JOBS BY MAJOR INDUSTRY GROUP IN THE UNITED STATES AND THE REGION: 1972



Source: U. S. Bureau of Labor Statistics; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

about 43 percent in 1963 to about 34 percent in 1972. To a lesser extent, the national economy has also become less manufacturing oriented and more service oriented. From 1963 to 1972, the proportion of total national employment made up by the private and government service groups increased from about 29 percent in 1963 to over 31 percent in 1972, while during the same period the proportion of total national employment made up by manufacturing decreased from 25 percent to 23 percent.

The structure of economic activity within the regional manufacturing industry is also quite different from the structure of the manufacturing industry nationally (see Table 26 and Figure 27). In contrast to the manufacturing industry of the United States, the manufacturing industry in the Region is heavily concentrated in the production of durable goods, particularly nonelectrical and electrical machinery and transportation equipment. In 1972, about 51 percent of the total manufacturing jobs within the Region were in these industries, compared to less than 27 percent nationally.

Compared to the national distribution, there is also a greater concentration of fabricated metal products, primary metal products, and printing and publishing activities in the Region. Relative to the national distribution, however, there is a lower concentration of regional economic activity associated with the production of many nondurable goods, such as textile, apparel, and leather products; paper and wood products; and chemical,

Table 25

PERCENTAGE DISTRIBUTION OF TOTAL EMPLOYMENT BY MAJOR INDUSTRY GROUP IN THE UNITED STATES AND THE REGION: 1963 and 1972

Industry Group	Percent of Total Employment				Point Change: 1963-1972	
	Region		United States			
	1963	1972	1963	1972	Region	United States
Agriculture	2.0	2.2	7.2	10.9	0.2	3.7
Construction and Mining	4.6	3.6	7.0	5.0	- 1.0	- 2.0
Manufacturing	42.7	34.4	25.5	23.2	- 8.3	- 2.3
Transportation[a]	6.0	4.9	6.1	5.5	- 1.1	- 0.6
Trade	20.2	20.5	20.7	19.2	- 0.4	- 1.5
Finance[b]	4.1	4.6	4.6	4.8	0.5	0.2
Services	11.8	16.3	15.0	15.1	4.5	0.1
Government[c]	8.6	13.4	13.9	16.3	4.8	2.4
Total	100.0	100.0	100.0	100.0	--	--

[a] *Includes communications and utilities.*

[b] *Incudes insurance and real estate.*

[c] *Includes public education.*

Source: U. S. Department of Labor, Bureau of Labor Statistics; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

Table 26

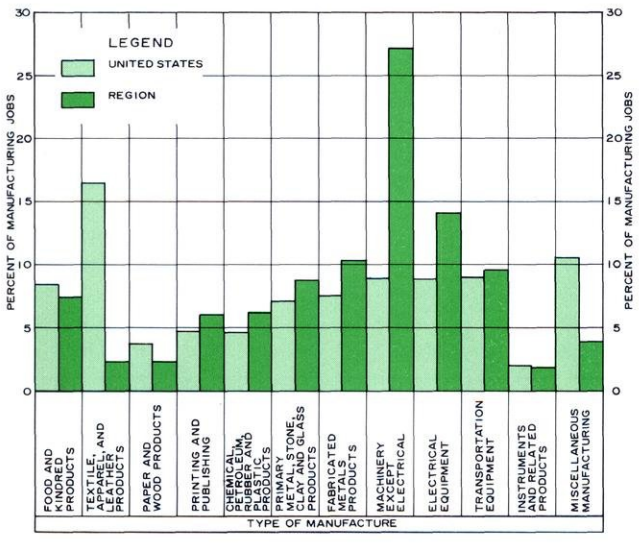
PERCENTAGE DISTRIBUTION OF MANUFACTURING EMPLOYMENT BY TYPE OF MANUFACTURING IN THE UNITED STATES AND THE REGION: 1963 AND 1972

Type of Manufacturing	Region		United States		Point Change: 1963-1972	
	1963	1972	1963	1972	Region	United States
Food and Kindred Products	8.9	7.6	10.2	8.5	- 1.3	- 1.7
Textile, Apparel, and Leather Products	5.6	2.4	14.9	16.6	- 3.2	1.7
Paper and Wood Products	3.8	2.5	9.4	3.9	- 1.3	- 5.5
Printing and Publishing	6.3	6.1	5.4	4.7	- 0.2	- 0.7
Chemical, Petroleum, Rubber, and Plastic Products	2.0	4.7	8.6	8.5	2.7	- 0.1
Primary Metals	7.4	8.7	6.8	7.1	1.3	0.3
Stone, Clay, and Glass Products	0.8	0.9	3.6	3.8	0.1	0.2
Fabricated Metal Products	7.6	10.3	6.8	7.6	2.7	0.8
Nonelectrical Machinery	24.0	27.2	8.9	8.9	3.2	0.0
Electrical Equipment	15.4	14.2	9.3	8.9	- 1.2	- 0.4
Transportation Equipment	14.1	9.6	9.5	9.0	- 4.5	- 0.5
Instruments and Related Products	1.5	1.9	2.2	2.0	0.4	- 0.2
Miscellaneous Manufacturing	2.6	3.9	4.4	10.5	1.3	6.1
Total	100.0	100.0	100.0	100.0	--	--

Source: U. S. Department of Labor, Bureau of Labor Statistics; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

Figure 27

PERCENTAGE DISTRIBUTION OF MANUFACTURING JOBS BY TYPE OF MANUFACTURING IN THE UNITED STATES AND THE REGION: 1972



Source: U. S. Department of Labor, U. S. Bureau of Labor Statistics; Wisconsin Department of Industry, Labor, and Human Relations; and SEWRPC.

petroleum, rubber, and plastics products. The only nondurable goods manufacturing activity, in addition to printing and publishing, which has a proportion of regional manufacturing employment approximating that of the national economy is the production of food and beverage products. This is due primarily to the number of very large breweries located in the Region.

Table 26 also indicates that from 1963 to 1972, the chemical, petroleum, rubber, and plastics industry; the nonelectrical machinery industry; and the fabricated metals industry experienced the largest relative employment increases of all the individual manufacturing industries in the Region. The chemical, petroleum, rubber, and plastic products industry increased its proportion of the total regional manufacturing employment from 2 percent in 1963 to about 5 percent in 1972, while the fabricated metal products manufacturing industry increased its relative proportion of total regional manufacturing employment from about 8 percent in 1963 to over 10 percent in 1972.

The most important manufacturing industry in the Region, nonelectrical machinery production, increased from 24 percent of the total regional manufacturing employment in 1963 to over 27 percent in 1972. During the same period, however, the second and third most important regional manufacturing industries in the Region—electrical equipment and transportation equip-

ment—each decreased their relative proportion of the total regional manufacturing employment. The transportation equipment industry experienced the largest decrease of proportionate manufacturing employment of all the manufacturing industries in the Region, declining from over 14 percent of the total manufacturing employment in 1963 to about 10 percent in 1972. During the same period the proportion of the total regional manufacturing employment made up by the electrical equipment industry decreased from over 15 percent of the total to about 14 percent of the total.

It is interesting to note that the most important manufacturing activity nationally, in terms of proportionate employment, is the production of textiles, apparel, and leather goods. Nearly 17 percent of total national manufacturing employment was accounted for by this industry in 1972. Within the Region, however, this industry accounted for only about 2 percent of the total manufacturing employment in 1972. This is due in part to the fact that the location of the Region does not lend itself to service of the national textile, apparel, and leather product markets. The manufacture of these products is generally of an unskilled labor intensive nature, while the regional labor force is oriented toward skilled or semiskilled manufacturing labor. Since the labor force in the Region is by nature skilled or semiskilled, labor costs in the Region are generally higher than for other areas of the nation (see Tables 27 and 28).

THE PUBLIC FINANCIAL RESOURCE BASE OF THE REGION

The major emphasis in the Commission's inventory of public financial resources has been on an appraisal of the sources and amounts of funds available in the Region for implementation of public transportation facility plans. Since transportation is only one of the many concerns of government, however, the proportionate share of total revenues available for the construction, operation, and maintenance of transportation facilities is greatly affected by the need for other public facilities and services. Knowledge of the proportionate share of total public revenues and expenditures historically allocated

Table 27

AVERAGE HOURLY EARNINGS FOR SELECTED MANUFACTURING INDUSTRIES IN THE UNITED STATES: 1960-1970

Selected Manufacturing Industries	Average Hourly Earnings											Absolute Change 1960-1970	Percent Change 1960-1970
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970		
Nonelectrical Machinery	$2.55	$2.62	$2.71	$2.78	$2.87	$2.96	$3.09	$3.19	$3.36	$3.58	$3.77	$1.22	47.8
Electrical Machinery and Equipment	2.28	2.35	2.40	2.46	2.51	2.58	2.65	2.77	2.93	3.09	3.29	1.01	44.3
Transportation Equipment	2.74	2.80	2.91	3.01	3.09	3.21	3.33	3.44	3.69	3.90	4.07	1.33	48.5
Food and Related Products	2.11	2.17	2.24	2.30	2.37	2.43	2.52	2.64	2.80	2.96	3.16	1.05	49.8
Fabricated Metals	2.43	2.49	2.55	2.61	2.68	2.76	2.88	2.98	3.16	3.34	3.53	1.10	45.3
Primary Metals	2.81	2.90	2.98	3.04	3.11	3.18	3.28	3.34	3.55	3.79	3.94	1.13	40.2
Printing and Publishing	2.68	2.75	2.82	2.89	2.97	3.06	3.16	3.28	3.48	3.69	3.92	1.24	46.3
Total Manufacturing Industry	$2.26	$2.32	$2.39	$2.46	$2.53	$2.61	$2.72	$2.83	$3.01	$3.19	$3.41	$1.15	50.9

Source: U. S. Department of Labor, Bureau of Labor Statistics; and SEWRPC.

Table 28

AVERAGE HOURLY EARNINGS FOR SELECTED MANUFACTURING INDUSTRIES IN THE REGION: 1960-1970

Selected Manufacturing Industries	Average Hourly Earnings											Absolute Change 1960-1970	Percent Change 1960-1970
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970		
Nonelectrical Machinery	$2.65	$2.73	$2.80	$2.92	$3.06	$3.15	$3.30	$3.40	$3.55	$3.90	$4.05	$1.40	52.8
Electrical Machinery and Equipment	2.71	2.77	2.86	2.93	3.05	3.11	3.21	3.33	3.50	3.67	3.88	1.17	43.2
Transportation Equipment	2.92	2.95	3.12	3.17	3.30	3.40	3.54	3.71	3.92	4.19	4.43	1.51	51.7
Food and Related Products	2.67	2.73	2.82	2.86	3.03	3.13	3.29	3.38	3.59	3.85	4.20	1.53	57.3
Fabricated Metals	2.53	2.59	2.67	2.76	2.82	2.90	3.02	3.09	3.26	3.48	3.68	1.15	45.5
Primary Metals	2.75	2.85	2.92	3.00	3.08	3.23	3.41	3.49	3.71	3.93	4.16	1.41	51.3
Printing and Publishing	2.76	2.87	2.98	3.06	3.15	3.26	3.39	3.50	3.68	3.92	4.24	1.48	53.6
Total Manufacturing Industry	$2.63	$2.68	$2.78	$2.85	$2.95	$3.04	$3.18	$3.28	$3.46	$3.69	$3.91	$1.28	48.7

Source: U. S. Department of Labor, Bureau of Labor Statistics; and SEWRPC.

to transportation is particularly useful in preparing forecast levels of the probable future funds available for transportation plan implementation.

While the state and federal governments raise and expend monies for many types of public services and facilities in the Region, the majority of these monetary exchanges are transacted directly through the local units of government. For example, direct federal and state expenditures for highway services and facilities in the Region totaled $29.6 million in 1972, while an additional $25.9 million in state and federal funds were received directly by the local units of government in the form of statutory and other related highway aids.

In this light, particular attention has been given to the amounts of monies received and expended by local units of government in the form of capital and noncapital direct and indirect outlays for highways, streets, and bridges. Since public expenditures for capital equipment and operation and maintenance of mass transit facilities in the Region from 1960 to 1972 have been virtually nonexistent, these types of public transportation expenditures have not been included as part of this analysis.

An important factor to be considered in a meaningful comparison of dollar changes in the revenue and expenditure levels of local units of government is the overall rate of price inflation. Such a comparison better identifies real changes in current dollar spending and purchasing power. One such measure of the overall rate of price inflation is the consumer price index, which purports to indicate average changes in the prices of goods and services. Changes in local government revenue and expenditure levels, therefore, should be compared to this index to measure real changes. From 1960 to 1972, the consumer price index increased to 41.3 percent, or almost a 3.5 percent average increase per year. It should be noted, however, that since 1972 the consumer price index has increased quite rapidly at annual rates approaching 10 percent at the time of this writing.

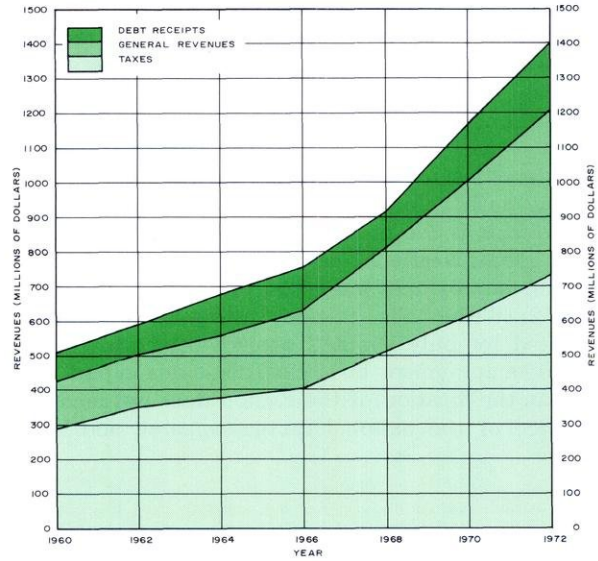
Revenue and expenditure patterns for the City of Milwaukee and Milwaukee County are presented separately from those of other city and county units of government in the Region, primarily because of the sheer size of these revenues and expenditures, and also because the revenue and expenditure patterns of these two government entities vary significantly from those of many other cities, villages, and counties in the Region.

General Revenue Patterns in the Region

Total public revenues of local governments in the Region, which include the revenues of school districts, counties, cities, villages, and towns, have increased steadily from 1960 to 1972. As shown in Figure 28, the combined public revenues of local units of government in the Region increased from about $507 million in 1960 to about $1,400 million in 1972, an overall increase of $892 million, or 176 percent. As previously noted, the consumer price index increased by about 41 percent over the same 12-year period. The total increase in revenue, therefore, was substantially greater than the corresponding increase in price inflation. As such, much of this increase in revenue was real, and not significantly distorted by the rate of price increase.

Figure 28

COMPOSITION OF PUBLIC REVENUES FOR ALL SCHOOL DISTRICTS AND GENERAL PURPOSE UNITS OF GOVERNMENT IN THE REGION SELECTED YEARS 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

The money raised each year by local governments comes from three primary sources: tax revenues, including both returned state and local property taxes; borrowing revenues; and general revenues, including receipts from public industries,[6] state and federal highway aids to local units of government, and miscellaneous revenues. The degree to which each of these individual revenue categories is relied upon varies considerably among the different governmental units and agencies in the Region.

Since 1960, the property tax levy has consistently been the major source of revenue for local governments in the Region. As shown in Table 29, per capita property taxes for local, county, school, and state purposes have increased from about $144 per capita in 1960 to over $327 per capita in 1972, an overall increase of $184 per capita, or 128 percent. Monies needed for the operation of local governments that are not received from other sources are principally supplied by the property tax levy. As such, the property tax is a residual source of government revenue, and may be expected to vary significantly by year and type of government as total local government revenues and expenditure change. Overall, the present tax levies for all general-purpose

[6] *Includes earnings from selected public facilities and services such as hospitals, airports, parks, and utilities.*

government types, with the exception of counties, in the Region are generally well below the tax levy ceiling imposed by the Wisconsin Legislature. The availability of future governmental revenues from property tax levies, therefore, maintains some flexibility as long as the property tax remains the important source of revenue that it is now.

The full, or equalized, value of all taxable real and personal property in the Region has increased from $8.73 billion in 1960 to $16.42 billion in 1972, an overall increase of about $7.7 billion, or 88 percent (see Table 30). The rate of increase in the full value of taxable property in the Region has not been distributed evenly among the seven counties. The rapidly urbanizing counties of Washington, Ozaukee, and Waukesha experienced the most rapid increases in the full value taxable property from 1960 to 1972, while the urban counties of Kenosha, Milwaukee, and Racine experienced the slowest increase over the same 12-year period.

Borrowing has been another major source of revenue for local units of government. Revenues from borrowing are most often used to finance needed public facilities which can be amortized over a considerable period of time. The length of time a municipality or special-purpose district other than a sewerage district may amortize a borrowed debt is generally limited by state law to a maximum of 20 years. The notable exceptions to this law in the Region are Racine, Milwaukee, and Waukesha Counties, which meet statutory population requirements enabling them to amortize bond issues for land acquisition purposes within their county up to a maximum of 50 years.

Table 29

PER CAPITA PROPERTY TAXES LEVIED BY ALL LOCAL UNITS OF GOVERNMENT IN THE REGION SELECTED YEARS 1960-1972

Unit of Government	1960	1962	1964	1966	1968	1970	1972	Per Capita Change 1960-1972	
								Absolute	Percent
Local	$ 38.07	$ 47.64	$ 41.50	$ 45.77	$ 50.18	$ 59.12	$ 72.28	$ 34.21	89.9
State	1.04	1.07	1.08	1.19	1.21	1.41	1.72	0.68	65.4
County	38.68	40.89	43.20	46.74	53.63	63.90	70.76	32.08	82.9
School	66.21	70.20	85.36	98.80	123.12	149.70	183.18	116.97	176.7
Total	$144.00	$159.80	$171.14	$192.50	$228.14	$274.13	$327.94	$183.94	127.7

Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Table 30

FULL VALUE OF REAL AND PERSONAL PROPERTY IN THE REGION BY COUNTY SELECTED YEARS 1960-1972

County	Full Value[a] (In Millions of Dollars)							Change 1960-1972	
	1960	1962	1964	1966	1968	1970	1972	Absolute	Percent
Kenosha	$ 496.0	$ 577.6	$ 646.6	$ 732.9	$ 792.0	$ 854.3	$ 989.3	$ 493.3	99.4
Milwaukee	5,822.3	6,045.6	6,259.2	6,750.6	7,503.9	8,613.7	9,233.9	3,411.6	58.6
Ozaukee	229.5	259.3	286.9	335.2	402.7	561.5	659.9	430.4	187.5
Racine	727.4	798.0	868.7	986.3	1,088.1	1,253.3	1,428.8	701.4	96.4
Walworth	330.8	358.2	408.1	466.7	542.1	676.6	855.7	524.9	158.7
Washington	229.8	252.5	324.4	363.4	440.6	567.3	705.1	475.3	206.8
Waukesha	890.6	1,002.5	1,140.5	1,354.6	1,668.0	2,113.8	2,546.9	1,656.3	186.0
Region	$8,726.4	$9,293.7	$9,934.4	$10,989.7	$12,437.4	$14,640.5	$16,419.6	$7,693.2	88.2

[a] *The full value ("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, merchants' inventories, manufacturers' inventories, furniture and fixtures; machinery, and tools, adjusted to current market value and equalized statewide by the State of Wisconsin Bureau of Property Taxation.*

Source: Wisconsin Department of Revenue, Bureau of Property Taxation; and SEWRPC.

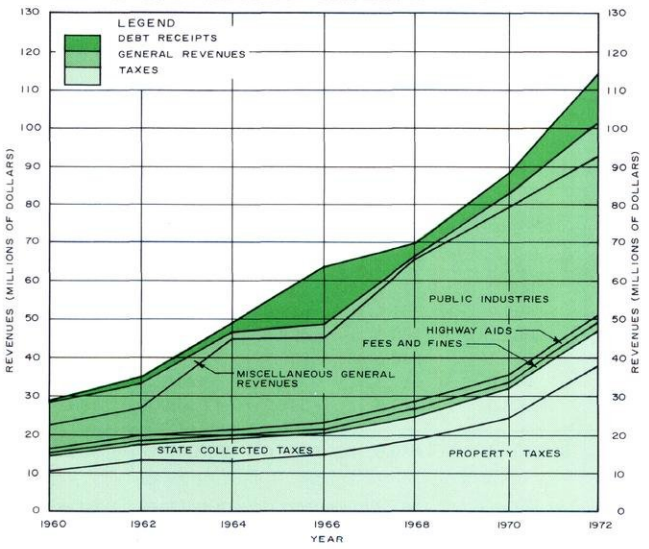
Many municipalities and school districts do not extend their debt repayment period to the maximum time allowable by state law, due in part to the expected efficiency period, or life cycle, of the project being funded, and the effect that the annual land repayment premiums have on the current or anticipated future fiscal stability of the respective unit of government. Presently, the levels of total bonded indebtedness of the general-purpose units of government in the Region are below their respective debt ceiling limits imposed by the Wisconsin Legislature. Future revenues from debt financing, therefore, may be utilized by many governments in the Region to provide future funding for public facilities to accommodate additional urban growth and development in the Region.

County Revenues[7]: The combined revenues of all counties in the Region, excluding Milwaukee County, increased rapidly from $29 million in 1960 to over $114 million in 1972, an overall increase of over $85 million, or 294 percent (see Figure 29). The single largest source of revenue for the counties since 1964 has been from public industries, while in 1960 and 1962, such revenue was second only to the property tax as the primary source of revenue. In 1960, public industry revenues contributed about $7 million, or 23 percent, of total county revenues, while by 1972, such revenues increased to about $42 million and comprised 36 percent of total revenues. This rapid increase is similar to that observed in the cities and villages of the Region, and reflects the rapid increase in population size since 1960 and attendant increase in demands for such public industries as hospitals, airports, and parks.

[7] *Excludes Milwaukee County.*

Figure 29

COMPOSITION OF PUBLIC REVENUES FOR ALL COUNTIES (EXCLUDING MILWAUKEE) IN THE REGION BY SELECTED REVENUE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

The second most important revenue source for counties from 1964 to 1972 was the property tax. In 1960, about $11 million of property taxes were levied for county purposes within the Region. In 1972, about $38 million of property taxes were levied, representing a tax levy increase during this period of over $27 million, or 252 percent. As noted above, the property tax provided the largest source of revenue from 1960 to 1962. The proportion of the total revenues provided by property taxes, however, actually declined by 4 percent, from about 37 percent in 1960 to about 33 percent in 1971, reflecting the increasing importance of other sources of revenue to the counties, particularly receipts from public industries and debt receipts.

Debt receipts provided the third largest source of revenue to the counties in 1972, and exhibited the largest relative increase of all the county revenue categories since 1960. In 1960, counties received about $1 million from indebtedness, while by 1972 this had increased to about $13 million, an overall increase of $12 million, or over 1,000 percent. The proportion of combined county revenues accounted for by debt receipts has also increased dramatically, from about 3 percent in 1960 to about 11 percent in 1972. Debt receipts as a source of county revenue are limited by state law, which specifies that the amount of indebtedness cannot exceed 5 percent of a county's equalized valuation of all taxable property. Thus, this source of revenue cannot increase indefinitely.

County revenues from highway aids have also increased steadily since 1960 as more transportation facilities have been constructed or improved to meet the demands of the increased resident population. Overall since 1960, revenue from this source has increased by over $1 million, or 100 percent, from about $1 million in 1960 to about $2 million in 1972. The proportion of the combined county revenues provided by highway aids, however, decreased from about 3 percent in 1960 to about 2 percent in 1972.

Combined county revenues from fees and fines and state collected taxes have increased from over $4 million in 1960 to over $11 million in 1972, an increase of $7 million, or 159 percent, over this period. The proportion of county revenues accounted for by these two categories combined, however, decreased from over 15 percent in 1960 to about 10 percent in 1972.

Milwaukee County: Total revenues for Milwaukee County increased from about $108 million in 1960 to over $285 million in 1972, an increase of about $178 million, or 165 percent (see Figure 30). From 1960 to 1972, the largest single source of revenue for Milwaukee County was the property tax, and like the other six counties of the Region, the proportion of Milwaukee County's total revenues accounted for by the property tax decreased by about 9 percent from 1960 to 1972. In 1960, $49 million of taxes were levied for county purposes, accounting for about 46 percent of the total county revenues. In 1972, over $105 million of property taxes were levied, accounting for about 37 percent of the total county revenues. As already noted, property tax receipts as

a proportion of total county revenues in the other six counties of the Region declined from over 37 percent in 1960 to about 33 percent in 1972.

The second largest categorical revenue source for Milwaukee County in 1972 was public industry. In 1960, revenues from public industries amounted to $13 million, or 12 percent or total revenues. In 1972, revenues from public industries amounted to about $42 million, or 15 percent of total revenues. In contrast, revenues from public industries in the other six counties of the Region accounted for about 23 percent of the total county revenues in 1960 and about 36 percent in 1972. It should be noted that the increasing magnitude of the revenues received by Milwaukee County from this source primarily reflects increased utilization of county facilities such as the County General Hospital and the Stadium.

Milwaukee County also relies more heavily on debt receipts than do the other regional counties combined. In 1960, revenues from debt receipts in Milwaukee County amounted to over $20 million, or over 18 percent of the total county revenues. Debt receipts accounted for about 3 percent of the combined revenues of the other counties. Similarly, in 1972 debt receipts in Milwaukee County amounted to about $36 million, or 13 percent of the total county revenues. Debt receipts accounted for about 11 percent of the combined revenues of the other counties in the same year.

A similarity between Milwaukee County and the other regional counties combined is the degree to which highway aids constitute a revenue source. In 1960, Milwaukee County received over $1 million from highway aids, which accounted for about 1 percent of the total revenues for that year. By 1972, revenues from highway aids had increased by only $0.4 million, or 40 percent, to about $1.4 million, or less than 1 percent of the total revenues for Milwaukee County during the same year. In comparison, revenues from highway aids received by the other six regional counties accounted for over 3 percent of the combined county revenues in 1960, and about 2 percent in 1972.

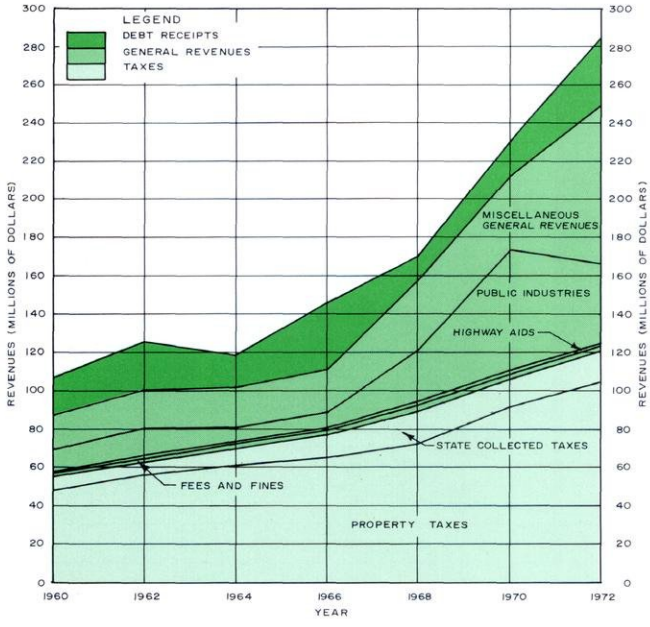
Milwaukee County revenues from other categories such as fees and fines and state collected taxes also increased steadily from 1960 to 1972. Revenues from state collected taxes increased by about $9 million, or 134 percent, from over $6 million in 1960 to over $15 million in 1972. Revenues from fees and fines increased even more rapidly over the same 12-year period, from about $1 million in 1960 to about $3 million in 1972, an increase of about $2 million, or 173 percent.

City Revenues[8]: Since 1960, the combined revenues of all cities in the Region except the City of Milwaukee increased by about $142 million, or 217 percent, from over $65 million in 1960 to over $207 million in 1972 (see Figure 31). The largest source of revenues for the cities has been the property tax levy. In 1960, over $18 million in property taxes were raised by the cities within the Region. By 1972, property taxes levied had increased to about $52 million, an increase of $34 million, or 185 percent, over the 12-year period. As shown in Table 31, that portion of the total property taxes levied by cities for local purposes has increased

[8] *Excludes the City of Milwaukee.*

Figure 30

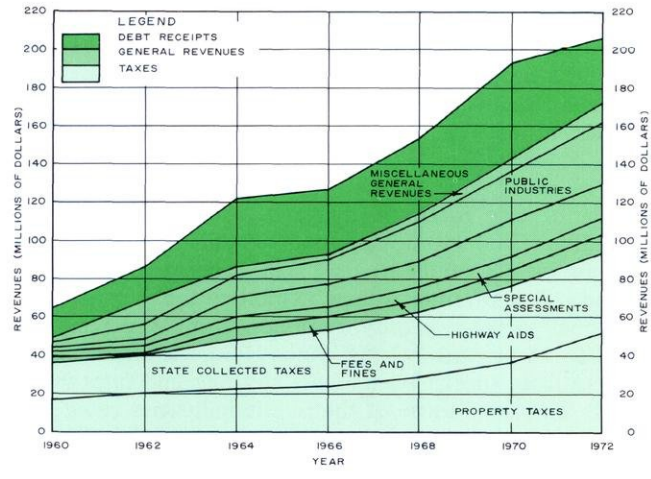
COMPOSITION OF PUBLIC REVENUES FOR MILWAUKEE COUNTY BY SELECTED REVENUE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Figure 31

COMPOSITION OF PUBLIC REVENUES FOR ALL CITIES (EXCLUDING MILWAUKEE) IN THE REGION BY SELECTED REVENUE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Table 31

PER CAPITA PROPERTY TAXES LEVIED BY ALL CITIES IN THE REGION EXCLUDING THE CITY OF MILWAUKEE: SELECTED YEARS 1960-1972

Unit of Government	1960	1962	1964	1966	1968	1970	1972	Change 1960-1972 Absolute	Change 1960-1972 Percent
State	$ 1.18	$ 1.24	$ 1.27	$ 1.40	$ 1.56	$ 1.80	$ 2.00	$ 0.82	69.5
County	37.92	40.49	43.29	47.70	61.51	72.05	76.06	38.14	100.6
Local	30.67	34.01	35.02	36.62	46.44	56.15	69.40	38.73	126.3
School	78.83	89.18	98.77	111.41	148.49	181.49	194.18	115.35	146.3
Total	$148.60	$164.92	$178.35	$197.13	$258.00	$311.49	$341.64	$193.04	129.9

Source: Wisconsin Department of Taxation and SEWRPC.

from about $31 per capita in 1960 to over $69 per capita in 1972, an increase of $39 per capita, or 126 percent. Although property tax levies have consistently been the primary source of city revenue, since 1960 the proportion of total city revenues supplied by the property tax actually declined slightly, from about 28 percent in 1960 to about 25 percent in 1972.

State collected taxes constituted the second largest source of revenues to cities in 1972. While such revenues increased by over $24 million, or 132 percent, from over $18 million in 1960 to about $43 million in 1972, they actually declined as a proportion of combined city revenues from 28 percent in 1960 to about 21 percent in 1972.

The third largest revenue category for cities in 1972, behind property and state collected taxes, was debt revenues. This category provided about $16 million in revenue for the cities in 1960, then increased rapidly from 1962 to 1964. After 1966, city receipts from indebtedness increased gradually to a peak of about $51 million in 1970, then decreased to the present level of about $34 million in 1972. Overall, from 1960 to 1972 debt receipts increased by $18 million, or 114 percent. The proportion of combined city revenues provided by debt receipts decreased from 24 percent in 1960 to 16 percent in 1972.

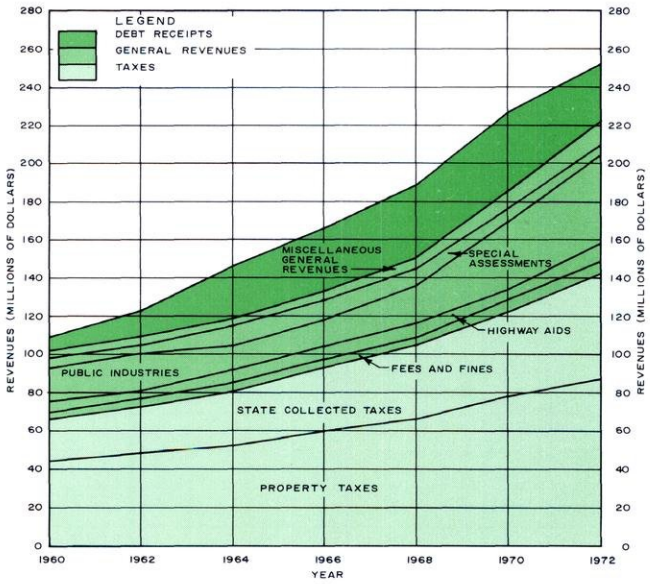
City revenues from public industries, the fourth largest source of city revenues, increased rapidly from about $2 million in 1960 to about $33 million in 1972, an increase of $31 million, or 1,711 percent, during this period. This revenue source exhibited the largest proportional increase in city revenues, from 3 percent in 1960 to 16 percent in 1972. Since 1960, the city revenue sources from special assessments and fees and fines show trends similar to those of the public industries category. Rapidly increasing revenues from these two categories may be indirectly attributed to increased population levels and the accompanying need for public facilities and services.

City revenues from highway aids, while increasing from $3 million in 1960 to nearly $8 million in 1972, actually declined as a proportion of total city revenues from 5 percent in 1960 to less than 4 percent in 1972.

City of Milwaukee: As shown in Figure 32, revenues raised from property taxes, the city's largest single revenue source, increased from $43 million in 1960 to $88 million in 1972, an increase of $44 million, or 102 percent, over this period. The proportion of total revenues obtained from property tax collections, how-

Figure 32

COMPOSITION OF PUBLIC REVENUES FOR THE CITY OF MILWAUKEE BY SELECTED REVENUE CATEGORY 1960-1972



Source: Wisconsin Department of State Audit Reports.

ever, declined from 41 percent in 1960 to 36 percent in 1972. This proportional decline is consistent with the trend in the other cities in the Region, although the other cities combined within the Region used the property tax to supply only about 25 percent of total revenues in 1972.

As shown in Table 32, the per capita property taxes levied in the City of Milwaukee for local use nearly doubled, from over $57 in 1960 to about $113 in 1972, an increase of $56, or 97 percent, over the 12-year period. This increase compares to a tax levy per capita increase of 126 percent for the other regional cities combined over the same period.

The second largest revenue source for the City of Milwaukee in 1972 was state collected taxes. In 1960, the City of Milwaukee received over $23 million from this source, while in 1972, it received $54 million. This increase in state collected tax revenues of $31 million, or 136 percent, compares with an increase of 132 percent for the other regional cities during the same period. The proportion of total City of Milwaukee revenues provided by state collected taxes remained relatively stable from 1960 to 1972, varying from 19 percent to 22 percent of total city revenue, while the proportion of these revenues for other cities in the Region declined over the same 12-year period, from 28 to 21 percent.

The third largest revenue source for the City of Milwaukee in 1972 was public industry. Revenues from public industries have remained a relatively stable revenue source, providing from 16 to 24 percent of Milwaukee's total revenue from 1960 to 1972. In 1960, public industries accounted for revenues of $20 million, or about 19 percent, of total city revenues, while in 1972, revenues from public industries increased to over $46 million, an overall increase of $26 million, or 132 percent, during this period, but still comprised 19 percent of the total city revenues as in 1960. Revenues from public industries for the other cities in the Region accounted for only about 3 percent of the combined revenues in 1960 and about 16 percent in 1972.

Debt receipts have been the most rapidly increasing revenue source for the City of Milwaukee. From 1960 to 1972, debt receipts increased by about $17 million, or 261 percent, from about $6 million in 1960, or about 6 percent of the total city revenues, to over $23 million in 1972, or about 10 percent of total revenues. Debt receipts accounted for about 24 percent of the combined revenues of other regional cities in 1960 and about 16 percent in 1972.

Other revenue for the City of Milwaukee, such as highway aids and fees and fines, has increased consistently since 1960. The proportion of total city revenue collected from these sources, however, has remained relatively stable. In 1960, these two revenue categories combined accounted for about 8 percent of total city revenues, while in 1972, this proportion had decreased to only about 7 percent of the total city revenues.

Village Revenues: The combined revenues of all 53 villages in the Region increased from about $26 million in 1960 to about $101 million in 1972, an overall increase of $75 million, or 294 percent (see Figure 33). This increase compares to an increase of 128 percent in the City of Milwaukee and about 217 percent in the revenues of the cities other than Milwaukee in the Region over the same 12-year period.

Revenues from public industries have consistently been the major source of revenue for villages. In 1960, village revenues from this category amounted to about $10 million, or 38 percent of the total combined village revenues, while in 1972, revenues increased to over $61 million, or 61 percent of combined revenues. In 1972, public industries accounted for about 16 percent of the combined revenues of cities in the Region other than Milwaukee.

The second largest source of village revenue in 1972 was from state collected taxes. In 1960, villages received about $7 million from this source, while in 1972, revenues from this source had increased to about $13 million, an increase of over $6 million, or 94 percent. The proportion of total revenues provided by this category decreased,

Table 32

PER CAPITA PROPERTY TAXES LEVIED BY THE CITY OF MILWAUKEE: SELECTED YEARS 1960-1972

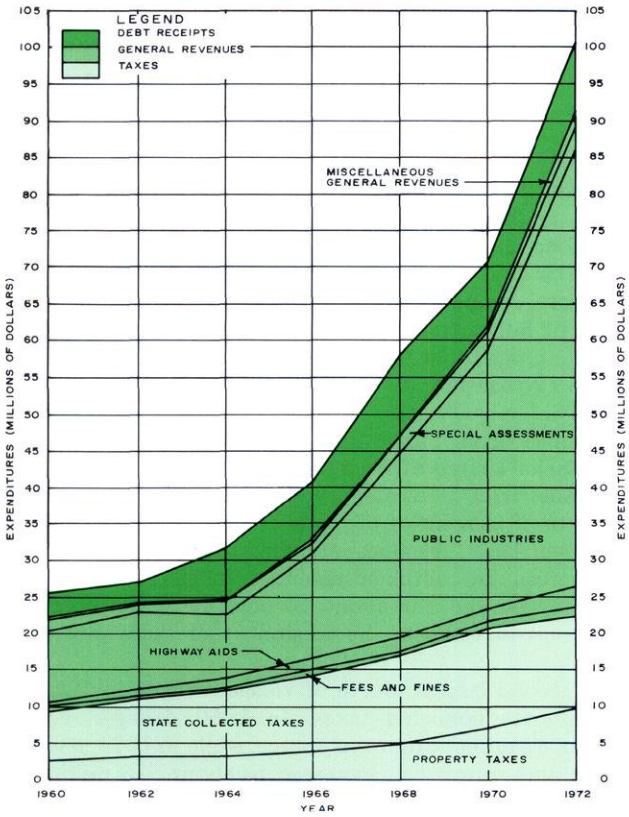
Unit of Government	1960	1962	1964	1966	1968	1970	1972	Change 1960-1972	
								Absolute	Percent
State	$ 1.01	$ 1.05	$ 1.07	$ 1.14	$ 1.24	$ 1.40	$ 1.47	$ 0.46	45.5
County	45.34	49.61	55.57	57.92	72.06	83.89	79.24	33.90	74.8
Local	57.10	68.63	69.17	78.42	91.18	107.51	112.70	55.60	97.4
School	58.44	66.92	82.16	93.51	129.93	145.86	173.76	115.32	197.3
Total	$161.89	$186.21	$207.97	$230.99	$294.41	$338.66	$367.17	$205.28	126.8

Source: Wisconsin Department of Revenue and SEWRPC.

however, from about 26 percent in 1960 to about 13 percent in 1972. Although state collected taxes are the second major source of revenue for villages, they are relied upon more heavily as a major source of revenue in cities than in villages.

Figure 33

COMPOSITION OF PUBLIC REVENUES FOR VILLAGES IN THE REGION BY SELECTED REVENUE CATEGORY 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

The local property tax levy provided the third largest revenue source for villages in the Region in 1972. In 1960, about $3.0 million in property taxes were collected for village purposes, while in 1972 about $10 million were collected, an increase of over $7 million in property tax levies, or 254 percent. The proportion of combined village revenues provided by property tax levies over this same period remained relatively stable, changing from 11 percent in 1960 to 10 percent in 1972. As shown in Table 33, the portion of total taxes levied by villages for local purposes increased from about $16 per capita in 1960 to over $56 per capita in 1972, or over $40 per capita, or 253 percent, during this 12-year period. In 1972, the cities of the Region other than Milwaukee had a combined local levy approximating $69 per capita.

It is significant to note that villages presently do not rely as heavily on short- and long-term borrowing as a major revenue source as do the cities. Receipts on account of indebtedness amounted to over $3 million in 1960, or 13 percent of the total village revenues, while in 1972 this category accounted for village revenues of over $8 million, or about 8 percent of total revenues. In 1972, debt receipts provided over 16 percent of the combined revenues of cities other than Milwaukee.

Village revenues from highway aids, special assessments, and fees and fines increased from 1960 to 1972. However, the proportion of combined revenues provided by these categories declined during the same period. In 1960, village revenues from these three categories accounted for over 11 percent of combined village revenues, while by 1972, revenues decreased to only about 6 percent of the total.

Town Revenues: Total revenues raised by all towns in the Region have increased from over $8 million in 1960 to over $32 million in 1972, an increase of $24 million, or 282 percent, over this 12-year period (see Figure 34). Since 1960, combined town revenues have increased at a more rapid rate than revenues for cities in the Region, but at a slower rate than village revenues.

Table 33

PER CAPITA PROPERTY TAXES LEVIED BY VILLAGES IN THE REGION: SELECTED YEARS 1960-1972

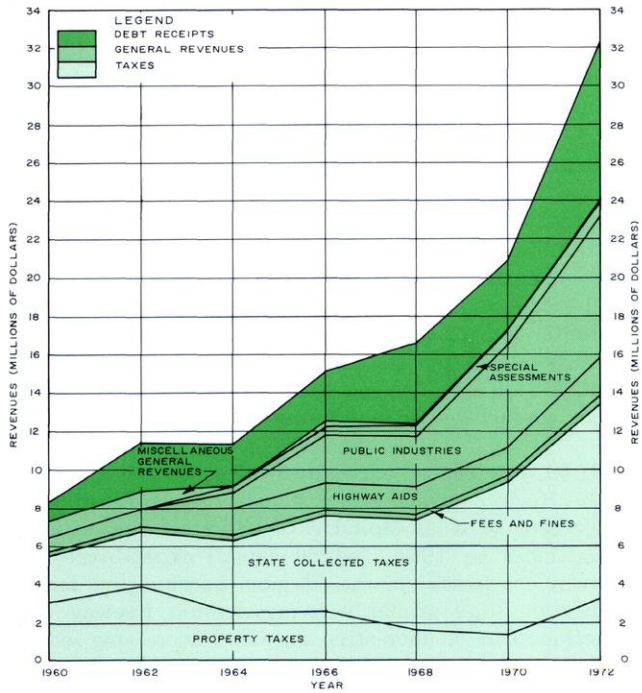
Unit of Government	1960	1962	1964	1966	1968	1970	1972	Change 1960-1972	
								Absolute	Percent
Local	$ 15.98	$ 18.33	$ 20.62	$ 22.89	$ 31.02	$ 38.75	$ 56.38	$ 40.40	252.8
State	1.39	1.38	1.43	1.56	1.71	2.01	2.36	0.97	69.8
County	49.14	50.16	52.58	56.35	68.94	81.35	84.92	35.78	72.8
School	103.65	110.64	122.45	141.58	180.73	213.45	249.69	146.04	140.9
Total	$170.16	$180.52	$197.08	$222.28	$282.41	$353.56	$393.35	$223.19	131.2

Source: Wisconsin Department of Revenue and SEWRPC.

Since 1964, returned state collected taxes have been the primary source of town revenue. As such, there is a proportionately greater reliance upon the state collected tax as a major source of revenue in the towns than in the cities and villages of the Region. Town revenues from this source increased by about $8 million, or 329 percent. from over $2 million in 1960 to over $10 million in 1972. Over this same 12-year period, the proportion of total town revenues accounted for by state collected taxes increased from about 29 percent to over 32 percent.

Figure 34

COMPOSITION OF PUBLIC REVENUES FOR TOWNS IN THE REGION BY SELECTED REVENUE CATEGORY 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

The second largest source of town revenue in 1972 was debt receipts, which, prior to 1968, were the third largest source of town revenues behind property tax collections and state collected tax returns. From 1960 to 1972, debt receipts represented the most rapidly increasing source of town revenue of all the revenue categories. Town revenues from borrowing increased by over $6 million, or 582 percent, from over $1 million in 1960, or 13 percent of combined town revenues, to nearly $8 million in 1972, or over 23 percent of the combined town revenues.

The large increase in town revenues from public industries since 1960, especially during the 1968 to 1972 period, can be attributed to payments for town utilities constructed to accommodate urban growth. In 1960, towns received no revenue from public industries. By 1972, this category accounted for receipts of about $8 million, over 23 percent of the combined town revenues. In comparison, revenues from public industries provided 61 percent of the combined revenues of villages in the Region in 1972, and 16 percent of the combined revenues of regional cities other than Milwaukee.

In 1960, towns levied $3.1 million in property taxes, which comprised 37 percent of total town revenues. By 1972, property tax levies had increased only slightly to $3.2 million, but now represented only 10 percent of total town revenues. As shown in Table 34, the amount of local property taxes levied per capita also declined from $6.78 in 1960 to $6.57 in 1972.

In 1960 and 1962, towns received no revenue from special assessments, while by 1972, revenues from this category totaled over $1 million, or 3 percent of total town revenues. Overall, trends from 1960 to 1972 indicate that town revenues from fees and fines and highway aids increased. However, the proportion of total town revenue provided by these categories declined from 13 percent to 7 percent of the combined town revenues.

General Expenditure Trends in the Region

Since 1960, the combined expenditures for all counties, cities, villages, towns, and public and vocational school districts in the Region have increased by about $854 million, or 168 percent, from $507 million in 1960 to about

Table 34

PER CAPITA PROPERTY TAXES LEVIED BY TOWNS IN THE REGION: SELECTED YEARS 1960-1972

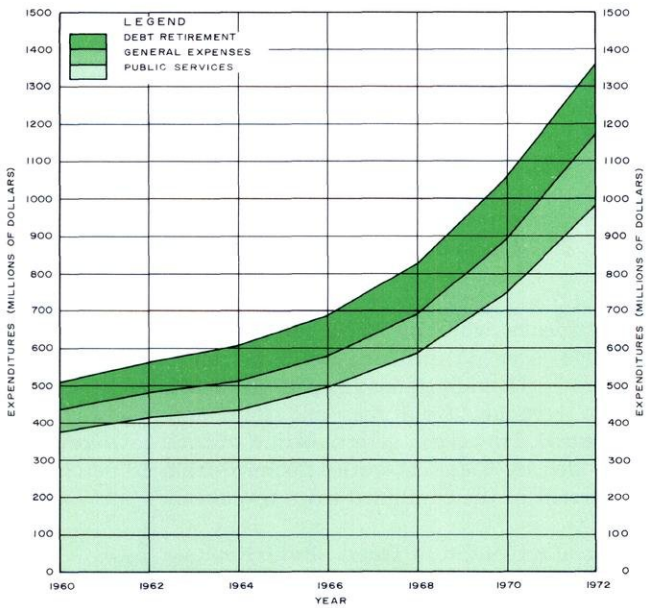
Unit of Government	1960	1962	1964	1966	1968	1970	1972	Per Capita Change 1960-1972	
								Absolute	Percent
Local	$ 6.78	$ 6.84	$ 6.64	$ 6.63	$ 5.81	$ 5.24	$ 6.57	$ - 0.21	- 9.1
State	1.00	1.01	1.09	1.28	1.45	1.72	2.17	1.17	117.0
County	23.60	23.27	22.51	28.12	33.12	44.79	55.58	31.98	135.5
School	74.71	83.80	95.98	114.55	159.2	200.01	225.35	150.04	201.6
Total	$106.09	$114.93	$126.23	$150.58	$199.60	$251.76	$289.67	$183.58	173.0

Source: Wisconsin Department of Revenue and SEWRPC.

$1,361 million in 1972 (see Figure 35). As previously noted, total revenues of local governments increased from $507 million in 1960 to $1,399 million in 1972, an increase of $892 million, or 176 percent. Since the rates of revenue and expenditure increase are greater than the 41 percent rate of price inflation over the same 12-year period, much of this increase is real in nature and is due primarily to the absolute increases in revenue and expenditure levels. It should be noted that total government revenues have exceeded total expenditures each year from 1960 to 1972. These revenues surpluses are brought forward from the previous year to become part of the next year's funding resources.

Figure 35

DISTRIBUTION OF PUBLIC EXPENDITURES BY ALL SCHOOL DISTRICTS AND GENERAL PURPOSE UNITS OF GOVERNMENT IN THE REGION SELECTED YEARS 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Governmental expenditures can be classified according to three major categories: debt service; general expenses, including expenditures for the administration of general government administration; and public service expenditures, including expenses and outlays for facilities and services such as recreation, highways, streets, bridges, health, sanitation, welfare, public industries, the protection of persons and property, and all expenditures by general-purpose governments and school districts for educational purposes. The relative importance of each of these expenditure categories as a major expenditure item will vary by type of government and year according to the needs of each individual local unit of government.

The three largest categories of expenditure by governments in the Region in 1972 in order of importance were education; health, sanitation, and welfare; and debt retirement. In 1972, these three categories accounted for expenditures of $909 million, or 70 percent of all governmental expenditures, while in 1960, about $323 million, or 64 percent of all government expenditures, were accounted for by these three categories combined.

Expenditures by all general-purpose units of government in the Region for the construction, operation, and maintenance of highways, streets, and bridges totaled $113 million in 1972, or 8 percent of total local expenditures, compared to $70 million in 1960, or 14 percent of total local government expenditures during the year. The amounts and proportions of capital expenditures for highway-related purposes made by local units of government and directly by the state and federal government are shown in Table 35 and Figure 36.

In 1960, city capital expenditures for highway purposes in the Region were the largest category, accounting for 46 percent of total capital expenditures for all sources. From 1962 to 1964, federal capital expenditures for highway purposes in the Region became the largest proportion, due primarily to accelerated freeway construction. Due to increasing state and decreasing federal level participation in freeway and expressway construction from 1966 to 1968, the proportion of total construction expenditures accounted for by federal expenditures decreased, while state capital construction

Table 35

CAPITAL EXPENDITURES FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE: SELECTED YEARS 1960-1972

Government Type	Total Capital Expenditures (In Millions of Dollars)							Change 1960-1972		Percent of Total Capital Expenditures							Point Change 1960-1972
	1960	1962	1964	1966	1968	1970	1972	Absolute	Percent	1960	1962	1964	1966	1968	1970	1972	
Federal	$ 9.0	$21.5	$27.7	$17.7	$10.3	$26.8	$22.1	$13.1	145.6	21.9	33.8	39.1	23.6	16.8	29.9	31.1	9.2
State	5.4	7.2	5.8	21.0	18.9	25.5	7.5	2.1	38.9	13.1	11.3	8.2	27.9	30.8	28.4	10.6	- 2.5
County	5.4	12.9	7.4	14.0	10.6	8.3	8.9	3.5	64.8	13.1	20.2	10.4	18.6	17.3	9.3	12.5	- 0.6
City	18.9	19.7	27.6	18.6	18.7	25.7	29.1	10.2	54.0	46.0	30.9	39.0	24.7	30.4	28.7	40.9	- 5.1
Village	1.9	2.0	1.9	3.2	2.1	2.4	2.5	0.6	31.6	4.6	3.1	2.7	4.3	3.4	2.7	3.5	- 1.1
Town	0.5	0.4	0.4	0.7	0.8	0.9	1.0	0.5	100.0	1.3	0.7	0.6	0.9	1.3	1.0	1.4	0.1
Total	$41.1	$63.7	$70.8	$75.2	$61.4	$89.6	$71.1	$30.0	73.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	--

Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; Wisconsin Department of Transportation; and SEWRPC.

showed a significant proportional increase. After 1968, however, federal capital expenditures again showed rapid increases in proportion to the total, reflecting roadway and safety improvements on the federal interstate highway system in addition to actual highway construction and reconstruction.

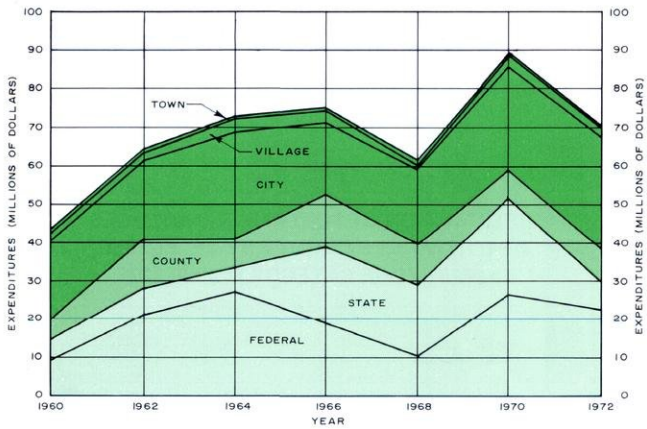
Although the sources of capital highway expenditures have varied considerably from year to year since 1960, the expenditure patterns by type of government can be observed (see Table 36). For example, counties in the Region devoted about 44 percent of total highway expenditures to capital improvements since 1960, while cities expended about 47 percent, villages, about 23 percent, and towns, about 14 percent.

County Expenditures[9]: The total amount of categorical expenditures by all counties in the Region, excluding Milwaukee County, increased from $28 million in 1960 to about $110 million by 1972, an increase of $82 million, or 288 percent (see Figure 37). This compares to an increase in total county revenues of over $90 million, or 311 percent, during the same period. The largest

[9] *Excludes Milwaukee County.*

Figure 36

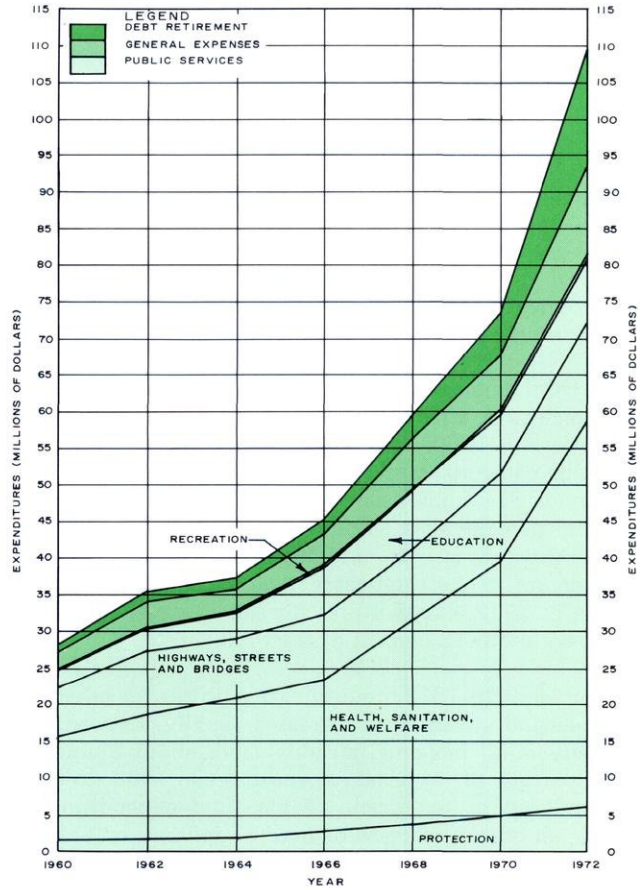
CAPITAL EXPENDITURES FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; Wisconsin Department of Transportation; and SEWRPC.

Figure 37

DISTRIBUTION OF PUBLIC EXPENDITURES FOR ALL COUNTIES IN THE REGION (EXCLUDING MILWAUKEE) BY SELECTED EXPENDITURE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Table 36

TOTAL EXPENDITURES FOR HIGHWAYS, STREETS, AND BRIDGES IN THE REGION BY GOVERNMENT TYPE: SELECTED YEARS 1960-1972

Government Type	Total Highway Expenditures (In Millions of Dollars)							Change 1960-1972		Percent of Total Highway Expenditures							Point Change 1960-1972
	1960	1962	1964	1966	1968	1970	1972	Absolute	Percent	1960	1962	1964	1966	1968	1970	1972	
Federal	$ 9.0	$ 21.5	$ 27.7	$ 17.7	$ 10.3	$ 26.8	$ 22.1	$13.1	145.6	10.5	19.0	25.0	12.6	9.9	17.9	14.9	4.4
State	7.2	9.2	8.0	23.5	22.1	29.9	13.2	6.0	83.3	8.4	8.1	7.2	16.7	21.2	20.2	8.9	0.5
County	14.2	23.9	19.4	32.5	23.2	17.7	23.6	9.4	66.2	16.5	21.2	17.5	23.1	22.3	11.8	15.9	- 0.6
City	44.8	47.9	45.1	51.6	30.4	56.5	62.4	17.6	39.3	52.3	42.4	40.6	36.6	29.2	37.7	41.9	-10.4
Village	7.0	6.8	7.1	10.5	11.5	12.2	15.6	8.6	122.9	8.2	6.0	6.4	7.4	11.1	8.2	10.5	2.3
Town	3.5	3.7	3.7	5.1	6.6	6.6	11.8	8.3	237.1	4.1	3.3	3.3	3.6	6.3	4.4	7.9	3.8
Total	$85.7	$113.0	$111.0	$140.9	$104.1	$149.7	$148.7	$63.0	73.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	--

Source: Wisconsin Department of Revenue, Bureau of the Municipal Audit; Wisconsin Department of Transportation; and SEWRPC.

amount expended in each year was for health, sanitation, and welfare purposes. The operation and maintenance of facilities such as county homes, hospitals, and institutions, and the administration of the many varied social welfare programs primarily caused the amount expended for this category to increase from about $14 million in 1960 to $53 million in 1972, an overall increase of over $39 million, or about 290 percent. During this 12-year period, however, the proportion of total county expenditures accounted for by the health, sanitation, and welfare category remained relatively stable, varying by less than 2 percent.

The second largest county expenditure category in 1972 was debt retirement. In 1960, counties expended over $1 million for debt retirement, or about 5 percent of the total county expenditures, while in 1972 they expended $16 million for debt retirement, or about 14 percent of the total expenditures, an increase of $14.7 million, or more than 12 times the 1960 level. This dramatic increase reflects the increasing utilization of debt receipts since 1960 as a primary source of county revenue to finance the cost of large-scale public works projects.

The third largest county expenditure category in 1972 was highways, streets, bridges, and related transportation facilities. In 1960, counties expended about $7 million for this category, while in 1972, expenditures increased to about $14 million, an overall increase of $7 million, or 100 percent. The amount expended by the counties for highways, streets, and bridges accounted for over 24 percent of the total categorical expenditures in 1960, while in 1972, expenditures for this category accounted for only about 12 percent of the total.

From 1960 to 1972, county expenditures for education and general government increased rapidly. Expenditures for education increased steadily from about $2 million, or 6 percent of the total expenditures in 1960, to about $9 million, or 8 percent of the total expenditures in 1972, an overall increase of over $7 million, or 418 percent. Similarly, county expenditures for general government increased from over $2 million in 1960, or about 9 percent of the total expenditures, to over $12 million in 1972, or about 11 percent of the total expenditures.

Historically, the smallest county expenditure category has been recreation. In 1960, the counties of the Region excluding Milwaukee expended only about $500,000 for recreation, representing only about 2 percent of the total county expenditures. By 1972, county expenditures for recreation purposes increased by only $100,000, or 20 percent, to a total expenditure level of $600,000, or only 0.5 percent of the total county expenditures in 1972.

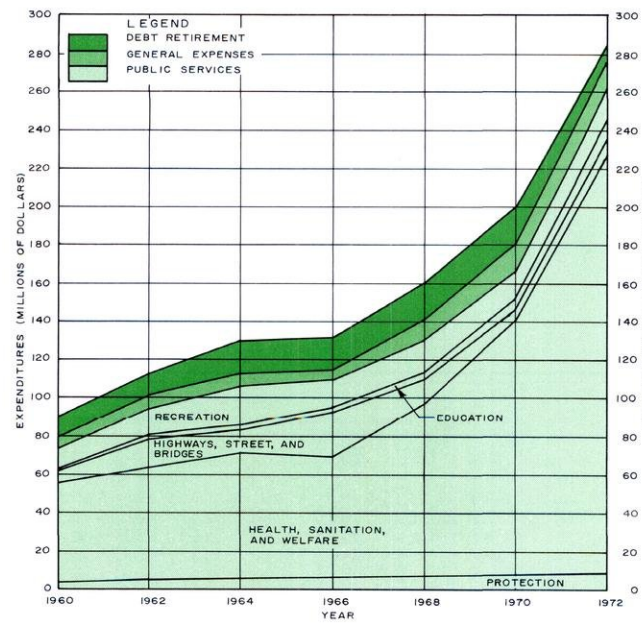
Milwaukee County: Total categorical expenditures for Milwaukee County increased from $91 million in 1960 to about $284 million in 1972, an overall increase of over $193 million, or 212 percent (see Figure 38). This compares to an increase of about $178 million, or 165 percent, in total Milwaukee County revenues. Expenditures for health, sanitation, and welfare since 1960 have consistently accounted for the majority of total county expenditures. In 1960, expenditures for this category amounted to about $52 million, or 57 percent of the total county expenditures, while in 1972, this increased to $222 million, or about 78 percent of the total county expenditures, an increase of $170 million, or 313 percent. Moreover, of this increase, expenditures for welfare purposes alone accounted for about $122 million, or 73 percent, increasing from $27 million in 1960 to over $149 million in 1972.

The second largest Milwaukee County expenditure category was recreation. Included within this category are monies expended for the capital improvements, operation, and maintenance of the exceptionally fine Milwaukee County park system. Expenditures for recreation in Milwaukee County amounted to about $11 million in 1960, or 12 percent of the total county expenditures, and about $18 million in 1972, or about 6 percent of the total county expenditures. The high priority that Milwaukee County places on recreation expenditures is particularly noteworthy in light of the relatively low level of recreation expenditures in the remaining six counties.

Milwaukee County's total 1972 recreation expenditures totaled about $18 million, or 30 times the 1972 recreation expenditures in the other six counties combined, which totaled $600,000. These expenditures reflect the importance of the development and operation of the

Figure 38

DISTRIBUTION OF PUBLIC EXPENDITURES BY MILWAUKEE COUNTY BY SELECTED EXPENDITURE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Milwaukee County park system which is closely scaled to, and coordinated with, the needs of the Milwaukee metropolitan complex. As this complex further expands into adjacent counties, recreation will have to receive increased attention from these counties if demands for public facilities are to be met.

The third largest Milwaukee County expenditure category in 1972 was general government, which includes expenditures for officials' salaries and departmental overhead. In 1960, about $5 million was spent by Milwaukee County for general government. By 1972, this expenditure had increased to over $14 million, an increase of about $10 million, or 218 percent. Despite this increase, the proportion of total county expenditures accounted for by general government remained stable at about 5 percent from 1960 to 1972.

The total reported monies expended by Milwaukee County for the construction and maintenance of streets, highways, bridges, and related transportation facilities from 1960 to 1972 varied greatly due to changes in the scheduling and scope of new freeway and highway construction from year to year. In 1960, expenditures for this category totaled over $7 million, or 8 percent of the total county expenditures. By 1966, this expenditure had increased to about $24 million, or 18 percent of the total county expenditures. By 1972, the expenditure totaled about $10 million, or only 3 percent of total expenditures.

Monies expended by Milwaukee County for the protection of persons and property and for education increased steadily from 1960 to 1972, with very little proportional change in these expenditures. Expenditures for debt retirement nearly doubled, from $12 million in 1960 to over $20 million in 1970, then decreased sharply to about $8 million in 1972, an overall decrease of $4.2 million, or 35 percent, from 1960 to 1972.

City Expenditures[10]: From 1960 to 1972, public expenditures for all cities in the Region, excluding the City of Milwaukee, increased by over $115 million, or 172 percent, from $67 million in 1960 to over $182 million in 1972 (see Figure 39). This compares to increases in total city revenues of $142 million, or 217 percent, over this same period. During this period, debt retirement increased by about $28 million, or 258 percent, from expenditures of about $11 million in 1960, or 16 percent of city expenditures, to expenditures of over $38 million in 1972, or 21 percent of the combined city expenditures, to become the largest expenditure category in 1972.

The second largest city expenditure category in 1972 was for public industries, which includes part of the cost for the administration of public sewerage facilities and all the costs for the construction, operation, and maintenance of other public utilities such as water and electric utilities. In 1960, about $12 million was expended for public industries, while in 1972, over $31 million was expended for this category, an increase of about $20 million, or 171 percent. The proportion of combined city expenditures accounted for by public industries, however, remained relatively stable at 17 percent.

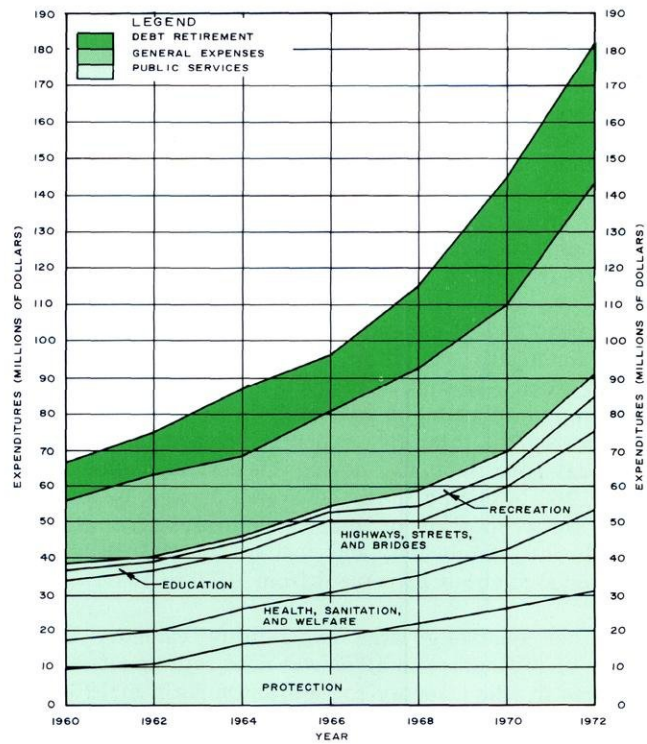
The third largest expenditure category for cities in the Region is the protection of persons and property. In 1960, cities expended over $10 million for this purpose, or 15 percent of total city expenditures. In 1972, these expenditures accounted for over $31 million, or over 17 percent of total city expenditures, an increase of over $21 million, or 209 percent.

Since 1960, city expenditures for highways, streets, bridges, and related facilities increased by about $5 million, or 30 percent, from about $17 million in 1960 to about $22 million in 1972. The proportion of total city expenditures accounted for by this category decreased, however, from about 25 percent in 1960 to only 12 percent in 1972.

Other city expenditure categories which showed relatively large expenditure increases from 1960 to 1972 were health, sanitation, and welfare; general government; and education. These three categories combined

Figure 39

DISTRIBUTION OF PUBLIC EXPENDITURES BY ALL CITIES (EXCLUDING MILWAUKEE) IN THE REGION BY SELECTED EXPENDITURE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

[10] *Excludes the City of Milwaukee.*

accounted for over 23 percent of combined city expenditures in 1960, and over 29 percent in 1972. The smallest city expenditure category in 1972 was recreation, for which cities expended over $2 million in 1960, or about 4 percent of the total city expenditures, and over $6 million in 1972, or 3 percent of total city expenditures.

City of Milwaukee: Total public expenditures made by the City of Milwaukee increased from over $124 million in 1960 to about $247 million in 1972, an overall increase of about $123 million, or 99 percent, in twelve years (see Figure 40). This compares to a total revenue increase for the City of Milwaukee of over $136 million, or 128 percent, over the same period.

The largest city expenditure in 1972 was for the protection of persons and property. Since 1960, expenditures for this category increased by $36 million, or 160 percent, from $22 million in 1960, or about 18 percent of the total city expenditures, to $58 million in 1972, or 24 percent of the total city expenditures. In comparison, this category accounted for only 15 percent of total expenditures by all the other cities of the Region in 1960, and about 17 percent in 1972.

The second largest expenditure category by the City of Milwaukee in 1972 was for general government. Since 1960, expenditures in this category have increased by $33 million, or 393 percent, from $8 million in 1960 to $41 million in 1972. Proportionately, monies expended for this purpose have increased by about 10 percent, from 7 percent of total city expenditures in 1960 to 17 percent in 1972, the largest proportional increase of any expenditure category for the city from 1960 to 1972.

The third largest City of Milwaukee expenditure category in 1972 was for highways, streets, and bridge construction and maintenance. Expenditures for this category increased from $28 million in 1960 to $41 million in 1972, an increase of over $12 million, or 44 percent. The proportion of expenditures for this purpose decreased, however, from 23 percent of total city expenditures in 1960 to 16 percent in 1972.

The next largest expenditure by the City of Milwaukee was for health, sanitation, and welfare, which increased from about $18 million in 1960 to $33 million in 1972, an overall increase of $15 million, or 86 percent. The proportion of total city expenditures accounted for by this category fluctuated during this period at levels below the 1960 level, and shows an overall decline. In comparison, the proportion of total expenditures accounted for by health, sanitation, and welfare in all other cities remained at about 12 percent from 1960 to 1972.

Another relatively large expenditure category in the City of Milwaukee in 1972 was debt retirement. Expenditures in this category totaled $25 million in 1960 and $30 million in 1972, an increase of only $5 million, or 18 percent. Proportionally, this expenditure category declined from 20 percent of total city expenditures in 1960 to only 12 percent in 1972.

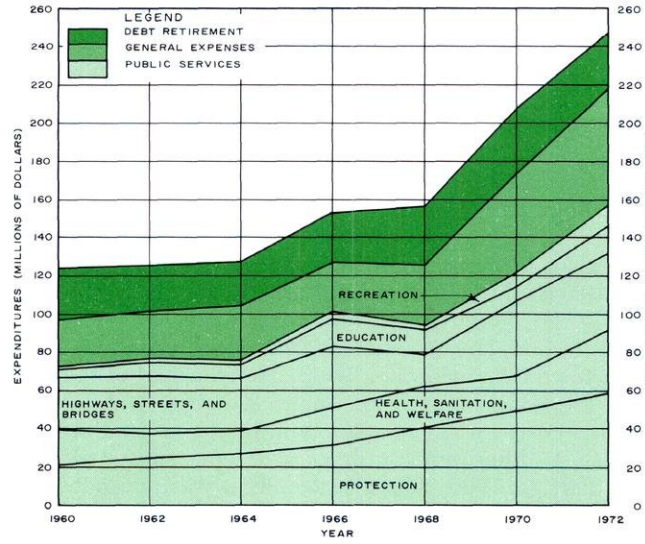
An expenditure category which is significantly different for the City of Milwaukee than for other cities in the Region is the public industries category. In 1960 the City of Milwaukee expended $17 million for public industries, while in 1972 the expenditure was $21 million, an increase of $4 million, or 23 percent, over this period. During the same period, however, total expenditures for this category by the other regional cities increased by about 171 percent. In 1960, the City of Milwaukee expended over $5 million more for public industries than the other regional cities combined, while by 1972 this relationship had reversed, with the City of Milwaukee expending over $10 million less for public industries than the other regional cities combined.

Another rapidly increasing expenditure category for both the City of Milwaukee and the other regional cities was education. Expenditures for this purpose amounted to about $4 million, or 3 percent of total City of Milwaukee expenditures in 1960, and increased to about $14 million, or 6 percent of total city expenditures, in 1972. These expenditures are particularly significant because they exclude direct payments and subsidies to school districts and include expenditures primarily for institutions oriented toward cultural education, such as the libraries and museums.

Village Expenditures: The combined total of public expenditures for all villages in the Region increased steadily from $24 million in 1960 to $94 million in 1972, an overall increase of $70 million, or 296 percent (see Figure 41). During this same period, total village revenue increased by $75 million, or 295 percent. The

Figure 40

DISTRIBUTION OF PUBLIC EXPENDITURES BY THE CITY OF MILWAUKEE BY EXPENDITURE TYPE: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

largest village expenditure in 1972 was for the protection of persons and property, which increased by $14 million, or 272 percent, from over $5 million in 1960 to $19 million in 1972. This category accounted for 20 percent of total village expenditures in 1972 and for about 17 percent of the total expenditures by regional cities other than Milwaukee.

The second largest village expenditure in 1972 was for debt retirement. Since 1960, village expenditures for debt retirement increased by over $13 million, or 532 percent, from over $2 million, or 11 percent of combined village revenues in 1960, to about $16 million, or 17 percent of the total expenditures in 1972. Debt retirement for the regional cities other than Milwaukee comprised about 21 percent of total expenditures during 1972.

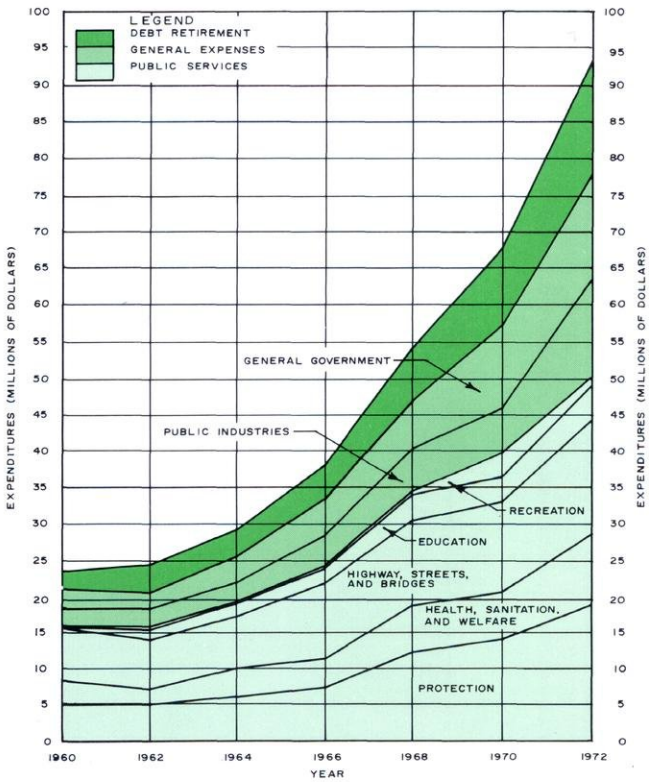
The third largest village expenditure category in 1972 was for the construction and maintenance of highways, streets, and bridges. In 1960 this category accounted for village expenditures of $7 million. In 1972 these expenditures had increased to about $16 million, an overall increase of about $9 million, or 123 percent. As in the regional cities other than Milwaukee, the percent of combined village expenditures accounted for by this category declined from about 30 percent in 1960 to about 17 percent in 1972.

Village expenditures for public industries also increased rapidly from about $2 million, or 6 percent of combined village expenditures in 1960, to about $14 million, or 14 percent of combined village revenues in 1972, an overall increase of $12 million, or 800 percent, over this period—the largest relative increase of any of the expenditure categories. During the same period, expenditures for public industries increased by 171 percent in the regional cities other than Milwaukee.

Since 1960, combined village expenditures for general government increased by about $12 million, or 433 percent, from about $3 million in 1960 to over $14 million in 1972, while expenditures for education increased by about $4 million, or 557 percent, from about $1 million in 1960 to about $5 million in 1972. The proportion of total village expenditures accounted for by these two categories combined also increased, from 14 percent in 1960 to 20 percent in 1972. The smallest level of expenditures by villages was for recreation, which showed an increase from $900,000, or 4 percent of the total village expenditures in 1960, to about $2 million, or 2 percent of the combined village expenditures in 1972.

Figure 41

DISTRIBUTION OF PUBLIC EXPENDITURES BY ALL VILLAGES IN THE REGION BY SELECTED EXPENDITURE CATEGORY: 1960-1972



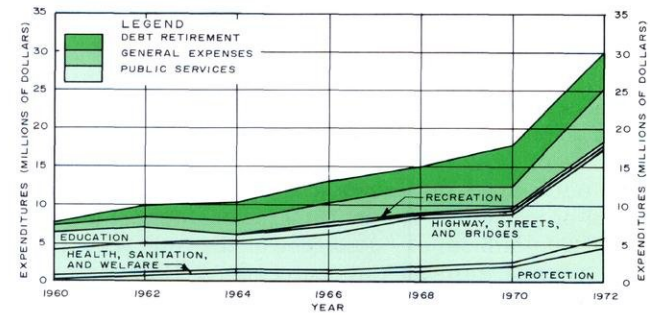
Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

Town Expenditures: Total public expenditures for towns in the Region increased steadily from $8 million in 1960 to $30 million in 1972, an overall increase of $22 million, or 288 percent (see Figure 42). Town revenues increased by $24 million, or 282 percent, over the same period. The largest expenditure category for towns historically has been for the construction and maintenance of highways, streets, and bridges. In 1960, this category accounted for a total expenditure of about $4 million, or about 45 percent of total town expenditures. In 1972, about $12 million was expended for this category, or 40 percent of total town expenditures.

The second largest expenditure category for towns in 1972 was for general government. Expenditures for this

Figure 42

DISTRIBUTION OF PUBLIC EXPENDITURES BY ALL TOWNS IN THE REGION BY SELECTED EXPENDITURE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

purpose increased from $1 million in 1960 to $5 million in 1972, an overall increase of $4 million. Proportionally, these expenditures also increased from 13 percent of total town expenditures in 1960 to 16 percent in 1972.

Town expenditures for debt retirement and the protection of persons and property showed the largest relative increases of all the expenditure categories. In 1960, town expenditures for the protection of persons and property amounted to $400,000, representing about 5 percent of the total expenditures, while in 1972, expenditures increased to over $4 million, representing about 15 percent of the total expenditures, an increase of about $4 million, or 1,000 percent. During the same period, town expenditures for debt retirement increased by over $4.4 million, or 1,100 percent, from $400,000 in 1960, representing 5 percent of the total expenditures, to about $5 million in 1972, representing 16 percent of the total expenditures. The proportion of total town expenditures accounted for by these two categories combined increased from 10 percent in 1960 to over 30 percent in 1972.

From 1960 to 1972, town expenditures for the combined health, sanitation, and welfare and public industries categories increased from only $200,000, or 3 percent of the total expenditures in 1960, to $3 million, or over 10 percent of the total town expenditures in 1972.

Town expenditures for recreation have remained relatively stable from 1960 to 1972, and have consistently accounted for less than 1 percent of the total town expenditures. In addition, town expenditures for education have decreased from over $2 million in 1960, or 29 percent of the total expenditures, to less than $1 million in 1972, or 2 percent of the total expenditures.

School Districts: The great variation in the type and administration of the approximately 100 public school districts and six vocational school districts presently operating in the Region, and the nature of the school district as a homogeneous property assessment district encompassing, on occasion, several municipalities in the case of public school districts and several counties in the case of vocational school districts, combine to make a meaningful comparison of school district revenue and expenditure patterns extremely difficult. The magnitude and relative importance of the corresponding school district revenue and expenditure patterns in the Region, however, require that an attempt be made to present such comparative data in the general manner.

Total school district revenues in the Region increased from $165 million in 1960 to $416 million in 1972, an increase of $252 million, or 152 percent (see Figure 43). The only direct tax source available to school districts is the property tax, and in 1960 regional school districts raised $99 million, or 60 percent of the total school district revenue, through this source. Since 1960, property tax revenues for school purposes have increased by about $193 million, or 195 percent, to a 1972 level of about $292 million, or 70 percent of the total school district revenue.

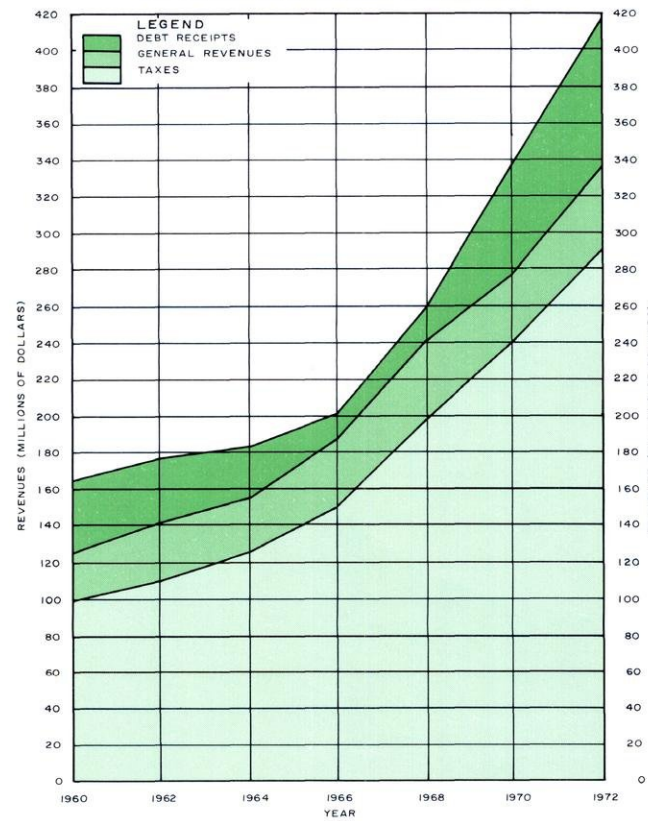
The pattern of borrowing by school districts has been somewhat erratic from 1960 to 1972, due in part to a greater utilization of short-term loans by school districts than by general-purpose units of government. In 1960, school districts within the Region raised $39 million, or 23 percent of the total revenues, through debt receipts. This revenue from borrowing gradually decreased to a 1966 level of about $14 million, or 7 percent of the total revenues, then increased rapidly to the 1972 level of $78 million, or 19 percent of total school district revenues.

The third largest source of revenue for school districts is educational aids received directly from the county, state, and federal governments. Combined, these aids amounted to $17 million in 1960, representing 10 percent of the total school district revenue, and $39 million in 1972, representing 9 percent of total school district revenue, an overall increase of $22 million, or 129 percent.

The category of other general revenues for school districts, which includes the rental of school facilities and county tax returns from prior levels, has been erratic

Figure 43

COMPOSITION OF TOTAL PUBLIC REVENUES FOR ALL SCHOOL DISTRICTS IN THE REGION BY REVENUE CATEGORY: 1960-1972



Source: Wisconsin Department of Revenue, Bureau of Municipal Audit; and SEWRPC.

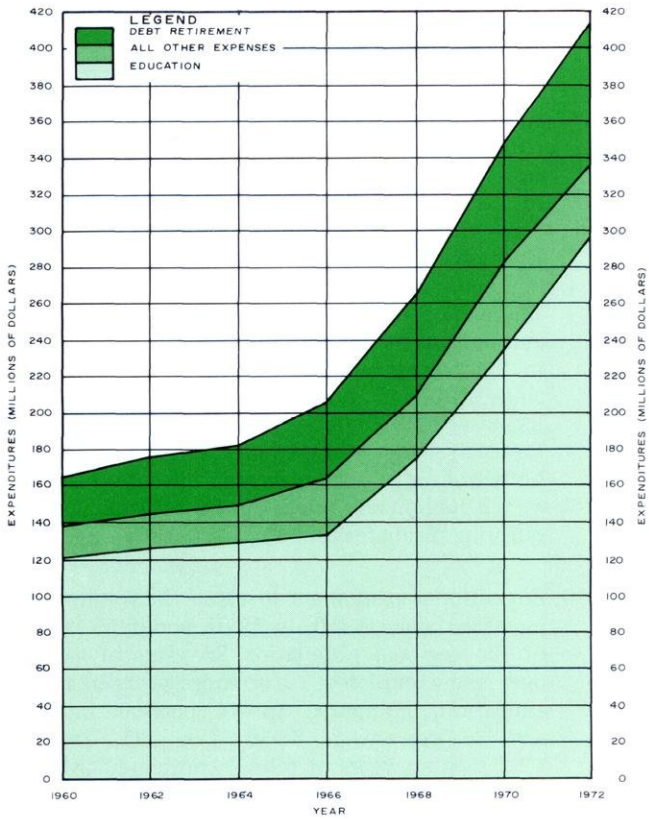
since 1960 with respect to the amounts of monies recorded as revenues. These revenues have shown an overall decline of over $3 million, or 31 percent, from 1960 to 1972. In 1960, other school district revenues amounted to $11 million, and by 1972 this amount declined to $8 millon, resulting in a proportional decline of 5 percent.

School district expenditures within the Region increased steadily between 1960 and 1972, from $165 million in 1960 to over $413 million in 1972, an increase of $248 million, or 150 percent (see Figure 44). In comparison, total expenditures by counties increased 230 percent, total expenditures by cities increased 124 percent, total expenditures by villages increased 296 percent, and total expenditures by towns increased 288 percent.

School district expenditures for education, the largest school district expenditure category, increased from $121 million in 1960 to over $296 million in 1972, an increase of over $175 million, or 145 percent. The proportion of total expenditures accounted for by education expenses declined, however, from over 73 percent in 1960 to about 64 percent in 1966, then increased to a level of almost 72 percent in 1972.

Figure 44

DISTRIBUTION OF TOTAL PUBLIC EXPENDITURES BY ALL SCHOOL DISTRICTS IN THE REGION BY EXPENDITURE CATEGORY: 1960-1972



Source: Wisconsin Department of State Audit Reports.

Debt retirement has also accounted for a significant proportion of total school district expenditures from 1960 to 1972. In 1960, school districts expended almost $25 million for the retirement of debt, representing 15 percent of total school district expenditures. In 1972 these expenditures increased to over $76 million, representing over 18 percent of total school district expenditures. It is interesting to note that in 1970 and 1972 the amount of school district expenditures for debt retirement purposes nearly equalled the total amount of revenue from borrowing.

Miscellaneous school district expenditures differ from general education expenditures in that they are generally monies expended indirectly by the school district through a municipality for capital improvement purposes. As such, these expenditures are greatly affected by the amount of new facility construction or equipment purchased in any given year. Both miscellaneous and education expenses, therefore, are classified as general expenditures. Since 1960, miscellaneous school district expenditures have increased by about $22 million, or 114 percent, from $19 million in 1960 to about $41 million in 1972. The proportion of total school district expenditures accounted for in this category has shown an overall decrease, from about 12 percent in 1960 to only about 10 percent in 1972, reflecting declines in school construction resulting from declines in the rates of population growth.

SUMMARY

This chapter has described historic trends in, and the contemporary state of, the demographic, economic, and public financial resource bases of the Southeastern Wisconsin Region. The interrelationships between these three bases are so numerous and close that the state of and trends in one cannot be properly treated without consideration of the other. The most important findings of these inventories and analyses include:

1. By 1970, the population of the Region had increased by more than 14 times its 1850 level. Over the same 120-year period, the nation's population increased by slightly over seven times its 1850 level, while Wisconsin's population increased by over 13 times its 1850 level. The sharp contrast between population growth trends during the two most recent decades reported in this chapter is more obvious in percentage than in absolute terms. Between 1950 and 1960, the total regional population increased by 27 percent, from 1,240,618 persons to 1,573,620. From 1960 to 1970, however, the total population in the Region increased by only 12 percent, from 1,573,620 persons to 1,756,086. One interpretation which may be placed on this reduced rate of regional population growth from 1960 to 1970 is that it signifies a return to rates established in pre-1950 periods of this century, and that the unprecedented absolute population increase of the 1950s may be viewed as exceptional, with a recurrence being unlikely.

2. Regional population increases since 1940 have been principally due to natural increase, one of the two major components of population change. Although the crude birthrates in the Region have declined steadily since 1960 after the high rates of the post-World War II period, the importance of natural increase as a component of regional population growth is indicated by the fact that natural increase accounted for 67 percent of the total population increase from 1950 to 1960, or 224,000 persons; all of the population increase from 1960 to 1970, or 203,000 persons; and all of the estimated population increase from 1963 to 1972, or about 168,000 persons.

3. Migration, the second major component of population change, accounted for an increase of 108,000 persons from 1950 to 1960, or about 33 percent of the total regional population increase. From 1960 to 1970 and from 1970 to 1972 this migration pattern reversed itself and produced a net outmigration in the Region. As a component of population change, therefore migration accounted for none of the total regional population increase from 1960 to 1970, and none of the estimated population increase in the Region from 1970 to 1972.

4. During the first three decades of the 1900s, the highest rates of population increase occurred in the now urban counties of Kenosha, Milwaukee, and Racine. Since 1930, however, the highest rates of increase have occurred in the suburban and rural areas in Ozaukee, Washington, and Waukesha Counties. This continuing trend of population decentralization from the older, urban centers of the Region has important implications for both land use and transportation planning. The demands for new and additional public services and facilities by urban growth and development will affect both the older urban centers and the newer suburban and rural-urban fringe areas of the Region.

5. During the 1950s, net in-migration accounted for more population growth than natural increase in Kenosha, Racine, Milwaukee, and Waukesha. This trend essentially reversed itself during the 1960s, especially in Milwaukee County, where a net out-migration of over 100,000 persons more than offset the net in-migration experienced in the other six regional counties, and resulted in a net out-migration of about 20,000 persons in the Region.

6. Regional population increases over the last two decades have had a significant effect upon the age structure of the population. During the 1950s, rapidly rising birthrates and declining death rates resulted in increases in the proportion of the regional population made up of persons under 20 and 65 and over, while the labor force age population 20 to 64 actually declined by more than 8 percent. During the 1960s, however, declining birthrates resulted in a decrease in the proportion of the total regional population made up of persons under 10 years of age and an increasing proportion of the total population made up of persons 10 years of age and over. The result of this age composition change since 1950 has been a declining proportion of the "productive" labor force age segment of the population, and an increasing proportion of the "dependent" segment of the population made up of persons under 18 and 65 and over.

7. Sex composition in the Region has generally changed toward a higher proportion of females to males. The number of males per every 100 females in the regional population declined from about 98 in 1950 to 97 in 1960 and 94 in 1970. Much of this change is due to the fact that women have a longer life expectancy than men.

8. Marital status, an indication of potential population growth, has exhibited a trend since 1950 toward a larger proportion of single persons in the regional population 14 years of age and over. This general trend reflects the decision by younger persons in the Region not to marry or to marry at later ages due to an extension of formal education. The number of persons 14 years of age and over who are widowed or divorced has also increased at a higher rate than the number of persons who are married.

9. A population characteristic of particular importance to land use and transportation planning is the number and size of households. From 1950 to 1970, the total number of households increased faster than the household population, resulting in declining persons per household rates from 3.36 in 1950 to 3.30 in 1960 and 3.20 in 1970. Estimates from the Commission's 1963 and 1972 regional travel inventories confirm these trends in the number of households, household population, and persons per household rates. The rapid decline in the average number of persons per household since 1952 is due, in part, to the dramatic increases in the number of one-person households. Presently, the average number of persons per household is generally larger in the suburban areas of the Region and smaller in the central cities and outlying rural areas.

10. Educational attainment levels in the Region have increased since 1950. In 1970, about 56 percent of the regional population 25 years of age and over had completed 12 or more years of formal education, compared to 44 percent in 1960 and 36 percent in 1950. The 1970 level of 12.2 median years of school completed is higher than for the nation as a whole. The highest levels of educational attainment in the Region are generally found in the suburban areas.

11. Since 1950, personal income levels in the Region have been increasing at declining rates. Total income in the Region, measured in constant 1967 dollars, increased by 71 percent in the 1950s and by 32 percent in the 1960s. Per capita income levels indicate a trend similar to that of total personal income. From 1950 to 1960, per capita incomes in the Region, measured in constant 1967 dollars, increased by 35 percent, compared to only a 18 percent increase from 1960 to 1970. Although the rates of per capita income increase in the Region have been declining, per capita income levels in the Region have continually been higher than those of the state and nation. Higher per capita income levels are generally associated with the suburban areas of the Region.

12. Trends in the value of single-family housing in the Region have been similar to those of regional income measures. From 1950 to 1960, the median market value of single-family housing units in the Region, measured in constant 1967 dollars, increased by about 16 percent. From 1960 to 1970, however, the median market value, in constant 1967 dollars, remained unchanged, reflecting the fact that the actual dollar increase in single-family housing values was about equally offset by the rate of price inflation. The spatial distribution of housing units in the Region is similar to that of per capita income and educational attainment, with major concentrations of higher housing values generally found in the suburban areas of the Region, and lower values found in the central cities of Kenosha, Racine, and Milwaukee.

13. Population and employment levels in the Region have historically followed quite similar patterns because population migrations between geographic areas are dependent upon the availability of jobs in these areas. The rapid historical growth of population in the Region, therefore, may be attributed primarily to the increasing economic activity in the Region. In the last two decades, significant changes in the distribution of economic activity in the Region have occurred as the amount of economic activity has decentralized from the established urban areas to the suburban areas of the Region. This trend is consistent with, but more moderate than, population movements over the two decades, and characterizes the "urban-spread" nature of development in the Region.

14. The segment of the population which can be most closely related to the economy is the labor force. From 1950 to 1960 the regional labor force, which is enumerated by place of residence, increased by 18 percent, a rate of growth greater than either the state or nation. From 1960 to 1970 the regional labor force increased by 17 percent. However, this growth rate was below that of both the state and nation. Kenosha, Milwaukee, and Waukesha Counties exhibited trends similar to the Region as a whole, that is, decreasing rates of labor force growth in the 1960s as compared to the 1950s. The labor force in each of the remaining four counties of Kenosha, Ozaukee, Walworth, and Washington grew faster in the 1960s than in the 1950s.

15. The labor force participation rate, which is the relationship between the labor force and total population, has increased from 57 percent in 1950 to 58 percent in 1960 and 59 percent in 1970. Much of this increase is due to increases in the proportion of working age females who entered the labor force. From 1950 to 1970 the portion of the total regional labor force made up of females increased by 85 percent, while the portion of the labor force made up of males increased by only 18 percent. The changes in the male and female segments of the labor force resulted in female participation rates increasing by 11 percent from 1950 to 1970, while male participation rates decreased by 6 percent over the same 20-year period.

16. Perhaps the single best measure of an area's economy is the number of employment opportunities, or jobs, available to residents. Historically, the number of jobs available to residents of the Region has changed at varying rates, generally corresponding to the state of the national economy. Overall from 1950 to 1972, the number of jobs in the Region has increased by 196,000, or 36 percent, with the largest increases occurring during the nine-year period from 1963 to 1972.

17. For land use and transportation planning purposes, the character of the regional economy can best be described according to the distribution of economic activity in the following eight major groups: 1) agriculture; 2) construction and mining; 3) manufacturing; 4) trade; 5) transportation, communication, and utilities; 6) finance, insurance, and real estate; 7) private services; and 8) government services. Historically, employment in the Region has been heavily concentrated in manufacturing. Economic activity in the Region is, however, becoming less concentrated in manufacturing and more oriented toward public and private services and trade, which reflects a national trend of increased demand for consumer goods and services and a decentralization of manufacturing away from the older manufacturing belt in the northeast and north central parts of the nation.

18. Total revenue and expenditure levels for general-purpose local units of government and school districts in the Region have been increasing at the rate of about 14 percent per year, from $507 million in 1960 to $1,399 million in 1972. Over the same period, per capita revenue and expenditure levels in the Region have increased

by about 12 percent per year, from $322 per capita in 1960 to $780 per capita in 1972. Price inflation has increased at an average annual rate of about 3.5 percent from 1960 to 1972, indicating that most of the increase in total regional revenue and expenditure levels during this period was due to real dollar increases. More recently, however, the overall rate of price inflation has approached a rate of 12 percent annually, a factor which may affect the future growth of total regional revenue and expenditure levels and the levels of municipal services.

19. The largest source of revenue to local units of government in the Region historically has been the property tax levy. Since 1960, the property tax levy has annually provided over 40 percent of total general-purpose local government revenue and over 60 percent of school district revenues in the Region. The property tax is a far more important source of revenue for counties and cities than for villages and towns in the Region. Per capita property taxes levied for the Region as a whole increased at an average annual rate of about 11 percent, from $144 per capita in 1960 to $328 per capita in 1972, compared to an average annual increase in property tax revenue of 13 percent, from $227 million in 1960 to $588 million in 1972. The proportion of total regional revenues provided by the property tax levy, however, has diminished slightly over this 12-year period for all local units of government except school districts.

20. One of the most rapidly increasing revenue sources to local units of government in the Region has been revenue derived from public industries, which reflects the rapid growth in urbanization which occurred during the 1960s. Public industries' revenues have increased by 357 percent, from $41 million in 1960 to $232 million in 1972, a more rapid increase than all other revenue sources overall. This increase was fastest in the cities, villages, and towns in the Region. Public industries' revenues have also increased substantially in proportion to total revenues, and have become the leading source of revenue to villages and towns in the Region and the second leading source of revenue to the Region as a whole.

21. The largest expenditure category for all general-purpose local units of government and school districts in the Region was education, which amounted to $152 million in 1960, comprising 30 percent of total expenditures, and $380 million in 1972, comprising 28 percent of total expenditures. The overall size of education expenditures in the Region principally reflects the magnitude of school district education expenditures, which comprised 80 percent of total regional education expenditures in 1960 and 78 percent of these expenditures in 1972.

22. Total federal, state, and local expenditures for highways, streets, and bridges in the Region increased at an average annual rate of 6 percent, from $86 million in 1960 to $149 million in 1972. Overall, expenditures for the construction, operation, and maintenance of highways in the Region have generally declined in proportion to total regional expenditures to the 1972 level of expenditures for highways of $149 million, representing 11 percent of total regional expenditures. This decline reflects both a slowdown in highway construction in the Region and more rapid increases in other expenditure categories such as health, sanitation, and welfare, and general government. Per capita expenditures for highways increased by nearly 6 percent per year, from $54 in 1960 to $85 in 1970, but actually declined from 1970 to 1972 by over 2 percent to $83 per capita, reflecting the recent slowdown in the overall growth of highway-related expenditures in the Region.

23. Federal highway monies expended in the Region increased rapidly during the early 1960s, reaching a peak in 1964 when federal highway dollars spent in the Region totaled $28 million, comprising 25 percent of total regional highway expenditures, compared to a 1960 level of $9 million, comprising 10 percent of total regional highway expenditures. Since 1964, federal highway monies spent in the Region have fluctuated downward in their proportion of total regional highway expenditures to a level of $10 million, comprising less than 10 percent of these expenditures in 1968, then increasing to a level of $22 million, comprising 15 percent of total regional highway expenditures in 1972. These proportional declines after 1966 reflect a general slowdown in federal interstate highway construction in the Region since that time.

24. State highway monies expended in the Region fluctuated widely between 1960 and 1972. State expenditures for highways in the Region increased dramatically from $7 million, representing 8 percent of total expenditures for highways in 1960, to nearly $24 million, representing 17 percent of total expenditures for highways in 1966, an increase of $17 million, or 243 percent, over this four-year period. State expenditures for highways increased to $30 million by 1970, and fell sharply to a level of $13 million, representing less than 9 percent of total expenditures for highway purposes in 1972.

25. Federal, state, and local capital expenditures for highway construction in the Region increased by an average of 6 percent per year, from $41 million in 1960 to $71 million in 1972. During this period, capital expenditures for highway construction fluctuated from a low of $41 million, representing 48 percent of total highway expenditures in 1960, to a high of $90 million, repre-

senting 60 percent of total highway expenditures in 1970. In 1960, city dollars for highway construction comprised 46 percent of total capital expenditures for highways, the largest proportion in that year. In 1962 and 1964, federal capital expenditures comprised the largest portion of the total at 34 and 39 percent, respectively. In 1966 and 1968, state monies expended for highway construction in the Region were the largest, comprising 28 and 31 percent of total highway construction expenditures, respectively. In 1970, federal dollars expended for highway construction were the largest, at 30 percent of the total, and in 1972, city expenditures for highway construction comprised 41 percent of the total, the largest in that year.

26. Urbanization within the Region from 1960 to 1972 has caused an increasing proportion of local government expenditures to be allocated for such services as general government administration; the protection of person and property; for health, sanitation, and welfare; and for the construction, operation, and maintenance of public industries, such as public sanitary sewer and water supply systems. It is expected that these trends will continue in the Region as growth from urbanization requires such facilities and services.

27. Recreation expenditures in the Region have increased at an average rate of 9 percent annually, from $17 million in 1960 to $37 million in 1972. These expenditures, however, have generally declined in proportion to total local government expenditures during this period. Milwaukee County's recreation expenditures comprise the largest single component of total regional recreation expenditures, comprising 65 percent of the Region total in 1960 and 48 percent of the total in 1972, reaching a peak in 1964 when Milwaukee County's recreation expenditures totaled $21 million, representing nearly 80 percent of total regional recreation expenditures. Per capita expenditures for recreation in the Region increased at an average rate of 7 percent annually, from $11 per capita in 1960 to $20 per capita in 1972. Milwaukee County's per capita recreation expenditures increased at an average rate of 3 percent annually, from $12 per capita in 1960 to $17 per capita in 1972. While recreation has been a relatively minor expenditure item outside of Milwaukee County, continued urbanization and increased amounts of leisure time available to residents of the Region may increase the future demand for recreation facilities and services in other parts of the Region.

The data presented in this chapter relate to historical changes in the demographic, economic, and financial resource bases of the Region. These data are important considerations in the land use and transportation planning process, since they provide the principal bases for the demographic and economic analyses and forecasts which determine the general scale and geographic distribution of the demand for land use and supporting transportation facilities and services. Certain conclusions which are outstanding from among the many possible interpretations of the data presented in this chapter follow.

Both short- and long-term data on the changes in regional population and economic activity levels indicate that the fundamental trend toward growth and urbanization in the Region, which has been uninterrupted over a period of more than 130 years, may be expected to continue over the foreseeable future. The most recent data on population and economic activity levels, both nationally and for the Region, do indicate, however, that the scale, if not the character, of this growth and urbanization process may be changing. Nationally, two long-term demographic phenomena particularly influenced the rapid growth of metropolitan regions in the United States. The first was the high rate of natural increase which produced the high population growth rate that marked the post-World War II period. The second was the massive rural to urban migration which occurred over a longer period of time and contributed to the rapid concentration of the population of the United States in its large metropolitan regions. Some evidence now exists that these trends may be coming to a close. The character of the new trends, however, will probably not be fully discernible until additional census data become available in 1980.

The current demographic analyses conducted by the Commission indicate, however, that the very high metropolitan population growth rates of the 1950 to 1960 decade will probably be replaced by more modest growth rates, approximating those of the 1940 to 1950 decade. The migration trends have been reversed in many of the large metropolitan areas of the United States, from high rates of in-migration during the 1950s to high rates of out-migration during the 1960s. This reversal has also occurred within the Region, and particularly within Milwaukee County. Moreover, birthrates nationally and within the Region have reached the lowest level since the 1930s, and may go even lower. These trends in migration and natural increase may be only short-term in nature, but even so will have long-term effects on the future growth and development of the Region. It should be stressed, however, that there is no incontrovertible evidence that population growth rates peaked for all time in the 1950s, or that metropolitan concentration peaked for all time in the 1960s, never to recur.

The current population and economic analyses conducted by the Commission indicate that the character of the urbanization process in the Region is continuing to change from the traditional growth pattern that was centered on the older and larger central cities of the Region to a highly diffused pattern of development, with urban growth penetrating areas which until 1950 had remained essentially rural in character. More recently, and for the first time in the history of the Region, this dispersal of population and economic activity has been accompanied by some declines in the population levels of the central cities and older first-ring suburbs.

Factors contributing to this diffusion of urban development include, with respect to population, changing preferences in residential location and density; and, with respect to economic activity, the population dispersal itself, the availability of relatively low cost land outside the central cities, the inability of firms to economically expand their physical plant on present sites, and the relatively high level of transportation service offered by outlying sites as opposed to more centrally located sites. This diffusion of urban growth may be expected to continue into the foreseeable future.

Other factors may affect both the scale and character of regional development patterns and trends. These include the increased energy demands of diffused urban development in the face of an increasingly costly and perhaps uncertain energy supply; the current uncertainties in national financial markets; the current high rates of price inflation within the United States; and the inability of the East North Central states, including Wisconsin, to compete with the newly developing industrial economies of the southern and western states for the location of new economic enterprises and the creation of employment opportunities. While all of these factors could affect the future scale and character of regional development, the manner in which they may do so, if at all, is not clear at this time.

The traditional means of financing the majority of local government and school district facilities and services—property tax revenues—are expected to continue into the foreseeable future. The most recent data on these revenue sources indicate that the proportion of total local government revenues provided by property tax levies is diminishing. This is due, in part, to public pressure on local elected officials to stabilize or reduce local property tax rates, especially in light of the smaller increases in the value of the property tax base upon which property taxes are levied. This has resulted in a shift toward other revenue sources, particularly public industries, to provide needed additional municipal revenues.

This shift toward public industries has provided another major source of local government revenues which can be expected to continue in proportion to the urbanization process, since these revenues are derived directly from the users of public facilities and services such as public sewer and water facilities. In addition to the new revenue source provided by public industries, shared tax receipts from state and federal sources have recently been used as a direct offset to property tax levies, effectively reducing the property tax rates in many of the Region's communities. This trend in the use of shared tax receipts is expected to continue, especially in those communities which are at or approaching their tax levy limits.

On the expenditures side, the largest single category of expenditures for all general-purpose local units of government and school districts in the Region is education, mainly reflecting the overall magnitude of school district expenditures. This overall trend is likely to continue in the foreseeable future, although declines in population growth from birthrate reduction may ultimately result in enrollment declines for the Region as a whole and a slow-down in capital expenditures for additional school facilities, thus reducing overall education expenditures over time.

Growth from urbanization has resulted in absolute and proportional increases in expenditures for the protection of persons and property; health, sanitation, and welfare; and general government administration for the Region as a whole. As noted previously, this process of urbanization in the Region, which has been virtually uninterrupted for a period of 130 years, may be expected to continue in the foreseeable future. Future expenditure levels for the protection of persons and property; health, sanitation, and welfare; and general government which are related to the urbanization process may, therefore, be expected to increase but at a slower rate, a factor which is consistent with expected trends in regional population growth.

Both overall revenue and expenditure levels for highway purposes in the Region have experienced relatively small increases in recent years, and have declined in proportion to total regional revenue and expenditure levels. In addition, public expenditures for capital equipment and operation and maintenance of mass transit within the Region from 1960 through 1972 have been virtually nonexistent with one notable exception. The City of Kenosha assumed ownership in 1971 of that city's transport company, and funded its operation in part from general revenues since that time. In 1974, the City of Kenosha became eligible for a direct transit subsidy from the Wisconsin Department of Transportation, covering up to two-thirds of any operating deficit. In 1974 this subsidy amounted to about $158,000. Milwaukee County and the City of Racine also became eligible for mass transit subsidies in 1974. Milwaukee County, which has been subsidizing elderly transport ridership from general revenues since 1973, received $280,000 in state subsidies in 1974 to cover a portion of each senior citizen's bus fare. Similarly, since 1972 the City of Racine has been subsidizing the privately owned transit company servicing that area out of general revenues. In 1974 the city's transit expenditures will be supplemented by a transit subsidy, not to exceed two-thirds of the expected operating losses, from the Wisconsin Department of Transportation.

Since 1972, therefore, total monies expended for mass transit purposes have increased in certain areas of the

Region; however, the funding of transit facilities and services in the Region may be expected to become an increasingly important purpose for municipal expenditures in the future. The lack of mass transit expenditures prior to 1972, the current low levels of expenditures for this purpose, and the recent declines in the proportional growth of expenditures for the construction, operation, and maintenance of highways, streets, and bridges in the Region create particular difficulties with respect to the total implementation of the regional transportation plan, which calls for a fully balanced regional transportation system including both highways and mass transit.

Chapter V

THE NATURAL RESOURCE AND PUBLIC UTILITY BASE

INTRODUCTION

The natural resources of an area are vital to its economic development and its ability to provide a pleasant and habitable environment for human life. Natural resources not only condition, but are conditioned by, regional growth and development. 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 natural resource capabilities is, therefore, particularly important to planning for the development of the Region.

The principal elements of the natural resource base of the Region are the climate, air, physiography, geology, soils, mineral and organic resources, surface water resources and associated shorelands and floodlands, groundwater resources and associated recharge areas, woodlands, wetlands, and fish and wildlife habitat areas. Existing and potential scenic, historic, and recreational-related open space sites, while not strictly a part of the natural resource base, are closely linked to the underlying resource base, and are therefore considered in this chapter along with that base.

Without a proper understanding and recognition of these elements and of the interrelationships which exist between them, human use and alteration of the natural environment proceeds at the risk of excessive costs in terms of both monetary expenditures and environmental degradation. The natural resource base is highly subject to grave misuse through improper land use and transportation facility development. Such misuse may lead to severe environmental problems which are difficult and costly to correct, and to the deterioration and destruction of the natural resource base itself. Intelligent selection of the most desirable land use and transportation plan from among the alternatives available must, therefore, be based in part upon a careful assessment of the effects of each plan upon the supporting natural resource base.

Public utility systems are one of the most important and permanent elements influencing regional growth and development. Moreover, certain utility facilities are closely linked to the surface water and groundwater resources of the Region, and may, therefore, affect the overall quality of the regional natural resource base. This is particularly true of 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 groundwater reservoir. Knowledge of the location and capacities of these utilities is, therefore, essential to intelligent land use and transportation planning. Because the public utility systems are so closely linked to the natural resource base, these systems are considered together with that base.

A complete inventory of the natural resource and public utility base of the Region was conducted in 1963 in order to facilitate preparation of the initial regional land use and transportation plans formally adopted by the Commission in 1966. Additional inventories of the natural resource and public utility base of the Region, and of subareas of the Region, were conducted under other Commission planning programs, and have served to both update and refine the extensive inventories conducted under the initial regional land use and transportation planning effort. The methodology and findings of these inventories are fully documented in previous Commission publications.[1]

Southeastern Wisconsin is a dynamic Region which has experienced many changes since the initial natural resource and public utility inventories were conducted in 1963. Surveillance of these changes as they may affect the natural resource and public utility base, and the continued validity of the adopted regional land use and transportation plans, is extremely important to plan reevaluation. This chapter, therefore, will not only identify and describe the significant elements of the natural resource and public utility base of the Southeastern Wisconsin Region as adapted to regional land use and transportation planning needs, indicating and quantifying the

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[1] *See SEWRPC Planning Reports No. 5, The Natural Resources of Southeastern Wisconsin, No. 6, The Public Utilities of Southeastern Wisconsin, No. 7, The Regional Land Use-Transportation Study, No. 8, Soils of Southeastern Wisconsin, No. 9, A Comprehensive Plan for the Root River Watershed, No. 12, A Comprehensive Plan for the Fox River Watershed, No. 13, A Comprehensive Plan for the Milwaukee River Watershed, and No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin; SEWRPC Technical Reports No. 1, Potential Parks and Related Open Spaces, No. 2, Water Law in Southeastern Wisconsin, and No. 4, Water Quality and Flow of Streams in Southeastern Wisconsin; and SEWRPC Planning Guides No. 5, Floodland and Shoreland Development Guide, and No. 6, Soils Development Guide.*

spatial distribution and extent of those resources and facilities, but will also assess the impact of changes within the Region over the last decade on the natural resource and public utility base. Finally, interpretations of the findings of the reinventories and analyses with respect to regional land use and transportation system development are provided. Of particular importance in this respect is the application of the concept of the environmental corridor.

CLIMATE[2]

Climate, especially the extreme variations in the three principal elements of climate—temperature, precipitation, and snow cover—directly affects the growth and development of an area. Climate determines to a large extent the recreational interests and pursuits that can be followed by residents of an area, ranging from swimming, boating, and numerous other summer recreation activities to skiing, snowmobiling, and ice skating in winter. Climate also has important economic implications. Rainfall and temperature affect the kinds of agricultural crops which can be produced, as well as the yields. Rainfall, temperature, and snow cover affect the design of buildings and structures of various kinds and the cost of operating and maintaining both private and public facilities and services. Climate, then, does have important implications for regional development.

General Climatic Conditions

Wisconsin's mid-continent location, far removed from the moderating effect of the oceans, gives the Region a typical continental type climate characterized primarily by a continuous progression of markedly different seasons and a large range in annual temperature. Low temperatures during the long, cold winter are accentuated by prevailing frigid northwesterly winds during the winter period; while summer high temperatures are reinforced by the warm southwesterly winds common during that season.

The Southeastern Wisconsin Region is positioned astride cyclonic storm tracks along which low pressure centers move from the west and southwest. The Region also lies in the path of high pressure centers moving in a generally southeasterly direction. This location at the confluence of major migratory air masses results in the Region as a whole being influenced by a continuously changing pattern of different air masses having alternately low and high pressure centers, and results in frequent weather changes being superimposed on the aforementioned large annual range in weather characteristics, particularly in winter and spring when distinct weather changes normally occur at least once every two or three days. These temporal weather changes consist of marked temperature variations, as well as variations in the type and amount of precipitation, relative humidity, wind magnitude and direction, and cloud cover.

Because of its proximity to Lake Michigan, the Region also exhibits spatial variations in weather, particularly during the spring, summer, and fall when the temperature differential between the lake water and the land air masses tends to be the greatest. During these periods, the presence of the lake tends to moderate the climate of the eastern border of the Region. It is common, for example, for midday summer temperatures in shoreline areas to abruptly drop to a temperature level 10°F lower than inland areas because of cooling lake breezes generated by air rising from the warmer land surfaces. This Lake Michigan temperature influence, which may have important implications for ambient air quality, is generally limited to a narrow band lying within several miles of the shoreline.

Temperature

Data for six selected temperature observation stations in southeastern Wisconsin, three of which—Port Washington, Milwaukee, and Kenosha—are located at the Lake Michigan shoreline, and three of which—West Bend, Waukesha, and Lake Geneva—are located at least 15 miles inland, are presented in Table 37 and Figure 45. These data, which encompass periods of record ranging from 10 to 30 years for the various observations, indicate the temporal and spatial variations in temperature and the temperature ranges which may be expected to occur within the Region. The temperature data also illustrate how regional air temperatures lag approximately one month behind summer and winter solstices during the annual cycle, with the result that July is the warmest month in southeastern Wisconsin and January the coldest.

The effects of Lake Michigan are also indicated by this data when comparisons are made between inland and shoreland observation stations that have the same latitude, that is, are generally located along the same east-west line so as to eliminate temperature effects attributable to latitude. It is also possible to identify latitudinal temperature effects by comparing data for observation stations generally located along the same longitudinal, or north-south, line.

The growing season, which is defined as the number of days between the last 32°F freeze in spring and the first in the fall, averages about 165 days for the Region. The lakeshore area has a growing season of about 175 days, while inland locations have a shorter growing season of about 155 days. The last 32°F frost in the spring normally occurs during the last week of April for areas near Lake Michigan, and during the first half of May for inland locations. The first freeze in the fall usually occurs in a two-week span during mid-October for all locations in the Region. Lake Michigan's moderating effect inhibits spring frost formation in the eastern extremities of southeastern Wisconsin, thereby giving that portion of the Region a slightly longer growing season.

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[2] *Unless otherwise indicated, climatic and weather descriptions and data presented herein are based on information extracted from publications of the National Weather Service, U. S. Department of Commerce, formerly known as the Weather Bureau, U. S. Department of Commerce.*

Table 37

TEMPERATURE CHARACTERISTICS AT SELECTED LOCATIONS IN THE REGION

Month	Observation Station[a]																					Month
	Lakeshore Location									Inland Location									Regional Summary			
	Port Washington Period of Record: 1961-1970			Milwaukee Period of Record: 1931-1960			Kenosha Period of Record: 1945-1959			West Bend Period of Record: 1930-1959			Waukesha Period of Record: 1930-1959			Lake Geneva Period of Record: 1945-1959					
	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[b]	Average Daily Minimum[b]	Mean[c]	Average Daily Maximum[d]	Average Daily Minimum[d]	Mean[e]	
January	26.1	10.1	18.1	28.3	12.8	20.6	31.4	14.9	23.2	28.6	11.7	20.2	29.0	12.3	20.7	29.8	13.2	21.5	28.9	12.5	20.7	January
February	30.5	14.0	22.3	30.2	14.6	22.4	34.2	18.0	26.2	31.0	13.5	22.3	31.6	14.5	23.1	33.2	16.4	24.8	31.8	15.2	23.5	February
March	39.1	24.2	31.7	38.8	23.2	31.0	42.8	26.6	34.7	39.9	23.0	31.5	40.8	23.4	32.1	42.6	24.5	33.6	40.7	24.2	32.4	March
April	50.4	34.3	42.4	53.1	34.1	43.6	55.7	36.8	46.2	54.9	34.6	44.8	56.0	34.7	45.4	58.6	36.4	47.5	54.8	35.2	45.0	April
May	60.8	42.9	51.9	63.9	42.9	53.4	66.4	45.1	55.8	67.5	45.4	56.5	68.2	44.8	56.5	69.6	45.9	57.8	66.1	44.5	55.3	May
June	71.0	52.1	61.6	73.9	52.6	63.3	77.1	55.7	66.4	77.4	55.8	66.6	78.6	55.2	66.9	79.2	56.8	68.0	76.2	54.7	65.5	June
July	76.7	59.2	68.0	78.9	58.4	68.7	81.9	62.3	72.1	82.9	60.7	71.8	84.1	60.1	72.1	84.0	61.9	73.0	81.4	60.4	71.0	July
August	76.7	58.3	67.5	77.7	57.8	67.8	81.5	62.3	71.9	80.8	59.5	70.2	82.6	59.0	70.8	82.6	61.3	72.0	80.3	59.7	70.0	August
September	69.1	51.7	60.4	70.7	49.9	60.3	74.0	53.8	63.9	72.4	51.3	61.9	74.1	50.6	62.4	74.1	52.4	63.3	72.4	51.6	62.0	September
October	59.3	41.8	50.6	60.1	39.9	50.0	64.2	44.2	54.2	60.8	41.1	51.0	62.3	40.2	51.3	63.7	42.7	53.2	61.7	41.7	51.7	October
November	45.3	30.4	37.9	44.1	27.5	35.8	47.3	30.2	38.8	44.1	27.8	36.0	44.8	27.9	36.4	45.0	28.7	36.9	45.1	28.8	37.0	November
December	28.9	15.3	22.1	32.0	17.1	24.6	35.6	19.5	27.6	32.0	16.7	24.4	32.4	17.4	24.9	33.2	18.6	25.9	32.4	17.4	24.9	December
Year	52.8	36.2	44.5	54.3	35.9	45.1	57.7	39.1	48.4	56.0	36.8	46.4	57.0	36.7	46.9	58.0	38.2	48.1	56.0	37.2	46.6	Year

[a] *Observation stations were selected both on the basis of the length of record available and geographic location within the Southeastern Wisconsin Region. Port Washington, Milwaukee, and Kenosha are representative of areas with temperatures influenced by Lake Michigan, whereas West Bend, Waukesha, and Lake Geneva are typical of inland areas having temperatures that are not generally influenced by Lake Michigan. Kenosha and Lake Geneva are representative of southerly areas in the Region, whereas Port Washington and West Bend typify northern locations.*

[b] *The monthly average daily maximum temperature and the monthly average daily minimum temperature are obtained by using daily measurements to compute an average for each month in the period of record, the results are then averaged for all the months in the period of record.*

[c] *The monthly mean temperature is the mean of the average daily maximum temperature and the average daily minimum temperature for each month.*

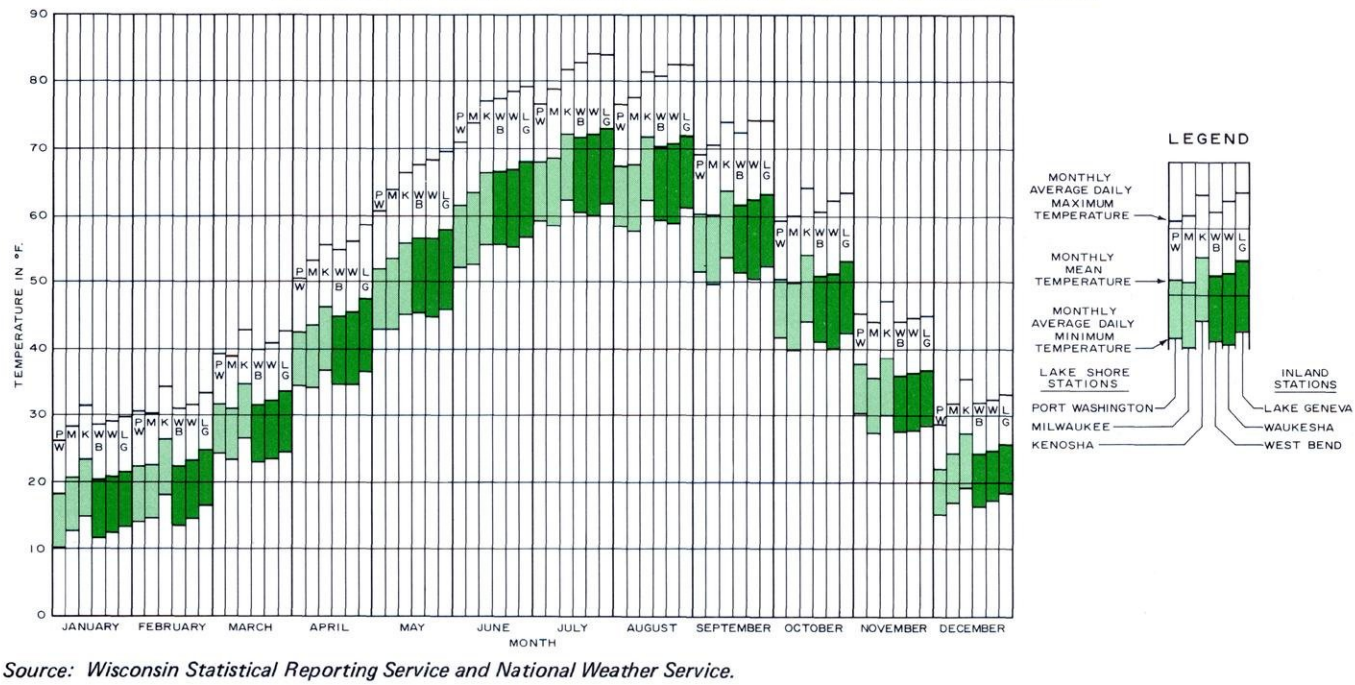
[d] *The monthly average daily maximum and minimum temperatures for the Region as a whole were computed as averages of the corresponding values for the six observation stations.*

[e] *The monthly mean for the Region as a whole is the mean of the regional monthly average daily maximum and average daily minimum, which is equivalent to the average of the monthly means for the six observation stations.*

Source: Wisconsin Statistical Reporting Service, National Weather Service, and SEWRPC.

Figure 45

TEMPERATURE CHARACTERISTICS AT SELECTED LOCATIONS IN THE REGION



Source: Wisconsin Statistical Reporting Service and National Weather Service.

Precipitation

Precipitation within the Region takes the form of rain, sleet, hail, and snow. It ranges from gentle showers of trace quantities to destructive thunderstorms, as well as major rainfall-snowmelt events causing property and crop damage, inundation of poorly drained areas, and stream flooding.

Precipitation and snowfall data for six representative precipitation observation stations in southeastern Wisconsin located on the Lake Michigan shoreline at Port Washington, Milwaukee, and Kenosha and inland at West Bend, Waukesha, and Lake Geneva are presented in Table 38 and Figure 46. These data, which encompass periods of record ranging from 15 to 65 years for the

Table 38

PRECIPITATION CHARACTERISTICS AT SELECTED LOCATIONS IN THE REGION

Month	Observation Station[a]												Regional Summary		Month
	Lakeshore Location						Inland Location								
	Port Washington		Milwaukee		Kenosha		West Bend		Waukesha		Lake Geneva				
	Period of Record 1896-1960[b]		Period of Record 1931-1960		Period of Record 1945-1959		Period of Record 1930-1959		Period of Record 1930-1959		Period of Record 1945-1959				
	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	Average Total Precipitation	Average Snow and Sleet	
January	1.61	11.5	1.83	12.7	1.56	11.9	1.68	12.3	1.70	11.8	1.73	11.0	1.69	11.9	January
February	1.56	10.2	1.40	8.0	1.08	12.1	1.36	8.1	1.26	6.6	1.26	5.5	1.32	8.4	February
March	2.21	8.0	2.31	9.3	2.29	7.3	2.01	10.5	2.16	10.7	2.55	10.1	2.26	9.3	March
April	2.73	1.9	2.53	1.2	3.19	1.4	2.54	1.2	2.52	1.1	3.24	1.1	2.79	1.3	April
May	3.37	0.1	3.16	0.0	3.49	0.2	2.98	0.4	3.46	0.4	3.69	0.1	3.36	0.2	May
June	3.32	0.0	3.64	0.0	4.05	0.0	3.96	0.0	3.72	0.0	4.46	0.0	3.86	0.0	June
July	2.79	0.0	2.95	0.0	3.23	0.0	3.34	0.0	3.31	0.0	4.18	0.0	3.30	0.0	July
August	2.92	0.0	3.06	0.0	3.08	0.0	2.89	0.0	3.06	0.0	3.60	0.0	3.10	0.0	August
September	3.20	0.0	2.72	0.0	2.19	0.0	3.16	0.0	2.93	0.0	1.98	0.0	2.70	0.0	September
October	2.30	0.2	2.10	0.0	1.85	0.1	2.21	0.1	2.09	0.0	2.13	0.0	2.11	0.1	October
November	2.06	3.0	2.18	2.5	1.96	2.5	2.13	2.9	2.30	3.5	2.16	4.5	2.13	3.2	November
December	1.55	7.2	1.63	9.8	1.89	9.7	1.50	7.8	1.56	7.7	2.12	10.8	1.71	8.8	December
Year	29.62	42.1	29.51	43.5	29.86	45.2	29.76	43.3	30.07	41.8	33.10	43.1	30.33	43.2	Year

[a] *Observation stations were selected both on the basis of the length of record available and geographic location within the Southeastern Wisconsin Region. Port Washington, Milwaukee, and Kenosha are representative of areas where precipitation would be influenced by Lake Michigan, whereas West Bend, Waukesha, and Lake Geneva are typical of inland areas having precipitation that is not generally influenced by Lake Michigan. Kenosha and Lake Geneva are representative of southerly areas in the Region, whereas Port Washington and West Bend typify northern locations.*

[b] *Snow and sleet data for Port Washington is based on the 56 year period 1894 through 1950.*

Source: Wisconsin Statistical Reporting Service, National Weather Service, and SEWRPC.

various observation stations, illustrate the temporal and spatial variations in the type and amount of precipitation that normally occur within the Region.

Precipitation data indicate that Lake Michigan does not have as pronounced an effect on precipitation within the Region as it does on temperature. A minor Lake Michigan effect is evident in a rainfall reduction of up to about 0.5 inch per month in late spring and summer in the eastern areas of the Region relative to the western areas, which may be attributable to the cool lake waters maintaining a cooler lower atmosphere that inhibits convective precipitation.

The influence of Lake Michigan as a source of moisture is reflected by slightly higher seasonal snowfalls for the entire Region relative to inland areas lying west of the Region.[3] Minor intraregional spatial snowfall differences occur in that seasonal snowfall tends to be greatest in the topographically higher northwest portion of the Region because moisture masses moving through that area are forced up onto the higher terrain where lower temperatures normally associated with increased height induce more snowfall than that which would occur in the absence of the topographic barrier.

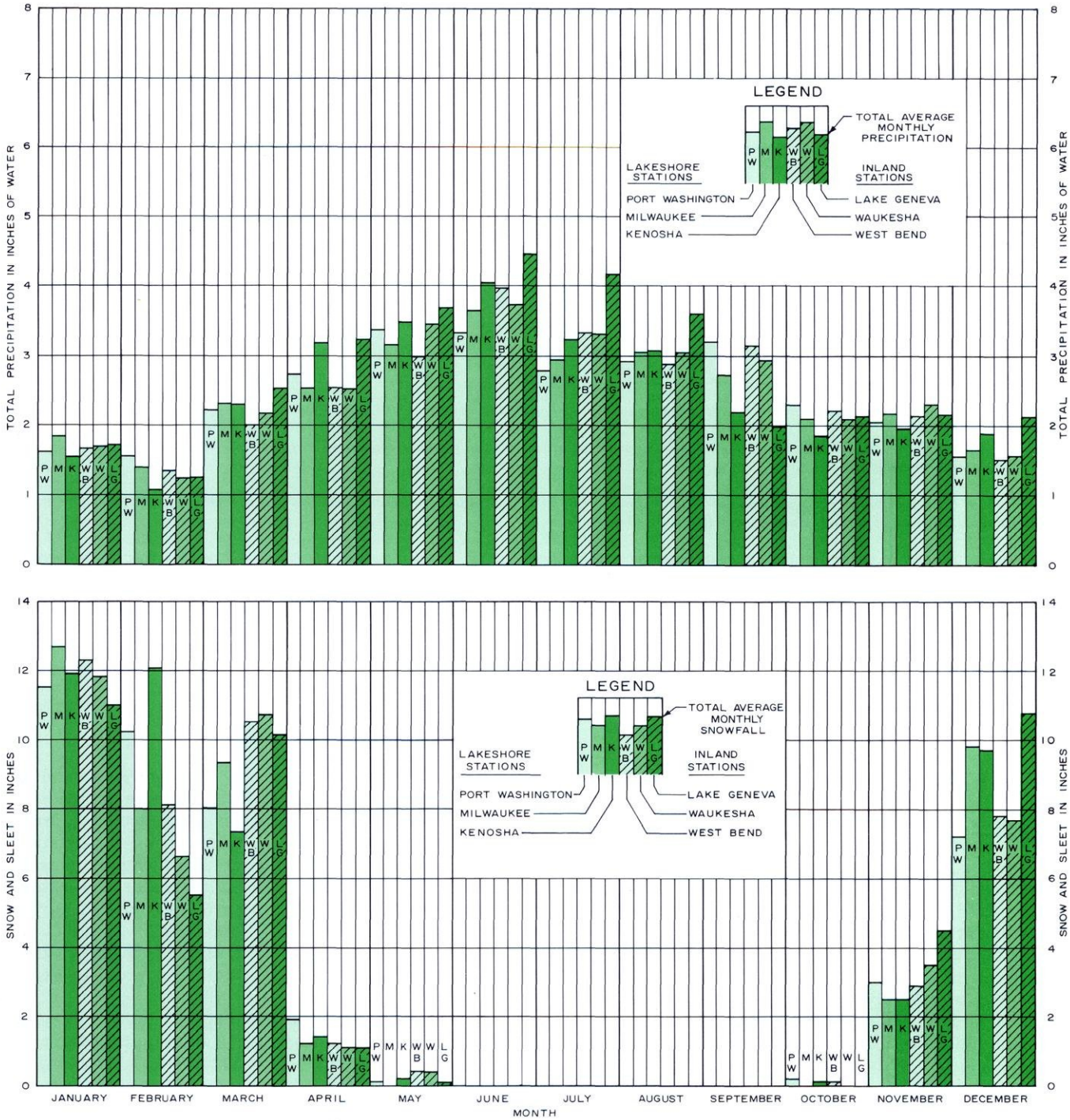
Snow Cover

Snow depth as measured at Milwaukee for the 70-year period of 1900 through 1969 and published in "Snow and Frost in Wisconsin," a 1970 Wisconsin Statistical Reporting Service report, is summarized and presented in Table 39. It should be emphasized that the tabulated data pertain to snow depth on the ground as measured at the place and time of observation, and are not a direct measure of average snowfall. Recognizing that snowfall

[3] *The effect of Lake Michigan on the annual snowfall in southeastern Wisconsin is minor relative to lake-effect snowfall experienced on the eastern shore of the lake. In the winter, prevailing northwesterly winds move cold, dry air over the relatively warm surface of Lake Michigan. The air gains moisture and heat energy and rises, producing annual snowfalls in excess of 80 inches, about twice that experienced in Wisconsin, over most of the western portion of the State of Michigan. For additional information, see K. F. Dewey, "Lake-Effect Snowfall and Some Implications for a Great Lakes Air Pollution Model," Northern Illinois University, Department of Geography, September 1970.*

Figure 46

PRECIPITATION CHARACTERISTICS AT SELECTED LOCATIONS IN THE REGION



Source: Wisconsin Crop Reporting Service, National Weather Service; and SEWRPC.

and temperatures, and therefore snow accumulation on the ground, vary spatially within the Region, the Milwaukee area data presented in Table 39 should be considered only as an approximation of conditions that would be encountered in other parts of the Region. As indicated by the data, snow cover is most likely during the months of December, January, and February, during which at least a 0.40 probability exists of having one inch or more of snow cover at Milwaukee. Furthermore, during January and the first half of February, at least a 0.30 probability exists of having one inch or more of snow on the ground during the first half of the month, while the probability of having that much snow cover diminishes to 0.07 by the end of the month.

Table 39

SNOW COVER PROBABILITIES AT MILWAUKEE BASED ON DATA FOR THE PERIOD 1900-1970

Date		Snow Cover[a]									
		1.0 Inch or More		5.0 Inches or More		10.0 Inches or More		15.0 Inches or More		Average (Inches)	
Month	Day	Number of Occurrences[b]	Probability of Occurrence[c]	Number of Occurrences[b]	Probability of Occurrence[c]	Number of Occurrences[b]	Probability of Occurrence[c]	Number of Occurrences[b]	Probability of Occurrence[c]	Per Occurrence[d]	Overall[e]
November	15	5	0.07	0	0.00	0	0.00	0	0.00	1.2	0.09
	30	12	0.17	1	0.01	1	0.01	0	0.00	2.8	0.49
December	15	33	0.47	10	0.14	0	0.00	0	0.00	3.3	1.54
	31	32	0.46	9	0.13	1	0.01	0	0.00	3.6	1.66
January	15	43	0.61	17	0.24	4	0.06	2	0.03	4.9	2.94
	31	48	0.69	22	0.31	9	0.13	4	0.06	6.2	4.26
February	15	44	0.63	23	0.33	7	0.10	3	0.04	6.0	3.69
	28	27	0.39	8	0.11	3	0.04	1	0.01	4.5	1.69
March	15	23	0.33	6	0.09	4	0.06	0	0.00	3.9	1.21
	31	5	0.07	1	0.01	1	0.01	0	0.00	3.4	0.24

[a] *Data pertain to snow depth on the ground as it was measured at the time and place of observation, and are not a direct measure of average snowfall.*

[b] *Number of occurrences is the number of times during the 70-year period of record when measurements revealed that the indicated snow depth was equaled or exceeded on the indicated date.*

[c] *Probability of occurrence for a given snow depth and date is computed by dividing the number of occurrences by 70, and is defined as the probability that the indicated snow cover will be reached or exceeded on the indicated date.*

[d] *Average snow cover per occurrence is defined as the sum of all snow cover measurements in inches for the indicated date divided by the number of occurrences for that date, that is, the number of times in which 1.0 inch or more of snow cover was recorded.*

[e] *Overall average snow cover is defined as the sum of all snow cover measurements in inches for the indicated date divided by 70, that is, the number of observation times.*

Source: Wisconsin Statistical Reporting Service, National Weather Service, and SEWRPC.

AIR QUALITY

Air Quality Resources

Air is one of the most important natural resources. Air is not only a particularly important determinant of the overall quality of the environment for life, but is essential to life itself. The earth's atmosphere provides the vital blend of oxygen and other gases needed to support terrestrial animal and plant life. Pure air, consisting only of this vital blend of gases necessary for life, is not known to exist in nature. Air always contains foreign matter in the form of smoke, soot, dust, fly ash, fumes, mists, odors, pollens, and spores, in addition to uncombined water vapor. Some of this foreign particulate and gaseous matter is contributed by such natural sources as volcanic activity, windstorms, and lighting-caused fires. Added to this naturally occurring foreign matter are contaminants contributed by man from land cultivation, waste burning, heat and power generation, industrial processes, and transportation movements. Those foreign particulate and gaseous materials which are contributed to the atmosphere through the activities of man and which have a deleterious effect on either the use of the air or on the contribution which air makes to the overall quality of the environment are defined as air pollutants.

Urbanization tends to intensify the contribution of air pollutants from human activities because it tends to concentrate commercial and industrial activities, transportation movements, waste burning, power generation, and space heating. When the rate at which pollutants are contributed by human activities exceeds the natural absorptive, diffusive, and dispersive capacity of the earth's atmosphere, and when the concentration of pollutants becomes so severe as to seriously and adversely affect health and property, an air pollution problem exists.

Comprehensive land use planning can be an extremely effective means for managing the air resources of an area. Alternative regional land use patterns can result in different air quality levels, and those land use patterns minimizing air pollution should be encouraged. The density and spatial distribution of residential, commercial, and industrial land uses; major transportation terminals; agricultural areas; and environmental corridors can all affect the overall air quality of the Region, and should be explicitly considered in the development of regional plans. Similarly, comprehensive transportation planning can be an extremely effective means of managing the air resources of an area. Alternative configurations of transportation systems and the relative use of alternative

modes of transportation can have important effects on air quality, as can the strategies for the operation of such facilities.

Major Air Pollutants

There are five major pollutants which have been identified as having significant adverse effects on human health or property; particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, and ozone. A sixth pollutant, gaseous hydrocarbons, must also be considered in air quality maintenance. Although direct adverse effects of this pollutant on human health have not been demonstrated to date, hydrocarbons under certain atmospheric conditions contribute to the formation of ozone, which has been demonstrated to have an adverse effect on human health and property.

Accordingly, these six major pollutants are of prime consideration in the Commission's regional air quality maintenance planning program. Preliminary data gathered from available sources for the Regional Air Quality Maintenance Planning Program Prospectus give an indication of the present levels of these pollutants within the Region. Measured against the U. S. Environmental Protection Agency (EPA) minimum ambient air quality standards, these preliminary data form a profile of the current air quality of the Region (see Table 40).

Particulate matter which remains suspended in the atmosphere or which slowly settles out of such suspension, consisting of soot, dust, and fly ash, and which may be accompanied by bacteria, viruses, pollens, and spores, may be corrosive and irritating, and may thereby cause or aggravate various human disorders and damage the respiratory system. Some particles, such as poisonous metals, may be toxic. Others, such as asbestos, may be carcinogenic. The particulate matter may also stain and corrode buildings and other real and personal property, damage clothing, and even contribute to soil and water pollution.

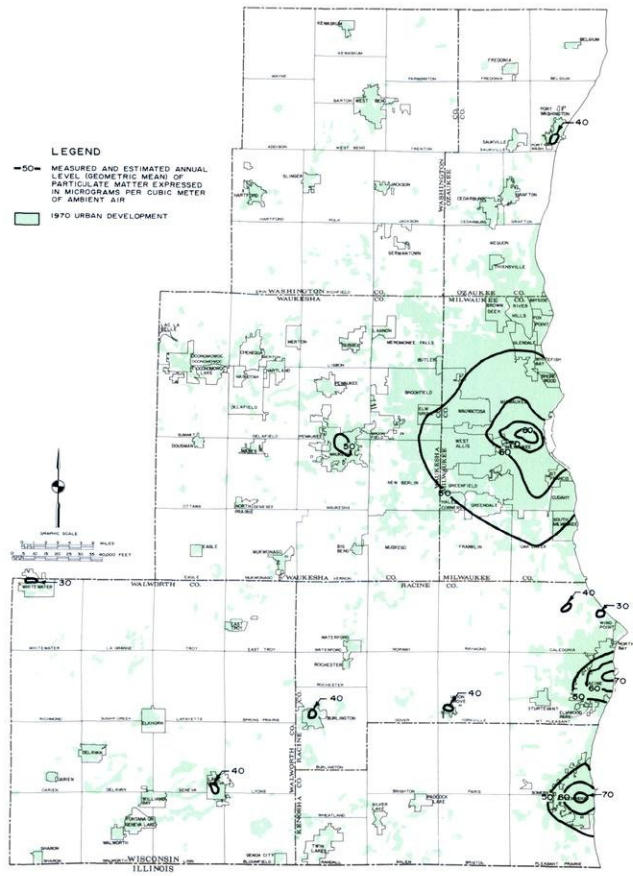
As shown on Map 15, measured and estimated levels of particulate matter for 1973 exceed the primary and secondary standards on an annual average basis over very small areas of the Region. These areas include the central business district of Milwaukee, the Menomonee River Valley industrial area, and the adjacent intensely urbanized area of Milwaukee County; and the intensely urbanized and industrial area of eastern Kenosha and Racine Counties. On an annual average basis, levels of particulate matter as high as 242 micrograms per cubic meter have been recorded in the Milwaukee area, with maximum daily levels exceeding 700 micrograms per cubic meter. During 1973, the highest annual average geometric mean value recorded was 121 micrograms per cubic meter, and the maximum 24-hour recorded value was 463 micrograms per cubic meter. The primary pollutant origins of these excessive levels of particulate matter are industrial processes, power generation, and space heating.

Oxides of sulfur, particularly the dioxide and trioxide, may react to form sulfuric acid in the atmosphere. This acid, in addition to attacking metals and masonry in structures, is a potent eye and respiratory irritant, and may cause bronchial and lung disorders.

With respect to sulfur dioxide, the adopted primary standard specifies that the level of sulfur dioxide present in the atmosphere on the basis of the annual arithmetic mean shall not exceed 0.03 parts per million (ppm), or 80 micrograms per cubic meter, and on the basis of the second highest 24-hour average over a one-year period shall not exceed 0.14 parts per million (365 micrograms per cubic meter). The secondary standard for sulfur

Map 15

ACTUAL MEASURED AND ESTIMATED GROUND-LEVEL CONCENTRATION OF SUSPENDED PARTICULATES IN THE REGION: 1973



This recent map of particulate isopleths for the Region illustrates the correlation between the greatest concentrations of that pollutant and the highly industrialized areas of urban development within the Region. Actual and estimated levels of particulate matter exceed the primary ambient air quality standard (annual average (geometric mean) level of 75 micrograms per cubic meter) and the secondary ambient air quality standard (annual average (geometric mean) level of 60 micrograms per cubic meter) over the intensely developed portions of Kenosha, Milwaukee, and Racine Counties.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Table 40

SUMMARY OF NATIONAL AMBIENT AIR QUALITY STANDARDS ISSUED APRIL 30, 1971 AND REVISED SEPTEMBER 14, 1973

Pollutant	Period of Measurement or Calculation	Concentration (Weight of Pollutant per Cubic Meter of Ambient Air Corrected to 25°C and 760 mm of Hg)	
		Primary Standard	Secondary Standard
Particulate Matter (PM)	Annual (Geometric Mean) 24 hour	75 μg 260 μg[a]	60 μg 150 μg[a]
The primary sources of particulate matter are industrial processes, power generation, and space heating. The primary and secondary standards have been exceeded in the Region.			
Sulfur Oxides (SO_x) (measured as sulfur dioxide)	Annual (Arithmetic Mean) 24 hour 3 hour	80 μg (0.03 ppm) 365 μg (0.14 ppm)[a] --	-- -- 1,300 μg (0.5 ppm)[a]
The primary sources of sulfur oxides are industrial processes, power generation, and space heating. The ambient primary air quality standard has been exceeded in the Region.			
Carbon Monoxide (CO)	8 hour 1 hour	10 mg (9 ppm)[a] 40 mg (35 ppm)[a]	Same as Primary Same as Primary
The primary source of carbon monoxide is gasoline-powered motor vehicles. The 8 hour primary air quality standard has been exceeded in the Region.			
Hydrocarbons (HC) (nonmethane measured as methane)	3 hour (6 a.m. to 9 a.m.)	160 μg (0.24 ppm)[a]	Same as Primary
The primary source of hydrocarbons is gasoline-powered motor vehicles. No hydrocarbon measurements have been made in the Region to date to indicate whether the primary air quality standard has been exceeded.			
Nitrogen Dioxide (NO_2)	Annual (Arithmetic Mean)	100 μg (0.05 ppm)	Same as Primary
The primary sources of nitrogen dioxide are gasoline-powered motor vehicles, industrial processes, and space heating. The primary air quality standard has been exceeded in the Region.			
Photochemical Oxidants (O_x) (measured as ozone)	1 hour	160 μg (0.08 ppm)[a]	Same as Primary
The primary sources of pollutants which contribute toward the formation of ozone are gasoline-powered motor vehicles and industrial processes. The primary air quality standard has been exceeded in the Region.			

[a] *Concentration not to be exceeded more than once per year.*

Source: Code of Federal Regulations Title 40, Part 50, 1973.

dioxide specifies the second highest three-hour average concentration over a one-year period shall not exceed 0.5 parts per million (1,300 micrograms per cubic meter).

As shown on Map 16, estimated levels of sulfur dioxide within the Region approach the primary air quality standard on an average annual basis in the highly industrialized Menomonee River Valley of Milwaukee County. The primary sources of sulfur dioxide in the atmosphere are industrial processes, electric power generation, and space heating. Because of the currently limited facilities available to monitor, and the current limited ability to predict, ambient air quality within the Region, the currently available data and estimates derived from these data may either understate or overstate the impact of the emissions from specific point and area sources on the ambient air quality within the Region.

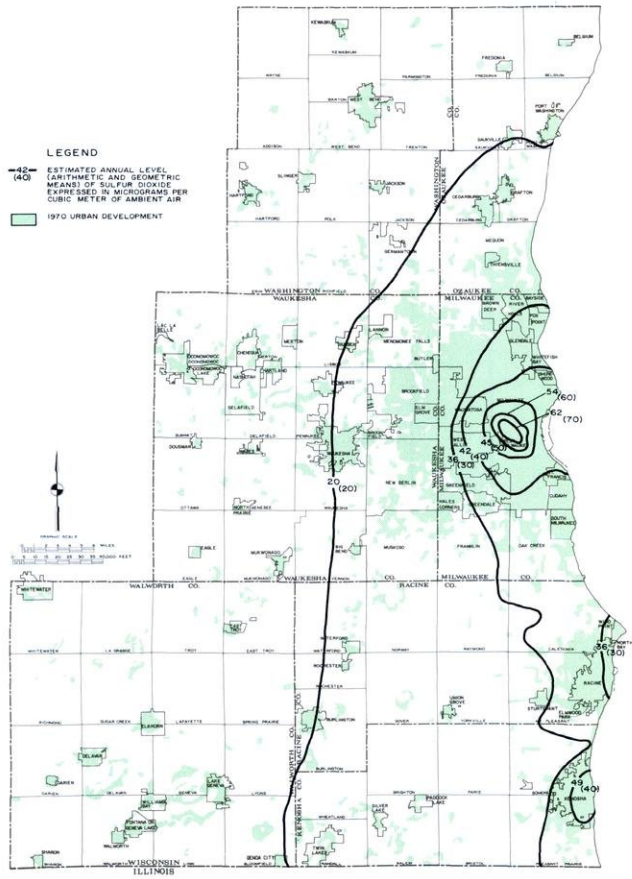
The effects of unique meteorological conditions adjacent to the shoreline of Lake Michigan, within which the major utility and industrial sources are located, may further aggravate the air pollution problem within the Region. On an annual average basis, maximum levels of sulfur dioxide approaching 0.04 parts per million have been recorded within the Region in and immediately adjacent to the highly industrialized Menomonee River Valley area of Milwaukee County.

Carbon monoxide is a particularly dangerous pollutant because it combines with the hemoglobin of the blood to reduce the oxygen carrying ability of the bloodstream. Exposure to excessive levels of carbon monoxide may aggravate coronary vascular disease, and cause headaches, impaired reactions, and death. The adopted primary and secondary air quality standards specify that the second highest level of carbon monoxide over a one-year period shall not exceed nine parts per million (10 micrograms per cubic meter) over an eight-hour period, and 35 parts per million (40 micrograms per cubic meter) over a one-hour period. Only very limited ambient air quality monitoring data are available in the Region to permit a comparison of the carbon monoxide in the ambient air with the specified standards. A review of these limited data reveals that during a single eight-hour period in 1973, maximum levels of carbon monoxide in excess of 10 parts per million (11 micrograms per cubic meter) were measured in Milwaukee County, indicating a likelihood that the specified carbon monoxide standards may be exceeded within this portion of the Region. The only available regionwide carbon monoxide data are 1969 estimates of annual average levels of carbon monoxide made by the U. S. Public Health Service (see Map 17). The methodology used in estimating these carbon monoxide levels does not, however, provide a good measure of short-term carbon monoxide levels, and hence no direct comparison with the air quality standards can be made. The primary sources of carbon monoxide are gasoline powered motor vehicles. It is estimated that in the Milwaukee area such vehicles account for over 90 percent of the carbon monoxide emissions.

Oxides of nitrogen may react to form nitric acid in the atmosphere, which may cause or contribute to

Map 16

ESTIMATED GROUND-LEVEL CONCENTRATION OF SULFUR DIOXIDE IN THE REGION: 1970



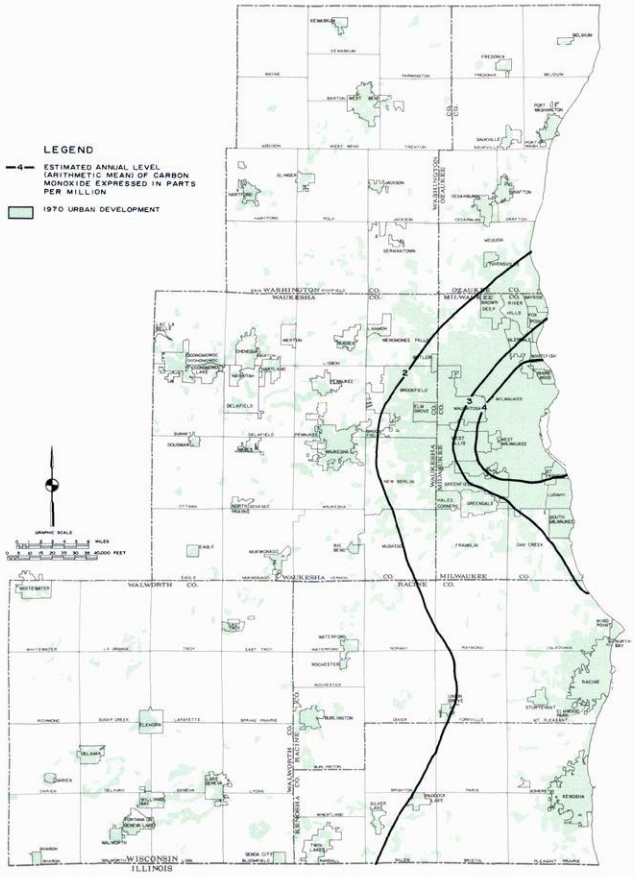
The adopted primary air quality standard specifies that the annual average level of sulfur dioxide in the atmosphere, calculated on the basis of the arithmetic mean, shall not exceed 80 micrograms per cubic meter. As shown on the above map, the estimated levels of sulfur dioxide within the Region in 1970 approached the primary air quality standard on an average annual basis only in the highly-industrialized Menomonee River valley of Milwaukee County. Because of the limited facilities available to monitor ambient air quality, however, the data presented above may not adequately represent the impact of the emissions from the major electric power generating plants on ambient air quality within the Region.

Source: Wisconsin Department of Natural Resources and SEWRPC.

respiratory disorders and which is harmful to plant life. Nitrogen dixoide exerts its primary toxic effect on the lungs. Oxides of nitrogen may also react with sodium, potassium, or other metals to form soluble nitrates which, when washed out of the atmosphere by rain, may contribute to the fertility of surface waters and thereby to surface water pollution. Absorption of ultraviolet light energy by nitrogen dioxide results in its dissociation into nitric oxide and free oxygen atoms. These oxygen atoms react with the atmospheric oxygen to form ozone. A small portion of the oxygen atoms and ozone also react with certain hydrocarbons to form free

Map 17

ESTIMATED CARBON MONOXIDE LEVELS IN THE REGION: 1969



The adopted primary air quality standard specifies that the second highest level of carbon monoxide over a one-year period shall not exceed nine parts per million over an eight-hour period and 35 parts per million over a one-hour period. While carbon monoxide measurements are not available for the entire Region in a form permitting direct comparison with these standards, the U. S. Public Health Service estimated in 1969 annual average levels of carbon monoxide, as shown above. Since the methodology used in these estimates does not provide a good measure of short-term carbon monoxide levels, it is probable that the primary air standard for carbon monoxide has been exceeded occasionally in certain areas of the Region, and in particular those areas of the Region that have high concentrations of automobile traffic.

Source: U. S. Public Health Service and SEWRPC.

radical intermediates and various chemical compounds. In a very complex manner, the free radical intermediates and ozone react with the nitric oxide produced initially. One result is the very rapid oxidation of the nitric oxide to nitrogen dioxide and an increased concentration of ozone.

With respect to nitrogen dioxide, the adopted primary and secondary standards specify that the annual arithmetic mean level of nitrogen dioxide in the atmosphere shall not exceed 0.05 parts per million (100 micrograms per cubic meter). On an annual average basis, maximum levels of this pollutant in excess of the air standards have been estimated for the central business district of Milwaukee. The primary sources of nitrogen dioxide are gasoline powered motor vehicles, industrial processes, and space heating.

Hydrocarbons, through photochemical reaction in the atmosphere as described above, contribute to the formation of smog, of which ozone is a component. Ozone is a lung and eye irritant, and may act to suppress the capacity of the body to combat infection. Eye irritation is one of the most frequent air pollution complaints. Ozone may also attack and deteriorate certain materials such as rubber.

With respect to photochemical oxidants, the adopted primary and secondary standard specifies that the second highest level of ozone in the atmosphere during a one-year period shall not exceed 0.08 parts per million (160 micrograms per cubic meter) over a one-hour period. Average hourly levels of ozone as high as 0.19 parts per million (380 micrograms per cubic meter) have been measured in Milwaukee County. Yearly averages, as applied to other pollutants, are not good measures of ambient air quality with respect to oxidant pollution, because ozone concentrations will necessarily be near zero for approximately 75 percent of the time when conditions are not favorable to photochemical reactions. Photochemical oxidants result from a complex series of atmospheric reactions initiated by sunlight. When reactive organic substances and oxides of nitrogen accumulate in the atmosphere and are exposed to the ultraviolet components of sunlight, the formation of new compounds, including ozone and peroxyacyl nitrates, takes place. A primary source of reactive organic substances and nitrogen oxides are gasoline powered motor vehicles, which emit unburned hydrocarbons, which in turn form ozone. Another major source of substances instrumental in the formulation of ozone are storage areas for motor fuels and certain commercial or industrial processes, including certain cleaning establishments.

Although the present level of air pollution within the Region generally may not be serious as it is in certain other regions of the United States, evidence exists that the national ambient air quality standards established by the EPA for particulate matter, carbon monoxide, sulfur dioxide, and photochemical oxidants are presently exceeded or have the potential for being exceeded during the next decade in certain areas of the Region. Estimated nitrogen dioxide concentrations within the Region exceed the established air quality standards by a very small measure.

The major sources of the pollutants contributing to air pollution within the Region are transportation movements, industrial processes, and power generation. Since the activities associated with these sources are essential to the social and economic well-being of the residents of the Region, the existing regional air pollution problem is complex. Its abatement requires a comprehensive

approach which considers alternative land use and transportation system development, operation, and maintenance, as well as abatement of existing point sources of pollution.

Air pollution, because of its direct relationship to human activities, is primarily an urban problem. Available data concerning ambient air quality levels clearly indicate that the levels of air pollutants in the atmosphere are directly related to the intensity of urban development. As urbanization increases, the attendant air pollution problems may also be expected to intensify.

PHYSIOGRAPHY

The land forms and physical features of the Region, such as the topography and drainage pattern, are important determinants of regional growth and development. The physiography of an area must not only be considered in any sound land use and supporting transportation, utility, and community facility planning and development, but it also contributes directly to the natural beauty and overall quality of life in an area.

The Southeastern Wisconsin Planning Region is located in the upper Midwest between Lake Michigan on the east, the Green Bay-Lake Winnebago lowlands on the north, the Rock River basin on the west, and the low dunes and swampland at the headwaters of the Illinois River on the south. The seven-county Region extends for approximately 52 miles from east to west at its widest point, and approximately 72 miles from north to south. The Region encompasses approximately 2,621 square miles of land area and 68 square miles of inland water area exclusive of Lake Michigan, or a total gross land and water area of approximately 2,689 square miles or 1,720,000 acres. Topographic elevations range from approximately 580 feet above sea level at the Lake Michigan shore to about 1,320 feet above mean sea level at Holy Hill in southwestern Washington County. The Region lies astride a major subcontinental divide between the upper Mississippi River and the Great Lakes-St. Lawrence River drainage basins.

Physiographic and Topographic Features

Glaciation has largely determined the physiography and topography as well as the soils of this part of the state. The physiographic features or surficial land forms of southeastern Wisconsin are shown on Map 18, whereas regional topography or variation in elevation is generalized on Map 19. There is evidence of four major stages of glaciation in the Region. The last and most influential in terms of present physiography and topography was the Wisconsin stage, which is believed to have ended about 11,000 years ago.

The dominant physiographic and topographic feature is the Kettle Moraine, an interlobate glacial deposit, or moraine, formed between the Green Bay and Lake Michigan tongues, or lobes, of the continental glacier which moved in a generally southerly direction from its point of origin in what is now Canada. Topographically high points in the Kettle Moraine include areas around Lake Geneva in Walworth County, areas in southwestern Waukesha County north of Eagle, areas in central Waukesha County around Lapham Peak, and areas around Holy Hill and Hartford in southwestern and western Washington County. The Kettle Moraine, which is oriented in a general northeast-southwest direction across western Washington, Waukesha, and Walworth Counties, is a complex system of kames, or crudely stratified conical hills; kettle holes marking the site of glacial ice blocks that became separated from the ice mass and melted to form depressions; and eskers, consisting of long, narrow ridges of drift deposited in abandoned drainageways. It forms some of the most attractive and interesting landscapes within the Region, as well as being the area of the highest elevation and the area of greatest local elevation difference, or relief, within southeastern Wisconsin. The Kettle Moraine of Wisconsin, much of which lies within the Region, is considered one of the finest examples of glacial interlobate moraine in the world. Because of its still predominantly rural character and its exceptional natural beauty, the Kettle Moraine and the surrounding area is and may be expected to continue to be subjected to increasing pressure for urban development.

The remainder of the Region is covered by a variety of glacial land forms and features, including kames, ground moraine or heterogeneous material deposited beneath the ice; recessional moraines consisting of material deposited at the forward margins of the ice sheet; lacustrine basins, or former lake sites; outwash plains formed by the action of flowing glacial meltwater; eskers, or elongated meandering ridges of rudely stratified waterlain sand and gravel deposits; and drumlins, or elongated mounds of drift molded by and parallel to the advancing glacier.

Glacial land forms are of economic significance because some are prime sources of sand and gravel for highway and other construction purposes. Many of the larger topographic depressions of the Region, including the kettle holes, have developed into the numerous lakes which dot large areas of western Washington, Waukesha, and Walworth Counties, and which are becoming increasingly popular both as recreational areas and as residential centers.

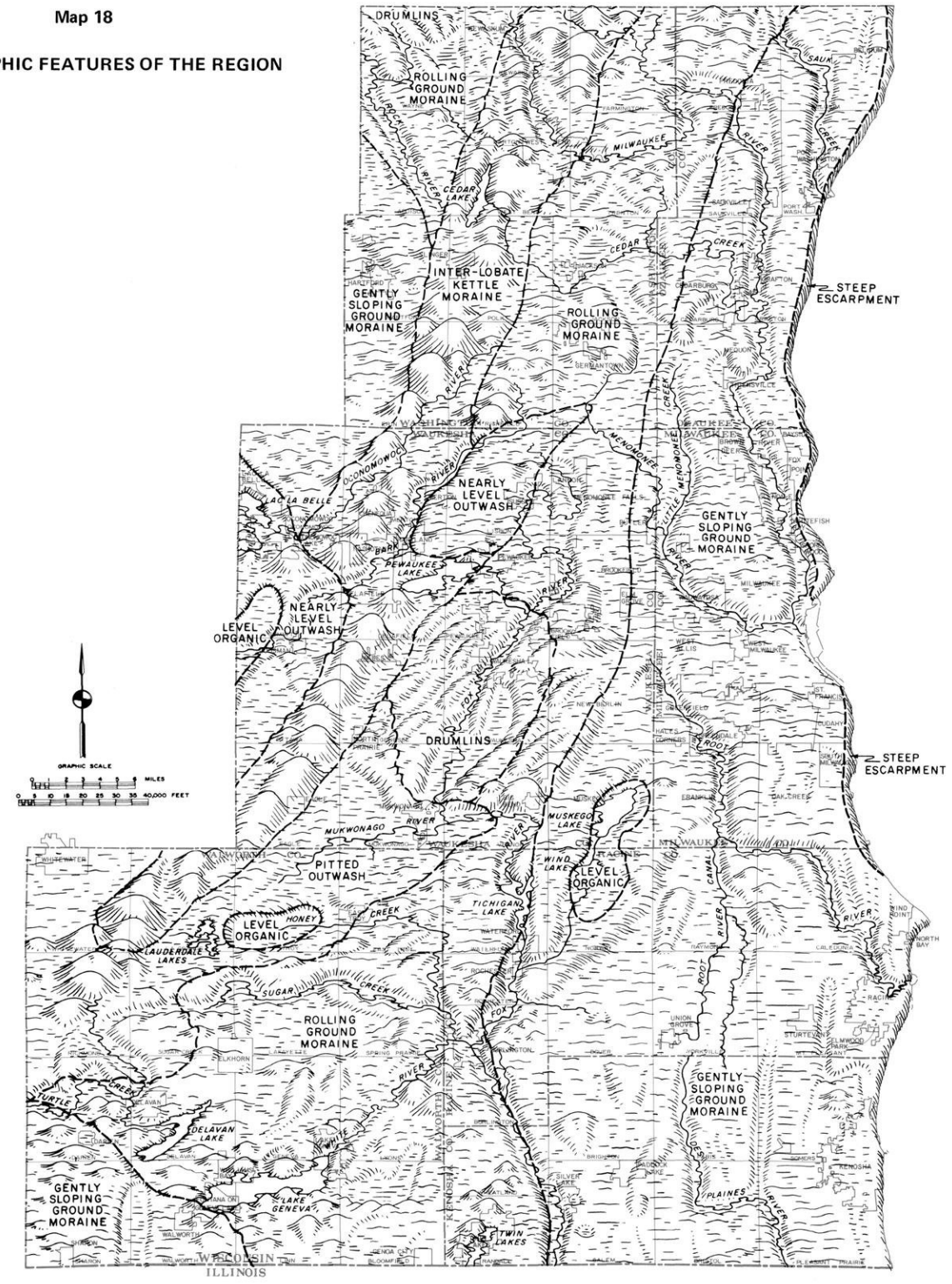
Surface Drainage

Surface drainage is poorly developed but highly diverse within the planning Region due to the effects of the relatively recent glaciation. The land surface is complex as a result of being covered by glacial drift, containing thousands of closed depressions that range in size from mere pots to large areas. Significant areas of the Region are covered by wetlands, and many streams are mere threads of water through these wetlands. The 11 major watersheds of southeastern Wisconsin are depicted on Map 20, along with the surface drainage pattern of the major perennial stream system.

A major subcontinental divide, oriented in a generally northwesterly-southeasterly direction, approximately bisects the Region so that about 1,685 square miles lying west of the divide, or 63 percent of the Region,

Map 18

PHYSIOGRAPHIC FEATURES OF THE REGION

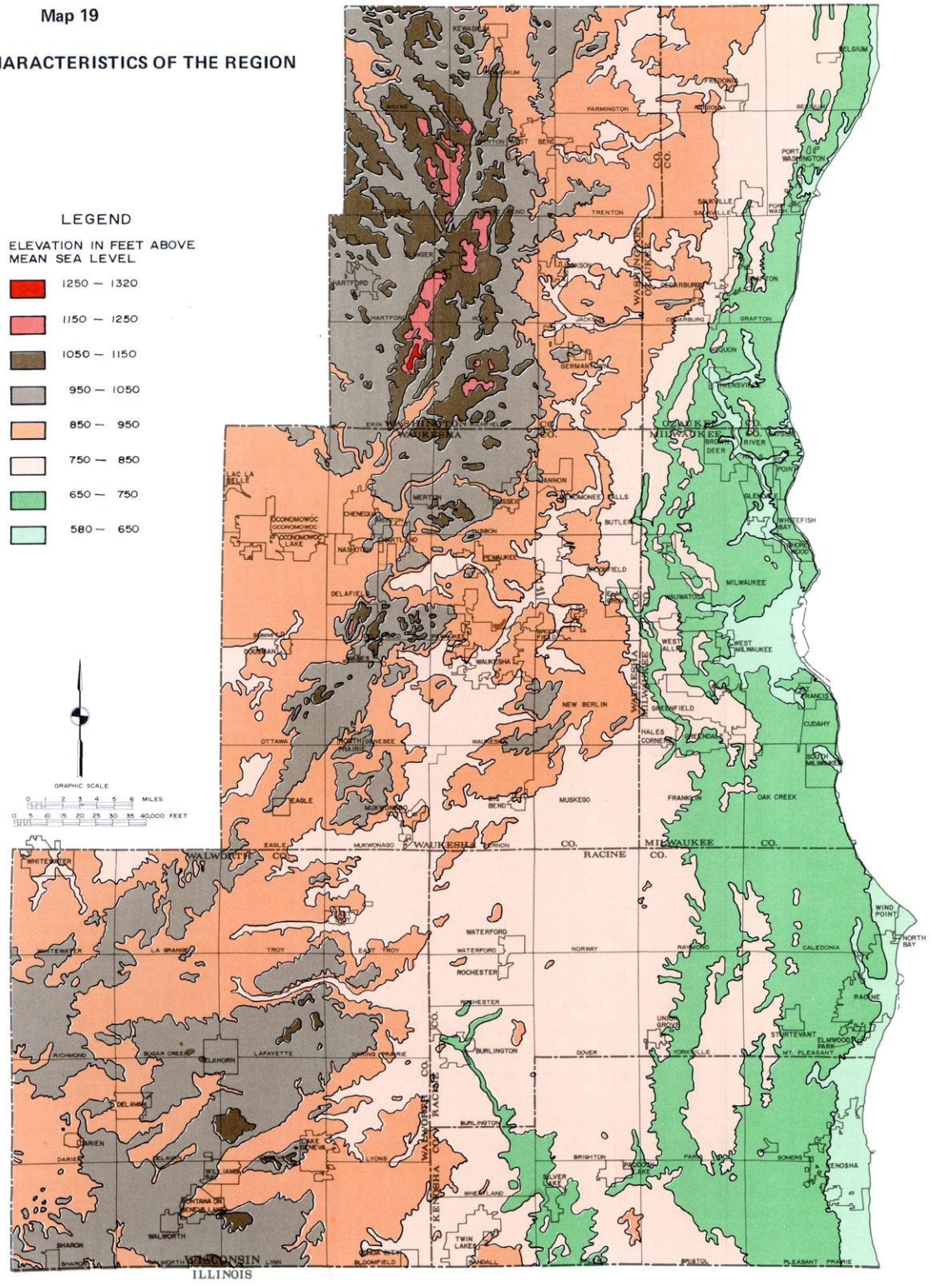


Physiographic features, or surficial land forms, throughout southeastern Wisconsin were determined largely by repeated stages of glaciation, the last of which, the Wisconsin stage, is believed to have ended about 10,000 years ago. Included in the great variety of interesting and attractive glacial land forms covering the Region are ground and recessional moraines, abandoned lake basins, outwash plains, kames, eskers, and drumlins. The dominant feature is the Kettle Moraine, an interlobate moraine lying in a northeasterly-southwesterly direction within the western part of the Region and formed by and between the Green Bay and Lake Michigan lobes of the continental glacier.

Source: SEWRPC.

Map 19

TOPOGRAPHIC CHARACTERISTICS OF THE REGION

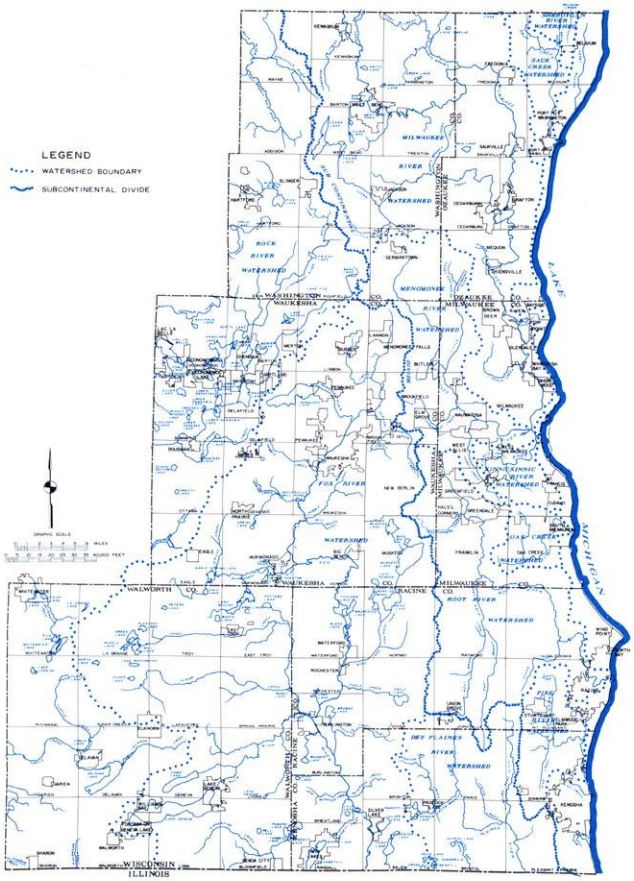


The topography, or relative elevation of the land surface throughout the Region, is determined by the configuration of the bedrock geology in combination with overlying glacial deposits. Elevations within southeastern Wisconsin range from a low of about 580 feet MSL on the Lake Michigan shore to a high of 1,320 feet MSL at Holy Hill in southwestern Washington County. Topographic highs and some of the most attractive landscapes and scenic vistas in the Region are coincident with the interlobate Kettle Moraine area in the western portion of the Region.

Source: SEWRPC.

Map 20

WATERSHEDS AND SURFACE WATER RESOURCES OF THE REGION



A subcontinental divide traverses the Southeastern Wisconsin Region. That part of the Region lying east of this divide is tributary to the Great Lakes-St. Lawrence River drainage system, while that part of the Region lying west of this divide is tributary to the Mississippi River drainage system. This subcontinental divide has certain important implications for water resources planning and management, since major diversions of water across this divide are restricted by law and interstate and international compacts. The generally dendritic surface water drainage pattern of the Region, which is the result of the glacial land forms and features, divides the Region into 11 individual watersheds, three of which—the Des Plaines, Fox, and Rock River watersheds—lie west of the subcontinental divide. In addition to the 11 watersheds, there are numerous small catchment areas along the Lake Michigan shoreline that drain directly to the lake, which areas together may be considered to comprise a twelfth watershed.

Source: SEWRPC.

drains to the Mississippi River, while the remaining 1,004 square miles, or 37 percent, is tributary to the Great Lakes-St. Lawrence River drainage basin. The subcontinental divide not only exerts a major physical influence on the gross drainage pattern of the Region, but also carries with it certain legal constraints on the diversion of water across the divide, and thereby constitutes an important consideration in land use planning.

The surface water drainage pattern of southeastern Wisconsin may be further subdivided so as to identify 11 major watersheds, five of which—the Root River, Menomonee River, Kinnickinnic River, Oak Creek, and Pike River watersheds—are wholly contained within the Region. In addition to these 11 major watersheds, there are numerous small catchment areas contiguous to Lake Michigan that drain directly to the lake by local natural watercourses and artificial drainageways. These areas together may be considered as comprising a twelfth watershed.[4] The drainage in the Region tends to exhibit a disordered dendritic pattern except for a small area of trellised or rectangular drainage evident in the Des Plaines River watershed and in the Racine County portion of the Root River watershed. The Fox River watershed and the headwaters of the Rock River and Des Plaines River watersheds drain to the south and southwest towards their confluences with the Illinois River, a tributary of the Mississippi River. The remainder of the Region drains in a generally easterly direction towards Lake Michigan by way of the Milwaukee, Menomonee, Root, and other drainages.

GEOLOGY

Knowledge of bedrock and the surficial deposits overlying the bedrock is important to land use and transportation planning. They directly affect the construction costs related to initial urban improvements, such as residential developments, street and highway facilities, and the extension of public utilities, particularly those involving extensive trenching or tunneling, and the placement of urban improvements in relation to the bedrock and surficial deposits may directly or indirectly affect the quality and quantity of the groundwater resources of the Region.

Bedrock

The bedrock formations underlying the unconsolidated surficial deposits of southeastern Wisconsin consist of Cambrian through Devonian Period rocks of the Paleozoic Era that attain a thickness in excess of 1,500 feet along the eastern limits of the Region, which are in turn underlain by older, predominantly crystalline rocks of the Precambrian Era. The bedrock geology of the Region is shown in Figure 47 by means of a map of the surface of the bedrock supplemented with a representative vertical section.

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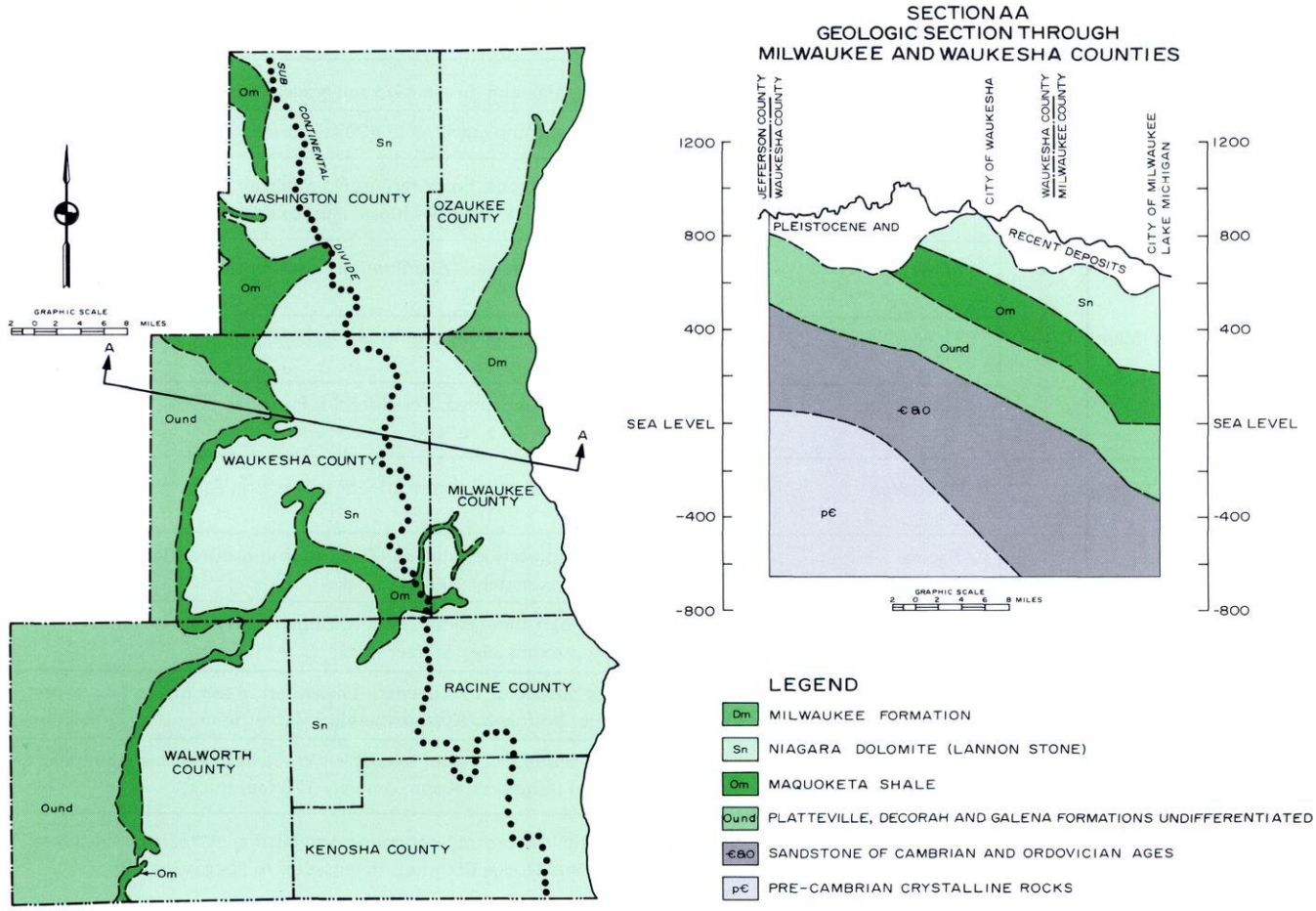
[4] *The Commission has completed comprehensive watershed studies for the 197 square mile Root River watershed, the 939 square mile Fox River watershed, and the 694 square mile Milwaukee River watershed, 430 square miles of which lie in the Region. Comprehensive watershed studies have, therefore, been completed for 1,566 square miles, or 58 percent of the 2,689 square mile seven-county Region. The Commission is currently (1975) conducting a comprehensive planning program for the 136 square mile Menomonee River watershed which, upon completion, will increase the portion of the Region included in watershed studies to 1,702 square miles, or 63 percent of the total area of the Region.*

Figure 47

MAP AND CROSS SECTION OF BEDROCK GEOLOGY IN THE REGION



Source: SEWRPC.

A stratigraphic column including a description of the lithologic characteristics of bedrock formations beginning with those dating back to the Ordovician Period and of glacial deposits is presented in Table 41. Bedrock formations in the Region dip gently down toward the east at an average slope of about 20 feet per mile, with the result that the bedrock lying immediately beneath the unconsolidated surficial deposits in the western extremities of the Region includes older rocks of the Ordovician Period, whereas in the east along Lake Michigan, younger rocks of the Silurian and Devonian Periods lie immediately beneath the surficial deposits.

Surficial Deposits

The bedrock of the Region is, for the most part, covered by deep, unconsolidated glacial deposits, attaining a thickness in excess of 500 feet in some buried preglacial valleys. Bedrock lies within 20 feet of the ground surface within areas of the Region which together total only about 150 square miles in extent, and a few localized areas exist where the bedrock is actually exposed at the surface. These shallow drift areas and rock outcrops tend to occur in Washington and Waukesha Counties along a northeasterly-southwesterly alignment generally paralleling the interlobate Kettle Moraine, and reflect the presence of a preglacial ridge. Map 21 depicts the spatial variation of the thickness of surficial deposits overlying the bedrock that may be generally expected within the Region.

MINERAL AND ORGANIC RESOURCES

Sand and gravel, building stone, and organic material are the three principal mineral and organic resources in the Region that have significant commercial value. The commercial utilization of the Region's mineral resources, which is limited to the mining of nonmetal deposits, is primarily directed toward supplying the construction materials needed for the continuing development of southeastern Wisconsin. Planning for future land development in the Region should take into consideration the location of mineral and organic resources, since urbanization of lands overlying these resources may make it economically impossible to efficiently utilize these resources in the future. Failure to recognize these resources in the land use and transportation planning

Table 41

STRATIGRAPHIC COLUMN OF BEDROCK AND GLACIAL DEPOSITS IN THE REGION

System	Series	Formation	Lithologic Description
Quaternary		Recent Deposits	Soils, muck, peat, alluvium, beach sand and gravel. 0 to 5 feet thick.
		Pleistocene Deposits	Till and outwash sand and gravel. 0 to 430 feet thick.
		Kenwood	Shale, black, carbonaceous. Fossiliferous. No outcrops. Found in City of Milwaukee intake tunnel—Lake Michigan. Approximately 55 feet thick.
Devonian	Middle Erian	Milwaukee	Shale, shaly limestone; lower 1/3 dolomite. Fossiliferous. Approximately 130 feet thick.
		Thiensville	Dolomite, thick to thin-bedded. Some fossils. Small amounts of bitumen. Approximately 65 feet thick.
		Lake Church	Dolomite, thick to thin-bedded. Fossiliferous. Pyritic in places. Approximately 27 feet thick.
Silurian	Cayugan	Waubakee	Dolomite, thin-bedded, hard and brittle. Fossils scarce. Approximately 30 feet thick.
	Niagaran	Racine	Dolomite, fine to coarsely crystalline. Thick to thin-bedded. Barren to fossiliferous. Approximately 100 feet thick.
		Manistique	Dolomite—lower part thin-bedded. Fossils. Upper—fairly thin-bedded, cherty. Many corals. Approximately 150 feet thick.
		Burnt Bluff	Dolomite, thick-bedded or thin-bedded. Lower part, a few fossils. Upper part, semilithographic. No fossils. Approximately 110 feet thick.
	Alexandrian	Mayville	Dolomite, thick-bedded, compact to coarsely crystalline. Brecciated in places, cherty, many reef structures. Approximately 175 feet thick.
Ordovician	Cincinnatian	Meda	Red-brown oolitic iron ore and nonoolitic ore. Missing in Racine, Milwaukee, Ozaukee, Door, and Dodge Counties. In lenses up to approximately 55 feet thick.
		Maquoketa	Shale, dolomitic and beds of dolomite. Fossiliferous. 90 to 225 feet thick.
	Champlainian	Salena	Dolomite, thick to thin-bedded, fine to coarsely crystalline. Cherty. Shaly and sandy in places; some fossils. Approximately 227 feet thick.

Source: SEWRPC.

process may eventually result in severe shortages and concomitant increases in the costs of those materials, which would ultimately be reflected in both consumer prices and the community tax structure.

Sand and Gravel

The Region as a whole has an abundant supply of sand and gravel deposits as a result of its glacial history. The highest quality deposits are found in glacial outwash areas, particularly near the interlobate Kettle Moraine, where the washing action of flowing meltwaters has sorted the unconsolidated material to form more or less homogeneous, and therefore commercially attractive, deposits.

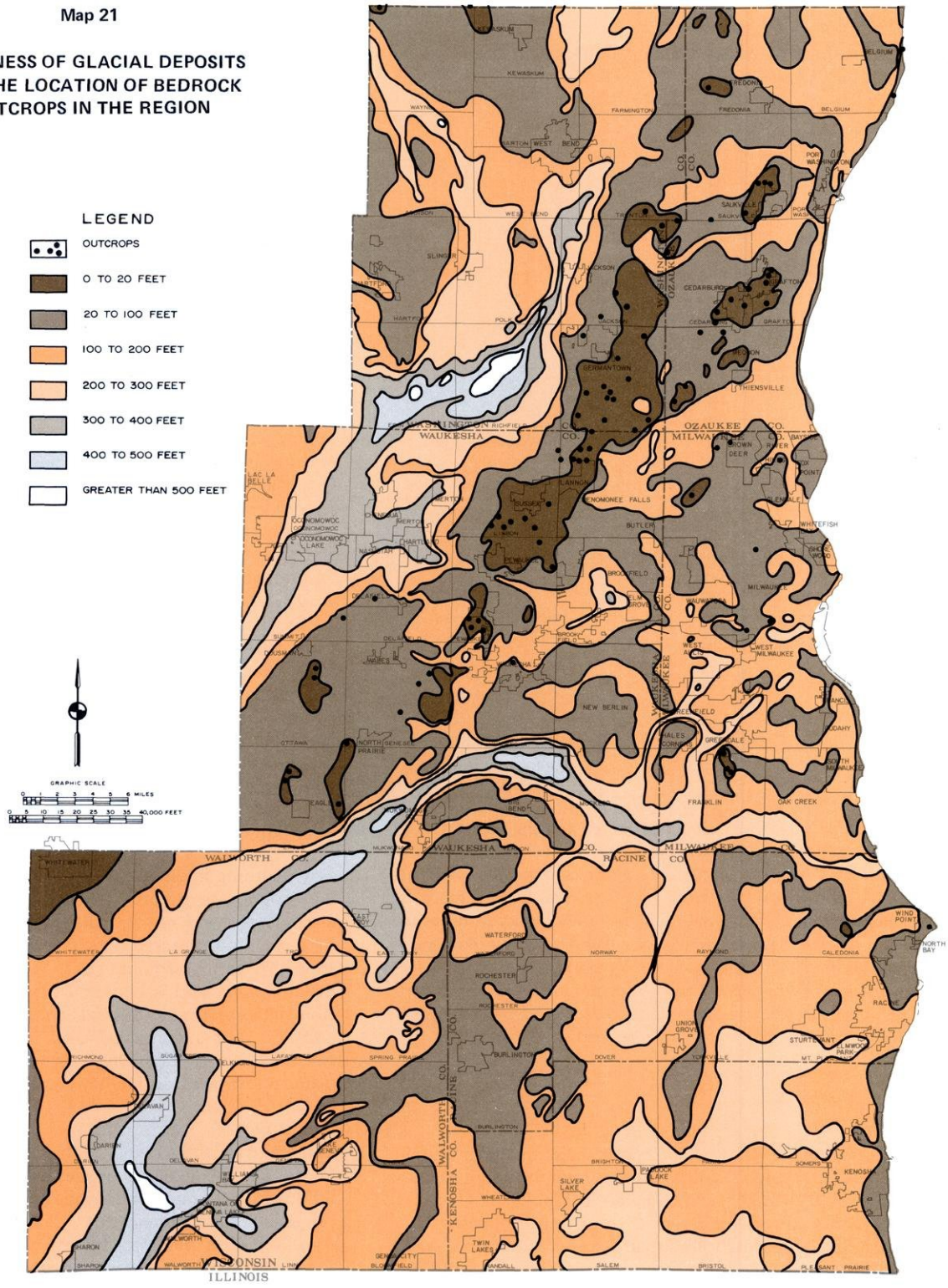
Deposits of sand and gravel are, as shown on Map 22, scattered throughout the Region. The greatest concentration of commercial strip mining activity, however, occurs in Waukesha County, because sand and gravel in that area has the most favorable quantity and quality characteristics. Sand and gravel deposits are important sources of concrete aggregate, gravel for road subgrade and surfacing, sand for mortar, and molding sand.

Stone Quarries

Niagara dolomite, which lies immediately below the glacial deposits throughout most of the Region (see Figure 47), has commercial value where it is found relatively close to the ground surface, both as a dimensional building stone and, when crushed, as an aggregate for construction or as a soil conditioner for agricultural purposes. The dolomite is mined in open quarries, and all the regional commercial operations that produce stone for building purposes are located in Waukesha County, where they are concentrated in rock outcrop areas (see Map 21) in the northeastern portion of the county. Waukesha County quarries yield thinly bedded, compact, and fine-grained dolomite well-suited for the mining and production of dimensional building stone. Although it is

Map 21

THICKNESS OF GLACIAL DEPOSITS AND THE LOCATION OF BEDROCK OUTCROPS IN THE REGION

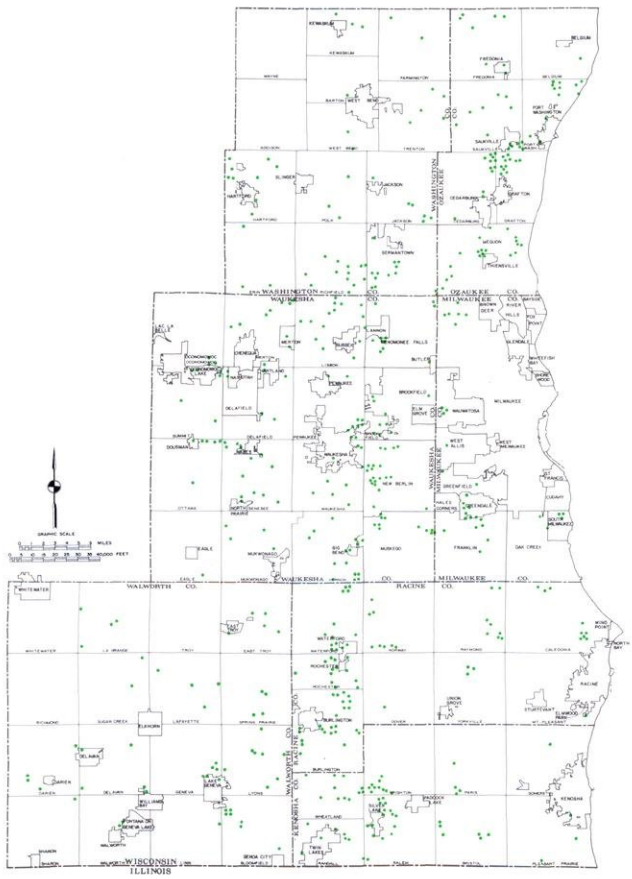


Most of the Region is covered by unconsolidated glacial drift deposited by continental glaciers. This drift attains a thickness in excess of 500 feet in some preglacial valleys. Dolomitic bedrock lies within 20 feet of the surface or is actually exposed as outcrops in areas totaling about 150 square miles. The northeasterly-southwesterly alignment of the rock outcrop sites indicates the presence of a buried preglacial bedrock ridge which is an important consideration in planning for and construction of septic tank systems, public sewerage systems, and other public works projects that involve extensive trenching and excavation.

Source: T. O. Friz, Man and the Materials of Construction, How They Interrelate in the Seven Counties of Southeastern Wisconsin, Ph.D. Dissertation, University of Wisconsin, Madison, Wisconsin, 1969.

Map 22

SAND AND GRAVEL PITS IN THE REGION



An abundant supply of sand and gravel deposits are scattered throughout southeastern Wisconsin, with the highest quality sources being found in glacial outwash areas where flowing melt waters tended to sort the sand and gravel so as to form more or less homogeneous, and therefore commercially attractive, deposits. Sand and gravel deposits, which are commercially mined by strip mining techniques, constitute a very important raw material for construction and certain industrial activities in the Region in that they provide concrete aggregate, gravel for road subgrades and surfacing, sand for mortar, and molding sand.

Source: Wisconsin Geological and Natural History Survey and SEWRPC.

in fact dolomite—that is, primarily calcium magnesium carbonate—the high-quality dimensional building stone commercially mined and produced in Waukesha County is commonly known or referred to as limestone—that is, primarily calcium carbonate—or lannon stone. Crushed limestone is produced not only in Waukesha County but also at other quarries throughout the Region.

Organic Deposits

Organic deposits are widely distributed throughout southeastern Wisconsin in small, scattered, low-lying, poorly drained areas. At these locations, excessive moisture inhibits oxidation and decay of the residues of water-tolerant plants producing organic peat deposits and muck soils with significant resulting fertilization potential. These organic deposits overlay the glacial drift of the Region and exhibit variable depths ranging from less than a foot to many feet.

Organic deposits have environmental value, often covering areas suitable for certain kinds of wildlife habitat and recreation areas, and have commercial value in their ability to support field crops such as corn or soybeans, specialized crops such as vegetables, and sod farming and peat mining, the last of which is excavated from open pits and marketed as an additive to improve soils for potted plants, gardens, and greenhouse nurseries. Agricultural use of organic deposits is contingent upon sufficient depth so that artificial drainage can be developed and maintained.

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 exists, therefore, 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 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 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.

When the Southeastern Wisconsin Regional Planning Commission was created, 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 part of the preparation of basic farm conservation plans. In order to fulfill the soils data requirements of the Commission's initial regional planning program, a cooperative agreement was negotiated with the Soil Conservation Service under which detailed operational soil surveys were completed for the entire Region. The results of the survey were published under the initial regional land use-transportation study in SEWRPC Planning Report No. 8, Soils of Southeastern Wisconsin.

In addition to detailed information on the physical, chemical, and biological properties of the soils mapped, the report contains interpretations of these data for planning purposes. These interpretations include suitability ratings for potential intensive and extensive residential, commercial, industrial, transportation, natural and developed recreational, and agricultural uses. Suitability ratings are also included for specific uses, such as onsite soil absorption sewage disposal, building foundations, earthwork, road subgrade, lawns, golf courses, and for the soil as a source of material for backfill, topsoil, and water reservoir embankments and linings. All of the data and interpretations are summarized in tabular form suitable for ready use in planning and engineering analyses.

The Commission staff, utilizing the data provided by the soil surveys, has prepared interpretative maps suitable for planning purposes at a scale of 1" = 2000' for six 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, and 6) transportation route location. Each interpretative map reflects soil limitations ratings of slight, moderate, severe, or very severe. In addition, the Commission in 1969 published Planning Guide No. 6, Soils Development Guide, to illustrate how the detailed soil survey and its accompanying interpretative analysis can be used in local as well as regional planning and development.

Generalized Soil Suitability Interpretations

The usefulness of generalized soil maps, as opposed to the detailed operational soil survey maps, for definitive planning purposes within the Region is severely limited because of the wide range of soil diversity resulting from the Region's glacial history. 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 general areawide development problems relating to soils.

Map 23 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 generally 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 generally occurs 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.

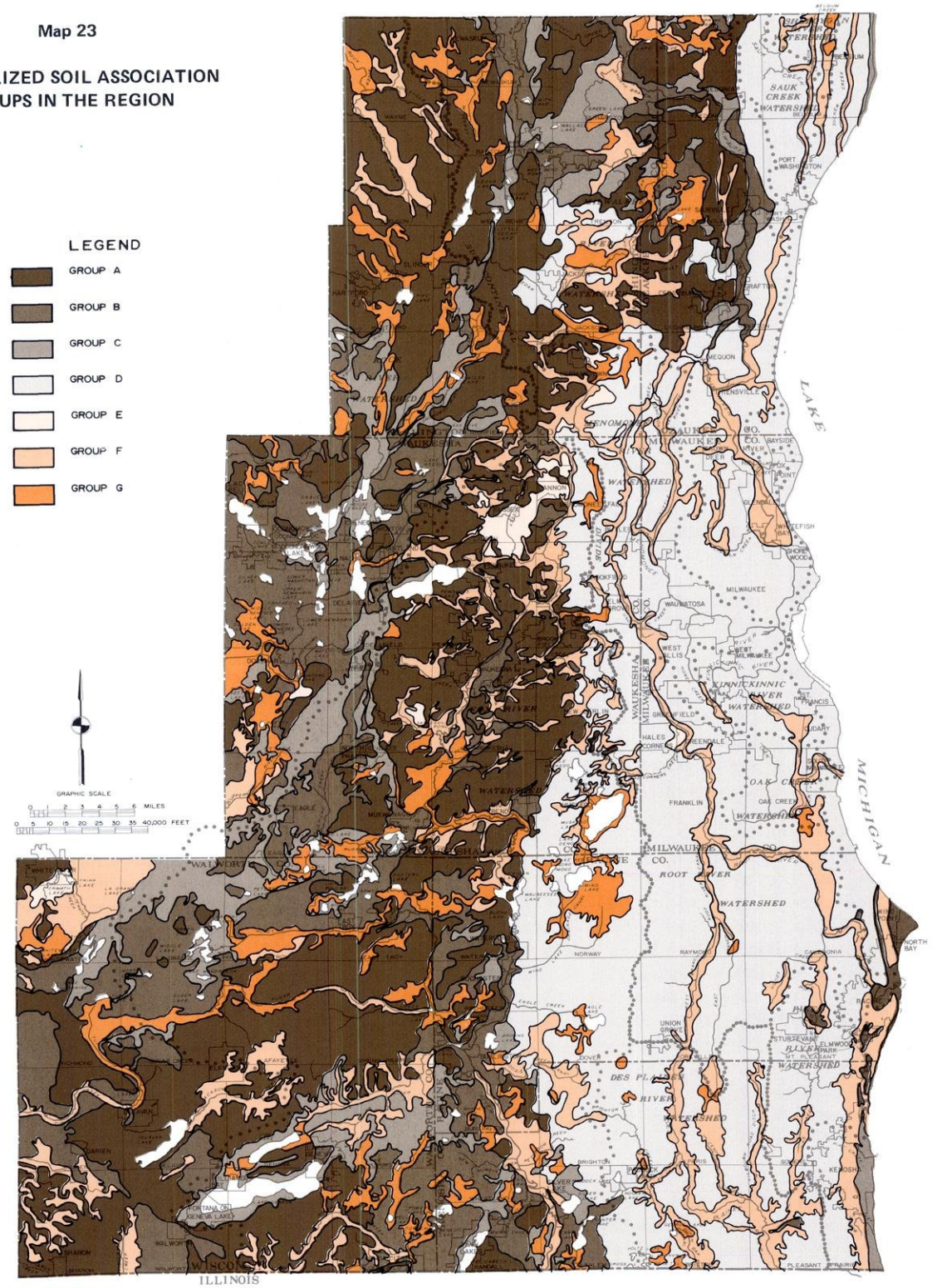
The soils designated as Group "D" are generally well suited for agricultural use but generally unsuited for urban development requiring the use of onsite septic tank sewage disposal systems. Urban development on these soils generally requires a high level of municipal improvements and careful attention 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. 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, wildlife conservation, and recreational uses.

Map 23

GENERALIZED SOIL ASSOCIATION GROUPS IN THE REGION



As shown on this generalized soil map of the seven-county Southeastern Wisconsin Region, nearly one-half of the 2,689 square mile Region is covered by soils in groups D, E, F, or G which are generally poorly suited for development with onsite soil absorption sewage disposal systems. The detailed soil survey completed for the Region in 1966 provides more definitive soils data for use in local, as well as regional, planning and development.

Source: U. S. Soil Conservation Service and SEWRPC.

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.

Proper location of new urban development in relation to soils of the Region is particularly important because, irrespective of the generalized groupings described above, analysis of the detailed soil survey data to date indicates that many soils have questionable characteristics for urban development, especially residential development in suburban and rural locations utilizing onsite sewage disposal systems. Approximately 40 percent of the estimated 125 soils series[5] 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 health authorities have placed restrictions on the development of new subdivision plats in certain areas of the Region and have issued orders for the installation of public sanitary sewer facilities in other areas originally developed with onsite 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. Urban development on such soil types is expensive not only to construct initially but also to maintain. 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.

Detailed Soil Suitability Interpretations

Soil suitability interpretations for specified types of urban development, especially residential development, are important to regional land use planning. These specified types of urban development include: residential development with public sanitary sewer service, residential development without public sanitary sewer service on lots smaller than one acre in size, and residential development without public sanitary sewer service on lots one acre or larger in size. Some of the more important considerations in determining soil suitability for urban development include depth to bedrock, depth of water table, likelihood of flooding, soil permeability, and slope.

On the basis of the detailed soil surveys, it is evident that much of the Southeastern Wisconsin Region exhibits severe or very severe limitations for specific types of urban development. As shown on Map 24, approximately 716 square miles, or about 27 percent of the area of the Region, are covered by soils which are poorly suited for residential development with public sanitary sewer service, or stated differently, poorly suited for residential development of any kind. Approximately 1,637 square miles, or about 61 percent of the area of the Region, are, as shown on Map 25, covered by soils which are poorly suited for residential development without public sanitary sewer service on lots smaller than one acre in size. As shown on Map 26 (left), approximately 1,181 square miles, or about 44 percent of the area of the Region, are covered by soils poorly suited for residential development without public sanitary sewer service on lots one acre or larger in size. It should be noted that the use suitability ratings on which these maps are based are empirical, being based upon the performance of similar soils elsewhere for the specified uses as well as upon the performance of similar soils elsewhere for the specified uses as well as upon the performance of such physically observed conditions as high water table, slow permeability, high shrink-swell potential, low bearing capacity, frost heave, and frequent flood overflow.

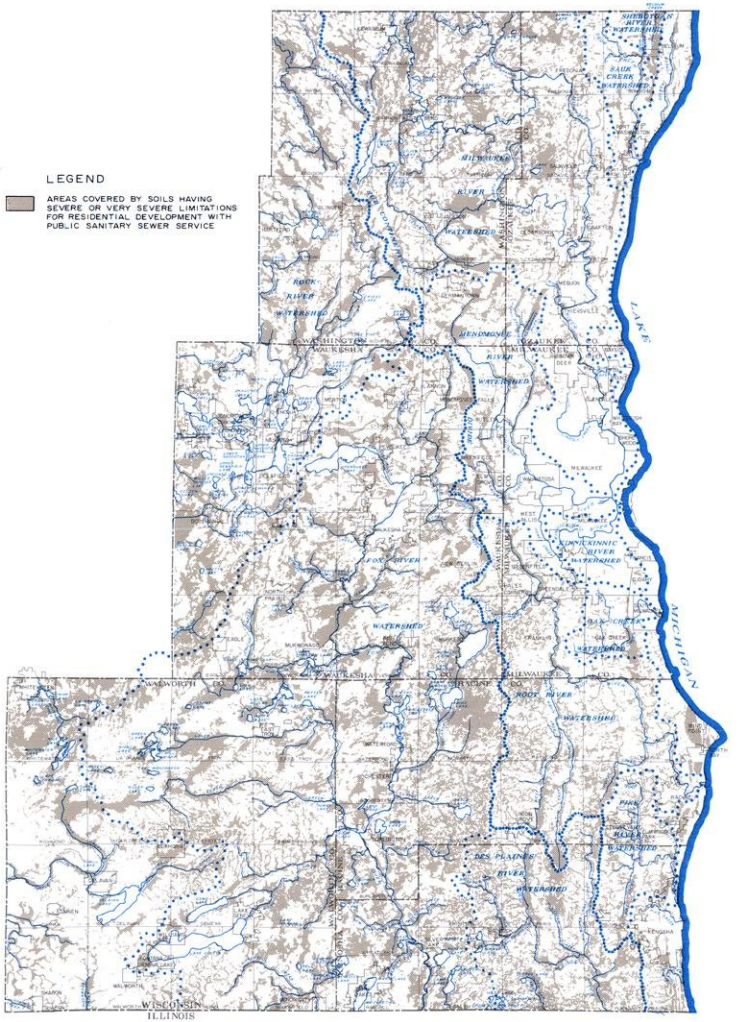
It should be noted that in May 1975 the Wisconsin Department of Health and Social Services, Division of Health, approved for use throughout Wisconsin three new types of "package" onsite soil absorption sewage disposal systems designed to overcome natural soil limitations relative to impermeability, high groundwater, and shallow bedrock. These three new package systems, which represent the first in a proposed series of such systems, were developed by the Division of Health and the University of Wisconsin after extensive research studies and in direct response to problems of groundwater contamination caused by malfunctioning septic tank systems throughout the state, but most notoriously concentrated in Door County where shallow bedrock conditions are prevalent.

Unlike the conventional gravity flow septic tank system, all three new systems utilize mechanical facilities to pump septic tank effluent through one-inch-diameter perforated distribution pipes placed in fill on top of the natural soil. When in place, this fill takes on the appearance of a mound; hence the new systems are commonly called "mound systems." The accompanying sketch illustrates the placement of a mound system on a one-acre single-family residential parcel. In this typical installation, which is assumed to be designed to accommodate wastes from a four-bedroom single-family home, the mound would approximate an area 64 feet wide by 84 feet long, or 5,376 square feet, representing about 12 percent of the total area of the lot. At its highest point, the mound would be approximately five feet in height. Because of the relatively large size of the mound, and the need to reserve sufficient area for a replacement mound at some future date, the utilization of mound type septic tank systems dictates that the residential parcels on which such systems are to be placed be at least one acre in area.

[5] *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.*

Map 24

SUITABILITY OF SOILS IN THE REGION FOR RESIDENTIAL DEVELOPMENT WITH PUBLIC SANITARY SEWER SERVICE

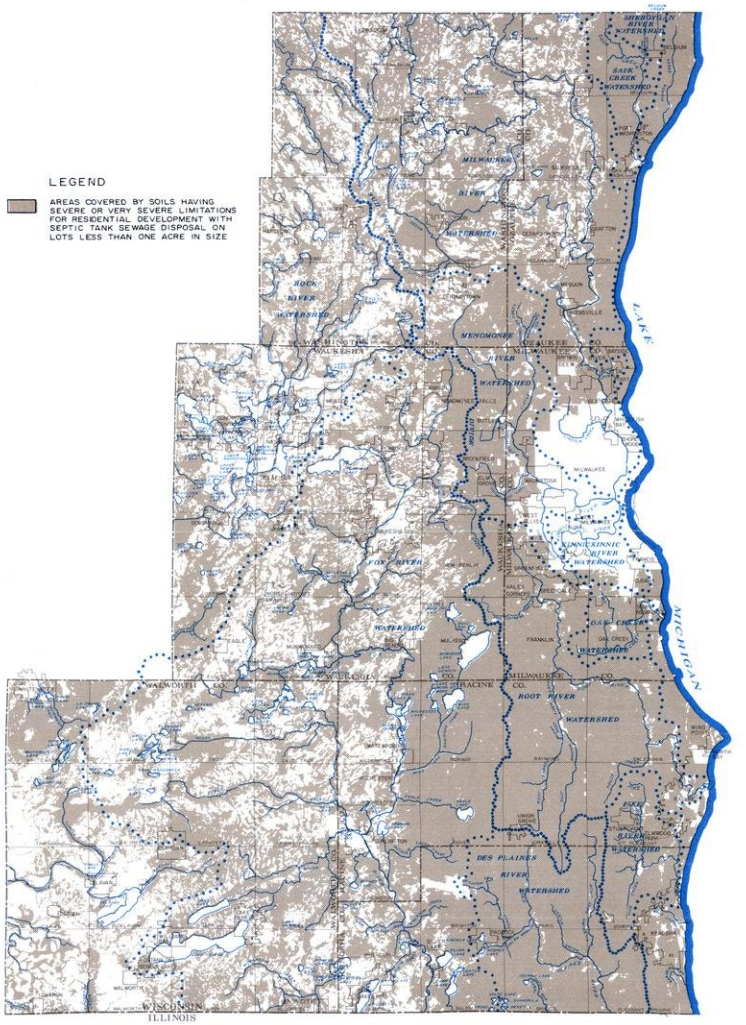


A recognition of the limitations inherent in the soil resource base is essential to the sound urban and rural development of the Region. About 716 square miles, or 27 percent of the area of the Region, are covered with soils which are poorly suited for residential development with public sanitary sewer service, or, more precisely, residential development of any kind. These soils, which include wet soils having a high water table or poor drainage, organic soils which are poorly drained and provide poor foundation support, and soils which have a flood hazard, are especially prevalent in the riverine areas of the Region.

Source: U. S. Soil Conservation Service and SEWRPC.

Map 25

SUITABILITY OF SOILS IN THE REGION FOR SMALL LOT RESIDENTIAL DEVELOPMENT WITHOUT PUBLIC SANITARY SEWER SERVICE



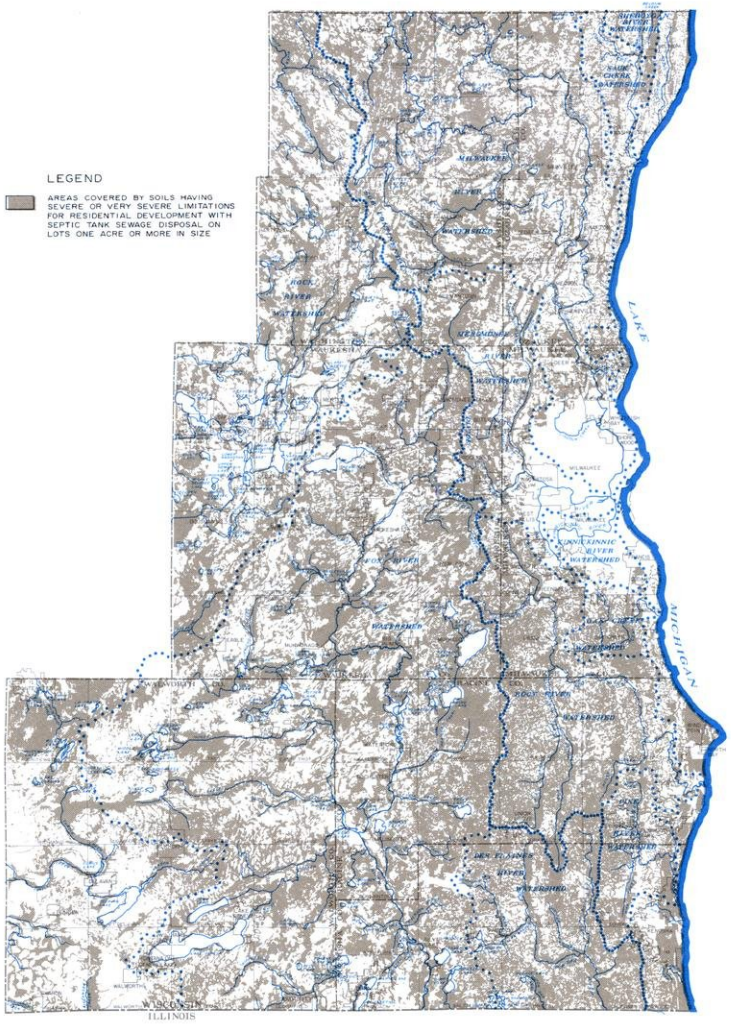
Approximately 1,637 square miles, or about 61 percent of the area of the Region, are covered by soils poorly suited for residential development on lots having an area smaller than one acre and not served by public sanitary sewerage facilities. Reliance on septic tank sewage disposal systems in these areas, which are covered by relatively impervious soils or are subject to seasonally high water tables, can only result in eventual malfunctioning of such systems and the consequent intensification of water pollution and public health problems in the Region.

Source: U. S. Soil Conservation Service and SEWRPC.

Map 26

SUITABILITY OF SOILS IN THE REGION FOR LARGE LOT RESIDENTIAL DEVELOPMENT WITHOUT PUBLIC SANITARY SEWER SERVICE

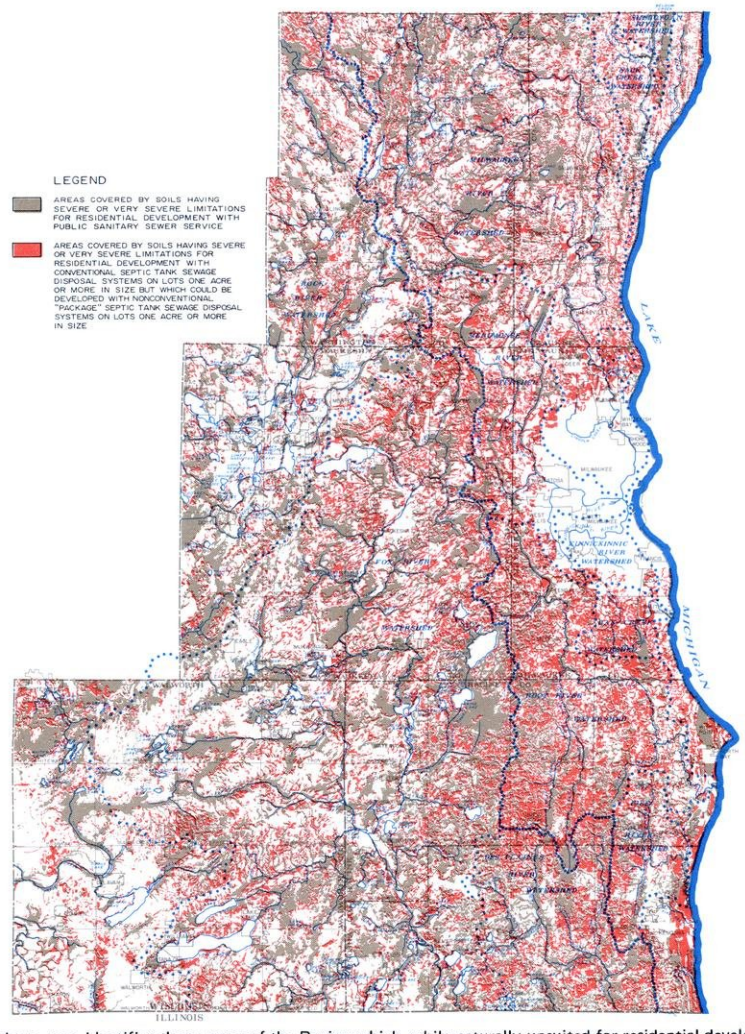
Suitability Assuming Conventional Septic Tank System



Approximately 1,181 square miles, or about 44 percent of the area of the Region, are covered by soils poorly suited for residential development on lots having an area of one acre or more and not served by public sanitary sewerage facilities. The inherent limitations of these soils for septic tank sewage disposal systems cannot be overcome simply by the provision of larger lots, and the use of such systems on these soils which cannot absorb the sewage effluent ultimately results in surface ponding and runoff of partially treated wastes into nearby watercourses.

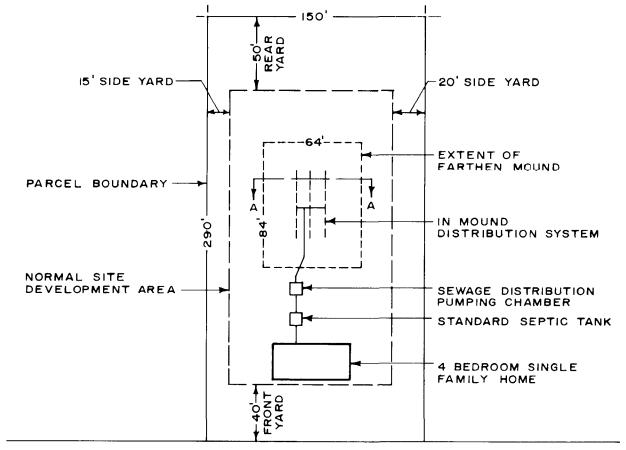
Source: U. S. Soil Conservation Service and SEWRPC.

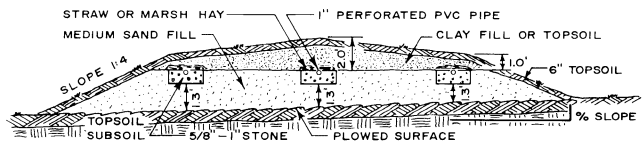
Suitability Assuming Nonconventional "Package" Septic Tank System



The above map identifies those areas of the Region which, while naturally unsuited for residential development with onsite soil absorption septic tank sewage disposal systems on large lots, could eventually be subject to such development assuming widespread use of the new "package" septic tank sewage disposal systems. Through the construction of artificial mounds and the utilization of mechanical dosing, the new systems overcome natural soil limitations relative to impermeability, high groundwater, and shallow bedrock. These additional areas amount to approximately 465 square miles, or about 17 percent of the area of the Region. Utilization of the new mound systems would require at least a one-acre parcel for a typical single-family home.

Source: SEWRPC.





CROSS SECTION A-A

As shown in the accompanying sketch, the mound system continues to utilize a standard septic tank, while adding a sewage distribution pumping chamber. The pump located in this chamber would function much like a sump pump, and would provide daily dosing of the septic tank effluent into the mound system. The mound itself would be constructed with sand fill covered by layers of clay and topsoil. The septic tank effluent distribution pipes would be placed in crushed stone trenches covered with straw or marsh hay.

The first of the three packages recently approved for use is designed to be constructed on slowly permeable soils having seasonally high water tables. Under the rule adopted by the Division of Health, this package may be used at the present time only to solve problems on existing developed parcels. The second and third packages are designed to overcome problems both with respect to existing and future development in those areas where soils are naturally permeable but where shallow creviced bedrock, in the case of package two, or high water tables, in the case of package three, exist. The use of any of the package systems must be approved by the Division of Health on a case-by-case basis, and is also subject to approval by the local units of government. All such systems must be monitored, with the monitoring results reported directly to the Division of Health.

While the rules adopted by the Division of Health currently restrict the applicability of the mound systems, it is likely that if the mound systems prove to be operational on a widespread basis over the next few years, all restrictions relating to such use would be lifted in the future. Similarly, it is highly likely that the additional package systems to be developed will be designed to overcome nearly all natural soil limitations that currently inhibit or restrict the utilization of onsite sewage disposal systems. The net result of these developments would be to remove soil limitations for onsite sewage disposal as a constraint on regional settlement patterns, and thereby permit substantial additional areas to be developed for urban use without centralized sanitary sewerage systems. Map 26 (right) identifies that additional area of the Region which likely could be subject to urban development with mound type septic tank systems if the current restrictions on the application of the mound system are lifted and the additional package systems now being developed are introduced. This area amounts to approximately 465 square miles, or about 17 percent of the area of the Region. In effect, only those soils currently unsuitable even for residential development with public sanitary sewer service would remain undevelopable.

WATER RESOURCES

Surface water resources, consisting of lakes, streams, and associated floodlands, form the singularly most important element of the natural resource base of the Region. Their contribution to the economic development, recreational activity, and aesthetic quality of the Region is immeasurable. The groundwater resources of southeastern Wisconsin are closely interrelated with the surface water resources inasmuch as they sustain lake levels and provide the base flow of streams. The groundwater resources, along with Lake Michigan, constitute the major sources of supply for domestic, municipal, and industrial water users.

Surface Water Resources

Lakes and streams constitute an extremely valuable part of the natural resource base of southeastern Wisconsin. Inasmuch as they are focal points for water-related recreational activities popular with the inhabitants of the Region, they provide extremely attractive sites for properly planned residential development, and when viewed in the context of open space areas, they greatly enhance the aesthetic aspects of the environment. In addition to being valued highly by the urban and rural population of the Region, it is important to note that lakes and streams are extremely susceptible to deterioration through the activities of that population. Water quality can degenerate as a result of excessive nutrient loads from malfunctioning or improperly placed septic tank systems, inadequate operation of waste treatment facilities, careless agricultural practices, and inadequate soil conservation practices. Lakes and streams are also adversely affected by the excessive development of lakeshore and riverine areas in combination with the filling of peripheral wetlands, which remove valuable nutrient and sediment traps while adding nutrient and sediment sources. The regional surface water resources must be properly managed to adjust man's uses to the quantity and quality of surface waters that are available, and to achieve a reasonable balance between public and private use and enjoyment of those surface water resources.

Lakes: Major lakes are defined herein as those having 50 acres or more of surface water area, a size capable of supporting reasonable recreational use with relatively little degradation of the resource. There are 100 major lakes within the Region, the location and relative sizes of

which are shown on Map 20. A tabular summary,[6] by county, of the surface water resources of southeastern Wisconsin is presented in Table 42. Major lakes in the Region have a combined surface water area of 57 square miles, or about 2 percent of the area of the Region, and provide a total of 448 miles of shoreline. The number of major lakes per county ranges from none in Milwaukee County to 33 in Waukesha County. The remaining five counties of Walworth, Kenosha, Washington, Racine, and Ozaukee contain, respectively, 25, 15, 15, 10, and two major lakes. Lake Geneva is by far the largest lake in southeastern Wisconsin, having a surface area of 5,262 acres, and is more than twice as large as Pewaukee Lake, which, with an area of 2,493 acres, is the second largest lake in the Region.

The lakes of southeastern Wisconsin are almost exclusively of glacial origin, being formed by depressions in outwash deposits, terminal and interlobate moraines, and ground moraines. Some lakes, such as Green Lake in northeastern Washington County or Browns Lake in southwestern Racine County, owe their origins to kettles, that is, depressions formed in the glacial drift as a result of the melting of ice blocks, that became separated from the melting continental ice sheet, and the subsequent subsidence of sand and gravel contained on and within those blocks. By virtue of their origin, glacially formed lakes are fairly regular in shape, with their deepest points located predictably near the center of the basin, or near the center of each of several connected basins. The beaches are characteristically gravel or sand on the windswept north, east, and south shores, while fine sediments and encroaching vegetation are common on the protected west shores and in the bays.

There are 228 lakes and ponds in the Region of less than 50 acres of surface water area, which are considered in this report as minor lakes. These minor lakes, the regional distribution of which is summarized in Table 42, have a combined surface water area of four square miles, or about 0.15 percent of the area of the Region, and provide 141 miles of shoreline. These small lakes generally have a few riparian owners and only marginal fisheries. In most cases, the value of the minor lakes is primarily aesthetic, and these lakes are incapable of retaining even this value with any degree of improper shoreland development.

It is also important to consider the present overall quality of the lakes in southeastern Wisconsin. The 694 square mile Milwaukee River watershed, 430 square miles of which lie in southeastern Wisconsin, has 21 major lakes. The 942 square mile Fox River watershed has 45 major lakes. These two watersheds were the subject of SEWRPC comprehensive watershed studies which included the collection, collation, and analysis of extensive lake water quality data for the purpose of assessing pollution problems in the major lakes and of developing plan elements to solve those problems. Since these two watershed studies were completed recently, and since the in-Region portions of these watersheds comprise just over 50 percent of the 2,689 square mile area of the Region and contain 57 of the 100 major lakes in southeastern Wisconsin, the quality characteristics of the major lakes in the Milwaukee and Fox River watershed studies may be taken as representative of regional lake water quality conditions and trends.

At least 13 of the 57 major regional lakes in these two watersheds were found to be in advanced stages of eutrophication as indicated by high phosphorus concentrations, low dissolved oxygen contents, and excessive growths of algae and aquatic weeds. Many other major lakes within the Fox and Milwaukee River watersheds were found to be receiving nutrients at rates such that nuisance growths of algae and aquatic weeds may be expected in the near future. In general, some indication of overfertilization was found in all major lakes in the Fox and Milwaukee River watersheds.

Domestic sewage pollution, as indicated by measured coliform levels and chloride concentrations, was found to constitute a health hazard in several of the lakes, including Little Cedar Lake in the Milwaukee River watershed and Little Muskego Lake in the Fox River watershed. High pesticide levels were encountered in the two watersheds, indicating another form of surface water contamination.

It is, therefore, apparent that many of the major lakes of southeastern Wisconsin are being degraded as a result of man's activities to the point where they now have, or soon will have, little or no value for recreational purposes, as desirable locations for properly planned and controlled lake-oriented residential development, or even as aesthetic assets in the Region.

Streams: As discussed earlier and as shown on Map 20, the surface drainage system of southeastern Wisconsin may be viewed as existing within 11 individual watersheds, five of which—the Root River, Menomonee River, Kinnickinnic River, Oak Creek, and Pike River watersheds—are contained entirely within the Region. In addition to the 11 watersheds, numerous small catchment areas immediately adjacent to the Lake Michigan shoreline drain directly to the lake via local natural streams and artificial drainageways, and these tributary areas together may be considered to comprise a twelfth watershed. The Region contains only a very small part of the Wisconsin portion of the large Rock River watershed, the streams of that watershed within the Region being limited to the headwater portions of such tributaries to the Rock as the Bark and Oconomowoc Rivers and Turtle Creek.

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[6] *See Appendix C, SEWRPC Planning Guide No. 5, Floodland and Shoreland Development Guide, for a detailed tabulation, by county, of lakes and ponds in southeastern Wisconsin. This report indicates the location of each lake and pond, and summarizes pertinent morphometric parameters for major lakes which have been revised under the Commission's Fox and Milwaukee River watershed studies published as SEWRPC Planning Reports No. 12, A Comprehensive Plan for the Fox River Watershed, Volumes 1 and 2, and No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volumes 1 and 2.*

Table 42

LAKES AND STREAMS IN THE REGION BY COUNTY

County		Lakes[a]									
		Major[b]						Minor[c]			
			Total Surface Area		Total Shoreline Length (Miles)	Largest Lake			Total Surface Area		Total Shoreline Length (Miles)
Name	Area (Square Miles)	Number	Square Miles	Percent of County		Name	Area (Acres)	Number	Square Miles	Percent of County	
Kenosha	278.28	15	5.06	1.82	48.62	Elizabeth Lake	637.80	9	0.27	0.10	5.85
Milwaukee . . .	242.19	--	--	--	--	--	--	40	0.26	0.11	14.99
Ozaukee	234.49	2	0.47	0.20	4.75	Mud Lake	245.40	36	0.63	0.27	25.40
Racine.	339.87	10	5.48	1.61	59.52	Wind Lake	936.20	7	0.17	0.05	4.59
Walworth. . . .	578.08	25	19.52	3.38	131.40	Lake Geneva	5,262.40	9	0.35	0.06	9.10
Washington . .	435.50	15	4.22	0.97	40.59	Big Cedar	932.00	43	0.70	0.16	24.32
Waukesha. . . .	580.66	33	22.07	3.80	162.89	Pewaukee	2,493.00	84	1.62	0.28	57.08
Region	2,689.07	100	56.82	2.11	447.77	--	10,506.80	228	4.00	0.15	141.33

County		Lakes[a]				Major Streams[d]			
		Total							
			Total Surface Area		Total Shoreline Length (Miles)		Total Length (Miles)	Total Surface Area	
Name	Area (Square Miles)	Number	Square Miles	Percent of County		Number		Square Miles	Percent of County
Kenosha	278.28	24	5.33	1.92	54.47	19	106.40	0.73	0.03
Milwaukee . . .	242.19	40	0.26	0.11	14.99	15	102.99	0.62	0.03
Ozaukee	234.49	38	1.10	0.47	30.15	29	112.20	1.25	0.05
Racine.	339.87	17	5.65	1.66	64.11	14	100.55	0.96	0.01
Walworth. . . .	578.08	34	19.87	3.44	140.50	29	173.00	0.58	0.01
Washington . .	435.50	58	4.92	1.13	64.91	38	219.80	1.03	0.02
Waukesha. . . .	580.66	117	23.69	4.08	219.97	50	333.30	1.31	0.02
Region	2,689.07	328	60.82	2.26	589.10	194	1,148.24	6.48	0.02

[a] *Appendixes B, C, and D to SEWRPC Planning Guide No. 5, Floodland and Shoreland Development Guide, contain detailed tabulations, by county, of all streams, lakes, and ponds in the Southeastern Wisconsin Region. These appendices indicate the location of each stream, lake, and pond and summarize pertinent morphometric parameters. Surface areas and shoreline lengths for some of the major lakes have been revised under the Commission Fox and Milwaukee River watershed studies, documented in SEWRPC Planning Report No. 12, A Comprehensive Plan for the Fox River Watershed, Volumes 1 and 2, and SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volumes 1 and 2. Entries in this table reflect the revised figures for major lakes.*

[b] *A major lake is defined as one having 50 acres or more of surface water area.*

[c] *A minor lake is defined as one having less than 50 acres of surface water area.*

[d] *A major stream is defined as one which maintains, at a minimum, a small, continuous flow throughout the year except for unusual drought conditions.*

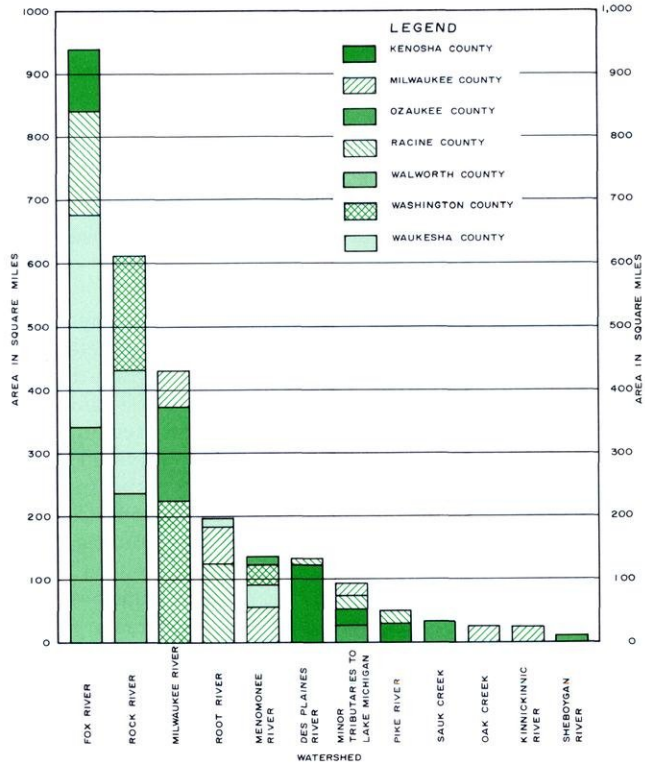
Source: Wisconsin Department of Natural Resources and SEWRPC.

Three of the 12 watersheds contained wholly or partly in southeastern Wisconsin—the Fox, Rock, and Des Plaines River watersheds, which have a combined area of 1,685 square miles, or 63 percent of the area of the Region—lie west of the subcontinental divide. As a result, the rivers and streams within these catchment areas flow in a generally south and southwesterly direction, and are a part of the Mississippi River drainage system. The rivers and streams in the nine watersheds comprising the remainder of southeastern Wisconsin, which have a combined area of 1,004 square miles, or 37 percent of the area of the Region, flow in an easterly direction and discharge into Lake Michigan, and are a part of the Great Lakes-St. Lawrence River drainage system. A tabular summary of watershed characteristics for southeastern Wisconsin is presented in Table 43, and a graphical representation of the range of watershed sizes is shown in Figure 48.

One of the most interesting, variable, and occasionally unpredictable features of each watershed is its river and stream system in its ever changing, sometimes widely fluctuating, discharges and stages. The stream systems of the Region receive a relatively uniform flow of groundwater from the shallow aquifer underlying the Region. This groundwater discharge constitutes the base flow of the streams. The streams also periodically intercept surface water runoff from rainfall and snowmelt, which is superimposed on the base flow and sometimes causes the streams to leave their channels and occupy the adjacent floodlands. The volume of water drained annually from southeastern Wisconsin by the stream system is equivalent to seven to eight inches of water spread over the seven-

Figure 48

SIZE AND DISTRIBUTION OF WATERSHEDS IN THE REGION BY COUNTY



Source: SEWRPC.

Table 43

WATERSHEDS IN THE REGION BY COUNTY

Watershed[a,b]	County														Total Watershed Area Within Region (Square Miles)	Percent of Region
	Kenosha		Milwaukee		Ozaukee		Racine		Walworth		Washington		Waukesha			
	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed	Area (Square Miles)	Percent of Watershed		
Fox River[d,f]	96.46	10.28	0.47	0.05	--	--	164.44	17.52	341.46	36.37	0.31	0.03	335.59	35.75	938.73	34.91
Rock River[d]	--	--	--	--	--	--	--	--	236.62	38.64	179.91	29.38	195.84	31.98	612.37	22.77
Milwaukee River[e,f]	--	--	56.97	13.24	150.54	34.99	--	--	--	--	222.76	51.77	--	--	430.27	16.00
Root River[c,e,f]	2.19	1.11	58.83	29.80	--	--	123.41	62.51	--	--	--	--	13.00	6.58	197.43	7.34
Menomonee River[c,e]	--	--	55.75	40.97	11.58	8.51	--	--	--	--	32.52	23.90	36.23	26.62	136.08	5.06
Des Plaines River[d]	122.85	91.96	--	--	--	--	10.74	8.04	--	--	--	--	--	--	133.59	4.97
Minor Tributaries to Lake Michigan[c,e]	26.99	28.87	18.22	19.49	27.44	29.35	20.84	22.29	--	--	--	--	--	--	93.49	3.48
Pike River[c,e]	29.79	59.31	--	--	--	--	20.44	40.69	--	--	--	--	--	--	50.23	1.87
Sauk Creek[e]	--	--	--	--	33.72	100.00	--	--	--	--	--	--	--	--	33.72	1.25
Oak Creek[c,e]	--	--	26.29	100.00	--	--	--	--	--	--	--	--	--	--	26.29	0.98
Kinnickinnic River[c,e]	--	--	25.66	100.00	--	--	--	--	--	--	--	--	--	--	25.66	0.95
Sheboygan River[e]	--	--	--	--	11.21	100.00	--	--	--	--	--	--	--	--	11.21	0.42
Total	278.28	--	242.19	--	234.49	--	339.87	--	578.08	--	435.50	--	580.66	--	2,689.07	100.00

[a] *Includes only that area of each watershed that lies within the seven-county Southeastern Wisconsin Region.*

[b] *Watersheds are listed in order of decreasing size within the Region.*

[c] *Indicates watershed wholly contained within the Region.*

[d] *Indicates watershed west of the subcontinental divide that is tributary to the Mississippi River basin. Three watersheds having a combined area of 1,684.69 square miles, or 62.7 percent of the Region, are in this category.*

[e] *Indicates watershed east of the subcontinental divide that is tributary to the Great Lakes-St. Lawrence River basin. Nine watersheds having a combined area of 1,004.38 square miles, or 37.3 percent of the Region, are in this category.*

[f] *Indicates watersheds for which comprehensive watershed plans have been prepared and adopted by the Southeastern Wisconsin Regional Planning Commission.*

Source: SEWRPC.

county Region, which amounts to about one-fourth of the average annual precipitation.

Major streams are defined herein as perennial streams which maintain, at a minimum, a small, continuous flow throughout the year except under unusual drought conditions. Within the Region, there are approximately 1,148 miles of such major streams, as summarized by county in Table 42. The length of major streams per county ranges from a low of 100 lineal miles in Racine County to a high of 133 lineal miles in Waukesha County. The latter county also has the largest number of major lakes, and is therefore particularly well endowed with surface water resources.

During a 14-month period extending from January 1964 through February 1965, the Commission conducted an extensive stream water quality sampling program during which 3,933 water samples were collected at 87 sampling stations established on 43 streams in the Region. The samples were analyzed for 32 chemical, physical, biochemical, and bacteriological water quality indicators for the purpose of assessing the then existing condition of stream water quality in relation to pollution sources, land use, and population distribution and concentration. Data developed during this regional stream water quality study were used to forecast probable future stream water quality conditions. Regional stream water quality data as of 1964 and 1965, interpretations of that data, and forecasts of future stream water quality conditions were published in 1966 in SEWRPC Technical Report No. 4, Water Quality and the Flow of Streams in Southeastern Wisconsin.

The study found that the original naturally high quality of the streams in the Region had been markedly deteriorated by the activities of man, as indicated by such key indicators of pollution as chlorides, dissolved solids, dissolved oxygen, and coliform bacteria. This deterioration may be attributed to the failure to properly adjust both rural and urban development within the Region to the capability of streams and watercourses to assimilate the pollution loadings attendant to such development. Evidence of occasional or persistently severe stream pollution was found in all of the 12 watersheds contained wholly or partly in the seven-county planning Region. The regional stream water quality study also revealed that not only has stream water quality markedly deteriorated as a result of man's activities, but that the deteriorated stream water quality has, in turn, impaired or prohibited the very aesthetic and recreational uses sought by the expanding urban population of the Region. Of the 43 streams sampled in the Region, 21 were found to be unsuitable for the preservation and enhancement of aquatic life, with 33 found to be unsuitable for any recreational activities in all or portions of the stream.

In 1967 the Commission undertook a comprehensive study of the Fox River watershed. It included a determination of existing stream water quality conditions in the watershed, and the development of a stream water quality simulation model to be used as a tool in the construction of a comprehensive watershed development plan, having as a major element a stream water quality management plan (see SEWRPC Planning Report No. 12, A Comprehensive Plan for the Fox River Watershed). Because this study was completed soon after the regionwide water quality study, and because the Wisconsin Department of Natural Resources had conducted additional sampling efforts as part of a stream basin survey, no major additional data collection efforts with respect to stream water quality were mounted in the study. The existing data were, however, thoroughly analyzed and utilized in the development and calibration of a stream water quality simulation model for the Fox River watershed.

In general, the findings of this study indicated that stream water pollution was very evident in most areas of the upper Fox River watershed, and was forecast to increase as the urbanization of this upper watershed area proceeded. The study concluded that pollution in the Fox River watershed rendered four of the 13 major streams unsuitable for the preservation and enhancement of aquatic life, with the remaining nine unsuitable for any recreational activities either in some sections of the stream or throughout the entire stream.

In 1968 the Commission undertook a comprehensive study of the Milwaukee River watershed. In addition to all of the stream water quality data previously collected as part of the regional stream water quality study in 1964 and 1965, a special stream water quality sampling program was mounted in the Milwauke River watershed study. It provided definitive data to permit a more thorough analysis of the existing stream water quality conditions in the watershed and the development and calibration of a stream water quality simulation model (see SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed.

The data collected from the previous regional stream water quality study, together with the additional data collected under the Milwaukee River watershed study, indicated that, although water quality conditions varied greatly from the upper to the lower reaches of the watershed, pathogenic concentrations and nutrient pollution, as indicated by coliform count and phosphorus concentration, are serious problems throughout almost all of the watershed. Organic pollution, as indicated by dissolved oxygen levels, was not found to be as serious a problem in the Milwaukee River watershed as in the Fox River watershed. Nevertheless, relatively long reaches of the Milwaukee River were found to exist in which dissolved oxygen levels fell below the minimum levels required to sustain fish life. Aesthetic pollution was clearly found, particularly in the lower reaches of the watershed.

Municipal sewage treatment plant discharges were found to constitute the major cause of water pollution in the middle and upper reaches of the Milwaukee River watershed, while sanitary and combined sewer overflows were found to be the major cause in the lower reaches of the watershed. Over 84 miles of the main stem of the Milwaukee River, or about 85 percent of its total length, did not meet the standards for the established stream water

use objectives. About 20 percent of the total length of the 29 major tributaries of the Milwaukee River, or about 44 miles, similarly did not meet the standards for the established water use objectives. In general, the Milwaukee River and its tributaries in the lower reaches were considered to be grossly polluted.

Also in 1968 the Commission entered into a cooperative agreement with the Wisconsin Department of Natural Resources whereby that Department and the Commission undertook a continuing stream water quality monitoring program within the Region. The objective of the program was to build upon the bench mark water quality data initially collected under the regional stream water quality study and the Milwaukee River watershed study by providing, on a continuous basis, the water quality information necessary to permit assessment of the long-term trends in stream water quality within the Region.

Although the stream water quality data collected under this continuing program have not to date been analyzed in detail, review of the data on a selected basis indicates that no significant, long-term changes in stream water quality conditions within the Region are as yet apparent. Consequently, although localized changes in water quality conditions have undoubtedly occurred since the initial 1964-1965 sampling period, the general conclusions of the Commission's regional stream water quality survey remain essentially valid and provide, together with the findings of the stream water quality analyses conducted under the Commission's watershed studies, a basic framework for reappraisal of the Commission's 1970 land use and transportation plan.

In general, it is apparent from all of the Commission's stream water quality data to date that many miles of major streams in southeastern Wisconsin are being degraded as a result of existing waste water treatment and disposal practices such that they are unsafe for most recreational activities and have a greatly reduced aesthetic value. All of the aforementioned Commission studies also clearly demonstrate the very basic interrelationship between land use and stream water quality, and thereby emphasize the need for concurrent areawide planning of land use and water quality control measures.

Floodlands: The floodlands of a river or stream are the wide, gently sloping areas contiguous with, and usually lying on both sides of, a river or stream channel. Rivers and streams occupy their channels most of the time. However, during even minor flood events, stream discharges increase markedly such that the channel is not able to convey all the flow. As a result, stages increase and the river or stream spreads laterally over the floodlands. The periodic flow of a river onto its floodlands is a normal phenomenon, and in the absence of major, costly structural flood control works, will occur regardless of whether or not urban development occurs on the floodlands.

For planning and regulatory purposes, floodlands are normally defined as the areas, excluding the channel, subject to inundation by the 100-year recurrence interval flood event. This is the event that would be reached or exceeded in severity once on the average of every 100 years. Stated another way, there is a 1 percent chance that this event will be reached or exceeded in severity in any given year. Commission studies indicate that about 6 to 10 percent of the total land area of any given watershed will be within the 100-year floodlands of the Region's rivers and streams. Obviously, the 100-year recurrence interval floodland contains within its boundaries the areas inundated by floods of less severe but more frequent occurrence such as the 50-, 25-, and 5-year recurrence interval events.

Floodland areas are generally not well suited to urban development because of flood hazards, high water tables, and inadequate soils. These floodland areas are, however, generally prime locations for much needed park and open space areas, and therefore, within the context of regional land use planning, every effort should be made to discourage indiscriminant urban development in floodplains while encouraging open space uses.

Flood hazard data for the numerous streams of the Southeastern Wisconsin Region, and particularly data on the limits of the natural floodlands of the streams for a flood of a specified recurrence interval, are important inputs to the regional planning process. Due to the importance of floodland data, the Commission, as an integral part of its comprehensive watershed studies, provides definitive data, including a delineation of the limits of the floodplains, on the 10- and 100-year recurrence interval floods for most of the perennial streams in each watershed.

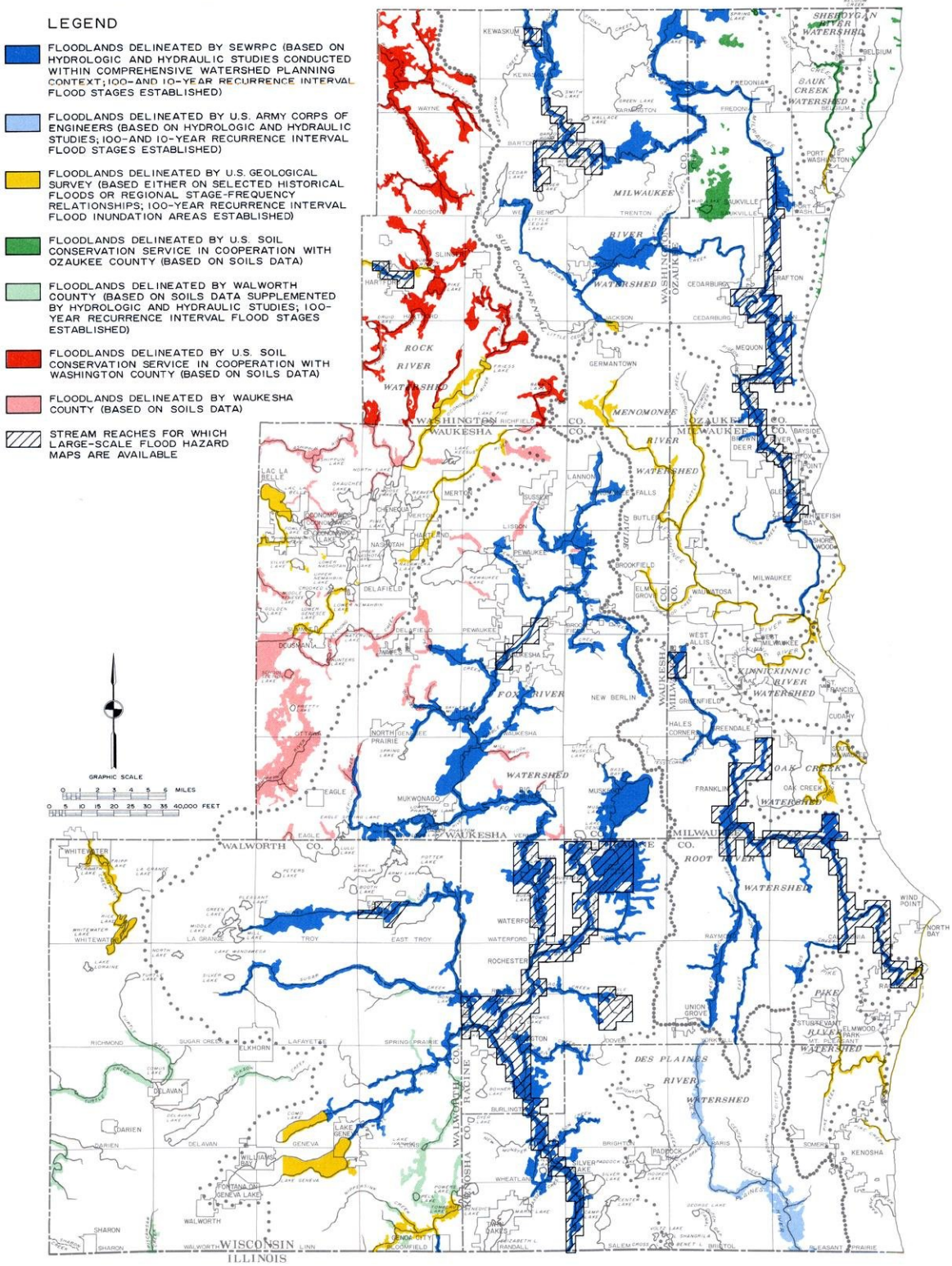
The status of existing flood hazard data in the Region as of January 1, 1975, is summarized on Map 27. The Commission has completed comprehensive watershed studies for the Root, Fox, and Milwaukee River watersheds resulting in the delineation of floodlands for about 458 miles of major stream channel, not including stream channels in the Milwaukee River watershed lying outside of the Region in Sheboygan and Fond du Lac Counties. Both 10- and 100-year recurrence interval floodplain limits have been established for the indicated stream reaches in these watersheds by the Commission. It is important that a flood used to delineate floodlands for land use planning as well as land use regulation purposes have a specified recurrence interval so that a sound economic analysis of the benefits and costs and of the advantages and disadvantages of various combinations of land use regulation, public acquisition, and public construction for flood damage abatement and prevention can be fully analyzed.

While the Commission is the only agency which has developed flood hazard data for the Region on the basis of comprehensive watershed studies, other federal and local agencies have developed flood hazard data for additional stream reaches within the Region. These are also indicated on Map 27.

Various studies are currently underway to develop additional flood hazard data for stream reaches in the Region.

Map 27

FLOODLANDS IN THE REGION



Delineation of the floodlands of southeastern Wisconsin is extremely important for sound local as well as regional planning and development. The above map summarizes the status of floodland data in the Region as of the end of 1974. The Commission itself, as an integral part of its comprehensive watershed studies, provides definitive data on the 10- and 100-year recurrence interval floods for most of the perennial streams in each watershed studied. Other agencies which have to date made flood hazard data available for various stream reaches in the Region are the U. S. Army Corps of Engineers, the U. S. Geological Survey, and the U. S. Soil Conservation Service, acting in cooperation with the Commission and with county zoning and planning staffs in Ozaukee, Washington, Waukesha, and Walworth Counties. In addition to identifying the stream reaches for which existing flood hazard data in the Region are available and the agency from which the data are available, the above map shows those stream reaches for which detailed, large-scale flood hazard maps are available from the Commission. These maps are available at scales of 1" = 100' with 2' contour intervals, or 1" = 200' with 2'-4' contour intervals, and enable precise delineations of the floodplains to be accomplished.

Source: SEWRPC.

The Commission is currently conducting a comprehensive watershed study for the Menomonee River watershed which will provide flood hazard data for 70 additional miles of major stream channel. The U. S. Army Corps of Engineers is currently undertaking detailed floodplain information studies along Whitewater Creek and along the Oconomowoc River at the request of the City of Whitewater and the City of Oconomowoc, respectively. The U. S. Soil Conservation Service is conducting detailed floodplain information studies in the Pike River watershed, at the request of Racine and Kenosha Counties, and along the Bark River, at the request of the Village of Dousman.

Finally, as a result of increased flood insurance activity in the Region, numerous studies are being undertaken by the U. S. Department of Housing and Urban Development to provide supplemental flood hazard data to be used in identifying flood-prone areas for flood insurance purposes. In areas where detailed flood hazard data already exist, these studies utilize the existing data and may include the development of flood hazard data for small, previously unstudied tributaries. In areas where no flood hazard data exists, these studies develop the data necessary for the determination of flood hazard areas.

Groundwater Resources

Groundwater resources constitute an extremely valuable element of the natural resource base of southeastern Wisconsin. The groundwater reservoir not only sustains lake levels and provides the base flow of the streams in the Region, but comprises a major source of water supply for domestic, municipal, and industrial water users. Like surface water, groundwater is susceptible to depletion in quantity and to deterioration in quality. An important consideration in land use and transportation facility development, therefore, is the protection of the quantity and quality of this valuable resource.

The seven-county Region is richly endowed with groundwater resources. Continuous, relatively uniform discharge from groundwater storage provides for the base flow of the major streams within the Region. In 1970, groundwater was the source of water supply for 46 public water utilities, or 69 percent of the 67 public water utilities within the Region. Together these 46 utilities serve a resident population of about 190,000 persons, or about 11 percent of the total resident population of the Region and 14 percent of the population of the Region served by public water utilities. In addition, many major industries within the Region utilize groundwater as a source of supply.

The rock units within the Region differ widely in the yield of stored water. Rock units that supply water in usable amounts to pumping wells and in important amounts to lakes and streams are called aquifers. The aquifers of southeastern Wisconsin extend to great depths, attaining a thickness in excess of 1,500 feet in the eastern portions of the Region. An enormous reservoir of groundwater, therefore, lies beneath the Region. Three major aquifers exist within the seven-county Region. From land surface downward, they are: 1) the sand and gravel deposits in the glacial drift; 2) the shallow dolomite strata in the underlying bedrock; and 3) the deeper sandstone, dolomite, siltstone, and shale strata.

Because of their relative nearness to the land surface, and because of the hydraulic interconnection, the first two aquifers are commonly referred to collectively as the "shallow aquifer," while the latter is referred to as the "deep aquifer." Wells tapping these aquifers are referred to as shallow or deep wells, respectively. The shallow and deep aquifers are separated by the Maquoketa shale, which forms a relatively impermeable barrier between the two aquifers. The spatial distribution of the unconsolidated surficial material and the thickness and orientation of the bedrock strata are depicted on Map 21 and Figure 47, and lithologic descriptions of the surficial deposits and the bedrock are provided in Table 41.

Some water is recharged to the deep sandstone aquifer underlying the Region by vertical movement through wells open to both the shallow and deep aquifers and by some vertical movement downward through the Maquoketa shale. The principal source of recharge to the deep aquifer, however, is precipitation percolating downward through glacial deposits into the deep aquifer which, as shown in Figure 47, is exposed beneath the glacial deposits only in the western one-half of Walworth County and the western one-quarter of Waukesha County. The deep aquifer recharge area for southeastern Wisconsin is a long narrow zone oriented in a generally north-south direction. It is bounded on the east by the Maquoketa shale and on the west by a groundwater divide—the separation between eastward and westward groundwater movements—that is located along the western edge of Waukesha and Walworth Counties. Groundwater in the deep aquifer beneath the Region moves in a generally easterly direction from the primary western recharge areas toward Lake Michigan. Thus, most of the water withdrawn from the deep sandstone aquifer by communities and industries in the seven-county Region originally entered the aquifer via the Waukesha and Walworth County recharge areas.

The influence of pumping from the confined sandstone aquifer is illustrated on Map 28, which shows the potentiometric[7] surface of the sandstone aquifer in 1880 and in 1973. Prior to intensive pumpage from the aquifer, groundwater motion in the aquifer was from west to east, with the potentiometric surface just below the ground surface and in some instances above the ground surface as evidenced by reports of flowing or artesian wells. Since 1880, the original potentiometric surface of the sandstone aquifer has been markedly altered, primarily as a result of pumpage in the Cities of Milwaukee and Waukesha in the Region, as well as heavy groundwater use south of the Region in northeastern Illinois. Drawdowns of up to 350 feet have occurred in the Milwaukee-Waukesha area, while drawdowns in excess of 275 feet are evident at the Wisconsin-Illinois line.

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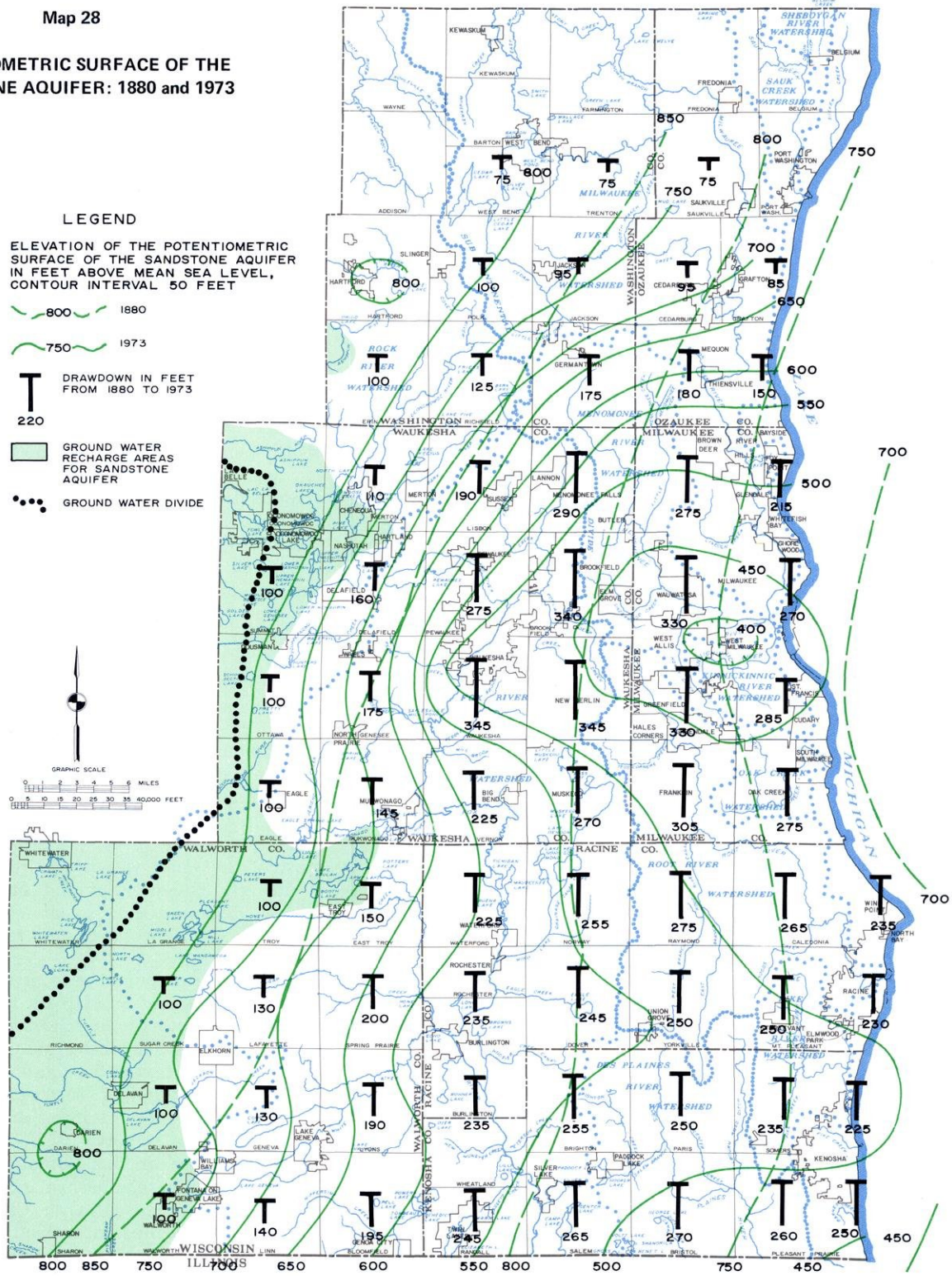
[7] *The potentiometric surface represents the static head of water in an aquifer as defined by the levels to which water will rise in wells penetrating the aquifer.*

Map 28

POTENTIOMETRIC SURFACE OF THE SANDSTONE AQUIFER: 1880 and 1973



The principal source of recharge for the deep sandstone aquifer underlying the Region is precipitation which percolates downward through glacial deposits located generally in the western one-half of Walworth County and the western one-quarter of Waukesha County as shown on the above map. Since 1880 the original potentiometric surface of the sandstone aquifer declined markedly primarily as a result of heavy groundwater use in the Milwaukee and Waukesha areas within the Region, as well as in the greater Chicago area. Drawdowns of up to 350 feet have occurred in the Milwaukee and Waukesha areas, while drawdowns in excess of 275 feet have occurred in the vicinity of the Wisconsin-Illinois state line. Currently, the deep sandstone aquifer serves the water supply needs of an estimated 150,000 persons in the Southeastern Wisconsin Region.

Source: U. S. Geological Survey.

Whereas the primary source of recharge for the deep sandstone aquifer is located partly outside of southeastern Wisconsin, the shallow aquifer, composed of the glacial drift and interconnected dolomitic bedrock, is recharged locally by downward percolation of precipitation and surface water. Contrasted with the deep aquifer, the direction of water movement in the shallow aquifer is much more variable and complex. Movement occurs from local recharge areas toward multiple points of discharge such as streams, lakes, marshes, and wells. Relative to the deep aquifer, the shallow aquifer is more susceptible to pollution by wastewater because it is nearer, both in terms of distance and time, to potential pollution sources, thus minimizing the potential for dilution, filtration, and other natural processes that tend to reduce the potential detrimental effects of pollutants.

The current quality of groundwater in both the shallow and deep aquifers throughout the Region is generally good, although it is very hard, containing high concentrations of calcium, magnesium, sulfate, and other dissolved solids, and therefore, softening is required for almost all water uses. Localized water quality problems include hardness, expressed as calcium carbonate, in excess of 500 mg/l in the deep sandstone aquifer along much of the eastern edge of the Region. Some wells in the Village of River Hills in Milwaukee County, for example, have measured hardnesses exceeding 1,500 mg/l and total dissolved solids concentrations in excess of 6,000 mg/l.

If the large quantity of groundwater underlying the Region is to remain a valuable asset to southeastern Wisconsin, regional development must be managed to protect the quality of that resource.

VEGETATION

Presettlement Vegetation

Historically, vegetational patterns in the Region were influenced by climate, glacial deposits, soil, fire, topography, and natural drainage characteristics. Historical records, including the original U. S. Public Land Survey carried out within the Region in 1836, indicate that frequent fires set by the Indians or initiated by natural causes maintained large portions of southeastern Wisconsin either as open level plains containing orchard-like stands of oak or as prairies dominated by big bluestem grass and colorful prairie forbs. Other portions of the Region that were protected from fire by the drainage pattern or local relief developed into mixed hardwood forests. The upland timber for the most part consisted of the hardwood species: sugar maple, oak, elm, ash, hickory, beech, linden, walnut, and ironwood; and one coniferous species, white pine. Common species found in the lowland forests included black ash, elm, willow, cedar, tamarack, aspen, and soft maple.

Woodlands

Woodlands in the Region have much value beyond monetary return for their forest products. Under good management they can serve a variety of uses compatible with other benefits. The quality of life within an area is greatly influenced by the overall quality of the environment, as measured in terms of clean air, clean water, scenic beauty, and diversity. In addition to contributing to clean air and water, the maintenance of woodlands within the Region can contribute to the maintenance of a diversity of plant and animal life in association with human life. The existing woodlands of the Region, which required a century or more to develop, can, however, be destroyed through mismanagement within a comparatively short time. The deforestation of hillsides contributes to the siltation of lakes and streams and the destruction of wildlife habitat. Woodlands can and should be maintained for their total values: scenic, wildlife, open space, educational, recreational, and watershed protection, as well as for their forest products. Under balanced use and sustained yield management, woodlands can serve many of these benefits at the same time.

Primarily located on ridges and slopes, along lakes and streams, and in wetlands, woodlands provide an attractive natural resource of immeasurable value. Not only is the beauty of lakes, streams, and glacial land forms of the Region accentuated by woodlands, but they are essential to the maintenance of the overall environmental quality of southeastern Wisconsin.

Six forest types are recognized within the Region: northern upland hardwoods, southern upland hardwoods, northern lowland hardwoods, southern lowland hardwoods, northern lowland conifers, and northern upland conifers. The northern and southern upland hardwood types are the most common in the Region. The two upland hardwood types are most utilized for production of commercial forest products.

Natural stands of trees within the Region consist largely of even-aged mature or nearly mature specimens with insufficient reproduction and saplings to maintain the stands when the old trees are harvested or die of disease or age. This lack of young growth is an unnatural condition brought about by mismanagement, and is associated with many years of excessive grazing by livestock.

Inventories of woodlands within the Southeastern Wisconsin Region were conducted by the Commission as part of the 1963 and 1970 land use inventories. As indicated in Table 44 and on Map 29, woodlands in the Region in 1970 covered a total combined area of about 125,300 acres, or approximately 7 percent of the total area of the Region, with over 91,700 acres, or 73 percent, located in Walworth, Washington, and Waukesha Counties. Milwaukee County, with about 3,200 acres, had the smallest amount of woodlands of any county in the Region.

Woodlands in the Region in 1963 covered a combined area of about 130,400 acres. Between 1963 and 1970, there were both decreases in woodlands in certain areas of the Region, due largely to the conversion of woodlands to intensive urban and agricultural land uses, as well as increases in woodlands in certain areas of the Region as a result of reforestation activities. The overall effect of these changes in woodlands between 1963 and 1970 is

Table 44

WOODLANDS IN THE REGION BY COUNTY: 1963 and 1970

County	Woodlands					
	1963[a]		1970		Change: 1963-1970	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	9,616	7.4	9,112	7.3	- 504	- 5.2
Milwaukee	3,455	2.6	3,213	2.6	- 242	- 7.0
Ozaukee	8,550	6.6	8,272	6.6	- 278	- 3.3
Racine	13,709	10.5	12,927	10.3	- 782	- 5.7
Walworth	32,750	25.1	31,755	25.3	- 995	- 3.0
Washington	27,855	21.4	27,410	21.9	- 455	- 1.6
Waukesha	34,482	26.4	32,597	26.0	- 1,885	- 5.5
Region	130,417	100.0	125,286	100.0	- 5,131	- 3.9

[a] *Identification and quantification of woodlands in the Region was based upon aerial photo interpretation completed as part of the regional land use inventories conducted in 1963 and 1970. The 1963 woodland acreage data differ slightly from the 1963 forest and woodlands acreage data presented in SEWRPC Planning Report No. 7, The Land Use and Transportation Study, Volume One, Inventory Findings, since the latter acreage was determined by the Wisconsin Conservation Commission for SEWRPC and included swamp woodlands and wet mesic woodlands, which were considered wetlands in the SEWRPC land use inventories, and also included only those woodlands 20 acres or over in area.*

Source: SEWRPC.

a net loss of about 5,100 acres of woodlands, representing a 4 percent decrease in the total amount of woodlands since 1963.

The spatial distribution in the change in woodlands within the Region between 1963 and 1970 is shown on Map 30. Except for a notable concentration of reforestation activities in the Kettle Moraine State Forest area, both increases and decreases in woodlands are distributed rather uniformly throughout the outlying areas of the Region. Among the seven counties, the net loss in woodlands ranged from less than 300 acres in Milwaukee and Ozaukee Counties to nearly 1,900 acres in Waukesha County.

Wetlands

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. Recognizing the many environmental attributes of wetland areas, continued efforts should be made to protect this resource by discouraging costly—both in monetary and environmental terms—wetland draining, filling, and urbanization.

Wetlands represent a variety of stages in the natural filling of lake and pond basins as well as floodplain areas. Wetlands are considered herein as areas which have the water table at or near the land surface and are generally unsuited or poorly suited for most agricultural or urban development purposes. Wetlands, however, have important ecological value in a natural state. Wetlands contribute to flood control and stream purification, since such areas naturally serve to temporarily store excess runoff and thereby tend to reduce peak flood flows. It has been found that except during exceptional periods of high runoff following prolonged drought, concentrations of nutrients in waters leaving such areas are considerably lower than in waters entering the wetlands.

Wetlands within Wisconsin have been classified by the Wisconsin Department of Natural Resources according to the national wetland classification system.[8] Under this system, seven major classes of wetlands are recognized, including potholes, fresh meadows, shallow marshes, deep marshes, shrub swamps, timber swamps, and bogs.

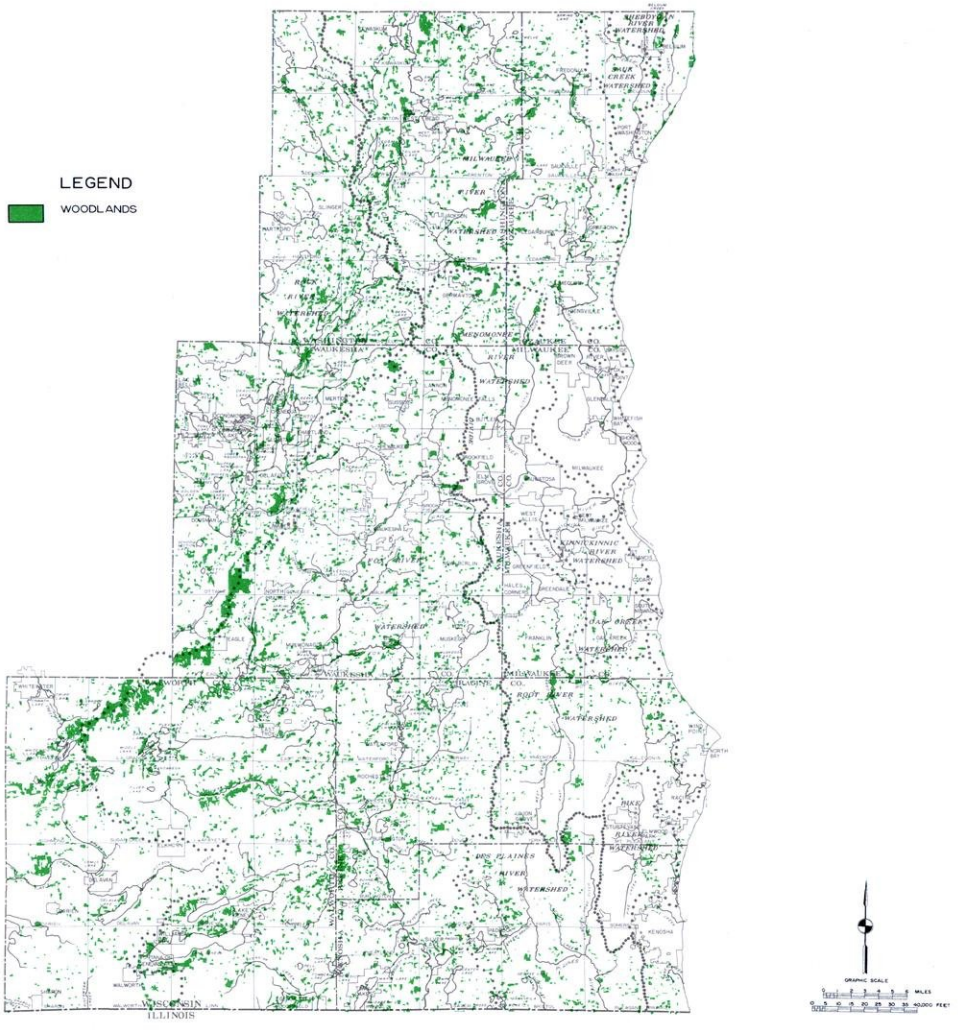
The wetlands with standing water are well suited for waterfowl and marsh furbearers, while drier types support upland game due to the protection afforded by vegetative cover. Shallow-water wetlands are subject to winter freeze and summer drought, and therefore are considered lower in value than the deep-water types of wetlands.

Inventories of water and wetlands within the Southeastern Wisconsin Region were conducted by the Commission as part of the 1963 and 1970 land use inventories. The water and wetland land use category includes all inland lakes, excluding Lake Michigan; all streams, rivers, and canals over 50 feet in width; and open lands which are intermittently covered with water or which are wet due to a high water table. As indicated in Table 45 and on Map 31 (left), water and wetland areas in the Region

[8] *Classification of Wetlands in the United States, Special Scientific Report: Wildlife No. 20, Fish and Wildlife Service, 1953.*

Map 29

WOODLANDS IN THE REGION: 1970

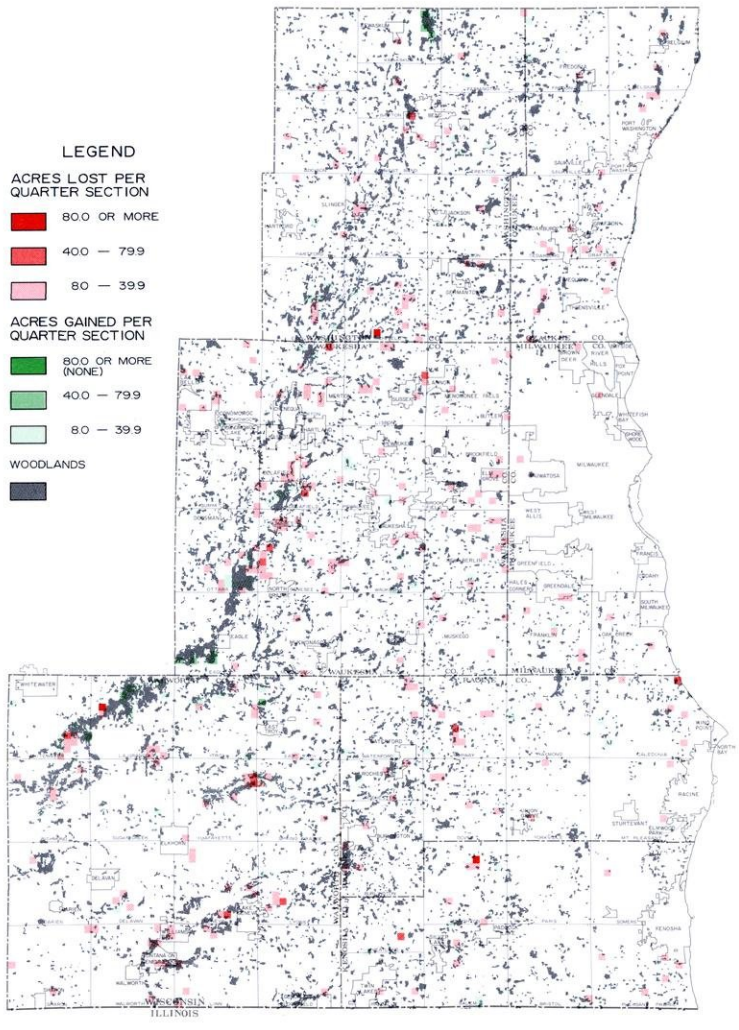


Woodlands currently occupy about 125,000 acres, or about 7 percent of the total land area of the Region. Woodlands have much value beyond monetary return for forest products. The maintenance of woodlands contributes to clean air and water and to the maintenance of a diversity of plant and animal life. Woodlands also provide an attractive natural resource of immeasurable value. Significant concentrations of woodlands are located in the Kettle Moraine State Forest and in several major stream valley areas in Walworth and Waukesha Counties. Together, these areas contain about 64,000 acres of woodland, representing slightly over one-half of the remaining woodlands in the Region.

Source: SEWRPC.

Map 30

CHANGE IN WOODLANDS IN THE REGION: 1963-1970



Between 1963 and 1970, there were both decreases in woodlands in certain areas of the Region, largely due to conversion of woodlands to intensive urban and agricultural land uses, as well as increases in woodlands in certain areas as a result of reforestation activity. The overall effect of these changes in woodlands between 1963 and 1970 was a net loss of about 5,100 acres, representing a decrease in the total amount of woodlands since 1963 of about 4 percent. As shown on the above map, there is a notable concentration of reforestation activities in the Kettle Moraine State Forest area. Woodland losses were greatest in Waukesha County, where nearly 1,900 acres were converted to intensive urban use.

Source: SEWRPC.

Table 45

SURFACE WATER AND WETLANDS IN THE REGION: 1963 and 1970

County	Surface Water and Wetlands					
	1963[a]		1970		Change: 1963-1970	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	19,584	10.7	19,445	10.8	- 139	- 0.7
Milwaukee	4,522	2.5	4,207	2.3	- 315	- 7.0
Ozaukee	15,083	8.3	14,879	8.2	- 204	- 1.4
Racine	17,218	9.4	17,712	9.8	494	2.9
Walworth	39,164	21.5	39,160	21.7	- 4	--[b]
Washington	36,032	19.7	35,638	19.7	- 394	- 1.1
Waukesha	50,871	27.9	49,789	27.5	- 1,082	- 2.1
Region	182,474	100.0	180,830	100.0	- 1,644	- 0.9

[a] *The 1963 water and wetland acreage data differ slightly from the data presented in SEWRPC Planning Report No. 7, The Land Use Transportation Study, Volume One, Inventory Findings, because the availability of more detailed information since 1963 permitted a refinement of water and wetland delineation for that year.*

[b] *Less than 0.1 percent.*

Source: SEWRPC.

in 1970 covered about 180,800 acres, or about 10 percent of the area of the Region, with over 124,500 acres, or 69 percent, being located in Walworth, Washington, and Waukesha Counties.

Of the total water and wetland category, only 48,000 acres, or 27 percent, actually consisted of surface water. The remaining 132,800 acres consisted of swamps, marshes, and other wetland areas. Large amounts of surface water areas are located in northwestern Waukesha County, southern Walworth County, and southwestern Kenosha County, while concentrations of wetland areas occur in the Cedarburg Bog in Ozaukee County, the Jackson and Theresa Marshes in Washington County, and the Menomonee Falls and Vernon Marshes in Waukesha County.

The extent of water and wetlands may change slightly in a given area over time as a result of drainage and landfill operations, as well as the construction of new impoundment areas. Furthermore, variations in precipitation may cause the boundaries of wetland areas to fluctuate from time to time. As a result of these phenomena, there was a net decrease of about 1,600 acres, or approximately 1 percent, in the water and wetlands category in the Region between 1963 and 1970.

As shown on Map 31 (right), both increases and decreases in water and wetland areas occurred in scattered fashion throughout the outlying areas of the Region. There was a net gain of almost 500 acres of water and wetland areas in Racine County between 1963 and 1970, while net decreases occurred in the other six counties, ranging from only four acres in Walworth County to over 1,000 acres in Waukesha County.

FISH AND WILDLIFE RESOURCES

Fish and wildlife are valuable assets to this Region's natural resource base. The variety and relative abundance of wildlife in the Region have provided numerous recreational pursuits and pleasures for fishermen, hunters, and nature enthusiasts. Fees collected as part of fish and game licenses have also contributed to the Region's economy. The remaining wildlife not only provide a valuable and much sought recreational resource, but also contribute both directly and indirectly to the regional economy of the Region.

Lake and Stream Fisheries

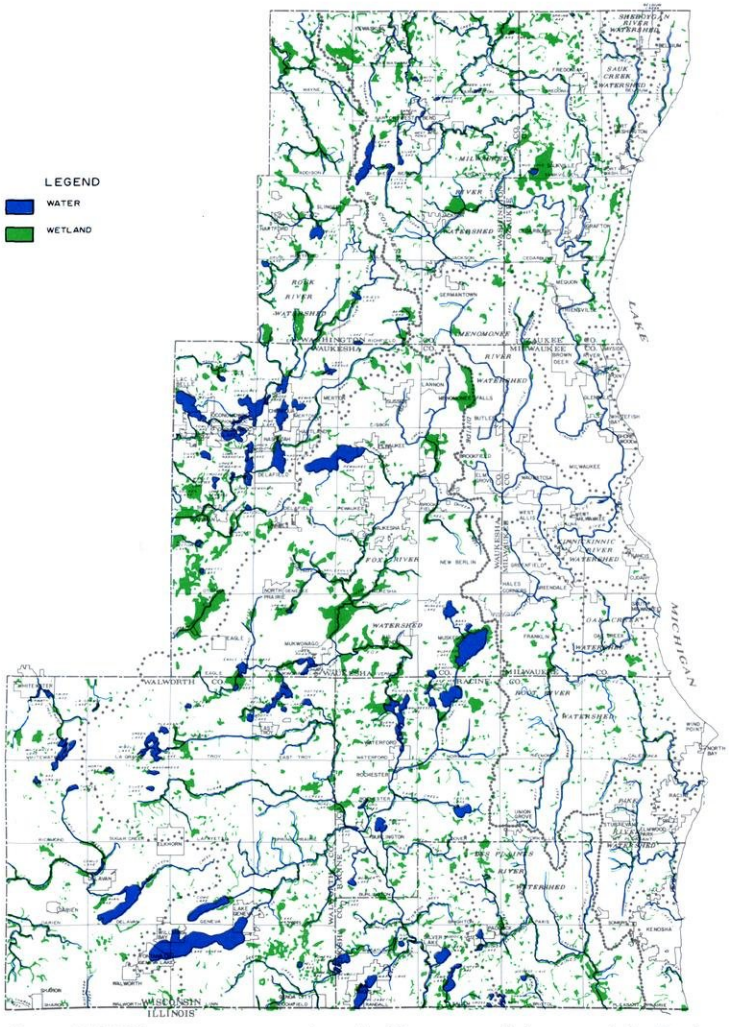
As noted earlier in this chapter, water quality data for 57 of the 100 major lakes in the Region was obtained under the Commission's Fox and Milwaukee River watershed studies. Only four of these 57 lakes were considered incapable of supporting significant populations of desirable fish under existing conditions. Assuming that the foregoing 57 lakes are representative of the 100 major lakes in the Region, it follows that most of the major lakes in southeastern Wisconsin are capable of supporting significant fish populations under existing conditions.

The earlier discussion of water quality in major lakes also noted, however, that 13 of the 57 major regional lakes were found to be in advanced stages of eutrophication as revealed by excessive phosphorus concentrations, low dissolved oxygen content, and excessive algae and aquatic weed growths. Thus, while most of the 100 major lakes in the Region are currently capable of supporting significant fish populations, a decline in water quality in general, and fishery suitability in particular, is occurring. This decline may be expected to continue in the absence of a sound

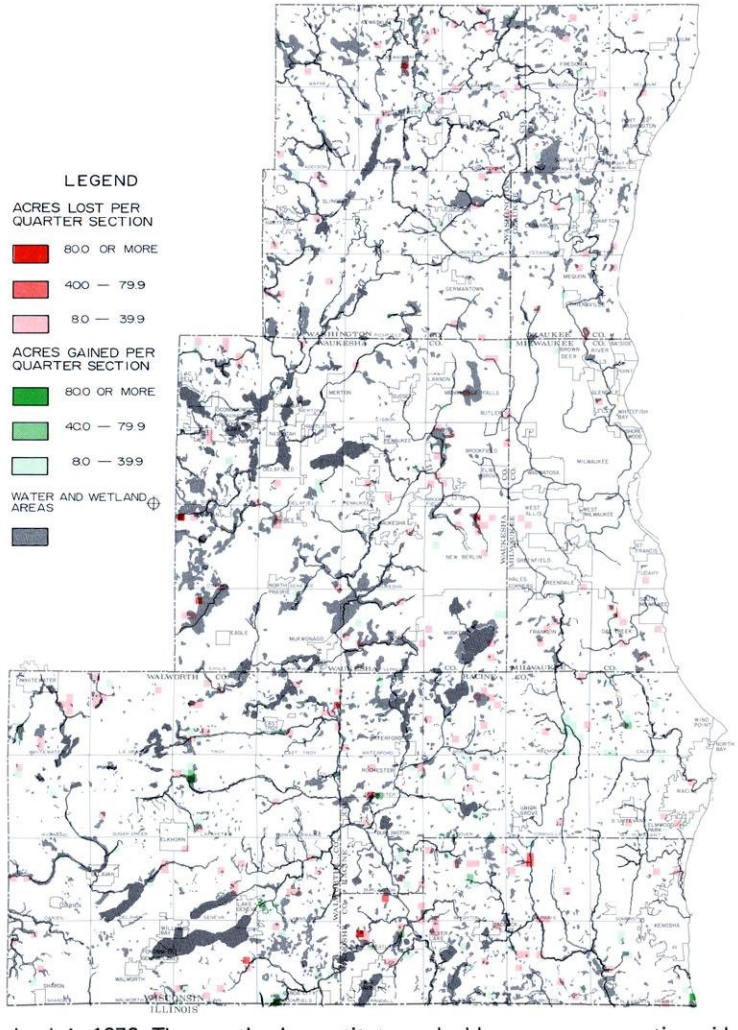
Map 31

EXISTING WATER AND WETLAND AREAS AND CHANGE IN WATER AND WETLAND AREAS IN THE REGION: 1963-1970

Existing Water and Wetland Areas: 1970



Change in Water and Wetland Areas: 1963-1970



About 180,800 acres, or approximately 10 percent of the area of the Region, was covered by water and wetlands in 1970. These wetlands constitute a valuable resource, supporting wide varieties of desirable forms of plant and animal life; assisting in reducing storm water runoff, stabilizing streamflows, and enhancing stream water quality by functioning as nutrient and sediment traps; and providing aesthetically pleasing vistas on the landscape. The extent of water and wetlands may change slightly over time as a result of drainage and landfill operations, as well as the construction of new impoundment areas. Furthermore, variations in precipitation may cause the boundaries of wetland areas to fluctuate. As a result of these changes, there was a net decrease of about 1,600 acres, or approximately 1 percent, in the water and wetland category in the Region between 1963 and 1970. As shown on the map at right, both increases and decreases in water and wetland areas occurred in scattered fashion throughout the Region. On a county basis, the most significant change occurred in Waukesha County, where there was a net loss of 1,000 acres of wetlands between 1963 and 1970.

Source: SEWRPC.

areawide water quality management plan and proper implementation of that plan.

Dominant fish species of lakes within the Region in order of importance to its fishery include bluegill, largemouth bass, northern pike, walleye, bullhead, black crappie, yellow perch, and carp. Other fish species existing in the lakes and streams, but of lesser importance to the fisherman, are pumpkinseed, warmouth, white sucker, and sunfish. Nearly every lake capable of supporting a fishery has a fish population comprised of northern pike, largemouth bass, bluegill, and bullhead. A few of the lakes, however, also support good walleye, muskellunge, cisco, and trout populations.

Lake fisheries are sustained primarily by natural spawning areas within the lakes. Presently, there are adequate shallow weedbed areas available for fish spawning within most major lakes. Other factors, however, such as deteriorating water quality, fluctuating water quality, and the lack of adequate boating regulations to protect spawning areas tend to limit the effectiveness of these areas for natural spawning. In many instances, therefore, lake fisheries must be sustained by fish stocking procedures.

Only limited quality stream fisheries are available within the Region. The Commission's Fox and Milwaukee River watershed studies, for example, found that stream fisheries were generally limited in that only some of the relatively large streams in these two watersheds are capable of supporting self-sustaining populations of walleye, smallmouth bass, northern pike, or panfish. Very few streams presently support trout populations. It is recognized that not every stream in the Region can, or should, be of such quality that it can support walleye, smallmouth bass, or trout. These species are, however, important indicators of environmental quality, and should be maintained or restored in selected streams throughout the area.

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.

Inventories of land and inland water in the Region known to be inhabited by various forms of wildlife were carried out cooperatively by the Wisconsin Department of Natural Resources and the Southeastern Wisconsin Regional Planning Commission in 1963 and 1970. As indicated in Table 46 and on Map 32, wildlife habitat areas in 1970 covered approximately 259,800 acres, or 15 percent of the total area of the Region. The overwhelming majority of this area, over 192,500 acres, or 74 percent, occurred in Walworth, Washington, and Waukesha Counties. It should be noted that over 77,900 acres, or 76 percent of the total high value wildlife habitat areas, and over 70,000 acres, or 75 percent of the total medium value wildlife habitat areas, occur in these counties as well.

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.

Wildlife habitat areas in 1963 covered 261,200 acres of the Region. This indicates a net loss of about 1,300 acres of wildlife habitat areas in the Region for the 1963 to 1970 period. The geographic distribution of losses in wildlife habitat areas during this period is shown on Map 33. While this loss of 1,300 acres of wildlife habitat may appear insignificant, further review of Table 46 indicates a decrease of over 3,000 acres, or about 3 percent, of high value wildlife habitat areas in the Region during this same period. Walworth County experienced a decrease of over 1,800 acres, or almost 7 percent, of its total high value wildlife habitat areas during this period. Kenosha County, with an increase of about 120 acres of high value wildlife habitat areas, is the only county to experience such an increase during this period.

The destruction of wildlife habitat areas is overwhelmingly a result of urbanization. While some wildlife habitat areas are lost due to widening or new construction of transportation facilities, most have been destroyed as a result of residential development. It would appear, then, that some high value wildlife habitat sites are high value sites for residential development as well.

Wildlife habitat must furnish food, cover, and protection. Consequently, areas of the Region having large proportions of forest, wetland, pasture land, and cropland and small proportions of land devoted to urban development have the largest areas and highest quality of the remaining wildlife habitat.

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 pasture lands, must be protected from mismanagement and continued urban encroachment.

PARKS, OUTDOOR RECREATION AREAS, AND RELATED OPEN SPACES

In an urbanizing region, open space 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 thereby to protect 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 water and groundwater quality and quantity. Open space may also be used to protect sites having scenic, historic, or scientific value.

Table 46

WILDLIFE HABITAT AREAS IN THE REGION BY VALUE RATING[a] AND COUNTY: 1963 and 1970

County	Value[a]	1963[b]		1970		Change: 1963-1970	
		Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	High	9,965	44.4	10,083	44.0	118	1.2
	Medium	6,285	28.0	6,136	26.8	- 149	- 2.4
	Low	6,189	27.6	6,683	29.2	494	8.0
	Total	22,439	100.0	22,902	100.0	463	2.1
Milwaukee	High	0	0.0	0	0.0	0	0.0
	Medium	1,251	66.6	1,225	68.9	- 26	- 2.1
	Low	626	33.4	553	31.1	- 73	- 11.7
	Total	1,877	100.0	1,778	100.0	- 99	- 5.3
Ozaukee	High	6,082	38.4	6,033	38.1	- 49	- 0.8
	Medium	8,422	58.1	8,310	52.4	- 112	- 1.3
	Low	1,341	8.5	1,512	9.5	171	12.8
	Total	15,845	100.0	15,855	100.0	10	0.1
Racine	High	9,044	23.8	8,945	33.4	- 99	- 1.1
	Medium	8,177	30.5	8,015	30.0	- 162	- 2.0
	Low	9,553	35.7	9,803	36.6	250	2.6
	Total	26,774	100.0	26,763	100.0	- 11	--[c]
Walworth	High	28,754	45.2	26,890	42.7	- 1,864	- 6.5
	Medium	20,272	31.9	20,775	32.9	503	2.5
	Low	14,593	22.9	15,368	24.4	775	5.3
	Total	63,619	100.0	63,033	100.0	- 586	- 0.9
Washington	High	19,844	38.3	19,340	37.2	- 504	- 2.5
	Medium	21,380	41.2	21,414	41.2	34	0.2
	Low	10,623	20.5	11,240	21.6	617	5.8
	Total	51,847	100.0	51,994	100.0	147	0.3
Waukesha	High	32,421	41.1	31,710	40.9	- 711	- 2.2
	Medium	28,809	36.6	28,255	36.5	- 554	- 1.9
	Low	17,559	22.3	17,542	22.6	- 17	- 0.1
	Total	78,789	100.0	77,507	100.0	- 1,282	- 1.6
Region	High	106,100	40.6	103,001	39.6	- 3,109	- 2.9
	Medium	94,596	36.2	94,130	36.3	- 466	- 0.5
	Low	60,484	23.2	62,701	24.1	2,217	3.7
	Total	261,190	100.0	259,832	100.0	- 1,358	- 0.5

[a] *High value wildlife habitat areas have a high diversity of species. The territorial requirements of the major species are met, in that minimum population levels are possible. The structure and composition of the vegetation provide for nesting, travel routes, concealment, and modification of weather impact. Also, such areas have experienced little or no disturbance as a result of man's activities and are located in close proximity to other wildlife habitat areas.*

Medium value wildlife habitat areas maintain all of the criteria described for a high value habitat, but at a lower level. The species diversity may not be as high as in the high value areas. The territorial requirements of the major species may not be adequately met, in that minimum population levels are not possible or are just barely met. The structure and composition of the vegetation may not adequately provide for nesting, travel routes, concealment, or modification of weather impact. The areas may have undergone disturbance as a result of man's activities, and also may not be located in close proximity to other wildlife habitat areas.

Low value wildlife habitat areas are of a supplemental or remnant nature. They are usually considerably disturbed but are included in the inventory since they provide the only available range in the vicinity, supplement areas of a higher quality, or they provide corridors linking higher habitat areas.

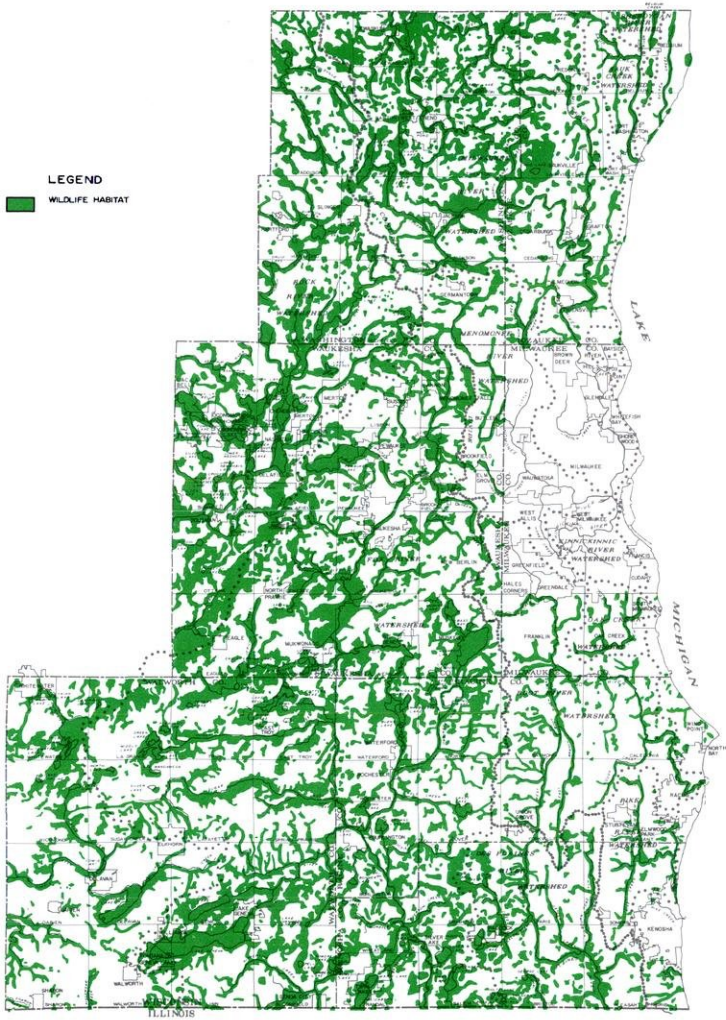
[b] *The 1963 wildlife habitat acreage data differ slightly from the data presented in SEWRPC Planning Report No. 7, The Land Use Transportation Study, Volume One, Inventory Findings, because the availability of more detailed information since 1963 permitted a refinement of the wildlife habitat delineation for that year.*

[c] *Less than 0.05 percent.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 32

WILDLIFE HABITAT IN THE REGION: 1970

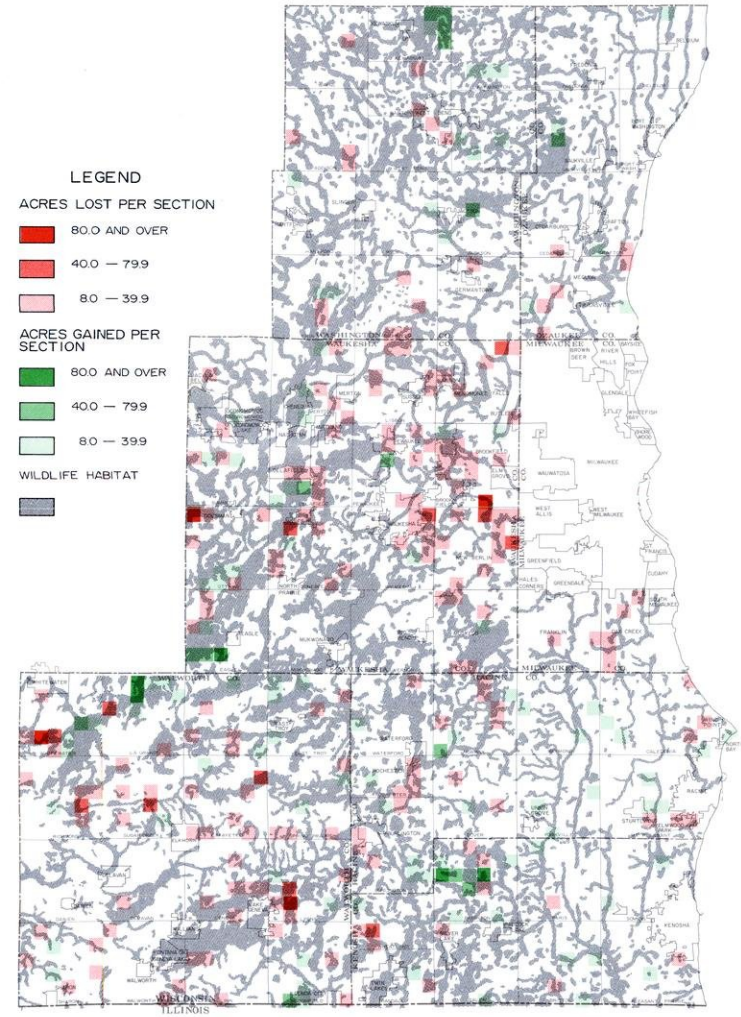


The remaining wildlife habitat areas and the wildlife therein provide an important recreational resource and constitute a valuable aesthetic asset of southeastern Wisconsin. As of 1970, approximately 260,000 acres, or 15 percent of the area of the Region, were identified as wildlife habitat.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 33

CHANGE IN WILDLIFE HABITAT AREAS IN THE REGION: 1963-1970



From 1963 to 1970 there was a net loss of about 1,300 acres of wildlife habitat in the Region. This loss represents about one-half of 1 percent of the approximately 261,000 acres of wildlife habitat that existed in the Region in 1963. The above map identifies those areas of the Region where wildlife habitat was destroyed by conversion to urban development during this period, as well as those areas where additional wildlife habitat areas were found in the 1970 inventory. The increases in wildlife habitat may be attributed to a number of reasons, including reforestation, impoundment and wetland creations, and the restoration of lands formerly used for agriculture to "natural" uses, including the establishment of wildlife cover. The most severe losses in the high value wildlife habitat areas during the 1963 to 1970 period occurred in Waukesha and Walworth Counties. Continued encroachment of incompatible rural as well as urban development into the remaining wildlife habitat areas of the Region will inevitably lead to a decline in wildlife population and contribute to the deterioration of the overall quality of life within the Region.

Source: SEWRPC.

Planning for the provision of the necessary open space in an urbanizing region requires definitive knowledge of the location and characteristics 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. Knowledge of these resources is essential and must constitute an input to the preparation of land use plans if such elements are to be protected from inadvertent destruction through poorly located urban development or transportation route location.

Woodlands, wetlands, and wildlife habitat areas were discussed in the three previous sections of this chapter. Attention in this section focused on existing park and recreation areas, potential park and related open space sites, and sites of historical significance. Inventories of existing park and recreation areas, potential park and related open space sites, and sites of historical significance were conducted by the Commission as part of the initial regional land use-transportation study in 1963. These inventories have since been updated as part of the Commission's regional park, outdoor recreation, and related open space planning program.

Existing Park, Outdoor Recreation, and Related Open Space Sites

The existing outdoor recreation sites inventory, conducted in 1973 as part of the Commission's regional park, outdoor recreation, and related open space planning program, revealed that there are 1,348 publicly and nonpublicly owned outdoor recreation sites in the Region, totaling 55,654 acres. In 1963, a similar inventory revealed 891 sites totaling 33,732 acres, consequently, there has been a significant increase in the total amount of recreation sites and acreage in the Region since 1963. The spatial distribution of the 1973 sites is shown on Map 34. The acreage and number of the 1963 and 1973 sites are shown by ownership status and by county in Table 47.

Publicly owned sites, in addition to providing recreational facilities, also permanently reserve lands for public use. The 787 publicly owned sites identified in 1973 totaled 29,140 acres. Almost half of the total sites are city-owned, and over two-thirds of the total acreage is county-owned. Milwaukee County alone owns 13,786 acres of park and related open space land, or about 47 percent of all publicly owned acreage in the Region.

Nonpublicly owned sites, though presently providing recreational facilities, are subject to conversion as urbanization continues, and cannot be relied upon as a permanent recreational resource. Of the 561 nonpublicly owned recreational sites, 24 percent are owned and operated by nonprofit organizations but are generally open to the public for a fee; 47 percent are commercial or privately owned and operated and open to the public for a fee; and 28 percent are private or privately owned and operated for members only, and therefore are not generally open to the public.

Not only has there been a significant increase in the number of park and outdoor recreation sites and acreage in the Region between 1963 and 1973, but, as shown in Table 48, there has also been a significant increase in the per capita acreage of recreational land during that period. All counties in the Region show an increase in acres of recreational land per 1,000 population, with both publicly and nonpublicly owned recreational acreage increasing by approximately 50 percent. The publicly owned recreational acres per 1,000 population range from 14 in the relatively urbanized counties of Racine and Milwaukee to 28 and 24 in Ozaukee and Washington Counties, respectively. Nonpublicly owned acres per 1,000 population range from two in Milwaukee County to 134 in Walworth County.

As indicated in Table 49, a comparison of 1963 and 1973 recreational sites and acreages shows that state ownership of acres of recreational land increased significantly during that period. This increase may be attributed in large part to the purchase of two multiuse recreational areas, Harrington Beach State Park in Ozaukee County and Pike Lake State Park in Washington County, as recommended in the adopted 1990 regional land use plan.

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 nearly 68 percent of the total number of county owned sites in the Region and 67 percent of the total county park area in the Region. The major parks are generally located along rivers and streams and the Lake Michigan shoreline. Many smaller recreation areas, however, are distributed throughout the various communities in the county in the form of neighborhood and community parks.

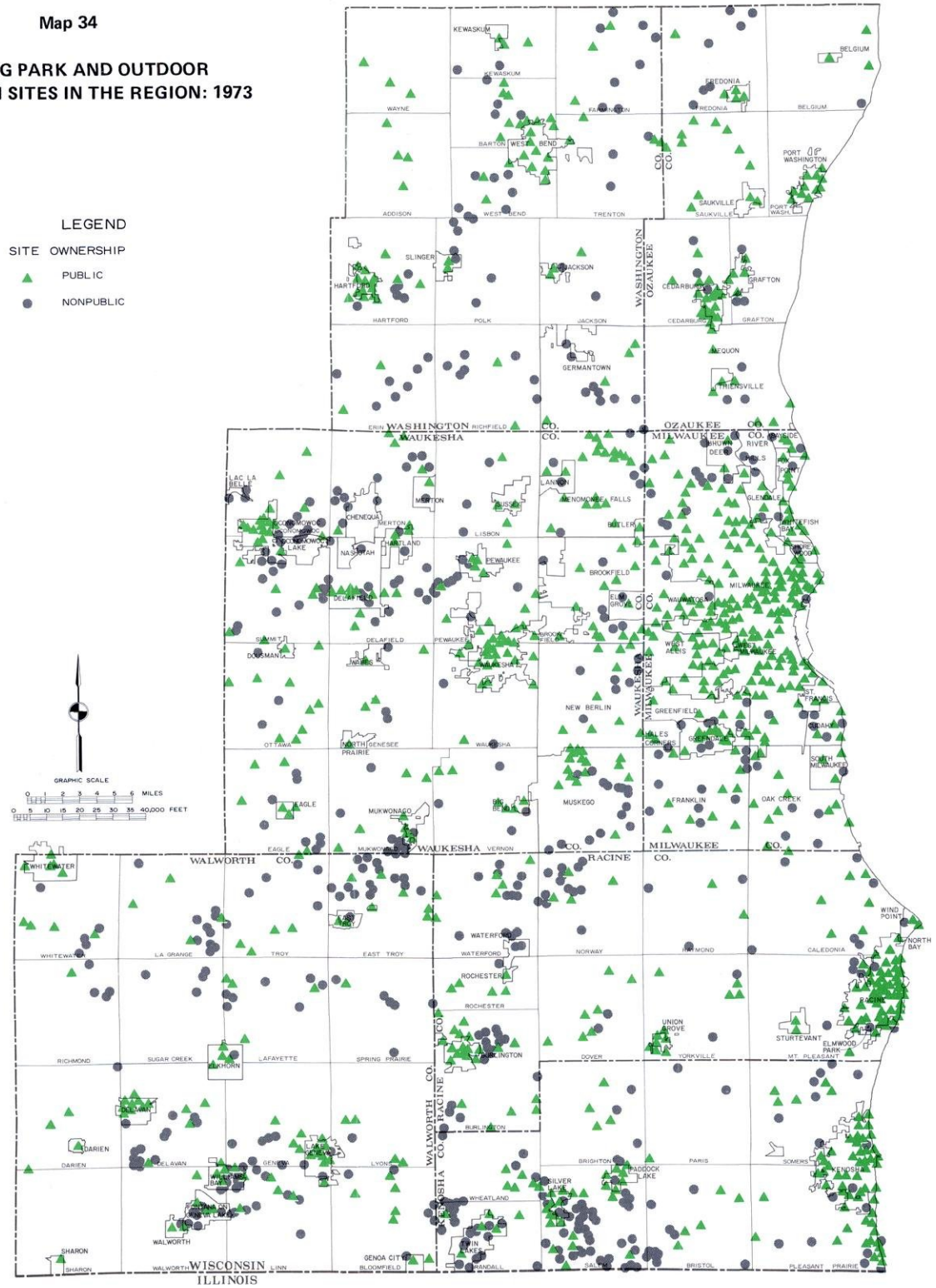
While Milwaukee County contains a high proportion of both the total county park sites and acreage within the Region, it contains only about 23 percent of the total number of recreation sites and only about 29 percent of the total acreage. These sites and acreage serve a county which contains almost 60 percent of the regional population, so that the ratio of total outdoor recreation area per 1,000 resident population is well below the regional average.

The remaining six counties of the Region combined contain about 77 percent of the total number of recreation sites within the Region and 71 percent of the total acreage. Most of the existing recreation sites outside of Milwaukee County and other urban areas are water oriented, with many of the nonpublicly owned sites being clustered along the shores of inland lakes and rivers. The Lake Michigan shoreline, with the exceptions of newly developing Harrington Beach State Park in Ozaukee County and Cliffside Park in Racine County, has not been utilized to any great extent for park and recreation purposes outside of the larger cities.

In addition to the recreational lands identified in the 1973 inventory, conservation lands, the primary function

Map 34

EXISTING PARK AND OUTDOOR RECREATION SITES IN THE REGION: 1973



Nearly 1,350 public and nonpublic park and outdoor recreation sites existed in the Region in 1970. Together these sites comprise a total area of nearly 56,000 acres. In 1963 there were about 890 such sites totaling about 34,000 acres. Thus, there has been a significant increase in the total amount of outdoor recreation sites and acreage within the Region over the period 1963 to 1973. There were about 790 publicly owned sites in 1970 totaling nearly 29,000 acres in area, representing about 58 percent of the total sites and 52 percent of the total acreage. Milwaukee County alone owns nearly 13,000 acres of park and related open space land, representing about 47 percent of all publicly owned park and outdoor recreation land in the Region.

Source: SEWRPC.

Table 47

EXISTING PARK AND OUTDOOR RECREATION SITES IN THE REGION BY COUNTY BY OWNERSHIP: 1963 and 1973

County	Year[a]		Public Ownership								Nonpublic Ownership					Total
			Federal	State	County	City	Village	Town	School District	Subtotal	Organizational	Commercial	Private	Other Nonpublic	Subtotal	
Kenosha	1963	Sites	0	0	4	27	15	13	0	59	10	21	4	0	35	94
		Acres	0	0	737	467	153	353	0	1,710	520	596	318	0	1,434	3,144
	1973	Sites	0	4	7	36	14	26	0	87	23	39	39	1	102	189
		Acres	0	169	1,302	569	37	154	0	2,231	900	1,463	895	1	3,259	5,490
Milwaukee	1963	Sites	0	3	89	74	15	0	13	194	5	12	14	0	31	225
		Acres	0	207	10,310	464	103	0	70	11,154	79	308	912	0	1,299	12,453
	1973	Sites	0	2	123	110	25	0	2	262	10	23	21	0	54	316
		Acres	0	214	13,786	497	198	0	12	14,707	101	307	1,299	0	1,707	16,414
Ozaukee	1963	Sites	0	3	6	9	11	1	0	30	4	7	2	0	13	43
		Acres	0	4	441	120	77	1	0	643	309	249	468	0	1,026	1,669
	1973	Sites	0	3	7	33	13	0	0	56	8	6	5	1	20	76
		Acres	0	636	657	318	91	0	0	1,702	421	280	857	1	1,559	3,261
Racine	1963	Sites	0	5	7	33	6	4	0	55	5	25	8	0	38	93
		Acres	0	9	160	454	18	46	0	687	220	1,114	455	0	1,789	2,476
	1973	Sites	0	6	17	64	10	3	0	100	13	30	22	1	66	166
		Acres	0	12	1,302	1,043	19	38	0	2,414	590	800	629	2	2,021	4,435
Walworth	1963	Sites	0	6	2	20	32	19	3	82	29	41	17	0	87	169
		Acres	0	275	105	122	106	226	9	843	2,323	1,328	768	0	4,419	5,262
	1973	Sites	0	9	6	25	17	13	1	71	29	60	30	0	119	190
		Acres	0	578	204	204	172	30	1	1,189	3,557	3,273	1,960	0	8,790	9,979
Washington	1963	Sites	0	3	0	11	6	6	0	26	14	22	3	0	39	65
		Acres	0	24	0	178	67	36	0	305	1,053	747	30	0	1,830	2,135
	1973	Sites	0	8	5	26	7	3	1	50	21	32	10	0	63	113
		Acres	0	709	482	413	74	9	29	1,716	2,218	1,539	546	0	4,303	6,019
Waukesha	1963	Sites	0	14	5	36	29	8	1	93	20	67	22	0	109	202
		Acres	0	401	1,137	400	312	45	3	2,298	738	2,163	1,394	0	4,295	6,593
	1973	Sites	0	12	17	77	41	12	2	161	32	76	28	1	137	298
		Acres	0	479	2,688	1,077	673	188	76	5,181	1,208	2,140	1,396	131	4,875	10,056
Region	1963	Sites	0	34	113	210	114	51	17	539	87	195	70	0	352	891
		Acres	0	920	12,890	2,205	836	707	82	17,640	5,242	6,505	4,345	0	16,092	33,732
	1973	Sites	0	44	182	371	127	57	6	787	136	266	155	4	561	1,348
		Acres	0	2,797	20,421	4,121	1,264	419	118	29,140	8,995	9,802	7,582	135	26,514	55,654

[a] *The 1963 park and outdoor recreation data differ from the data presented in SEWRPC Planning Report No. 7, The Land Use Transportation Study, Volume One, Inventory Findings, because of the availability of more detailed information since 1963 compiled as part of the Commission's regional park and open space planning program.*

Source: SEWRPC.

of which is the preservation of significant natural resource areas in the Region for conservation, wildlife management, scientific, or educational purposes, were also identified as part of the 1973 inventory. As shown in Table 50, 81 such sites totaling 39,822 acres existed in the Region in 1973. Of these, 55 sites totaling 37,528 acres were state owned, with the balance of the acreage being divided primarily among county-owned conservation lands, school related educational areas, and organizationally owned nature areas.

The 1973 inventory also identified all recreational areas related to school facilities. Sites in this category include all school properties with developed active recreational facilities, and acreage figures represent areas of land available for outdoor recreational activity on school property. As shown in Table 51, 787 school sites totaling 8,017 acres possess outdoor recreational facilities, with almost half of these sites being located in Milwaukee County.

Potential Parks and Related Open Space Sites

The original potential park and related open space inventory was conducted by the Commission in 1963 as part of its initial land use and transportation planning program. The findings were reported in SEWRPC Technical Report No. 1, Potential Parks and Related Open Spaces. Fourteen broad recreational resource areas and 606 specific potential park and related open space sites were identified

Table 48

ACRES OF EXISTING PARK AND OUTDOOR RECREATION LAND
PER THOUSAND POPULATION IN THE REGION BY COUNTY: 1963 and 1973

County	Year	Public			Nonpublic			Total		
		Sites	Acres	Acres/1,000 Population	Sites	Acres	Acres/1,000 Population	Sites	Acres	Acres/1,000 Population
Kenosha	1963	59	1,710	16	35	1,434	13	94	3,144	29
	1973	87	2,231	18	102	3,259	27	189	5,490	45
Milwaukee	1963	194	11,154	10	31	1,299	1	225	12,453	11
	1973	262	14,707	14	54	1,707	2	316	16,414	16
Ozaukee	1963	30	643	15	13	1,026	25	43	1,669	40
	1973	56	1,702	28	20	1,559	26	76	3,261	54
Racine	1963	55	687	5	38	1,789	12	93	2,476	17
	1973	100	2,414	14	66	2,021	11	166	4,435	25
Walworth	1963	82	843	15	87	4,419	80	169	5,262	95
	1973	71	1,189	18	119	8,790	134	190	9,979	152
Washington	1963	26	305	6	39	1,830	37	65	2,135	43
	1973	50	1,716	24	63	4,303	61	113	6,019	85
Waukesha	1963	93	2,298	12	109	4,295	23	202	6,593	35
	1973	161	5,181	21	137	4,875	20	298	10,056	41
Region	1963	539	17,640	10	352	16,092	10	891	33,732	20
	1973	787	29,140	16	561	26,514	15	1,348	55,654	31

Source: SEWRPC.

within the Region as a part of this inventory. In 1968, as part of the Commission's continuing land use-transportation study, an additional 58 sites were added, bringing the total number of potential park and related open space sites in the Region at that time to 664.

The Commission has, as part of its regional park, outdoor recreation, and related open space planning program, reevaluated all 664 sites identified in the 1963 and 1968 potential park sites inventory utilizing 1970 aerial photos at a scale of 1" = 400' as source material. The 1970 aerial photographs were examined to monitor changes in land use which have occurred within and adjacent to each site since the 1963 and 1968 inventories. The purpose of the potential park and related open space reevaluation was twofold: 1) to identify those potential park and open space sites which either in part or total had actually been converted to recreation areas from 1963 to 1970; and 2) to identify those potential park and open space sites which either in part or total had been lost due to urban encroachment during the same period.

In any consideration of the changes which have occurred in the character of the potential park and related open space sites, it is important to note that these sites were originally identified as potential park and related open space sites. This identification was intended to assist the federal, state, and local units and agencies of government concerned in the preparation, adoption, and implementation of parkland acquisition and development plans and programs. The identification was also intended to assist in the preservation of the potential sites until the best use of each site could be determined within the framework of local planning programs. It was not proposed that all 664 potential sites, which have a combined area of over 100,000 acres, be converted to park or open space use. Indeed, the adopted regional land use plan recommended an incremental addition of only 8,700 acres of new public recreation lands by the year 1990, 5,900 acres of which were proposed to be acquired by the year 1970.

It is apparent, then, that based upon the objectives and standards incorporated in the adopted regional land use plan, only a relatively small percentage of identified potential park and open space areas are actually needed for public recreation use. It should be noted, however, that while all potential park and related open space sites may not be required as public recreation areas, such sites must also serve as the reservoir for future private recreation development within the Region, and therefore

Table 49

PERCENTAGE DISTRIBUTION OF EXISTING PARK AND OUTDOOR RECREATION SITES AND ACREAGE IN THE REGION BY OWNERSHIP: 1963 and 1973

Ownership		Year	Number of		Percent of Public		Percent of Nonpublic		Percent of Total	
			Sites	Acres	Sites	Acreage	Sites	Acreage	Sites	Acreage
PUBLIC	State	1963	34	920	6.3	5.2	--	--	3.8	2.7
		1973	44	2,797	5.6	9.6	--	--	3.3	5.0
	County	1963	113	12,890	20.9	73.1	--	--	12.7	38.2
		1973	182	20,421	23.1	70.1	--	--	13.5	36.7
	City	1963	210	2,205	38.9	12.5	--	--	23.6	6.6
		1973	371	4,121	47.2	14.2	--	--	27.5	7.4
	Village	1963	114	836	21.2	4.7	--	--	12.8	2.5
		1973	127	1,264	16.1	4.3	--	--	9.4	2.3
	Town	1963	51	707	9.5	4.0	--	--	5.7	2.1
		1973	57	419	7.2	1.4	--	--	4.2	0.8
	School District	1963	17	82	3.2	0.5	--	--	1.9	0.2
		1973	6	118	0.8	0.4	--	--	0.5	0.2
	Subtotal	1963	539	17,640	100.0	100.0	--	--	60.5	52.3
		1973	787	29,140	100.0	100.0	--	--	58.4	52.4
NONPUBLIC	Organizational	1963	87	5,242	--	--	24.7	32.6	9.8	15.5
		1973	136	8,995	--	--	24.3	33.9	10.1	16.2
	Commercial	1963	195	6,505	--	--	55.4	40.4	21.9	19.3
		1973	266	9,802	--	--	47.4	37.0	19.7	17.6
	Private	1963	70	4,345	--	--	19.9	27.0	7.8	12.9
		1973	155	7,582	--	--	27.6	28.6	11.5	13.6
	Other Nonpublic	1963	0	0	--	--	0.0	0.0	0.0	0.0
		1973	4	135	--	--	0.7	0.5	0.3	0.2
	Subtotal	1963	352	16,092	--	--	100.0	100.0	39.5	47.7
		1973	561	26,514	--	--	100.0	100.0	41.6	47.6
Total		1963	891	33,732	--	--	--	--	100.0	100.0
		1973	1,348	55,654	--	--	--	--	100.0	100.0

Source: SEWRPC.

remain a valuable part of the Region's natural resource base. In this respect, indiscriminate urban encroachment into these sites should be discouraged until the proper use of the sites can be determined on the basis of more detailed local planning programs.

A summary of the findings of the potential park and related open space reevaluation is presented in Table 52 and on Map 35. As of April 1970, 32 of the 664 potential park and related open space sites in the Region had been converted to recreational use in their entirety. In addition, portions of another 96 potential park sites had been converted to recreation use as well. A total, then, of all or portions of 128 potential park sites comprising over 9,700 acres, or more than 9 percent of the 102,200 acres of potential park sites, were in park or recreation use as of 1970. In this respect, it is important to note that of the eight potential parks sites considered in 1963 to be of state significance, six were recommended for acquisition as regional park sites in the adopted regional land use plan. As of 1973, all or portions of four of these sites, namely, Harrington Beach in Ozaukee County, Pike Lake

Table 50

CONSERVATION LANDS IN THE REGION BY COUNTY BY OWNERSHIP: 1973

County	Element	Public								Nonpublic					Total
		Federal	State	County	City	Village	Town	School District	Subtotal	Organizational	Commercial	Private	Other Nonpublic	Subtotal	
Kenosha	Sites	0	10	0	0	1	0	2	13	2	0	0	0	2	15
	Acres	0	6,324	0	0	5	0	256	6,585	217	0	0	0	217	6,802
Milwaukee	Sites	1	0	0	0	1	0	0	2	1	0	0	0	1	3
	Acres	39	0	0	0	19	0	0	58	164	0	0	0	164	222
Ozaukee	Sites	0	4	0	0	0	0	0	4	1	0	0	0	1	5
	Acres	0	1,534	0	0	0	0	0	1,534	249	0	0	0	249	1,783
Racine	Sites	0	9	3	2	0	0	2	16	0	0	0	0	0	16
	Acres	0	2,831	288	91	0	0	316	3,526	0	0	0	0	0	3,526
Walworth	Sites	0	18	0	0	0	0	0	18	0	0	0	0	0	18
	Acres	0	7,163	0	0	0	0	0	7,163	0	0	0	0	0	7,163
Washington	Sites	0	5	0	0	1	0	1	7	0	0	0	0	0	7
	Acres	0	7,507	0	0	121	0	13	7,641	0	0	0	0	0	7,641
Waukesha	Sites	0	9	2	1	2	0	2	16	1	0	0	0	1	17
	Acres	0	12,169	130	172	88	0	61	12,620	64	0	0	0	64	12,684
Region	Sites	1	55	5	3	5	0	7	76	5	0	0	0	5	81
	Acres	39	37,528	418	263	233	0	646	39,127	694	0	0	0	694	39,821

Source: SEWRPC.

Table 51

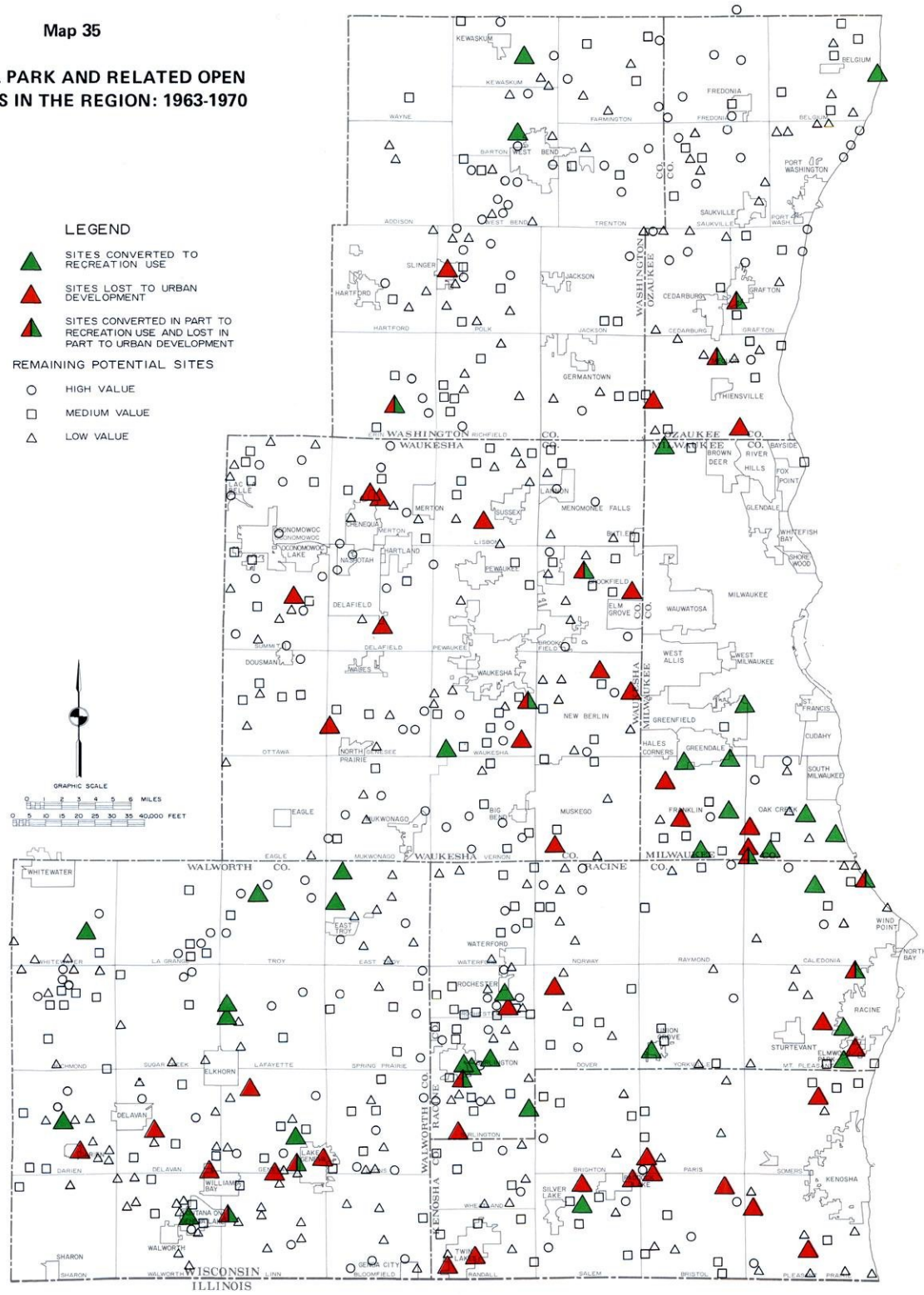
SCHOOL RECREATIONAL SITES IN THE REGION BY COUNTY BY OWNERSHIP: 1973

County	Element	Public								Nonpublic					Total
		Federal	State	County	City	Village	Town	School District	Subtotal	Organizational	Commercial	Private	Other Nonpublic	Subtotal	
Kenosha	Sites	0	1	0	0	0	0	43	44	17	0	0	0	17	61
	Acres	0	747	0	0	0	0	321	1,068	157	0	0	0	157	1,225
Milwaukee	Sites	0	1	0	0	0	0	255	256	109	0	3	0	112	368
	Acres	0	25	0	0	0	0	1,588	1,613	558	0	65	0	623	2,236
Ozaukee	Sites	0	0	0	0	0	0	23	23	11	0	0	0	11	34
	Acres	0	0	0	0	0	0	285	285	43	0	0	0	43	328
Racine	Sites	0	0	1	0	0	0	51	52	24	0	0	0	24	76
	Acres	0	0	1	0	0	0	369	370	133	0	0	0	133	503
Walworth	Sites	0	0	0	0	0	0	36	36	7	0	1	3	11	47
	Acres	0	0	0	0	0	0	411	411	224	0	70	174	468	879
Washington	Sites	0	1	0	0	0	0	33	34	14	0	0	0	14	48
	Acres	0	30	0	0	0	0	342	372	49	0	0	0	49	421
Waukesha	Sites	0	1	0	1	0	0	112	114	38	0	1	0	39	153
	Acres	0	61	0	14	0	0	1,167	1,242	1,181	0	2	0	1,183	2,425
Region	Sites	0	4	1	1	0	0	553	559	220	0	5	3	228	787
	Acres	0	863	1	14	0	0	4,483	5,361	2,345	0	137	174	2,656	8,017

Source: SEWRPC.

Map 35

POTENTIAL PARK AND RELATED OPEN SPACE SITES IN THE REGION: 1963-1970



As shown on the above map, 32 of the 664 potential park sites, totaling about 3,900 acres, identified by the Commission in the initial regional land use-transportation study effort have been converted to park and outdoor recreation use. A total of 10 sites, totaling about 1,970 acres, have been converted in part to park and outdoor recreation use and in part to other urban land uses. Another 39 sites, totaling about 3,160 acres, have been wholly lost to urban development. A total of 583 potential park and open space sites remain available in the Region, of which 162 are high value sites, 202 are medium value sites, and 219 are low value sites.

Source: SEWRPC.

Table 52

POTENTIAL PARKS AND RELATED OPEN SPACE SITES REEVALUATION BY COUNTY: 1963-1970

County	Site Value[a]	Original Sites		Site Change to Recreation Use													
				Total Site to Recreation Use				Partial Site to Recreation Use				Acres to Recreation Use				Total Acres to Recreation Use	
				Public		Private		Public		Private		Public		Private			
		Number	Acres	Number	Acres	Number	Acres	Number	Acres	Number	Acres	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	High	14	2,506	1	286	0	0	0	0	0	0	286	100.0	0	0.0	286	11.4
	Medium	25	2,717	0	0	0	0	1	27	2	77	27	26.0	77	74.0	104	3.8
	Low	28	3,051	0	0	0	0	1	45	2	125	45	26.5	125	73.5	170	5.6
	Total	67	8,273	1	286	0	0	2	72	4	202	358	63.9	202	36.1	560	6.8
Milwaukee	High	11	2,756	3	590	0	0	4	902	1	66	1,492	95.8	66	4.2	1,558	56.5
	Medium	11	1,410	3	340	1	52	3	34	0	0	374	87.8	52	12.2	426	30.2
	Low	7	548	2	253	0	0	1	143	0	0	396	100.0	0	0.0	396	72.3
	Total	29	4,715	8	1,183	1	52	8	1,079	1	66	2,262	95.0	118	5.0	2,380	50.5
Ozaukee	High	26	4,595	1	262	0	0	2	50	6	247	312	55.8	247	44.2	559	12.2
	Medium	16	3,023	0	0	0	0	0	0	1	173	0	0.0	173	100.0	173	5.7
	Low	23	1,652	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0	0.0
	Total	65	9,269	1	262	0	0	2	50	7	420	312	42.6	420	57.3	732	7.9
Racine	High	28	5,455	2	78	0	0	6	602	0	0	680	100.0	0	0.0	680	12.5
	Medium	40	4,547	6	594	0	0	1	1	0	0	595	100.0	0	0.0	595	13.1
	Low	35	2,926	1	78	0	0	0	0	0	0	78	100.0	0	0.0	78	2.7
	Total	103	12,929	9	750	0	0	7	603	0	0	1,353	100.0	0	0.0	1,353	10.5
Walworth	High	49	14,964	1	311	2	267	13	580	12	601	891	50.7	868	49.3	1,759	11.8
	Medium	45	5,504	2	138	1	149	0	0	3	118	138	34.0	267	66.0	405	7.4
	Low	67	4,447	0	0	3	160	4	129	2	187	129	27.1	347	72.9	476	10.7
	Total	161	24,914	3	449	6	576	17	709	17	906	1,158	43.9	1,482	56.1	2,640	10.6
Washington	High	34	8,246	0	0	1	67	6	836	2	224	836	74.2	291	25.8	1,127	13.7
	Medium	24	2,794	1	203	0	0	1	1	1	80	204	71.8	80	28.2	284	10.2
	Low	30	3,621	0	0	0	0	0	0	4	144	0	0.0	144	100.0	144	4.0
	Total	88	14,661	1	203	1	67	7	837	7	448	1,040	66.9	515	33.1	1,555	10.6
Waukesha	High	50	12,732	1	85	0	0	3	97	5	105	182	63.4	105	36.6	287	2.3
	Medium	52	7,677	0	0	0	0	4	121	0	0	121	100.0	0	0.0	121	1.6
	Low	49	7,039	0	0	0	0	2	45	3	87	45	34.1	87	65.9	132	1.9
	Total	151	27,448	1	85	0	0	9	263	8	192	340	64.4	192	35.6	540	2.0
Region	High	212	51,253	9	1,612	3	334	34	3,067	26	1,243	4,679	74.8	1,577	25.2	6,256	12.2
	Medium	213	27,672	12	1,275	2	201	10	184	7	448	1,459	69.2	649	30.8	2,108	7.6
	Low	239	23,284	3	331	3	160	8	362	11	543	693	49.6	703	50.4	1,396	6.0
	Total	664	102,209	24	3,218	8	695	52	3,613	44	2,234	6,831	70.0	2,929	30.0	9,760	9.5

in Washington County, Monches in Waukesha County, and Cliffside in Racine County, had been acquired for public use. No action has yet been taken on the proposed Paradise Valley site in Washington County or the Sugar Creek site in Walworth County.

From 1960 to 1970, 39 sites totaling over 3,000 acres, and portions of an additional 249 sites totaling almost 4,400 acres, were lost as potential park and related open space areas due to urban encroachment. In addition, because of land use or resource changes which occurred within or adjacent to the site since the original inventory period, several high and medium value sites were lowered in value, resulting in a loss of 25 high value sites and a net increase of 22 medium and three low value sites. A total of 583 potential park and related open space areas totaling over 82,000 acres, or more than 80 percent of the original potential park and related open space acreage identified in 1963 and 1968, remained in 1970.

Table 52 indicates that of the 9,760 acres of potential park sites which were actually converted to recreational use, over 6,800 acres, or 70 percent, were converted to public recreation use, and over 2,900 acres, or 30 percent,

Table 52 (continued)

County	Site Value[a]	Original Sites		Site Loss to Urban Development						Site Value Change		Remaining Sites		
				Total Site to Urban Development		Partial Site to Urban Development		Total Acres to Urban Development						
		Number	Acres	Number	Acres	Number	Acres	Acres	Percent	Number	Acres	Number	Acres	Percent
Kenosha	High	14	2,506	2	268	5	17	285	11.4	- 2	- 101	9	1,833	73.1
	Medium	25	2,717	2	104	11	185	289	10.6	2	101	25	2,427	89.3
	Low	28	3,051	6	206	13	142	348	11.4	0	0	22	2,532	83.0
	Total	67	8,273	10	578	29	344	922	11.1	--	--	56	6,792	82.1
Milwaukee	High	11	2,756	1	164	3	5	169	6.1	- 3	- 449	3	556	20.2
	Medium	11	1,410	2	152	1	4	156	11.1	3	449	8	1,278	90.6
	Low	7	548	1	52	0	0	52	9.5	0	0	4	100	18.2
	Total	29	4,715	4	367	4	9	376	8.0	--	--	15	1,934	41.0
Ozaukee	High	26	4,595	0	0	17	345	345	7.5	- 3	- 180	20	3,510	76.4
	Medium	16	3,023	1	225	8	107	332	11.0	3	180	18	2,699	89.3
	Low	23	1,652	1	51	2	7	58	3.5	0	0	22	1,595	96.5
	Total	65	9,269	2	276	27	459	735	7.9	--	--	60	7,804	84.2
Racine	High	28	5,455	1	62	13	188	250	4.6	- 4	- 466	20	4,040	74.1
	Medium	40	4,547	3	219	14	306	525	11.5	3	357	33	3,461	76.1
	Low	35	2,926	1	39	10	168	207	7.1	1	109	34	2,753	94.4
	Total	103	12,929	5	320	37	662	982	7.6	--	--	87	10,254	79.3
Walworth	High	49	14,964	2	306	21	385	691	4.6	- 5	- 977	38	11,484	76.7
	Medium	45	5,504	2	58	17	74	132	2.4	4	948	44	5,902	107.2
	Low	67	4,447	2	46	20	824	870	19.6	1	29	62	3,108	69.9
	Total	161	24,914	6	410	58	1,283	1,693	6.8	--	--	144	20,494	82.3
Washington	High	34	8,246	0	0	15	231	231	2.8	- 2	- 771	31	6,025	73.1
	Medium	24	2,794	0	0	7	58	58	2.1	1	75	24	2,527	90.4
	Low	30	3,621	1	41	10	155	196	5.4	1	696	29	3,933	108.6
	Total	88	14,661	1	41	32	444	485	3.3	--	--	84	12,485	85.2
Waukesha	High	50	12,732	2	137	22	461	598	4.7	- 6	- 1,404	41	8,145	64.0
	Medium	52	7,677	4	500	23	452	952	12.4	6	1,404	50	7,829	102.0
	Low	49	7,039	5	534	17	257	791	11.2	0	0	46	6,327	89.9
	Total	151	27,448	1	1,171	62	1,170	2,341	8.5	--	--	137	22,301	87.2
Region	High	212	51,253	8	937	96	1,632	2,569	5.0	- 25	- 4,348	162	35,593	69.4
	Medium	213	27,672	14	1,258	81	1,186	2,444	8.8	22	3,514	202	26,123	94.4
	Low	239	23,284	17	970	72	1,553	2,523	10.8	3	834	219	20,348	87.4
	Total	664	102,209	39	3,164	249	4,371	7,535	7.4	--	--	583	82,064	80.3

[a] *Potential park sites were evaluated and assigned a high, medium, or low value classification based upon a review of the following criteria: location, existing land use, size, key attraction, accessibility, soils, water use, beach use, type of forest cover, topography and drainage, development possibilities, expansion possibilities, and favorable or unfavorable exposure.*

High value sites are those which ranked highest when evaluated against the foregoing criteria. They possessed the most favorable development potential for the type of development recommended and revealed no serious development limitations.

Medium value sites are those which ranked lower than the high value sites because they possessed certain minor development limitations but could take on added value if demand for park sites within the Region increases.

Low value sites are those which ranked lowest when evaluated against the foregoing criteria. They possessed major development limitations, and therefore have relatively poor potential for development as park sites without major modifications.

Source: SEWRPC.

were converted to private recreation use. This is especially noteworthy since the adopted land use plan recommended that just under 6,000 acres of new public recreation areas be acquired by 1970. Over 2,250 acres, or 33 percent of the 6,800 acres of potential park sites converted to public recreation use, were so converted in Milwaukee County. These 2,250 acres represent almost 48 percent of all potential park acreage in Milwaukee County and 95 percent of the potential park acreage converted to recreation use in Milwaukee County from 1963 to 1970. Significant amounts of public recreation acreage were also acquired in Racine County (1,350 acres), Walworth County (1,150 acres), and Washington County (1,050 acres).

The majority of the conversion of potential park sites to private recreational use, almost 1,500 acres or half of the total of 3,000 acres, occurred in Walworth County. Including the 1,150 acres of potential park acreage which were converted to public use, Walworth County had over 2,600 acres of potential park sites placed in recreational use in the 1963 to 1970 period, the largest of any county in the Region.

Relatively small amounts of potential park acreage were converted to recreational use from 1963 to 1970 in Kenosha County (560 acres) and Waukesha County (540 acres).[9] The 560 acres in Kenosha County represent about 7 percent of the total potential park acreage in the county, while the 540 acres in Waukesha County represent only 2 percent of the potential park acreage in that county.

It is interesting to note that Waukesha County, with 2,350 acres, also has the largest quantity of potential park acreage lost to urban development, while Kenosha County, with over 900 acres, or 11 percent of its potential park acreage lost to urban development, represents the highest percentage of potential park acreage lost to urban development in the 1963 to 1970 period.

As of 1970, Waukesha County, with 137 potential park sites totaling over 22,000 acres, and Walworth County, with 144 potential park sites totaling over 20,000 acres, together accounted for 281 or 48 percent of the 583 remaining potential park sites and almost 43,000 acres or 52 percent of the remaining potential park and related open space acreage in the Region. While the conversion of 9,760 acres of potential park site acreage to actual recreational use is significant and indicates that much has been accomplished in the way of providing additional public and private recreation areas in the Region, it is also apparent that over 7,500 acres of potential park acreage have been lost to urban development. Even though all potential park site acreage is not required to meet the recreational needs of the Region to the design year of the plan, such sites must serve the Region, in effect, for all time. Consequently, the remaining potential park and related open space sites should be preserved from incompatible land use development until the best use of these lands can be determined through sound local planning programs.

Historic Sites

To indicate the need for, and progress of, preservation of the Region's historic sites, which are an irreplaceable part of the Region's natural and cultural heritage, inventories of sites of historic significance were conducted in 1963 in conjunction with the preparation of the initial regional land use-transportation plan and in 1973 in conjunction with the Commission's regional park, outdoor recreation, and related open space planning program.

As shown in Table 53, the 1973 inventory identified 781 sites of historic significance within the Region, including 235 cultural features, 85 natural features, and 461 structures. Seventy-five percent, or 69 of the 93 marked historic cultural feature sites, are located in Milwaukee, Racine, and Waukesha Counties. Most of the cultural features within the Region are sites of Indian or early white settlements or are closely related to such settlements, and include old plank roads, early trails, and burial grounds and cemeteries. Natural feature historic sites consist primarily of wetland and woodland areas, with only seven, or 8 percent, of the 85 identified natural feature sites being marked. A total of 461, or 59 percent, of all the identified historic sites are structures, the majority of which are generally located in the urbanized areas of the Region, particularly in Milwaukee County. Indeed, 49, or 56 percent, of the 87 marked structure sites are located in Milwaukee County. Historic homes, churches, inns, and schools predominate in this category, which also includes government buildings, mills, and museums. Map 36 shows the spatial distribution of the cultural, natural, and structural sites of historic significance identified in the 1973 inventory.

The findings of the 1973 historic sites inventory paralleled those of the 1963 inventory with regard to types and locations of sites. The 1973 inventory also revealed that the Region experienced a loss of historic sites from 1963 to 1973, especially in urban and urbanizing areas. Map 37 shows that nine of the 56 sites identified as marked[10] in 1963 have been destroyed, generally as a result of changes in land use due to urban renewal and suburban sprawl.

In summary, as urbanization continues, many historic sites which provide distinct authentic links to the past will continue to be threatened by destruction, and once destroyed, they cannot be replaced. Plans for future land

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[9] *Between 1970 and 1973, Kenosha and Waukesha County each acquired a large acreage park site located in a high value potential park site. Bristol Woods County Park in Kenosha County (189 acres) and Nashotah County Park in Waukesha County (437 acres) add significant acreage to those two counties, which had converted relatively small amounts of potential park acreage to recreation use in the 1963-1970 period.*

[10] *In the 1963 inventory, the marked sites were sites identified by each county historical society as those being officially recognized and marked in some manner.*

Table 53

HISTORIC SITES IN THE REGION BY TYPE OF SITE BY COUNTY: 1973

Type of Site[a]	Kenosha	Milwaukee	Ozaukee	Racine	Walworth	Washington	Waukesha	Region
Cultural Features								
Marked	6	23	3	22	9	6	24	93
Unmarked	11	10	19	1	11	19	71	142
Subtotal	17	33	22	23	20	25	95	235
Natural Features								
Marked	0	2	0	0	1	1	3	7
Unmarked	13	0	3	19	25	6	12	78
Subtotal	13	2	3	19	26	7	15	85
Structures								
Marked	3	49	5	4	5	3	18	87
Unmarked	40	71	49	55	42	33	84	374
Subtotal	43	120	54	59	47	36	102	461
Total Sites								
Marked	9	74	8	26	15	10	45	187
Unmarked	64	81	71	75	78	58	167	594
Total	73	155	79	101	93	68	212	781

[a] *Marked sites are those which have been officially recognized and marked in some manner by historical groups or local, county, or state historical societies. Unmarked sites are those which: a) are being considered for marking by historical societies or groups or b) are identified as having historical significance by historical societies or groups but are not yet being considered for marking.*

Source: SEWRPC.

development in this Region must, therefore, be cognizant of sites of historical significance if these sites and the historic heritage of the Region which they represent are to be preserved.

ENVIRONMENTAL CORRIDORS

The Corridor Concept

One of the most important tasks completed under the initial regional land use planning effort was the identification and delineation of those areas in the Region in which concentrations of natural resource and natural resource related elements occur. It was recognized that preservation of the natural resource and natural resource related elements, especially where these elements are concentrated in identifiable geographic areas, was essential both to the maintenance of the overall environmental quality of the Region as well as to the continued provision of amenities required to maintain the quality of life for the resident population.

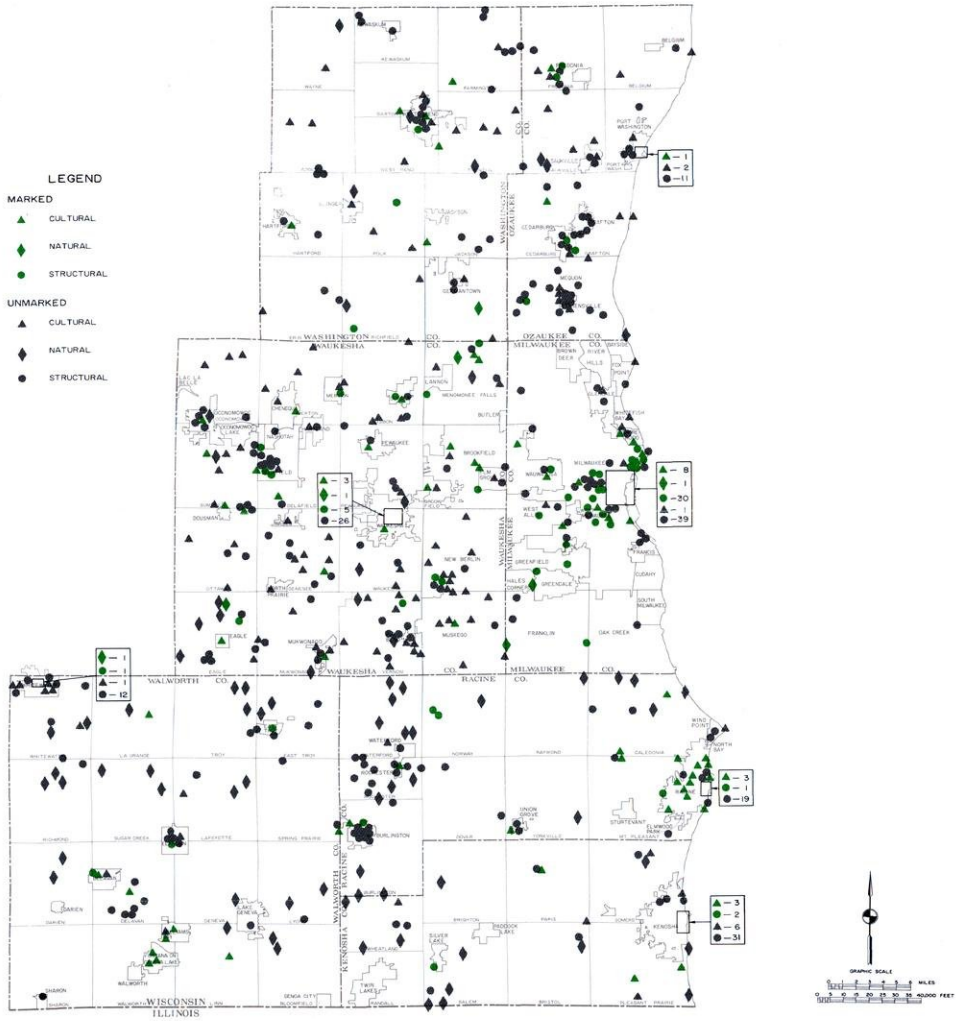
Seven resource elements of the natural resource base, all of which have been previously discussed in this chapter, are considered essential to the maintenance of both the ecological balance as well as the overall quality of life in the Region. These include: 1) lakes, rivers, and streams and their associated floodplains; 2) wetlands; 3) woodlands; 4) wildlife habitat areas; 5) rugged terrain and high relief topography; 6) significant geological formations and physiographic features; and 7) wet or poorly drained soils. In addition, there are certain other elements which, although not a part of the natural resource base per se, are closely related to or centered on that base. These elements are: 1) existing outdoor recreation sites, 2) potential outdoor recreation and related open space sites, 3) historic sites and structures, and 4) significant scenic areas and vistas.

The delineation of these natural resource and natural resource related elements on a map of the Region results in an essentially lineal pattern encompassed in narrow elongated areas which have been termed environmental corridors by the Commission. Primary environmental corridors are those areas which encompass three or more of the aforementioned 11 environmental elements. Secondary environmental corridors are contiguous areas exhibiting one or two of the 11 elements.

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

Map 36

HISTORIC SITES IN THE REGION: 1973

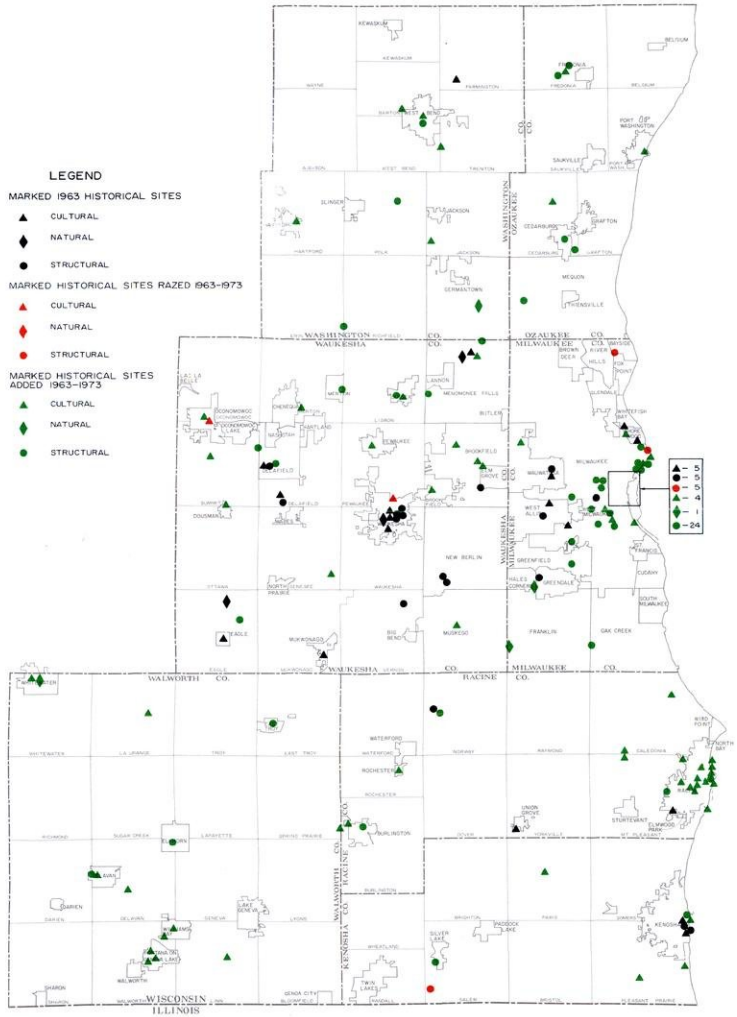


A total of 781 sites of historic significance were identified in the Region in 1973. Of this total, 235 are cultural featues, primarily sites of Indian or early white settlements; 85 are natural features, primarily wetland and woodland areas; and 461 are structures, including historic homes, churches, inns, and schools. Of the total number of historic sites, 187 are officially recognized and marked in some manner by historical groups and societies.

Source: SEWRPC.

Map 37

MARKED HISTORIC SITES IN THE REGION: 1963-1973



Over the 1963 to 1973 time period the Region has experienced a loss of 9 of 56 sites identified as officially marked historic sites in 1963. These sites have been destroyed as a result in changes in land use due to both urban development and urban renewal. Plans for future land development in the Region must be cognizant of sites of historic significance if these sites and the accompanying historic heritage of the Region which they represent are to be preserved.

Source: SEWRPC.

far-reaching effects, since such drainage may destroy fish spawning grounds, wildlife habitat, groundwater 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 groundwater 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 a 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.

Primary Environmental Corridors

The primary environmental corridors of southeastern Wisconsin generally lie along major stream valleys, surround major lakes, or are found in the Kettle Moraine area, and contain almost all of the remaining high value wildlife habitat areas and woodlands within the Region, in addition to most of the wetlands, lakes and streams, and associated floodlands. These corridors also contain many of the best remaining potential park sites. The primary environmental corridors are, in effect, a composite of the best of the individual elements of the natural resource base of southeastern Wisconsin.

Primary environmental corridors were identified within the Region in 1963 as part of the Commission's original land use-transportation planning program. The corridor delineation has since been refined, primarily as a result of the Commission watershed studies but also because of the availability of more detailed information which permitted a more definitive delineation of these lands.

The delineation of primary environmental corridors is indicated on Map 38, while a presentation of the land use components which comprise the corridor are indicated in Table 54. The gross primary environmental corridor area, defined as including all land uses, both urban and rural, within the corridor configuration, are delineated on Map 38. These totaled 341,500 acres, or about 20 percent of the total area of the Region. Net primary environmental corridor areas are defined as the gross corridor acreage minus the noncompatible urban land use acreages in the corridor. Net corridor areas, therefore, include recreational land use, agricultural and related land use, water, wetlands and woodlands uses, and other open space land uses.

Of particular importance to the land use plan reevaluation is an analysis of changing land uses within the net primary environmental corridors since 1963, and a quantification of the extent to which the corridors have been preserved. Net primary environmental corridors in 1970 totaled over 319,900 acres, or about 94 percent of the total gross corridor acreage. The majority of net corridor acreage in 1970 consisted of agricultural and related land (92,800 acres), wetlands (90,600 acres), and woodlands (64,700 acres). The 319,900 acres of net corridor in 1970 represent a decrease of 4,000 acres from the 323,900 acres of net corridor which existed within the Region in 1963. Decreases in net corridor acreage in the Region were primarily due to losses in agricultural use (5,100 acres) and, to a lesser extent, to losses in woodlands (1,600 acres) and wetlands (1,500 acres). While some of the losses in agricultural, woodland, and wetland uses may have resulted in gains in recreational land use, which is also considered part of the net environmental corridor, much of these lands were lost as a result of urban encroachment, especially residential land use, which increased by 3,000 acres, and transportation uses, which increased by 700 acres. Increases in commercial and industrial land uses in the corridor during the 1963-1970 period totaled only about 250 acres.

It is interesting to note that the loss of net primary environmental corridor acreage was not uniform within all counties of the Region (see Map 39). Waukesha County experienced the largest loss of net corridor acreage, over 1,600 acres, with the loss occurring primarily as a result of a decrease in the agricultural and wetlands land use categories. Walworth County lost almost 900 acres of net environmental corridor, primarily in the agricultural and woodland categories. Losses in the net corridor acreage were less than 500 acres for the remaining five counties of the Region, with virtually no loss at all in Kenosha County. It appears that recent trends within southeastern Wisconsin 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 as well.

Significant achievements, however, have been made regarding the preservation of primary environmental corridors. Table 55 quantifies the amount and Map 40 indicates the spatial distribution of primary environmental corridor land preserved as of 1973. Primary environmental corridors were considered permanently preserved if they were publicly owned as park, outdoor recreation, or related open space lands; if they were publicly leased for park, outdoor recreation, or open space (long-term lease 25 years or more); or if they were protected through a locally enacted floodland zoning ordinance which substantially carries out the Commission plan recommendation regarding preservation of floodland areas. Primary environmental corridors were considered temporarily preserved if they were protected through a locally enacted conservancy district zone, if they were part of a private park, outdoor recreation, or open space area, if they were protected through a locally enacted public or private park and outdoor recreation zone, or if they were part of an exclusive agricultural or country

Table 54

DISTRIBUTION OF PRIMARY ENVIRONMENTAL CORRIDOR LANDS IN THE REGION BY MAJOR LAND USE WITHIN COUNTY 1963 and 1970

County	Year	Gross Primary Environmental Corridor													
		Total[b]		Urban Development										Subtotal	
				Residential		Commercial		Industrial		Transportation		Governmental and Institutional			
		Acres	Percent of Region	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent of Gross Corridor
Kenosha	1963	29,490	8.6	1,007	3.4	23	0.1	10	--[a]	638	2.2	105	0.4	1,783	6.0
	1970	29,490	8.6	1,072	3.6	25	0.1	15	0.1	596	2.0	112	0.4	1,820	6.2
	Change 1963-1970	0	--	65	0.2	2	--	5	0.1	- 42	- 0.1	7	--	37	0.2
Milwaukee	1963	14,779	4.3	727	4.9	48	0.3	123	0.8	1,078	7.3	176	1.2	2,152	14.5
	1970	14,779	4.3	853	5.8	101	0.7	141	1.0	1,176	7.9	206	1.4	2,477	16.8
	Change 1963-1970	0	--	126	0.9	53	0.4	18	0.2	98	0.6	30	0.2	325	2.3
Ozaukee	1963	24,648	7.2	1,215	5.0	33	0.1	23	0.1	708	2.9	12	--[a]	1,991	8.1
	1970	24,648	7.2	1,497	6.1	32	0.1	26	0.1	803	3.2	19	0.1	2,377	9.6
	Change 1963-1970	0	--	282	1.1	- 1	--	3	--	95	0.3	7	0.1	386	1.5
Racine	1963	33,750	9.9	770	2.3	16	--[a]	55	0.2	713	2.1	86	0.3	1,640	4.9
	1970	33,750	9.9	1,005	3.0	22	0.1	38	0.1	786	2.3	70	0.2	1,921	5.7
	Change 1963-1970	0	--	235	0.7	6	0.1	- 17	- 0.1	73	0.2	- 16	- 0.1	281	0.8
Walworth	1963	88,527	25.9	1,975	2.2	81	0.1	39	--[a]	1,429	1.6	148	0.2	3,672	4.1
	1970	88,527	25.9	2,630	3.0	105	0.1	47	0.1	1,615	1.8	145	0.2	4,542	5.2
	Change 1963-1970	0	--	655	0.8	24	--	8	0.1	186	0.2	- 3	--	870	1.1
Washington	1963	56,286	16.5	988	1.7	37	0.1	43	0.1	1,107	1.9	39	0.1	2,214	3.9
	1970	56,286	16.5	1,360	2.4	41	0.1	60	0.1	1,156	2.1	67	0.1	2,684	4.8
	Change 1963-1970	0	--	372	0.7	4	--	17	--	49	0.2	28	--	470	0.9
Waukesha	1963	94,051	27.6	1,815	1.9	82	0.1	191	0.2	1,896	2.0	203	0.2	4,187	4.4
	1970	94,051	27.6	3,052	3.2	116	0.1	281	0.3	2,127	2.3	225	0.3	5,801	6.2
	Change 1963-1970	0	--	1,237	1.3	34	--	90	0.1	231	0.3	22	0.1	1,614	1.8
Region	1963	341,531	100.0	8,497	2.5	320	0.1	484	0.1	7,569	2.2	769	0.2	17,639	5.1
	1970	341,531	100.0	11,469	3.4	442	0.1	608	0.2	8,259	2.4	844	0.2	21,622	6.3
	Change 1963-1970	0	--	2,972	0.9	122	--	124	0.1	690	0.2	75	--	3,983	1.2

Table 55

PRESERVATION OF PRIMARY ENVIRONMENTAL CORRIDOR IN THE REGION: 1970

County	1970 Gross Primary Environmental Corridor (Acres)	Primary Environmental Corridor Preserved												
		Permanent Preservation				Temporary Preservation							Total	
		Public Parks Owned (Acres)	Floodland Zoning (Acres)	Subtotal		Conservancy Zoning (Acres)	Private Recreation (Acres)	Park Zoning (Acres)	Exclusive Agriculture Zoning (Acres)	Country Estate Zoning (Acres)	Subtotal			
				Acres	Percent of Gross Corridor						Acres	Percent of Gross Corridor	Acres	Percent of Gross Corridor
Kenosha	29,490	3,173	6,126	9,299	31.5	243	1,162	0	581	0	1,986	6.7	11,285	38.2
Milwaukee . . .	14,779	8,470	1,072	9,542	64.6	62	581	7	0	85	735	5.0	10,277	69.6
Ozaukee	24,648	2,166	7,624	9,790	39.7	3,145	566	54	3,337	0	7,102	28.8	16,892	68.5
Racine.	33,750	4,112	13,803	17,915	53.1	751	260	76	2,604	0	3,691	10.9	21,606	64.0
Walworth. . . .	88,527	7,408	23,005	30,413	34.4	2,076	5,719	2	0	0	7,797	8.8	38,210	43.2
Washington . .	56,286	7,102	62	7,164	12.7	4,502	1,949	22	3,288	0	9,761	17.3	16,925	30.0
Waukesha. . . .	94,051	13,674	31,659	45,333	48.2	13,195	1,712	7	612	471	15,997	17.0	61,330	65.2
Region	341,531	46,105	83,351	129,456	37.9	23,974	11,949	168	10,422	556	47,069	13.8	176,525	51.7

Source: SEWRPC.

Table 54 (continued)

County	Year	Gross Primary Environmental Corridor															
		Total		Net Primary Environmental Corridor												Subtotal	
				Recreation		Agriculture and Related		Water		Wetlands		Woodlands		Other Open Lands			
		Acres	Percent of Region	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent of Gross Corridor
Kenosha	1963	29,490	8.6	1,165	4.0	9,715	32.9	3,446	11.7	9,017	30.6	2,957	10.0	1,407	4.8	27,707	94.0
	1970	29,490	8.6	1,646	5.6	9,870	33.5	3,551	12.0	8,624	29.2	2,673	9.1	1,306	4.4	27,670	93.8
	Change 1963-1970	0	--	481	1.6	155	0.6	105	0.3	- 393	- 1.4	- 284	- 0.9	- 101	- 0.4	- 37	- 0.2
Milwaukee	1963	14,779	4.3	5,186	35.1	2,668	18.0	707	4.8	1,506	10.2	1,131	7.7	1,429	9.7	12,627	85.5
	1970	14,779	4.3	5,757	39.0	2,046	13.8	761	5.1	1,449	9.8	1,079	7.3	1,210	8.2	12,302	83.2
	Change 1963-1970	0	--	571	3.9	- 622	- 4.2	54	0.3	- 57	- 0.4	- 52	- 0.4	- 219	- 1.5	- 325	- 2.3
Ozaukee	1963	24,648	7.2	835	3.4	6,705	27.2	1,513	6.1	8,888	36.1	3,770	15.3	946	3.8	22,657	91.9
	1970	24,648	7.2	903	3.7	6,380	25.9	1,540	6.3	8,803	35.7	3,675	14.9	970	3.9	22,271	90.4
	Change 1963-1970	0	--	68	0.3	- 325	- 1.3	27	0.2	- 85	- 0.4	- 95	- 0.4	24	0.1	- 386	- 1.5
Racine	1963	33,750	9.9	848	2.5	13,920	41.2	3,787	11.2	7,166	21.2	5,149	15.3	1,240	3.7	32,110	95.1
	1970	33,750	9.9	1,075	3.2	13,318	39.5	3,970	11.8	7,188	21.3	4,909	14.5	1,369	4.0	31,829	94.3
	Change 1963-1970	0	--	227	0.7	- 602	- 1.7	183	0.6	22	0.1	- 240	- 0.8	129	0.3	- 281	- 0.8
Walworth	1963	88,527	25.9	2,680	3.0	27,709	31.3	13,495	15.3	17,106	19.3	21,391	24.2	2,474	2.8	84,855	95.9
	1970	88,527	25.9	4,030	4.5	25,939	29.3	13,747	15.5	17,050	19.3	20,779	23.5	2,440	2.7	83,985	94.8
	Change 1963-1970	0	--	1,350	1.5	- 1,770	- 2.0	252	0.2	- 56	--	- 612	- 0.7	- 34	- 0.1	- 870	- 1.1
Washington	1963	56,286	16.5	629	1.1	14,819	26.3	3,414	6.1	21,585	38.4	12,574	22.3	1,051	1.9	54,072	96.1
	1970	56,286	16.5	804	1.4	14,251	25.3	3,451	6.1	21,423	38.1	12,574	22.3	1,099	2.0	53,602	95.2
	Change 1963-1970	0	--	175	0.3	- 568	- 1.0	37	--	- 162	- 0.3	--	--	48	0.1	- 470	- 0.9
Waukesha	1963	94,051	27.6	3,606	3.8	22,433	23.9	15,253	16.2	26,805	28.5	19,347	20.6	2,420	2.6	89,864	95.6
	1970	94,051	27.6	4,224	4.5	21,031	22.4	15,264	16.2	26,055	27.7	19,018	20.2	2,658	2.8	88,250	93.8
	Change 1963-1970	0	--	618	0.7	- 1,402	- 1.5	11	--	- 750	- 0.8	- 329	- 0.4	238	0.2	- 1,614	- 1.8
Region	1963	341,531	100.0	14,949	4.4	97,969	28.7	41,615	12.2	92,073	27.0	66,319	19.4	10,967	3.2	323,892	94.9
	1970	341,531	100.0	18,439	5.4	92,835	27.2	42,284	12.4	90,592	26.5	64,707	19.0	11,052	3.2	319,909	93.7
	Change 1963-1970	0	--	3,490	1.0	- 5,134	- 1.5	669	0.2	- 1,481	- 0.5	- 1,612	- 0.4	85	--	- 3,983	- 1.2

[a] *Less than 0.05 percent.*

[b] *The 1963 primary environmental corridor acreage data differ from the data presented in SEWRPC Planning Report No. 7, The Land Use Transportation Study, Volume One, Inventory Findings, due to the availability of more detailed natural resource base information permitting a refinement of the primary environmental corridor delineation.*

Source: SEWRPC.

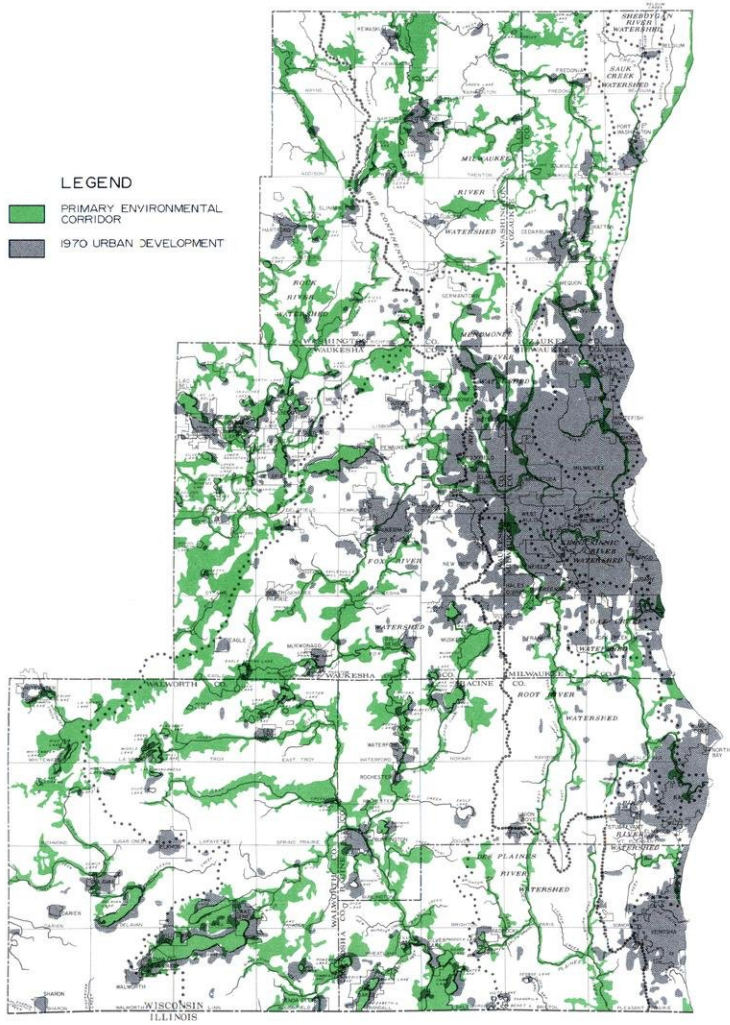
estate zoning district which required a lot size of five acres or more per farm or dwelling unit.

As indicated in Table 55, 129,500 acres, or 38 percent, of the 341,500 gross primary environmental corridor acreage had been permanently preserved as of 1973. The majority of this area (83,400 acres) is preserved through floodland zoning. Over 47,000 acres, or 14 percent, of the gross corridor acreage has been temporarily preserved, with the majority of this area (24,000 acres) being protected through conservancy zoning districts. In total, over 176,500 acres, or 52 percent, of the gross primary environmental corridors in the Region were either permanently or temporarily preserved as of 1973.

The preservation of the primary environmental corridors from degradation is and should continue to be one of the principal objectives of the adopted regional land use plan. They should be considered inviolate, and their preservation in a natural state or in park and related open space uses, including limited agricultural and country estate type uses, will serve to maintain a high level of environmental quality in the Region and protect its unique natural beauty.

Map 38

PRIMARY ENVIRONMENTAL CORRIDORS IN THE REGION: 1970

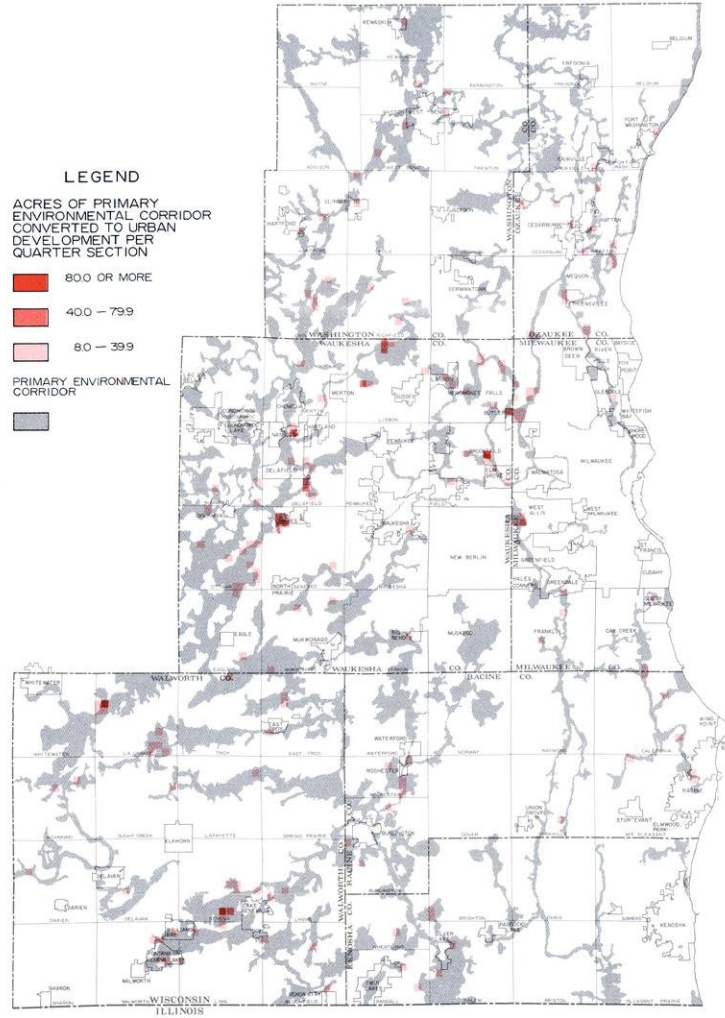


Approximately one-fifth of the Region lies within primary environmental corridors, which encompass almost all of the best remaining woodlands and wetlands, the best remaining wildlife habitat areas, almost all of the streams and lakes and associated undeveloped floodlands and shorelands, as well as many of the significant topographical, geological, and historical features remaining in the Region. The preservation of these corridors in compatible open uses is essential to maintaining the overall quality of the environment within the Region.

Source: SEWRPC.

Map 39

LOSS OF PRIMARY ENVIRONMENTAL CORRIDOR IN THE REGION: 1963-1970

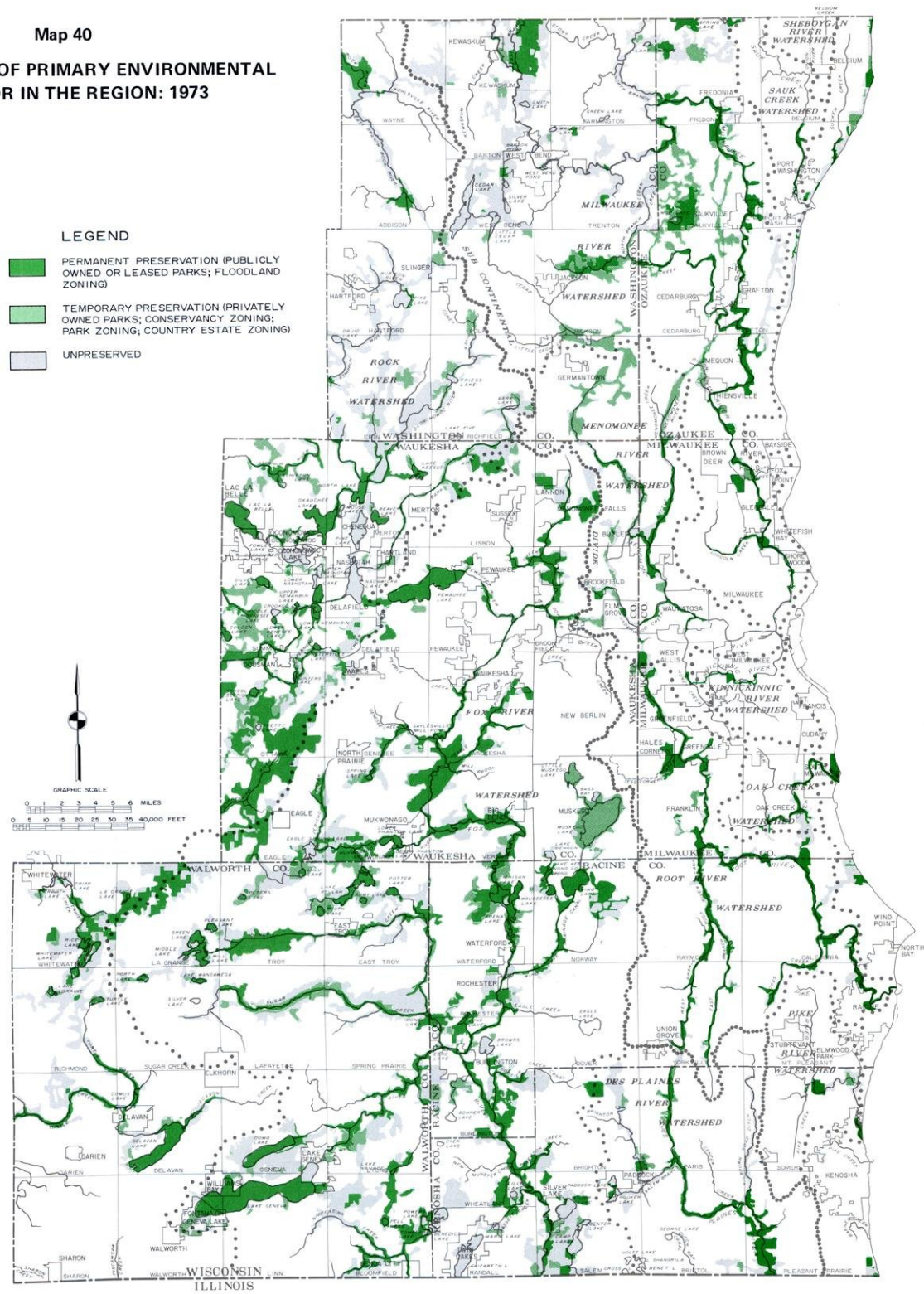


Between 1963 and 1970, about 4,000 acres of primary environmental corridor lands were converted to incompatible land uses and thus lost forever. This represents a loss of about 1 percent of the approximately 324,000 acres of primary environmental corridor lands which existed in the Region in 1963, and which were recommended in the adopted regional land use plan for permanent preservation, protection, and enhancement. Most of the loss resulted from urban encroachment by residential land uses. New residential development in the primary environmental corridors of the Region totaled about 3,000 acres over the seven-year period. While such losses were distributed throughout the entire seven-county Region, losses were particularly heavy in Waukesha and Walworth Counties, where together about 2,500 acres of primary environmental corridor land were lost. The above map identifies those U. S. Public Land Survey quarter sections where losses exceed eight acres. The unplanned or poorly planned intrusion of urban development into these corridors not only contributes to the creation of severe environmental problems, but tends to destroy the very resources and related amenities sought by the development.

Source: SEWRPC.

Map 40

PRESERVATION OF PRIMARY ENVIRONMENTAL CORRIDOR IN THE REGION: 1973



Significant achievements have been made since adoption of the regional land use plan in preserving primary environmental corridor lands. By 1973, about 129,500 acres, or 38 percent of the total primary environmental corridor acreage, had been permanently preserved; that is, such lands were either publicly owned or leased for park and outdoor recreation purposes or protected from development by a floodland zoning ordinance. An additional 47,000 acres, representing about 14 percent of the primary environmental corridor acreage, have been temporarily preserved through the enactment of conservancy or park zoning or through private park ownership. In total, about 176,500 acres, or 52 percent of the primary environmental corridor area of the Region, were either permanently or temporarily preserved by the end of 1973.

Source: SEWRPC.

PUBLIC UTILITY BASE

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 provide the individual land uses with power, light, communication, heat, water, and sewerage. Water supply and sanitary sewerage utilities have a particularly important interrelationship. Water supply facilities bring potable water from its sources to the user, while sanitary sewerage facilities collect the used water, convey it to a treatment plant, and after treatment return it to the natural environment from which it came.

The majority of water and sewerage utilities in the Region are organized as water and sewer departments of incorporated municipalities, and serve only those areas within the political boundaries of that municipality. Where sanitary districts have been organized, sewer and water service area limits may not be coterminous, although the individual service areas will often tend to approximate one another. Therefore, a general pattern of water and sewer service areas following political boundary lines rather than natural topographic boundaries, such as watershed boundaries, exists within the Region.

Sanitary Sewerage Utilities

Recognizing the importance of sanitary sewerage to regional development, the Commission in 1969 initiated a regional sanitary sewerage system planning program. This program was completed in 1974, and the findings are published in SEWRPC Planning Report No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin.

One of the initial steps in the regional sanitary sewerage system planning program was an inventory of all existing sanitary and combined sewerage systems within the Region, whether publicly or privately owned. The inventory found that there are a total of 91 existing public sanitary sewerage systems in the Southeastern Wisconsin Region which provide public sanitary sewer service to various subareas of the Region. Together these 91 systems serve a total area of about 309 square miles, or about 11 percent of the total area of the Region, and a total population of about 1.5 million, or nearly 85 percent of the total population of the Region (see Map 41). The area and population served by public sanitary sewerage systems in each county in the Region are summarized in Table 56. The percent of the total area of a county served by sewers ranges from a high of 74 percent in highly urbanized Milwaukee County to a low of 2 percent in largely rural Walworth County. The percent of the total county population served ranges from a high of 98 percent in Milwaukee County to a low of 47 percent in Washington County.

Comparable data relating to sanitary sewer service area and population served by sanitary sewers for 1963, the year when the Commission first inventoried sanitary sewerage systems as a part of the initial regional land use-transportation study, are also presented in Table 56. Interestingly, the proportion of the total regional population served has remained nearly constant over the seven-year period, despite significant gains in both the number and proportion of the total population served in several counties. For example, the proportion of the total population served in rapidly urbanizing Ozaukee County, which was about 49 percent in 1963, rose to nearly 67 percent by 1970, while the proportion of the total population served in rapidly urbanizing Waukesha County, which was about 43 percent in 1963, rose to 53 percent in 1970. That these and other similar significant gains in the proportion of the total population served in the outlying counties of the Region did not materially increase the proportion of the total regional population served can be attributed to the fact that the actual

Table 56

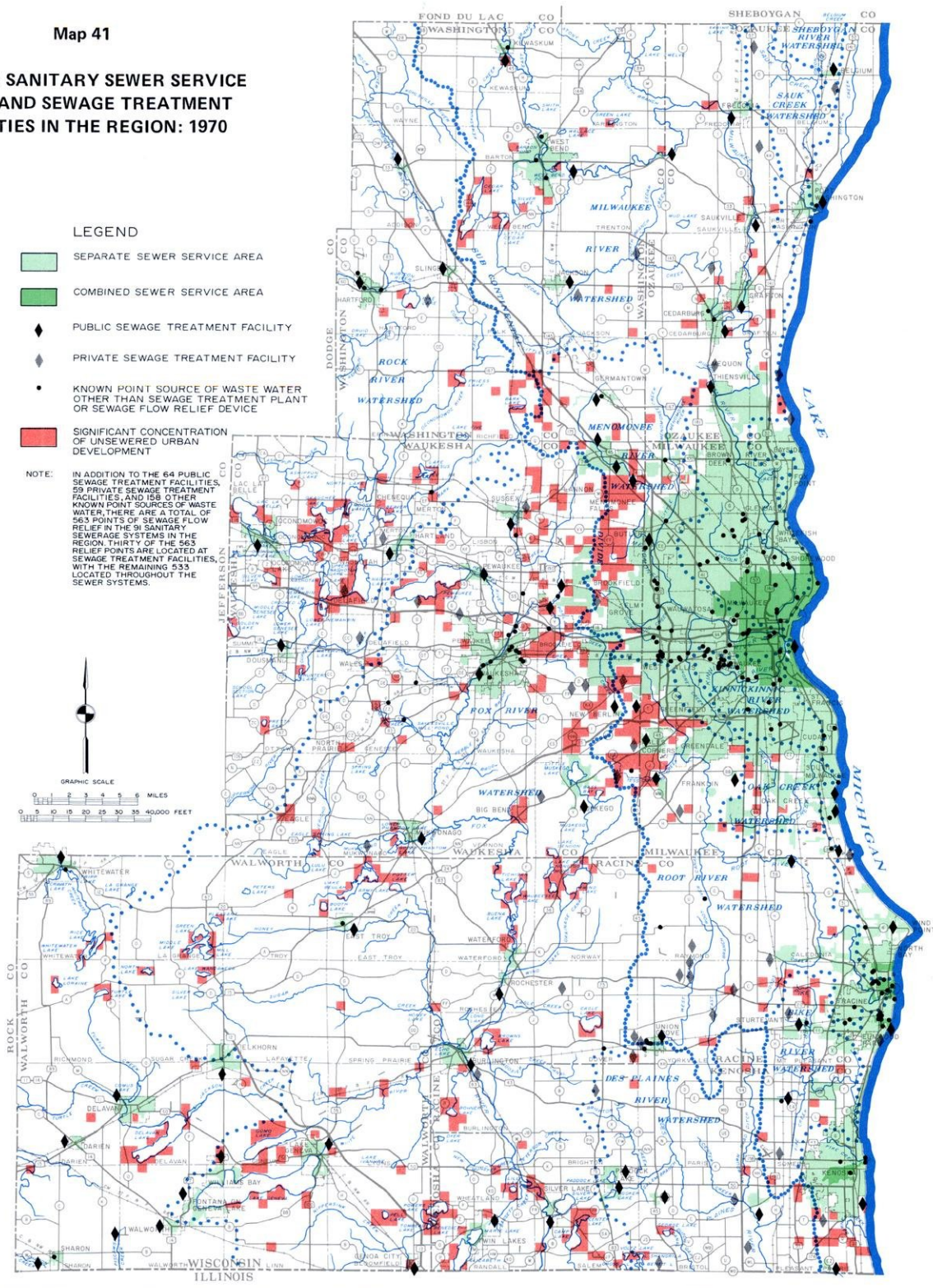
EXISTING AREA AND POPULATION SERVED BY CENTRAL SANITARY SEWERS IN THE REGION BY COUNTY: 1963 and 1970

County	Sanitary Sewer Service Area				Population Served			
	1963		1970		1963		1970	
	Square Miles	Percent of County	Square Miles	Percent of County	Number	Percent of County	Number	Percent of County
Kenosha	14.0	5.0	23.83	8.6	79,160	74.2	94,000	79.7
Milwaukee	142.3	58.8	179.00	73.9	1,075,000	99.0	1,034,700	98.2
Ozaukee	6.2	2.6	17.28	7.4	20,340	48.9	36,300	66.7
Racine	19.1	5.6	29.49	8.7	112,600	74.8	135,900	79.6
Walworth	8.6	1.5	11.84	2.1	28,925	52.1	35,500	56.0
Washington	6.1	1.4	9.42	2.2	23,050	46.6	30,200	47.3
Waukesha	20.7	3.6	38.51	6.6	79,950	43.4	122,100	52.8
Region	217.0	8.1	309.37	11.5	1,419,025	84.8	1,488,700	84.8

Source: SEWRPC.

Map 41

EXISTING SANITARY SEWER SERVICE AREAS AND SEWAGE TREATMENT FACILITIES IN THE REGION: 1970



Centralized public sanitary sewer service in the Region is currently provided by 91 public sewerage systems to an area of about 309 square miles, or 11 percent of the total area of the Region. These 91 systems serve nearly 1.5 million persons, or about 85 percent of the total population of the Region. About 31 square miles, primarily located in the central cities of Kenosha, Milwaukee, and Racine, are served by combined storm and sanitary sewers. Treatment for sewage generated in the Region is provided at 64 public sewage treatment facilities, which collectively discharge about 265 million gallons of sewage effluent per day. Of this total, 233 mgd, or nearly 88 percent, are discharged directly to Lake Michigan. There are also 59 sewage treatment facilities serving isolated enclaves of urban land use development, as well as 158 known point sources of wastewater other than sewage treatment plants, which sources consist primarily of industrial cooling, rinse, and wash waters discharged directly to storm sewers or streams. While not shown on this map, there are an additional 533 known points of sewage flow relief in the Region, consisting of combined sewer overflows, relief pumping stations, crossovers from the sanitary to the storm sewer system, and gravity bypasses directly to the streams of the Region. In total, then, there are over 800 point sources of raw sewage, sewage effluent, and industrial waste discharge throughout the Region.

Source: SEWRPC.

number of people served in highly urbanized Milwaukee County actually declined by about 40,000 persons, from about 1,075,000 in 1963 to about 1,034,700 in 1970. This decline in the population served in Milwaukee County is due to the actual loss of population experienced by the central City of Milwaukee and certain older "first ring" suburbs during this period, and concomitant declines in central city population densities.

Of the total square miles of area served by public sanitary sewers in the Region, about 31 square miles, or nearly 10 percent, consist of combined sewer service area where, by design, sanitary sewage and storm water are collected and conveyed in a single sewer system (see Map 41). About 26 of the 30 square miles of combined sewer service area are in the City of Milwaukee, about one square mile is in the Village of Shorewood, and about two square miles each are in the Cities of Kenosha and Racine.

As noted earlier, centralized sanitary sewerage systems in the Region serve a total area of about 309 square miles, or about 11 percent of the total area of the Region, and a total population of nearly 1.5 million, or nearly 85 percent of the total population of the Region. The remaining 15 percent of the total Region population, or about 268,000 persons, rely on septic tank sewage disposal systems for domestic sewage disposal. About 27,000 of these persons are reported in the U. S. Census of Population as living on farms. The remaining 241,000 persons constitute urban dwellers generally living in scattered fashion throughout the rural and rural-urban fringe areas of the Region. Of this total, about 139,000 persons, or about 8 percent of the total regional population, reside in significant concentrations of urban development (see Table 57). These scattered urban concentrations total about 61 square miles of urban land use, or slightly over one-fifth of the area of the Region (see Map 41).

Table 57

EXISTING POPULATION NOT SERVED BY CENTRALIZED PUBLIC SANITARY SEWERS IN THE REGION BY COUNTY: 1970

County	Unsewered Urban Development[a]					Rural Population[b]			
	Population			Square Miles		Farm		Nonfarm	
	Number	Percent of Total Urban Population	Percent of Total Population	Number	Percent of Total Urban Area	Number	Percent of Total Population	Number	Percent of Total Population
Kenosha	11,800	11.2	10.0	5.6	18.7	3,297	2.8	9,220	7.8
Milwaukee . . .	12,700	1.2	1.2	4.5	2.5	--	--	7,349	0.7
Ozaukee	4,900	11.9	9.0	2.5	12.6	3,124	5.7	10,137	18.0
Racine.	11,800	7.9	7.0	4.7	13.3	4,613	2.6	18,525	10.8
Walworth. . . .	13,500	27.6	21.0	9.8	45.3	5,779	9.1	8,765	13.6
Washington . .	9,600	24.0	15.0	4.0	30.0	6,677	10.5	17,262	27.0
Waukesha. . . .	74,800	38.0	31.6	30.0	47.0	3,930	1.5	30,508	13.0
Region	139,100	8.5	7.5	61.1	16.6	27,420	1.6	101,766	5.8

[a] *Urban development is defined in this context as concentrations of urban land uses within any given U. S. Public Land Survey quarter section that has at least 32 housing units, or an average of one housing unit per five gross acres, and is not served by public sanitary sewers.*

[b] *For the purposes of this study, rural population has been divided into "farm" and "nonfarm." The rural farm population includes all those persons enumerated as such by the U. S. Bureau of the Census and includes all persons living on actively operating farms. The rural nonfarm population shown in this table is less than the rural nonfarm population as enumerated by the Bureau of the Census, since many persons classified as rural nonfarm by the Bureau live in the urban development areas as defined in footnote above. The rural nonfarm population shown in this table is a residual number derived in the following manner:*

$A = B - (C + D + E)$

where: A = *Rural nonfarm population*
B = *Total population*
C = *Population served by public sanitary sewers*
D = *Population attributed to "unsewered urban development"*
E = *U. S. Census rural farm population*

Source: SEWRPC.

As already noted, an inventory was also conducted of all local plans and engineering reports relating to the future provision of sanitary sewer service in the Region. As shown in Table 58, local units of government in the Region have proposed the extension of sanitary sewer service to about an additional 447 square miles of land throughout the Region. This can be compared to the approximately 309 square miles of area in the Region now served by centralized sanitary sewers. If it is assumed that urban development would take place throughout the locally proposed sewer service area at an average overall population density equal to 5,000 persons per square mile, the average population density for new developments as recommended in the adopted regional land use plan, the locally proposed sewer service area could be expected to accommodate a future population increment of about 2.2 million persons. Thus, locally proposed sewer service areas in the Region already contain enough area to more than double the population of the Region. Even the most optimistic population forecasts indicate an increase in the population of the Region over the next 20-30 years of no more than 600,000 persons. Clearly, there is a need to better coordinate land use development with sewer service. The most appropriate vehicle for providing such coordination is the regional land use plan.

Water Utilities

Most of the water supply service within the Region is provided by public water utilities. As shown in Table 59, there are a total of 67 publicly owned water utilities within the Region. Of these 67 utilities, all but one—the North Shore Water Utility in Milwaukee County—provide retail water service to consumers.

The North Shore Water Utility provides only wholesale water service to three other water utilities—the Glendale Water Utility, the Village of Whitefish Bay Water Utility, and the Water Utility of the Village of Fox Point. Together, these 67 publicly owned water utilities serve an area of about 259 square miles, or about 10 percent of the total area of the Region, and about 1.4 million persons, or about 80 percent of the total 1970 resident population of the Region. The population, service area and consumption characteristics of the 67 public utilities in the Region are shown in Table 59. The existing (1970) service areas of these utilities all are shown on Map 42.

In addition to the publicly owned water utilities, there are at least 59 private or cooperatively owned water systems throughout the Region (see Table 60). Many of these small water systems serve isolated residential

Table 58

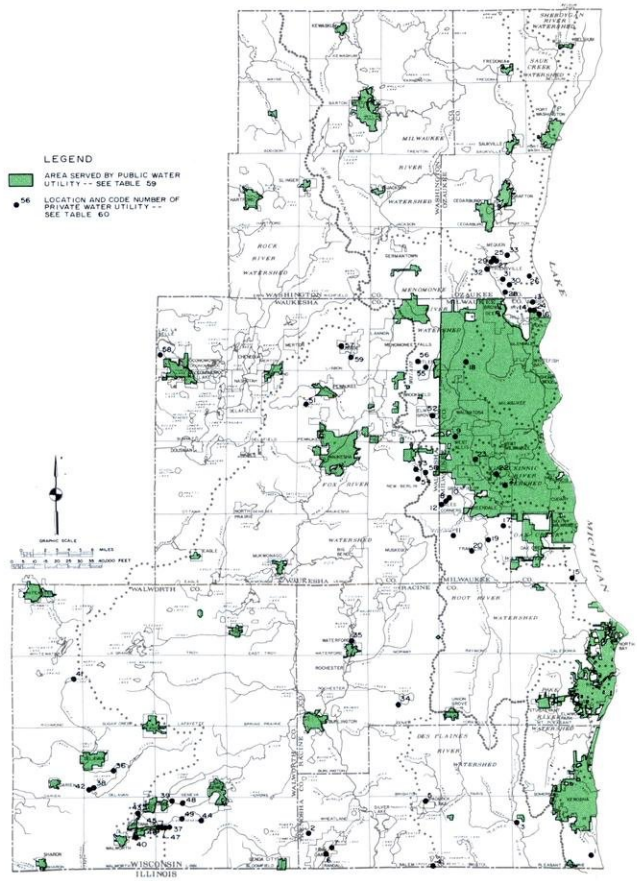
LOCALLY PROPOSED ADDITIONAL SANITARY SEWER SERVICE AREAS IN THE REGION BY COUNTY: 1970

County	Proposed Sewer Service Area	
	Square Miles	Percent of County
Kenosha	51.96	18.7
Milwaukee	56.72	23.4
Ozaukee	35.57	15.2
Racine.	63.95	18.8
Walworth.	39.32	6.8
Washington . . .	40.21	9.2
Waukesha.	158.90	27.4
Region	446.63	16.6

Source: SEWRPC.

Map 42

WATER UTILITIES IN THE REGION: 1970



Most of the water supply service in the Region is provided by 67 publicly owned water utilities. The service areas of these 67 utilities are shown on this map. In addition, there are at least 59 private or cooperatively owned water supply systems in the Region which provide water service generally to individual subdivisions. The location of these private systems is also shown on this map. Lake Michigan is by far the most important source of water supply in the Region, with about 1.2 million persons, or 68 percent of the total Region population, currently being supplied from that source. An additional 190,000 persons, or about 14 percent of the total Region population, are supplied by public utilities relying on groundwater.

Source: SEWRPC.

Table 59

PUBLIC WATER UTILITIES IN THE REGION: 1970

Public Water Utility		Area Served (Square Miles)	Estimated Population Served	Estimated Average Consumption MGD)
Name	Location			
Kenosha County				
Kenosha Water Utility[a,b]	City of Kenosha	15.20	78,810	11.85
Pleasant Park Utility Co., Inc.[c]	Town of Pleasant Prairie - Pleasant Homes Subdivision	0.28	420	0.04
Pleasant Prairie Water Works[c]	Unincorporated Village of Pleasant Prairie	0.25	340	0.02
Sanitary District No. 1, Town of Somers[a]	Town of Somers	0.60	1,020	0.13
Town of Bristol Water Utility	Town of Bristol	0.11	370	0.02
Subtotal—Kenosha County	--	16.44	80,960	12.06
Milwaukee County				
Brown Deer Public Water Utility[a]	Village of Brown Deer	3.68	12,620	1.11
City of Oak Creek Water & Sewer Utility	City of Oak Creek	5.00	5,700	0.88
Cudahy Water Department[a]	City of Cudahy	4.72	22,080	2.52
Glendale Water Utility[a]	City of Glendale	5.93	13,440	2.45
Milwaukee Water Works[a,d]	City of Milwaukee	107.66	750,390	131.65
North Shore Water Utility[a,e]	City of Glendale	--	--	--
Village of Greendale Water & Sewer Utility[a]	Village of Greendale	3.49	15,090	1.06
Village of Whitefish Bay Water Utility[a]	Village of Whitefish Bay	2.12	17,390	1.81
Water Utility of the Village of Fox Point[a]	Village of Fox Point	2.87	7,940	0.94
Wauwatosa Water Works[a]	City of Wauwatosa	13.23	58,680	5.25
West Allis Water Utility[a]	City of West Allis	10.20	71,720	11.42
Shorewood Municipal Water Utility[a]	Village of Shorewood	1.58	15,580	1.62
South Milwaukee Water Utility[a]	City of South Milwaukee	4.68	23,300	4.20
Subtotal—Milwaukee County	--	165.16	1,013,390	164.91
Ozaukee County				
Belgium Municipal Water Utility	Village of Belgium	0.23	800	0.06
Cedarburg Light & Water Commission	City of Cedarburg	2.19	7,700	1.32
Fredonia Municipal Water & Sewer Utility	Village of Fredonia	0.44	1,050	0.07
Grafton Sewer & Water Utility	Village of Grafton	1.47	6,000	0.77
Port Washington Municipal Water Utility[a]	City of Port Washington	2.23	8,750	0.93
Saukville Municipal Water & Sewer Utility	Village of Saukville	0.61	1,390	0.33
Subtotal—Ozaukee County	--	7.17	25,690	3.48
Racine County				
Burlington Water Works	City of Burlington	2.33	7,480	1.36
Caddy Vista Sanitary District	Town of Caledonia	0.25	1,180	0.06
Crestview Sanitary District	Town of Caledonia	0.46	1,600	0.09
North Cape Sanitary District	Towns of Norway & Raymond	0.09	110	0.01
North Park Sanitary District[a,f]	Town of Caledonia	3.01	3,250	0.54
Racine Water Department[a,g]	City of Racine	13.40	95,160	18.73
South Lawn Sanitary District[a]	Town of Mt. Pleasant	0.40	2,040	0.13
Sturtevant Water & Sewer Utility[a]	Village of Sturtevant	0.81	3,380	0.16
Town of Caledonia Water Utility District No. 1[a]	Town of Caledonia	1.98	690	0.07
Union Grove Water Department	Village of Union Grove	0.65	2,700	0.33
Waterford Water Utility	Village of Waterford	0.57	1,920	0.15
Wind Point Municipal Water Utility[a]	Village of Wind Point	1.28	1,390	0.10
Subtotal—Racine County	--	25.23	120,900	21.73
Walworth County				
Darien Municipal Water & Sewer Utility	Village of Darien	0.35	840	0.07
Delavan Water & Sewage Commission	City of Delavan	2.24	5,530	0.55
East Troy Municipal Water Utility	Village of East Troy	0.58	1,710	0.23
Elkhorn Light & Water Commission	Village of Elkhorn	1.50	3,990	0.42
Fontana Municipal Water Utility	Village of Fontana-on-Geneva Lake	0.95	1,460	0.20
Genoa City Municipal Water & Sewer Utility	Village of Genoa City	0.58	1,090	0.06
Lake Geneva Water Commission	City of Lake Geneva	1.54	4,890	0.72
Lyons Sanitary District No. 1	Town of Lyons	0.03	240	0.02
Sanitary District No. 1, Town of Troy	Town of Troy	0.04	140	0.01
Village of Sharon Water Works & Sewer System	Village of Sharon	0.49	1,220	0.06
Walworth Municipal Water & Sewer Utility	Village of Walworth	1.14	1,640	0.22
Whitewater Municipal Water Utility	City of Whitewater	2.04	12,040	1.03
Williams Bay Municipal Water Utility	Village of Williams Bay	1.19	1,550	0.19
Subtotal—Walworth County	--	12.67	36,340	3.78

Table 59 (continued)

Public Water Utility		Area Served (Square Miles)	Estimated Population Served	Estimated Average Consumption (MGD)
Name	Location			
Washington County				
Allenton Sanitary District No. 1	Town of Addison	0.27	610	0.03
City of Hartford Utilities Department	City of Hartford	1.57	6,500	1.05
City of West Bend Water Department	City of West Bend	4.33	16,560	2.50
Jackson Municipal Water Utility	Village of Jackson	0.31	560	0.05
Kewaskum Municipal Water Department	Village of Kewaskum	0.52	1,930	0.52
Slinger Utilities	Village of Slinger	0.40	1,020	0.19
Village of Germantown Water Utility	Village of Germantown	0.69	1,120	0.08
Subtotal—Washington County	--	8.09	28,300	4.42
Waukesha County				
Butler Water Utility	Village of Butler	0.78	2,260	0.22
City of Brookfield Water Utility	City of Brookfield	1.39	3,830	0.37
City of Oconomowoc Electric and Water Departments	City of Oconomowoc	3.20	8,740	0.89
Hartland Municipal Water Department	Village of Hartland	2.35	2,760	0.21
Mukwonago Municipal Water Utility	Village of Mukwonago	0.72	2,370	0.16
New Berlin Water Utility	City of New Berlin	1.30	2,400	0.29
Pewaukee Water & Sewage Utility	Village of Pewaukee	0.92	3,270	0.32
Village of Eagle Water Utility	Village of Eagle	0.27	750	0.03
Village of Menomonee Falls Water Utility	Village of Menomonee Falls	4.01	17,200	1.67
Westbrooke Sanitary District No. 1	Town of Brookfield	0.35	560	0.03
Waukesha Water Utility	City of Waukesha	9.32	40,260	7.54
Subtotal—Waukesha County	--	24.61	84,400	11.73
Region	--	259.37	1,390,520	222.11

[a] *These utilities utilize Lake Michigan as the sole source of water supply.*

[b] *The Kenosha Water Utility provides retail water service to portions of the Towns of Pleasant Prairie and Somers and wholesale water service to the Town of Somers Sanitary District No. 1. The data presented in this table for the Kenosha Water Utility include the communities served on a retail basis.*

[c] *The Pleasant Park Utility Company, Inc. and the Pleasant Prairie Water Works are not public water utilities since they are privately owned. Because, however, these utilities operate in the same fashion as a public water utility and because they are capable of ready expansion much the same as a public water utility, they have been classified for analysis purposes in the study as public water utilities.*

[d] *The Milwaukee Water Works provides retail water service to the Cities of Greenfield and St. Francis and the Village of West Milwaukee and provides wholesale water service to the Cities of Wauwatosa and West Allis and the Villages of Brown Deer, Greendale, and Shorewood. The data presented in this table for the Milwaukee Water Utility include the communities served on a retail basis.*

[e] *The North Shore Water Utility provides no retail water service and exists only to sell water on a wholesale basis to the City of Glendale and the Villages of Fox Point and Whitefish Bay.*

[f] *The North Park Water Utility provides water on a wholesale basis to the Wind Point Municipal Water Utility.*

[g] *The Racine Water Department provides retail water service to the Villages of North Bay and Elmwood Park and the Town of Mt. Pleasant and wholesale water service to the Village of Sturtevant, the North Park Sanitary District, the South Lawn Sanitary District, and the Town of Caledonia Utility District No. 1. The data presented in this table for the Racine Water utility include the communities served on a retail basis.*

Source: Wisconsin Public Service Commission, Wisconsin Department of Natural Resources, and SEWRPC.

enclaves, while some serve summer residents only and suspend operations during cold weather. Very few of these private systems have standby supply or storage facilities, and the great majority do not keep detailed records or file annual reports with the state or regulatory bodies. It is anticipated that many of these systems will eventually be absorbed into publicly owned municipal water utilities.

All water supplied by the publicly owned water utilities is drawn either from Lake Michigan or from wells. The Region is not only rich in surface water resources, but in groundwater resources, being underlain by two separate aquifers. Treated Lake Michigan water averaging 197 mgd (millions of gallons per day) was supplied in 1970 to an aggregate service area of about 199 square miles, or about 7 percent of the total area of the Region, and a popula-

Table 60

PRIVATE WATER UTILITIES IN THE REGION: 1970

Private Water Utility		
Code Number on Map 42	Name	Civil Division
	Kenosha County	
1	Carol Beach Water Co. Inc.	Town of Pleasant Prairie
2	Lake Knolls	Town of Randall
3	Oak Hi Subdivision	Town of Pleasant Prairie
4	Oakwood Knolls	Town of Salem
5	Paddock Lake Delles	Village of Paddock Lake
6	Twin Lakes Park Water Company	Village of Twin Lakes
7	Wy-wood Co-op	Village of Twin Lakes
	Milwaukee County	
8	Blossom Heath Water Trust	Village of Hales Corners
9	Colony Homes Co-op[a]	City of West Allis
10	Hales Happiness Homesites	Village of Hales Corners
11	Mission Hills	City of Franklin
12	Monaco Heights	Village of Hales Corners
13	North Shore East	Village of Bayside
14	Northway Water Co-op No. 2	Village of Bayside
15	Oakview No. 3	City of Oak Creek
16	Pelham Heath	Village of Bayside
17	Rawson Homes	City of Franklin
18	Robert William Park	City of Milwaukee
19	Root River Heights	City of Franklin
20	Security Acres	City of Franklin
21	Southgate Manor	City of Greenfield
22	Town View Water Co-op	City of Greenfield
23	Van Dyke Water Co-op[a]	City of West Allis
24	Vista Del Mar	Village of Bayside
	Ozaukee County	
25	Alberta Subdivision	Village of Thiensville
26	Bonnie Lynn Highlands	City of Mequon
27	Century Estates No. 1 Additions	Village of Thiensville
28	Lac Du Cours	City of Mequon
29	Laurel Acres	Village of Thiensville
30	North Shore Estates	City of Mequon
31	North Shore Heights	City of Mequon
32	Village Heights Co-op	Village of Thiensville
33	Villa du Parc (Country Club Estates)	City of Mequon
	Racine County	
34	Eagle Lake Manor	Town of Dover
35	Waterford Woods Association	Town of Waterford
	Walworth County	
36	Assembly Grounds Association	Town of Delavan
37	Camp Sybil	Town of Linn
38	Chicago Club	Town of Delavan
39	Cisco Beach Subdivision	Town of Linn
40	Country Club Estates	Village of Fontana
41	Crystal Bowl	Town of Raymond
42	Delavan Lake	Town of Delavan
43	Gardens Association	Town of Walworth
44	Lake Geneva Beach Subdivision	Town of Linn
45	Lake Geneva Club	Town of Linn
46	Oak Shores Association	Town of Linn
47	Shore Haven Association	Town of Linn
48	Sunset Hills Association, Inc.	Town of Linn
49	Woodale Subdivision	Town of Linn
	Washington County	--
	None	
	Waukesha County	
50	Glendale Park	City of New Berlin
51	Highlands Co-op	Town of Pewaukee
52	Marion Heights	Village of Elm Grove
53	Monterey Park	City of New Berlin
54	Regal Manors	City of New Berlin
55	Riverview Manor Co-op	Village of Menomonee Falls
56	Silver Spring Terrace	Village of Menomonee Falls
57	Spring Green Heights	Village of Sussex
58	Sunnyfield Acres	Town of Oconomowoc
59	Sussex Estates	Village of Sussex

[a] *These private utilities were connected to the City of West Allis Public Water Utility system in 1971.*

Source: Wisconsin Public Service Commission, Wisconsin Department of Natural Resources, and SEWRPC.

tion of about 1.2 million persons, or about 68 percent of the total population of the Region. Twenty-one of the 67 public utilities in the Region utilize Lake Michigan as a source of supply. Of these 21, seven own and operate water intake and treatment facilities, while 14 utilities purchase water on a wholesale basis. Generally, Lake Michigan offers an unusually good source of supply to those areas lying east of the subcontinental divide and within economic reach of this source of supply.

Well water averaging about 25 mgd was supplied in 1970 to an aggregate area of about 60 square miles, or about 2 percent of the total area of the Region, and a population of about 190,000 persons, or about 14 percent of the total resident population of the Region. Forty-six of the public utilities in the Region utilized the groundwater as a source of supply.

In general, water service from a municipal utility is, as a matter of local policy, furnished only to property within the municipal limits of that municipality. Only the Cities of Kenosha, Milwaukee, and Racine in the Region provide water service beyond their corporate limits in any substantial amounts.

Gas Utilities

Three gas utilities are authorized to operate within the Region and provide all public gas service therein. The Wisconsin Gas Company is authorized to operate in parts of Milwaukee, Ozaukee, Washington, and Waukesha Counties. The Wisconsin Natural Gas Company is authorized to operate in parts of Kenosha, Milwaukee, Racine, Walworth, and Waukesha Counties. The Southern Gas Company is authorized to operate in parts of Kenosha, Racine, and Walworth Counties. Only in the Towns of Erin and Wayne, both in Washington County, is there no gas utility presently authorized to operate. Natural gas is supplied to the three gas utilities by the Michigan-Wisconsin Pipeline Company and the Natural Gas Pipeline Company of America. Gas service may be considered to be virtually ubiquitous, and does not constitute a major constraint on the location and intensity of urban development in the Region, although limited availability of future gas supplies may cause the utilities to curtail gas pipeline extensions.

Electric Utilities

Two major privately owned electric utilities are authorized within the Region which, together with five small municipal utilities, provide service to the entire Region. The Wisconsin Electric Power Company is authorized to operate throughout nearly the entire Region. The Wisconsin Power and Light Company is authorized to operate in parts of Kenosha and Walworth Counties. Municipal electric power utilities are operated by the Cities of Cedarburg, Elkhorn, Hartford, and Oconomowoc and the Village of Slinger. Generally, an adequate supply of electric power is available throughout the Region. Residential service is available on demand anywhere within the Region. Therefore, electric power service may be considered virtually ubiquitous and not a major constraint on the location and intensity of urban development in the Region.

SUMMARY

This chapter has described the natural resource and related public utility base of the Region. The natural resources and related public utilities of an area are vital to its economic development and to its ability to provide a pleasant and habitable environment. The following findings have particular significance for regional land use and transportation planning:

1. Air pollution exists in certain highly developed subareas of the Region. It is evidenced by particulate matter, sulfur dioxide, and photochemical oxidant levels in the atmosphere, which approach and sometimes exceed the air quality standards established by the U. S. Environmental Protection Agency. Air pollution results from concentrations of commercial and industrial activity, transportation movements, waste burning, power generation, and space heating, and occurs primarily in and around the highly industrialized areas of the Cities of Milwaukee, Racine, Kenosha, and Waukesha.

2. The highly complex soil relationships existing within the Region and the 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. Analysis of detailed soil survey data revealed that severe or very severe limitations for residential development exist, particularly in Ozaukee, Milwaukee, and the eastern portions of Waukesha, Racine, and Kenosha Counties. Approximately 716 square miles, or about 27 percent of the area of the Region, are covered by soils which are poorly suited for residential development even with public sanitary sewer service; about 1,637 square miles, or 61 percent of the Region, are covered by soils which are poorly suited for residential development without public sanitary sewer service on lots smaller than one acre; and about 1,181 square miles, or 44 percent of the Region, are covered by soils poorly suited for residential development without public sanitary sewer service on lots one acre or larger.

3. There are 100 major lakes of 50 acres or more in the Region having a combined surface water area of 57 square miles, or about 2 percent of the total area of the Region. In addition, there are 228 lakes in the Region of less than 50 acres having a combined surface water area of four square miles, or about 0.15 percent of the area of the Region. At least 13 of the 57 major regional lakes sampled in Commission watershed studies were found to be in advanced stages of eutrophication. They are being degraded as a result of man's activities to the point where they now have, or soon will have, little or no value for recreational purposes, as desirable locations for properly planned and controlled lake-oriented residential development, or even as aesthetic assets to the Region.

4. As of 1970, groundwater was the source of water supply for 46 public water utilities serving a resident population of about 190,000 persons, or about 11 percent of the total resident population of the Region and 14 percent of the population of the Region served by public water utilities. The original potentiometric surface of the deep sandstone aquifer has been markedly altered, primarily as a result of pumpage in the Cities of Milwaukee and Waukesha in the Region, as well as heavy groundwater use south of the Region in northeastern Illinois. Drawdowns of up to 350 feet have occurred in the Milwaukee-Waukesha area, while drawdowns in excess of 275 feet are evident at the Wisconsin-Illinois line. Current groundwater quality in both the shallow and deep aquifers throughout the Region is generally good, but is very hard, since it contains high concentrations of calcium, magnesium, sulfate, and other dissolved solids.

5. Woodlands in the Region in 1970 covered a total combined area of about 125,300 acres, or approximately 7 percent of the total area of the Region. Over 91,700 acres, or 73 percent of the total, were located in Walworth, Washington, and Waukesha Counties. The Region experienced a net loss of over 5,100 acres, or 4 percent of the woodlands which were present in 1963. Nearly 1,900 acres, or 37 percent of the loss in woodlands, occurred in Waukesha County. Woodlands in the Region serve scenic, wildlife, open space, educational, and recreational uses, and contribute to the quality of the environment as measured in terms of clean air, clean water, and scenic beauty.

6. Water and wetland areas covered 180,800 acres, or about 10 percent of the area of the Region, in 1970. This represents a net decrease of approximately 1,600 acres of water and wetlands over the 1963 figure. Water and wetland areas contribute to resource conservation and recreation and wetland areas are particularly important to flood control and stream and lake water quality preservation.

7. Wildlife habitat areas covered approximately 259,800 acres, or 15 percent of the total area of the Region, in 1970. Over 103,000 acres, or 40 percent, were classified as high-value wildlife habitat areas; 94,100, or 36 percent, were classified as medium-value; and 62,700, or 24 percent, were classified as low-value wildlife habitat. Over 192,000 acres, or 74 percent of the wildlife habitat, were located in Walworth, Washington, and Waukesha Counties. Approximately 1,300 acres, or less than 1 percent of the wildlife habitat area in the Region, were destroyed from 1963 to

1970. The predominant cause for wildlife habitat loss is urbanization, more specifically, residential development.

8. A total of 1,348 publicly and nonpublicly owned outdoor recreation sites totaling 55,564 acres existed in the Region in 1973, a significant increase over the 891 sites totaling 33,372 acres which existed in 1963. The 787 publicly owned sites were located primarily in the urbanized areas of the Region, while the 561 nonpublicly owned sites were located primarily in the Region's significant water resource areas. Other outdoor recreation and related open space sites existing in the Region in 1973 included 81 conservation sites totaling 39,822 acres, and 787 school facilities totaling 8,017 acres.

9. Reevaluation of 664 potential park and related open space sites in the Region during 1970 revealed that since 1963, over 9,700 acres, or about 9 percent of the total 102,200 original potential park acreage, were converted to recreational use. Over 6,800 acres of this total were converted to public recreational use. This amount exceeded the adopted land use plan recommendation, which proposed an increment of an additional 5,900 acres of public recreational land in the Region by 1970. Approximately 7,500 acres, or 7 percent of the potential park and related open space acreage, were lost to urban development between 1963 and 1970. Over 580 potential park and open space sites, totaling almost 82,000 acres, remained in the Region in 1970. The majority of this potential park site acreage, 35,600 acres, or 43 percent, are high-value sites; 26,100 acres, or 32 percent, are medium-value sites; and 20,300 acres, or 25 percent, are low-value potential park sites. While only a fraction of these sites may be required to meet future recreational needs of the regional population, they should be preserved from incompatible land use development until the best use of the land can be determined.

10. A total of 781 sites of historic significance existed in the Region in 1973. Of this total, 235, or 30 percent, were cultural features such as sites of Indian or early white settlements; 85, or 11 percent, were natural features such as woodland or wetland areas; and 461, or 59 percent, were historic structures such as homes, churches, inns, or schools. Of the 187 marked historical sites in 1970, 70 sites, or 37 percent, were located in Milwaukee County. Nine of the 56 marked historic sites which existed in 1963 were destroyed as a result of urbanization by 1970.

11. The most important elements of the regional resource base, including the best remaining woodlands, wildlife habitat, surface water and wetlands, and historic, scenic, and recreational sites, when combined, result in essentially lineal elongated patterns termed by the Commission as environmental corridors. There were 319,900 acres of net primary environmental corridor in the Region in 1970, which represented a decrease of 4,000 acres from the 323,900 acres of net corridor which existed in the Region in 1963. Much of the loss in corridor lands occurred as a result of urban encroachment, particularly residential land uses which increased by 3,000 acres, and transportation uses which increased by over 700 acres from 1963 to 1970. Significant achievements have been made regarding the preservation of primary environmental corridors. Park, outdoor recreation, or related open space land acquisition; floodland, conservancy, or recreational district zoning; and exclusive agricultural or country estate zoning have essentially preserved a total of 176,500 acres, or 52 percent, of the gross primary environmental corridors in the Region.

12. Ninety-one existing public sanitary sewerage systems serve an area of 309 square miles, or about 11 percent of the total area of the Region, and a population of about 1.5 million, or nearly 85 percent of the total population of the Region. The percent of the total area of a county served by sewers ranges from a high of 74 percent in Milwaukee County to a low of 2 percent in Walworth County. The percent of total county population served ranges from a high of 98 percent in Milwaukee County to a low of 47 percent in Washington County. The proportion of the total regional population served remained nearly constant from 1963 to 1970, despite significant gains in both the number and proportion of the total population served in several counties. Locally proposed sewer service areas in the Region could be expected to accommodate a future population increment of about 2.2 million persons, even though the most optimistic population forecasts indicate an increase of no more than 600,000 persons in the Region over the next 20 to 30 years. Fifteen percent of the total Region population, or about 268,000 persons, rely on septic tank sewage disposal systems for domestic sewage disposal. About 241,000 of these persons are urban dwellers generally living in scattered fashion throughout the rural and rural-urban fringe areas of the Region.

13. Sixty-seven publicly owned water utilities in the Region serve an area of about 259 square miles, or about 10 percent of the total area, and about 1.4 million persons, or about 80 percent of the total 1970 population of the Region. Of this total, 21 utilize Lake Michigan as the source of supply and 46 utilize groundwater as the source of supply.

The data presented in this chapter relate to the natural resource and related public utility bases of the Region. These data are important to the land use and transportation planning process because natural resources within the Region are limited and can be subject to misuse through improper land use and transportation facility

development. Certain conclusions concerning the natural resources base, especially recent changes to that base which may affect the design of alternative land use and transportation plans, are presented herein.

The urban sprawl residential development pattern as witnessed by empirical data presented in this chapter resulted in the encroachment of such development upon many important natural resource elements, including woodlands, wetlands, wildlife habitat, potential park sites, and historic sites. This encroachment has in turn resulted in a general deterioration of surface water quality, potential contamination of groundwater supplies, and destruction of portions of the rural landscape and scenic topography. However, with the exception of continued deterioration of surface water quality, the total impact of urban encroachment on the regional resource base from 1963 through 1970 remains relatively insignificant, especially when changes in individual natural resource elements are compared to the total qualitative and quantitative aspects of those resource elements within the Region. Indeed, as indicated by the significant achievements in preserving and protecting various natural resource elements through purchase, lease, or zoning, far more has been accomplished toward preservation and enhancement of that natural resource base than toward its destruction.

Based upon a growing public awareness of the need for environmental protection and enhancement, a general recognition of the important attributes of the natural resource base, and mandates from state and federal government agencies related to environmental protection, it would appear that the trend toward preservation and protection of natural resource base elements which occurred from 1963 to 1970 will continue. Through implementation of well-conceived land use and transportation plans and of such related plans as watershed and sanitary sewerage systems plans, the recreational, aesthetic, ecological, and cultural attributes of the natural resource base will not only be maintained, but in some cases, such as regional surface water quality, will even improve.

Chapter VI

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 determine 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. Such a complete inventory of land use in southeastern Wisconsin was first conducted in 1963 in order to facilitate the preparation of the regional land use-transportation plan formally adopted by the Commission in 1966. An inventory of historical development patterns within the Region was also conducted during the Commission's initial land use-transportation study. The inventory of historical growth patterns in conjunction with the 1963 inventory of land use provided a sound basis for analyzing urban activity and determining feasible future land use patterns as part of the initial land use planning effort. The methodology and findings of the 1963 land use inventory, as well as of the inventory of historical growth, are fully documented in previous Commission publications.[1]

Southeastern Wisconsin is a dynamic region which has experienced rapid urbanization since the initial land use inventory in 1963. Analysis of changing development patterns in relation to the adopted regional land use plan is particularly important in the plan reevaluation process. The original 1963 inventory of land use in southeastern Wisconsin was updated in 1967 and 1970 as part of the Commission's continuing land use-transportation study.[2] The 1970 reinventory of land use, in particular, represents an important new benchmark of information concerning existing land development in southeastern Wisconsin, providing a basis for quantitative description of the changes in the regional land use pattern which have taken place since 1963. This description not only facilitates review of the relationships existing between land use and transportation, but facilitates evaluation of the conformance or departure of recent development trends from the adopted regional land use plan.

In 1963, 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. It was designed to be 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 in use within the Region at that time.

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 scale of 1" = 400', measured, checked, coded, edited, and submitted for data processing. 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. The 1970 land use reinventory was conducted as an update of the previous Commission inventories. Utilizing 1970 aerial photograph enlargements at a scale of 1" = 400', the land use reinventory was accomplished by visually comparing each 1970 aerial photograph with each corresponding 1963 and 1967 aerial photograph existing in the SEWRPC files, and delineating and quantifying any changes in land use that occurred.

This chapter describes and analyzes the land use information most relevant to the plan reevaluation process. It includes a discussion of the type, intensity, and spatial distribution of 1970 land use within the Region, as well as a summary of changes in the amount and location of the major land uses between 1963 and 1970, with emphasis on the relationship between actual land development over the last decade and that recommended under the adopted regional land use plan. Because the current trends in land use development are most meaningfully evaluated in the context of the historical growth of the Region, a brief review of historical development patterns in southeastern Wisconsin has been incorporated into the first section of this chapter.

Actual implementation of the adopted regional land use plan is an extremely difficult process to monitor, both because of the scope and complexity of the plan and

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[1] *A detailed description of the methodology and classification scheme utilized in the 1963 regional land use inventory is contained in SEWRPC Procedural Manual No. 5, Land Use Inventory. The findings of the 1963 regional land use inventory, as well as the methodology and findings of the inventory of historical development within the Region, have been documented in SEWRPC Planning Report No. 7, Land Use-Transportation Study, Volume 1, Inventory Findings—1963.*

[2] *The procedures utilized in the 1967 and 1970 regional land use inventories are fully documented in SEWRPC Staff Memorandum No. 19, Conduct of the 1967 Land Use Inventory, and in SEWRPC Procedural Manual No. 7, Land Use Inventory, respectively.*

because of the dynamic nature of regional development. In evaluating progress toward implementation of the regional land use plan, attention should be focused on the most important and essential plan elements. Care should be taken to avoid becoming lost in plan details whose effects are not significant regionally.

The regional land use plan has been considered to be largely achieved if the primary environmental corridors of the Region are protected from incompatible urban development; if the remaining prime agricultural lands in the Region are preserved in agricultural use; if the major regional park and outdoor recreation areas are acquired for public use; if future residential development within the Region approximates the density and spatial distribution pattern recommended by the plan; and if the major activity centers—that is, the major shopping and industrial centers—approximate the scale and spatial location recommended by the plan.

Progress in the implementation of the first of these major plan elements was described in the previous chapter of this report. Progress toward the implementation of the remaining four plan elements, which relate to agricultural land preservation, residential land development, public acquisition of major regional park and outdoor recreation sites, and the development of major activity centers, is described and analyzed in this chapter.

In order to provide a sound basis for regional land use and transportation plan reevaluation, the surveillance of recent development trends in relation to the adopted regional development objectives as presented in this chapter extends beyond a consideration of the major plan elements referred to above. In addition, for each of the major land use categories, the amount of land actually devoted to a given land use in 1970 is compared to the amount of land proposed for that use under the 1970 stage of the adopted plan. While the comparison of actual land development between 1963 and 1970 with that suggested under the adopted regional land use plan does not in itself indicate the success or failure of regional plan implementation, such a comparison may assist in identifying major shortcomings of, or progress in, plan implementation, and may contribute to the refinement and revision of the adopted regional land use and transportation plans and the objectives, principles, and standards on which those plans are based.

HISTORIC GROWTH

The first permanent European settlement in the Region was a trading post established in 1795 on the east side of the Milwaukee River, just north of what is now Wisconsin Avenue. The movement of European 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 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 (see Map 43) 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 in many of the smaller communities that exist in the Region today. These include the still unincorporated community of Wilmot in southwestern 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 community of Boltonville and the City of Hartford and Villages of Germantown, Slinger, and Newburg in Washington County; and the Cities and Villages of Delafield, Eagle, 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

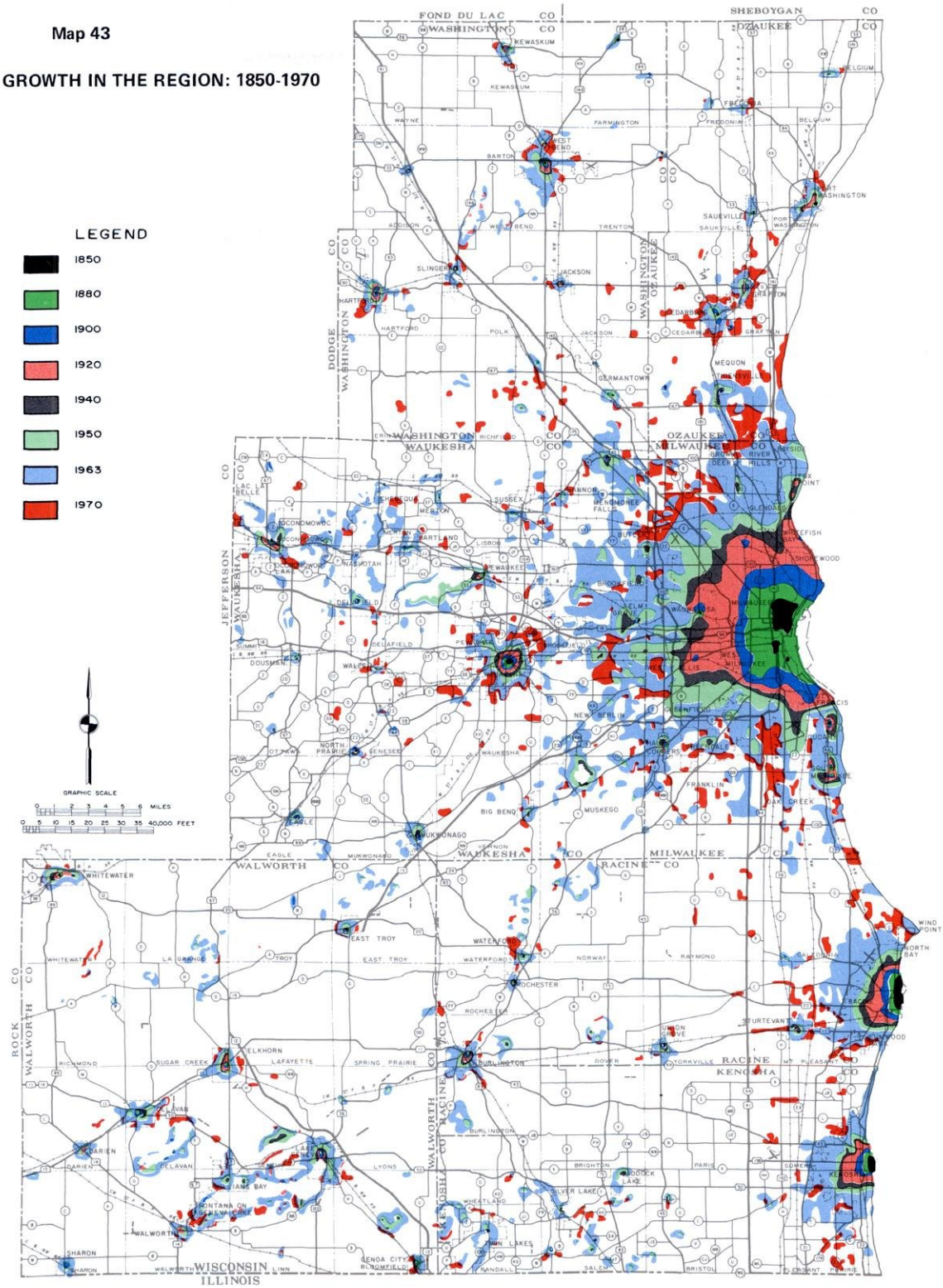
Urban development[3] in the Region increased significantly between 1850 and 1880, between 1890 and 1920, and between 1950 and 1970. The 1920 to 1940 period, which included a severe national depression and slow recovery, and the 1940 to 1950 period, while inaugurating the post-war housing boom, do not 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 20-year period from 1950 to 1970 shows the most dramatic increase in urban development. The pattern of development occurring around the existing communities of the Region during this period is descriptively referred to as "urban sprawl." While the urban population of the Region increased by 47 percent during this period, land devoted to urban uses increased by 188 percent.

The conversion of land to urban uses occurred at the rapid rate of 15.5 square miles per year between 1950 and 1963. Since the initial regional land use inventory in 1963, urban development has continued at a some-

[3] *Urban development as defined for the purposes of this report includes those areas of the Region wherein houses or other buildings have been constructed in relatively 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 nonurban type land uses, such as agriculture, woodlands, or wetlands prevailed, and the above conditions were generally absent.*

Map 43

HISTORIC URBAN GROWTH IN THE REGION: 1850-1970



Urban development within the Region occurred in a fairly regular pattern until about 1950, forming concentric rings of relatively high-density urban development contiguous to, and outward from, the existing urban areas and long-established mass transit, utility, and community facility systems. Soon after World War II, however, the character of urban growth in the Region began to change to a much more diffused pattern of development, with relatively low densities and high proliferation of clusters of noncontiguous development. Between 1963 and 1970, this sprawl pattern of development continued with an additional 57 square miles of land committed to urban use within the Region over that period, representing a rate of approximately 8 square miles per year. The continuation of this sprawl pattern of land use development threatens further destruction of prime agricultural lands and of the underlying and sustaining natural resource base and the creation of urban enclaves in essentially rural areas that will be difficult to serve economically, if at all, with necessary public utilities and services.

Source: SEWRPC.

what lower rate, 8.1 square miles per year. It should be recognized that the proportionate increase in urban development (17 percent) exceeded the proportionate increase in the urban population (6 percent) during the 1963-1970 period.

The 1970 reinventory of land use within the Region indicated that between 1963 and 1970 approximately 57 square miles of land were converted from rural to urban use within the Region. From analysis of Map 43, it is apparent that the diffused nature of urban development which began to manifest itself in the 1950s continued in the Region during this period. Urban development in the Milwaukee metropolitan area continued to increase in the area's once far removed rural communities between 1963 and 1970. Thus, to the north and west, considerable urban development occurred in the Mequon, Cedarburg, Grafton, Germantown, and Waukesha areas. To the south, substantial urban development occurred in the communities of Greendale, Franklin, and Oak Creek in Milwaukee County as well as in the Town of Caledonia in Racine County, which is subject to the outward spread of urban development from two metropolitan centers, Milwaukee and Racine. Close to Lake Michigan, the considerable urban development which occurred both north and south of the Kenosha, Milwaukee, and Racine metropolitan areas between 1963 and 1970 lends further support to 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 the lake from South Bend, Indiana, to Port Washington, Wisconsin.

The historical 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, and 36, and USH 18, 41, and 141, on the spatial location of urban development is clearly evident in more recent years, the historical 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 influences 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 between 1850 and 1970 is presented in Tables 61 and 62. During this 120-year period, the regional population increased more than 15-fold, from 113,389 to 1,756,086. As a result, the overall population density of the Region increased steadily from 42 persons per square mile in

Table 61

POPULATION DENSITY TRENDS IN THE REGION: SELECTED YEARS 1850-1970

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	70.6	147,726	29.4	501,808	37	2,689	9,569.8	186.6
1920	635,376	81.1	148,305	18.9	783,681	56	2,689	11,346.0	291.4
1940[a]	991,535	92.9	76,164	7.1	1,067,699	90	2,689	11,017.1	397.1
1950[a]	1,179,084	95.0	61,534	5.0	1,240,618	138	2,689	8,544.1	461.4
1963[a]	1,634,200	97.6	40,100	2.4	1,674,300	340	2,689	4,806.5	622.6
1970[a]	1,728,949	98.5	27,137	1.5	1,756,086	397	2,689	4,355.0	653.1

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

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

Table 62

ESTIMATED POPULATION DENSITY TRENDS IN THE MILWAUKEE, RACINE, AND KENOSHA URBAN DEVELOPMENT AREAS: SELECTED YEARS 1850-1970

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	194.6	5,858	106,000	27.6	3,841	82,000	20.4	4,020
1970	1,204,000	255.8	4,707	122,000	32.1	3,800	88,000	21.9	4,018

Source: SEWRPC.

1850 to 653 persons per square mile in 1970. Population densities within urban areas of the Region, however, have followed a different trend. The population density of the urban area of the Region increased from 7,156 persons per square mile in 1850 to its highest level of 11,346 persons per square mile in 1920. After 1920, the population density of the urban area of the Region began a steady decline. In 1950, the urban population density in the Region was 8,544 persons per square mile. By 1963, the urban population density had dropped to 4,807 persons per square mile, a substantial reduction from the 1920 peak and significantly lower than the 1950 level. Reduction in urban population density which occurred in the Region during the period from 1950 to 1963 amounted to an annual reduction of about 288 persons per square mile, or a decrease of 3 percent per year. Since the initial land use inventory in 1963, the urban population density continued to decline to about 4,355 persons per square mile in 1970. These dramatic reductions have important implications for regional land use and public facilities planning, and particularly for highway and mass transit system planning.

The rate of decline in urban population density has, however, slowed to an annual reduction of about 65 persons per square mile, or a decrease of about 1 percent per year (see Figure 15). The adopted regional land use plan recommended the stabilization of the urban population density so that by 1990, the design year of the plan, the overall urban population density within the Region would approximate 4,353 persons per square mile, about the same as the actual 1970 urban population density of the Region.

As indicated in Table 62, similar decreases in population densities occurred in the three major urban development areas[4] of the Region—Kenosha, Milwaukee, and Racine—between 1920 and 1963. Between 1963 and 1970, however, the population density in the Racine and Kenosha urban development areas remained relatively stable because of similar rates of increase in urban land area and urban population levels during this time. In the Milwaukee metropolitan area, however, the amount of land included in the urban development area increased by 61.2 square miles, or 31 percent, between 1963 and 1970, while the population in the urban development area increased by only 64,000 persons, or nearly 6 percent. Accordingly, the population density of the Milwaukee urban development area decreased from 5,858 persons per square mile in 1963 to 4,707 persons per square mile in 1970.[5]

The increases in population and urban area and decreases in urban population density have been 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 beyond 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

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[4] *The urban development areas of Kenosha, Milwaukee, and Racine are the areas of continuous urban development in and around the Cities of Kenosha, Milwaukee, and Racine, respectively. The continuity of an urban development area was considered interrupted if a quarter mile or more of nonurban type land uses prevailed and urban development was generally absent.*

[5] *Increases in the size of the Kenosha, Milwaukee, and Racine urban development areas between 1963 and 1970 generally consisted of land actually developed for urban purposes during this period, but additionally may include formerly removed areas of urban development existing in 1963 which were "linked" to the urban centers by land development which occurred between 1963 and 1970.*

extent to which this form of diffused urban development continues will be a prime determinant of future environmental conditions within the Region, as well as of transportation and public facility needs.

Factors contributing to the diffusion of urban development and the associated decline in urban population densities include the widespread availability of electric power and telephone service; the practicality of an onsite sewage disposal and water supply made possible by the septic tank and electrically powered well, respectively; the development of "all weather" highway facilities and the attendant use of the automobile for mass transportation; and the apparent desirability with which the American public regards low density residential development and the premium which that public places on space in the vicinity of its residence. Before the widespread availability of the automobile, limited transportation facilities served to constrain, to some extent, the spread of residential development and other forms of urban land use. Increasingly quick and convenient automobile travel, however, has effectively made large amounts of land accessible for development, thereby reducing the need for the intensive urban land development patterns of the past. It must be recognized, however, that the rapid expansion of urban land development is not necessarily consistent with a judicious use of the limited fiscal and physical resources of the Region as recommended in the adopted regional land use plan. In the following section of this chapter, the 1970 land use base of the Region is described and the conformance or departure of recent development trends from the regional development objectives embodied in the adopted plan are analyzed in detail.

EXISTING LAND USE

Although southeastern Wisconsin is an urban region, less than 20 percent of its total area is presently devoted to urban land uses. As will be shown later, however, these urban uses are so diffused throughout the Region that they have not only created an impression of widespread urbanization, but have also created many serious area-wide environmental problems. The spatial distribution of land uses in the Region in 1970 is shown in a generalized manner on Map 44.

As indicated in Table 63, agricultural land remains the largest single category in the Region, occupying 1,040,121 acres, or 60 percent of the total area of the Region, in 1970. The next largest land use category is open lands, consisting of woodlands, water and wetlands, and unused lands[6] totaling 353,136 acres, or 21 percent of the Region. Accordingly, 1,393,257 acres of land representing 81 percent of the total area of the Region were devoted to nonurban land uses—agricultural and open land—in 1970.

Between the initial regional land use inventory in 1963 and the land use inventory update in 1970, considerable amounts of agricultural and open lands were converted to urban land uses. The amount of land devoted to agricultural uses decreased by 43,679 acres, or 4 percent, over this period, while the amount of open lands declined by 3,854 acres, or about 1 percent, primarily because of the conversion of woodlands to urban uses.

For regional planning purposes, urban land is defined as lands devoted to residential, commercial, industrial, governmental and institutional, transportation, and recreational uses. As further indicated in Table 63, residential land use occupies the greatest area, accounting for 156,266 acres, or 9 percent of the total area of the Region. A close second are transportation, communication, and utilities uses, which account for 109,407 acres, or 6 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.

The very small area and proportion of land presently devoted to 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 amounts to only 16,556 acres, or 1 percent of the total area of the Region, yet this small area provides the basis for more than 81 percent of the jobs in southeastern Wisconsin.

Among the urban land uses, the greatest absolute increase—27,047 acres—between 1963 and 1970 occurred in the residential category, while the smallest absolute increases were observed for land devoted to economic activities—commercial and industrial land use—which increased by 758 acres and 1,871 acres, respectively. On a percentage basis, the rates of increase among the urban land uses between 1963 and 1970 ranged from a low of 9 percent for the transportation, communication, and utility category to a high of 23 percent for the industrial, government and institutional, and recreation land use categories.

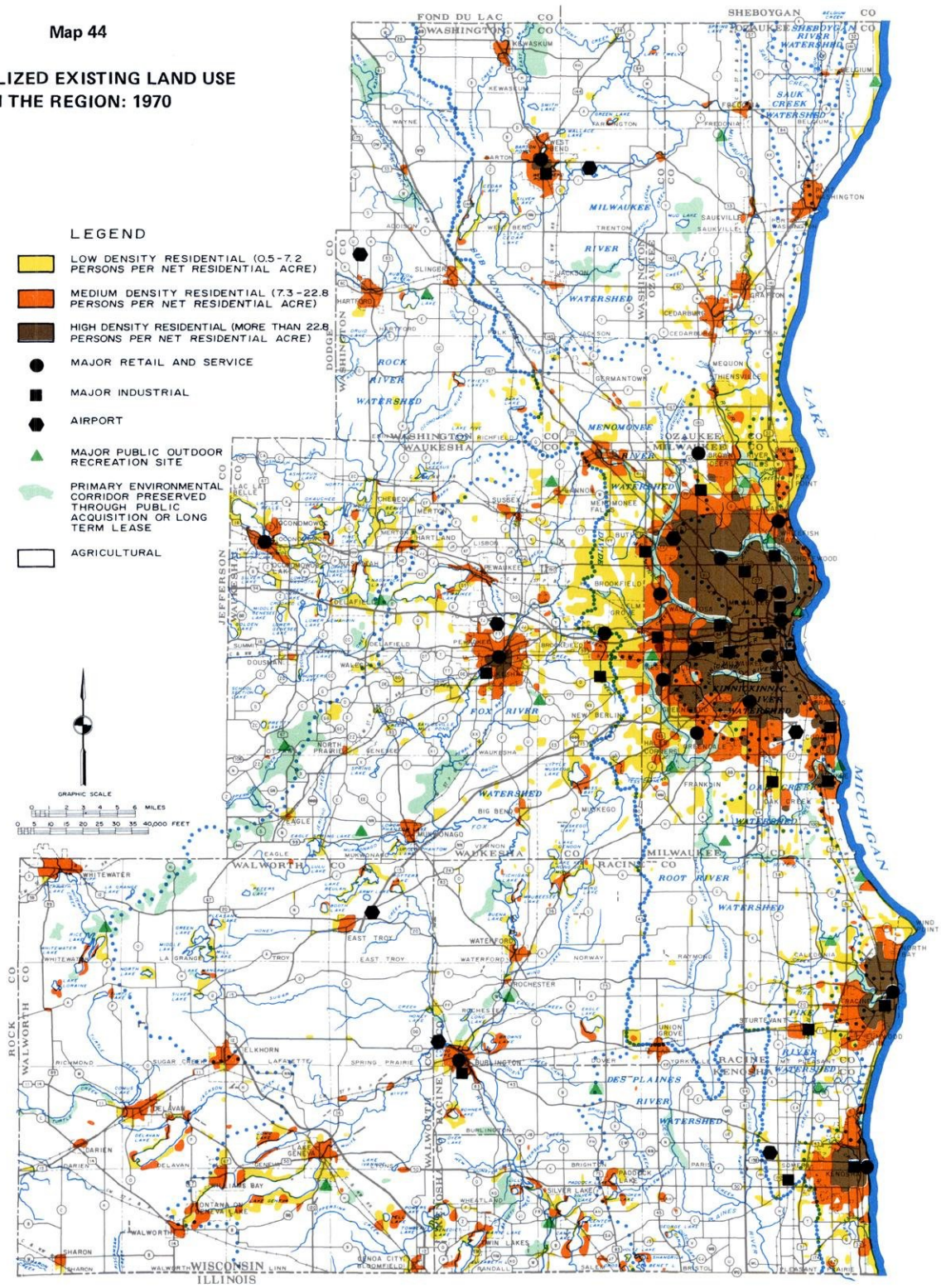
Table 64 represents a summary of the conversion of land from nonurban to urban uses within the Region between 1963 and 1970. Urbanization occurred at a rapid rate, with approximately 47,600 acres of land, representing 3 percent of the total area of the Region, being converted from nonurban to urban uses. Waukesha County experienced the largest absolute increase—15,405 acres, or almost one-third of the total increment in urban land in the Region. Urban land development also occurred at a rapid rate in Ozaukee and Washington Counties, and urban land increased by more than 24 percent in these three outlying counties between 1963 and 1970.

The diffused nature of urban land development within the Region between 1963 and 1970 is evident on Map 45, which depicts the urban development which occurred within each U. S. Public Land Survey quarter section between 1963 and 1970 in relation to the extent of

[6] *Unused lands are lands which are neither developed, cropped, tilled, grazed, or used as a place of storage.*

Map 44

GENERALIZED EXISTING LAND USE IN THE REGION: 1970



This map summarizes the spatial distribution of the various land uses existing within the Region as of April 1970. Although southeastern Wisconsin is a highly urbanized Region, less than 20 percent of its total area is presently devoted to urban type land uses. Agriculture, while declining in economic importance within the Region, still occupies 60 percent of the total land use in the Region, with the remaining 20 percent occupied by water, woodlands, and wetlands.

Source: SEWRPC.

Table 63

DISTRIBUTION OF LAND USE IN THE REGION BY COUNTY: 1963 and 1970

County	Year[h]	Major Land Use Category							
		Residential[a]		Commercial		Industrial[b]		Transportation[c]	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1963.	11,919	6.7	453	0.3	685	0.4	8,786	4.9
	1970.	13,477	7.5	504	0.3	811	0.5	8,927	5.0
	Change . . .	1,558	13.1	51	11.3	126	18.4	141	1.6
Milwaukee	1963.	41,920	27.1	2,591	1.7	4,415	2.8	32,397	20.9
	1970.	45,632	29.4	2,875	1.9	4,899	3.2	35,431	22.9
	Change . . .	3,712	8.9	284	11.0	484	11.0	3,034	9.4
Ozaukee	1963.	9,203	6.1	307	0.2	313	0.2	7,198	4.8
	1970.	12,321	8.2	330	0.2	444	0.3	8,054	5.4
	Change . . .	3,118	33.9	23	7.5	131	41.9	856	11.9
Racine	1963.	13,391	6.2	641	0.3	749	0.3	11,561	5.3
	1970.	16,625	7.6	575	0.3	1,099	0.5	12,442	5.7
	Change . . .	3,234	24.2	- 66	- 10.3	350	46.7	881	7.6
Walworth	1963.	11,937	3.2	546	0.2	730	0.2	10,884	2.9
	1970.	13,408	3.6	593	0.2	827	0.2	12,020	3.3
	Change . . .	1,471	12.3	47	8.6	97	13.3	1,136	10.4
Washington	1963.	7,395	2.7	244	0.1	318	0.1	10,534	3.8
	1970.	11,525	4.1	299	0.1	434	0.2	11,286	4.1
	Change . . .	4,130	55.8	55	22.5	116	36.5	752	7.1
Waukesha	1963.	33,454	9.0	977	0.3	958	0.3	18,693	5.0
	1970.	43,278	11.6	1,341	0.4	1,525	0.4	21,247	5.7
	Change . . .	9,824	29.4	364	37.3	567	59.2	2,554	13.7
Region	1963.	129,219	7.5	5,759	0.3	8,168	0.5	100,053	5.8
	1970.	156,266	9.1	6,517	0.4	10,039	0.6	109,407	6.3
	Change . . .	27,047	20.9	758	13.2	1,871	22.9	9,354	9.3

existing 1970 public sanitary sewer service areas in the Region, as well as those areas of the Region for which public sanitary sewer service is planned by the year 1990. As shown on Map 45, the dispersal of urban land development continued within the seven-county Region between 1963 and 1970, contrary to the recommendation of the adopted regional land use plan that urban growth be encouraged to occur contiguously to and outward from existing urban centers in areas which can readily be served by essential public utilities, particularly sanitary sewerage.

Only about 39 percent of all urban development occurring between 1963 and 1970 was located in areas presently served by public sanitary sewerage facilities (see Table 65) while only about 45 percent of the new urban development was located in areas for which public sanitary sewer service is planned by 1990. In Milwaukee County, more than 85 percent of all urban land developed between 1963 and 1970 was served by public sewerage facilities. However, less than half of the incremental urban development between 1963 and 1970 was served by sanitary sewerage facilities within each of the other six counties of the Region, with the actual proportions ranging from a low of 14 percent in Walworth County to a high of nearly 44 percent in Ozaukee County.

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, which are termed people-use ratios, are commonly developed for several major land use categories, and are expressed as the number of acres of a given land use per thousand persons in the area under consideration. These people-use ratios are applied primarily in the preparation of conditional forecasts of future land use requirements, which are accomplished by

Table 63 (continued)

County	Year[h]	Major Land Use Category									
		Governmental[d]		Recreation		Agriculture		Open Lands[e]		Total	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1963. . . .	957	0.5	2,099	1.2	116,754	65.5	36,445	20.5	178,098	100.0
	1970. . . .	1,324	0.7	2,672	1.5	113,930	64.0	36,455	20.5	178,100	100.0
	Change . .	367	38.3	573	27.3	- 2,824	- 2.4	10	--[g]	2	0
Milwaukee	1963. . . .	6,494	4.2	9,040	5.8	34,870	22.5	23,269	15.0	154,996	100.0
	1970. . . .	7,490	4.8	9,924	6.4	28,607	18.4	20,206	13.0	155,064	100.0
	Change . .	996	15.3	884	9.8	- 6,263	- 18.0	- 3,063	- 13.2	68[f]	--[g]
Ozaukee	1963. . . .	718	0.5	1,339	0.9	105,126	70.1	25,809	17.2	150,013	100.0
	1970. . . .	940	0.6	1,657	1.1	100,491	67.0	25,776	17.2	150,013	100.0
	Change . .	222	30.9	318	23.7	- 4,635	- 4.4	- 33	- 0.1	0	0
Racine	1963. . . .	1,360	0.6	2,119	1.0	153,641	70.6	34,084	15.7	217,546	100.0
	1970. . . .	1,744	0.8	2,585	1.2	147,207	67.7	35,284	16.2	217,561	100.0
	Change . .	384	28.2	466	22.0	- 6,434	- 4.2	1,200	3.5	15[f]	--[g]
Walworth	1963. . . .	980	0.3	2,871	0.8	265,694	71.8	76,340	20.6	369,982	100.0
	1970. . . .	1,192	0.3	4,275	1.2	261,744	70.8	75,923	20.4	369,982	100.0
	Change . .	212	21.6	1,404	48.9	- 3,950	- 1.5	- 417	- 0.5	0	0
Washington	1963. . . .	687	0.2	1,230	0.4	191,674	68.8	66,652	23.9	278,734	100.0
	1970. . . .	919	0.3	1,664	0.6	186,466	66.9	66,141	23.7	278,734	100.0
	Change . .	232	33.8	434	35.3	- 5,208	- 2.7	- 511	- 0.8	0	0
Waukesha	1963. . . .	2,282	0.6	4,850	1.3	216,041	58.1	94,391	25.4	371,646	100.0
	1970. . . .	3,009	0.8	6,219	1.7	201,676	54.3	93,351	25.1	371,646	100.0
	Change . .	727	31.9	1,369	28.2	- 14,365	- 6.6	- 1,040	- 1.1	0	0
Region	1963. . . .	13,478	0.8	23,548	1.4	1,083,800	63.0	356,990	20.7	1,721,015	100.0
	1970. . . .	16,618	1.0	28,996	1.7	1,040,121	60.4	353,136	20.5	1,721,100	100.0
	Change . .	3,140	23.3	5,448	23.1	- 43,679	- 4.0	- 3,854	- 1.1	85[f]	--[g]

[a] *Includes all residential areas, developed and under development.*

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

[c] *Includes off-street parking areas of more than 10 spaces.*

[d] *Includes institutional land uses.*

[e] *Includes woodlands, quarries, water and wetlands, as well as unused and other open lands.*

[f] *Increases due to landfill along Lake Michigan.*

[g] *Less than 0.1 percent.*

[h] *The 1963 data reported for certain land uses herein differ slightly from data presented in SEWRPC Planning Report No. 7, The Land Use-Transportation Study, Volume One, Inventory Findings, due to a refinement of the inventory data. The maximum variance in this regard is less than 1 percent.*

Source: SEWRPC.

Table 64

PROPORTION OF URBAN AND NONURBAN LAND USES IN THE REGION BY COUNTY: 1963 and 1970

County	Urban/ Nonurban Status	1963		1970		Change: 1963-1970	
		Acres	Percent of County	Acres	Percent of County	Acres	Percent
Kenosha	Urban[a]	24,899	14.0	27,715	15.6	2,816	11.3
	Nonurban[b]	153,199	86.0	150,385	84.4	- 2,814	- 1.8
	Total	178,098	100.0	178,100	100.0	2[c]	--[d]
Milwaukee	Urban	96,857	62.5	106,251	68.5	9,394	9.7
	Nonurban	58,139	37.5	48,813	31.5	- 9,326	- 16.0
	Total	154,996	100.0	155,064	100.0	68[c]	--[d]
Ozaukee	Urban	19,078	12.7	23,746	15.8	4,668	24.5
	Nonurban	130,935	87.3	126,267	84.2	- 4,668	- 3.6
	Total	150,013	100.0	150,013	100.0	--	--
Racine	Urban	29,821	13.7	35,070	16.1	5,249	17.6
	Nonurban	187,725	86.3	182,491	83.9	- 5,234	- 2.8
	Total	217,546	100.0	217,561	100.0	15[c]	--[d]
Walworth	Urban	27,948	7.6	32,315	8.7	4,367	15.6
	Nonurban	342,034	92.4	337,667	91.3	- 4,367	- 1.3
	Total	369,982	100.0	369,982	100.0	--	--
Washington	Urban	20,408	7.3	26,127	9.4	5,719	28.0
	Nonurban	258,326	92.7	252,607	90.6	- 5,719	- 2.2
	Total	278,734	100.0	278,734	100.0	--	--
Waukesha	Urban	61,214	16.5	76,619	20.6	15,405	25.2
	Nonurban	310,432	83.5	295,027	79.4	- 15,405	- 5.0
	Total	371,646	100.0	371,646	100.0	--	--
Region	Urban	280,225	16.3	327,843	19.0	47,618	17.0
	Nonurban	1,440,790	83.7	1,393,257	81.0	- 47,533	- 3.3
	Total	1,721,015	100.0	1,721,100	100.0	85[c]	--[d]

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

[b] *Includes agricultural lands, woodlands, water and wetlands, and unused and other open lands, including quarries.*

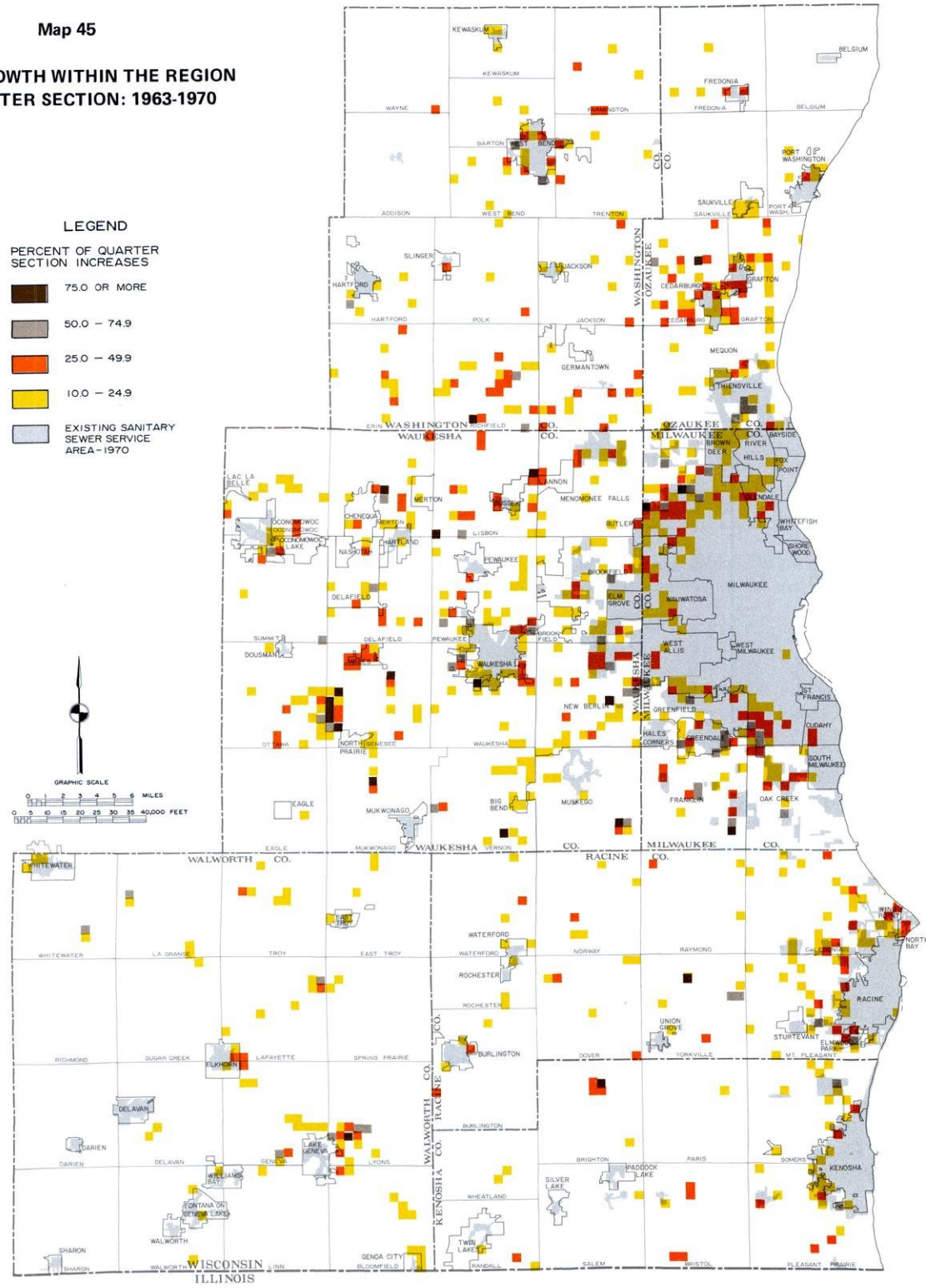
[c] *Increases due to landfill operations along Lake Michigan.*

[d] *Less than 0.1 percent.*

Source: SEWRPC.

Map 45

URBAN GROWTH WITHIN THE REGION BY QUARTER SECTION: 1963-1970



The 1990 regional land use plan proposed to concentrate new urban development in those areas of the Region which were covered by soils suitable for urban use; which could be efficiently provided with sanitary sewer and water supply services through the extension of existing systems; and which could be readily provided with such essential public services as police and fire protection, solid waste collection, and mass transit. As shown on this map, urban development is still occurring within the Region outside of the area recommended to contain urban development by 1990. This continued diffusion of urban land uses and of population and employment have important implications for the physical and fiscal well-being of the communities in the Region. The rapidly increasing costs of urban development, together with increased public and private expenditures required to sustain such development, should be of concern to every municipality in the Region as well as to the citizens who will have to bear the burden of supporting the costs of such development.

Source: SEWRPC.

Table 65

PROVISION OF PUBLIC SANITARY SEWER SERVICE TO URBAN LAND DEVELOPED IN THE REGION BY COUNTY: 1963-1970

County	New Urban Land Development[a] Between 1963 and 1970					
	Served by Public Sanitary Sewerage Facilities		Not Served by Public Sanitary Sewerage Facilities		Total	
	Acres	Percent of County Development	Acres	Percent of County Development	Acres	Percent
Kenosha	1,051	37.3	1,765	62.7	2,816	100.0
Milwaukee	8,066	85.9	1,328	14.1	9,394	100.0
Ozaukee	2,060	44.1	2,608	55.9	4,668	100.0
Racine	1,925	36.7	3,324	63.3	5,249	100.0
Walworth	628	14.4	3,739	85.6	4,367	100.0
Washington	1,023	17.9	4,696	82.1	5,719	100.0
Waukesha	3,850	25.0	11,555	75.0	15,405	100.0
Region	18,603	39.1	29,015	60.9	47,618	100.0

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

Source: SEWRPC.

combining the ratios with forecasts of future population levels to arrive at the probable future demand for specific land use categories.

People-use ratios for certain major land use categories for 1963 and 1970 by county are shown in Table 66. For each land use category, the lowest people-use ratios in 1970 occurred in the highly urbanized counties of the Region—Kenosha, Milwaukee, and Racine—while higher people-use ratios occurred in the Region's outlying counties. Very low people-use ratios were observed in Milwaukee because of the intensive nature of urban development within that county. Of the seven counties, Racine most closely approximates the regional average for each ratio in every land use category.

As indicated in Table 66, people-use ratios for the Region overall for each of the selected land use categories increased between 1963 and 1970, reflecting faster rates of growth for each category than for the regional population. The people-use ratio for residential land in particular increased substantially, indicating a continuation of the trend toward declining residential densities. In contrast to this rise within the major land use categories, the people-use ratio for residential land decreased in Ozaukee, Walworth, and Waukesha Counties; decreased for commercial land in Ozaukee, Racine, Walworth, and Washington Counties; and decreased for recreational land in Ozaukee County.

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 persons employed in a given activity is related to the amount of land devoted to that activity. Employee-land use ratios for certain major land use categories are presented by county for 1963 and 1970 in Table 67. Because of the concentration of commercial, manufacturing, and wholesaling employment in Milwaukee County, the employee-land use ratios are significantly greater in this county than the regional average.

As indicated in Table 67, the employee-land use ratio increased with respect to commercial activity but decreased with respect to manufacturing and wholesaling activity in the Region between 1963 and 1970. The employee-land use ratio for commercial activity increased substantially due to the fact that growth in commercial employment (57 percent) far surpassed growth in commercial land (13 percent). The decrease in the employee-land use ratio for manufacturing activity can be traced to an actual decline in manufacturing employment between 1963 and 1970, and a moderate increase (9 percent) in manufacturing land. The decrease in the employee-land use ratio for wholesaling activity is due to the fact that the growth rate in wholesaling land between 1963 and 1970 (46 percent) was substantially greater than the growth rate in wholesale employment (6 percent).

Residential Land Use

The residential land use category includes and identifies both land actually occupied by a residence and vacant land which was either under development for residential use or immediately available for such use. The latter category includes vacant building sites between existing residences, and improved but still vacant residential subdivisions.

Table 66

DEVELOPED ACRES OF SELECTED LAND USES PER THOUSAND PERSONS IN THE REGION BY COUNTY: 1963 and 1970

County	Year	Selected Land Use Category			
		Residential[a]	Retail Commercial[b]	Governmental[c]	Active Recreational
Kenosha	1963	91.4	4.2	9.0	19.7
	1970	92.2	4.3	11.2	22.7
	Change	0.8	0.1	2.2	3.0
Milwaukee	1963	36.5	2.4	6.0	8.3
	1970	40.6	2.7	7.1	9.4
	Change	4.1	0.3	1.1	1.1
Ozaukee	1963	180.1	7.4	17.3	32.2
	1970	171.8	6.1	17.3	30.4
	Change	- 8.3	- 1.3	--	- 1.8
Racine	1963	77.7	4.3	9.0	14.1
	1970	83.3	3.4	10.2	15.1
	Change	5.6	- 0.9	1.2	1.0
Walworth	1963	182.3	9.8	17.7	51.7
	1970	176.8	9.3	18.8	67.4
	Change	- 5.5	- 0.5	1.1	15.7
Washington	1963	131.9	4.9	13.9	24.8
	1970	134.9	4.7	14.4	26.1
	Change	3.0	- 0.2	0.5	1.3
Waukesha	1963	150.1	5.3	12.4	26.3
	1970	149.6	5.8	13.0	26.9
	Change	- 0.5	0.5	0.6	0.6
Region	1963	67.4	3.4	8.0	14.1
	1970	75.0	3.7	9.5	16.5
	Change	7.6	0.3	1.5	2.4

[a] *Includes farm homesteads and does not include residential land under development.*

[b] *Includes services.*

[c] *Includes institutional.*

Source: SEWRPC.

At the time of the 1970 land use inventory, there were 156,266 acres of residential land in the Region (see Table 68). Single-family detached residences represent the predominant type of residential land use, with land devoted to single-family housing comprising 78 percent of all residential land area in the Region, down slightly from 81 percent in 1963. Lands under residential development comprise 16 percent of the total, up from nearly 13 percent in 1963, while two-family residences accounted for nearly 4 percent of the total, down from 4 percent in 1963. Mobile homes and multifamily residences combined represented less than 3 percent of all residential land in the Region in 1970, compared to nearly 2 percent in 1963.

As further indicated in Table 68, between 1963 and 1970 the amount of residential land in the Region increased by 27,047 acres, or 21 percent. Most of this increase consisted of single-family residences and residential lands under development. Growth in land devoted to multifamily housing occurred at a rapid rate (more than 40 percent) due to increased demand for rental housing

Table 67

EMPLOYEES PER ACRE OF SELECTED LAND USES IN THE REGION BY COUNTY: 1963 and 1970

County	Year	Land Use Category		
		Retail Commercial and Services	Manufacturing	Wholesaling
Kenosha	1963 . . .	20.4	80.9	1.4
	1970 . . .	18.6	74.8	1.1
	Change . .	- 1.8	- 6.1	- 0.3
Milwaukee	1963 . . .	59.0	72.2	15.9
	1970 . . .	80.8	58.7	11.6
	Change . .	21.8	- 13.5	- 4.3
Ozaukee	1963 . . .	8.9	17.7	1.2
	1970 . . .	15.6	29.3	1.2
	Change . .	6.7	11.6	--
Racine	1963 . . .	26.4	44.1	9.0
	1970 . . .	38.8	38.4	3.6
	Change . .	12.4	- 5.7	- 5.4
Walworth	1963 . . .	5.4	8.9	0.6
	1970 . . .	17.4	15.8	0.6
	Change . .	12.0	6.9	--
Washington	1963 . . .	11.2	21.1	1.8
	1970 . . .	20.1	36.2	1.2
	Change . .	8.9	15.1	- 0.6
Waukesha	1963 . . .	10.7	16.8	2.9
	1970 . . .	18.5	22.1	5.7
	Change . .	7.8	5.3	2.8
Region	1963 . . .	34.4	53.2	9.7
	1970 . . .	47.6	45.6	7.1
	Change . .	13.2	- 7.6	- 2.6

Source: SEWRPC.

and multifamily condominiums. Land developed as mobile home sites also increased at a rapid rate between 1963 and 1970, but as indicated in Table 68, the mobile home category remained an insignificant component of residential land use in the Region at the end of this period.

Among the seven counties, the largest absolute increases in residential land between 1963 and 1970 occurred in Waukesha County (9,824 acres) and Washington County (4,130 acres), representing more than half of the total increment of residential land in the Region. On a relative basis, residential land development also occurred at a rapid rate, increasing by more than 24 percent in Ozaukee and Racine Counties during this period. Conversely, the rate of development of residential land was relatively slow in the urban counties of Milwaukee and Kenosha, as well as in largely rural Walworth County.

In addition to the structure type, another important consideration in the analysis of residential land development patterns is the density, expressed as the number of housing units per acre of residential land at which the development occurs. Such densities are calculated for each U. S. Public Land Survey quarter section. The following net residential density classifications were adopted by the Commission as part of the initial land use-transportation planning effort: low density—0.2 to 2.2 housing units per acre; medium density—2.3 to 6.9 housing units per acre; and high density—7.0 to 17.9 housing units per acre. The amount of residential development within each density classification is presented for the Region by county for 1963 and 1970 in Table 69. It should be noted that lands under residential development have been included in the same density classification as the adjacent fully developed residential lands.

Low-density residential development was the largest land consumer of the several residential density classifications, accounting for 56 percent of all residential land in the Region in 1970. Medium-density residential land represented an additional 28 percent of all residential development, while high-density residential land comprised the remaining 16 percent. High-density residential development in southeastern Wisconsin was concentrated in Milwaukee County, which contained 20,876 acres of high-density residential land, or 82 percent of the regional total. Milwaukee County also contained the most medium-density residential lands, with its 13,140 acres comprising 30 percent of the regional total for this density classification. On the other hand, low-density residential development predominated in the other six counties of the Region, representing more than half of all residential land within each of these counties.

Substantial increases occurred within each residential density classification between 1963 and 1970. The largest absolute and relative increase occurred in the medium-density category, which increased by 11,634 acres, or 37 percent. The low-density category was second, increasing by 11,483 acres, or 15 percent. Lands developed as high-density residential areas increased by 3,930 acres, representing a relative increase of 18 percent. With respect to the development of residential land in each of the seven counties between 1963 and 1970, high-density development predominated in Milwaukee County; medium-density development predominated in Kenosha and Walworth Counties; and low-density development predominated in Ozaukee, Racine, Washington, and Waukesha Counties.

From further analysis of Table 69, it is apparent that between 1963 and 1970, residential land development in southeastern Wisconsin occurred at a rate substantially higher than that proposed under the adopted regional land use plan. Under the adopted plan, 140,121 acres of land were proposed to be devoted to residential use by 1970. This planned amount is 16,145 acres, or 10 percent, less than the existing area of 156,266 acres recorded in the regional land use inventory. The existing residential development exceeded the planned acreage in each county except Milwaukee. For these six counties, the absolute variances between the planned and existing residential areas ranged from 372 acres in Kenosha to 7,140 in Waukesha. The relative variances ranged from 3 percent, also in Kenosha, to 33 percent in Washington County.

Table 68

RESIDENTIAL LAND USE BY STRUCTURE TYPE IN THE REGION BY COUNTY: 1963 and 1970

County	Year	Type of Residential Development													
		Single Family		Two Family		Multifamily Low Rise[a]		Multifamily High Rise[b]		Mobile Homes		Under Development		Total Residential	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1963 . . .	9,301	78.0	284	2.4	71	0.6	--[c]	--[d]	97	0.8	2,166	18.2	11,919	100.0
	1970 . . .	10,342	76.8	283	2.1	99	0.7	--[c]	--[d]	152	1.1	2,601	19.3	13,477	100.0
	Change . .	1,041	11.2	- 1	- 0.4	28	39.4	--[c]	--[d]	55	56.7	435	20.1	1,558	13.1
Milwaukee	1963 . . .	33,040	78.8	4,735	11.3	1,691	4.0	61	0.2	94	0.2	2,299	5.5	41,920	100.0
	1970 . . .	35,617	78.1	4,689	10.3	2,288	5.0	90	0.2	111	0.2	2,837	6.2	45,632	100.0
	Change . .	2,577	7.8	- 46	- 1.0	597	35.3	29	47.5	17	18.1	538	23.4	3,712	8.9
Ozaukee	1963 . . .	7,423	80.7	38	0.4	23	0.2	0	0.0	6	0.1	1,713	18.6	9,203	100.0
	1970 . . .	9,256	75.1	40	0.3	51	0.4	0	0.0	12	0.1	2,962	24.1	12,321	100.0
	Change . .	1,833	24.7	2	5.3	28	121.7	0	0.0	6	100.0	1,249	72.9	3,118	33.9
Racine	1963 . . .	11,283	84.3	308	2.3	84	0.6	4	--[d]	21	0.2	1,691	12.6	13,391	100.0
	1970 . . .	13,697	82.4	311	1.9	164	1.0	4	--[d]	50	0.3	2,399	14.4	16,625	100.0
	Change . .	2,414	21.4	3	1.0	80	95.2	0	0.0	29	138.1	708	41.9	3,234	24.2
Walworth	1963 . . .	10,028	84.0	18	0.2	38	0.3	2	--[d]	35	0.3	1,816	15.2	11,937	100.0
	1970 . . .	11,028	82.3	23	0.2	58	0.4	21	0.2	87	0.6	2,191	16.3	13,408	100.0
	Change . .	1,000	10.0	5	27.8	20	52.6	19	950.0	52	148.6	375	20.6	1,471	12.3
Washington	1963 . . .	6,421	86.8	46	0.6	44	0.6	0	0.0	17	0.2	867	11.8	7,395	100.0
	1970 . . .	8,467	73.5	40	0.4	63	0.5	0	0.0	39	0.3	2,916	25.3	11,525	100.0
	Change . .	2,046	31.9	- 6	- 13.0	19	43.2	0	0.0	22	129.4	2,049	236.3	4,130	55.8
Waukesha	1963 . . .	27,325	81.7	134	0.4	131	0.4	14	--[d]	39	0.1	5,811	17.4	33,454	100.0
	1970 . . .	34,100	78.8	187	0.4	247	0.6	3	--[d]	64	0.1	8,677	20.1	43,278	100.0
	Change . .	6,775	24.8	53	39.6	116	88.5	- 11	- 78.6	25	64.1	2,866	49.3	9,824	29.4
Region	1963 . . .	104,821	81.1	5,563	4.3	2,082	1.6	81	0.1	309	0.2	16,363	12.7	129,219	100.0
	1970 . . .	122,507	78.4	5,573	3.6	2,970	1.9	118	0.1	515	0.3	24,583	15.7	156,266	100.0
	Change . .	17,686	16.9	10	0.2	888	42.7	37	45.7	206	66.7	8,220	50.2	27,047	20.9

[a] *Less than four stories.*

[b] *Four stories or more.*

[c] *Less than 0.5 acre.*

[d] *Less than 0.1 percent.*

Source: SEWRPC.

The development of residential land in southeastern Wisconsin at a faster rate than that proposed under the adopted land use plan between 1963 and 1970 is directly related to the continued proliferation of low-density residential development patterns during this period, contrary to the recommendations embodied in the plan. The regional land use plan seeks to increase urban population densities by encouraging new residential development primarily at medium densities in locations contiguous to existing urban development which can be readily served by the extension of public facilities. Nevertheless, low-density residential land comprised more than 60 percent of all residential land development in rapidly urbanizing Ozaukee, Washington, and Waukesha Counties between 1963 and 1970, and approximately 50 percent of the residential development in Racine County. As a result, the existing stock of low-density residential land in southeastern Wisconsin in 1970 was 8,384 acres greater than the amount proposed under the adopted regional land use plan, thereby accounting for more than half of the overall variance between existing and proposed residential development in the Region.

Further insight into the conformance or departure of recent residential development patterns to or from regional development objectives may be gained from the study of Maps 46 and 47, which show the spatial distribution of existing residential land use within the Region in 1970 and the change in residential land use between 1963 and 1970, respectively. The heavy concentration of residential land use in the Kenosha, Milwaukee, and Racine metropolitan areas is obvious on Map 46. Scat-

Table 69

RESIDENTIAL LAND USE BY DENSITY CLASSIFICATION IN THE REGION BY COUNTY EXISTING 1963 AND 1970 AND PLANNED 1970

County	Density[a] Category	Residential Land Use						
		Existing[b]				Planned 1970 (Acres)	Variance Between Existing and Planned Land Use	
		1963 (Acres)	1970 (Acres)	Change: 1963-1970				
				Acres	Percent		Acres[c]	Percent[d]
Kenosha	Low	7,146	6,780	- 366	- 5.1	7,603	- 823	- 12.1
	Medium	3,656	5,202	1,546	42.3	4,356	846	16.3
	High	1,117	1,495	378	33.8	1,146	349	23.3
	Total	11,919	13,477	1,558	13.1	13,105	372	2.8
Milwaukee	Low	12,053	11,616	- 437	- 3.6	12,248	- 632	- 5.4
	Medium	11,539	13,140	1,601	13.9	14,391	- 1,251	- 9.5
	High	18,328	20,876	2,548	13.9	19,217	1,659	7.9
	Total	41,920	45,632	3,712	8.9	45,856	- 224	- 0.5
Ozaukee	Low	7,758	9,788	2,030	26.2	8,607	1,181	12.1
	Medium	1,429	2,480	1,051	73.5	1,671	809	32.6
	High	16	53	37	231.2	16	37	69.8
	Total	9,203	12,321	3,118	33.9	10,294	2,027	16.5
Racine	Low	7,770	9,371	1,601	20.6	8,252	1,119	11.9
	Medium	3,942	5,153	1,211	30.7	4,680	473	9.2
	High	1,679	2,101	422	25.1	1,799	302	14.4
	Total	13,391	16,625	3,234	24.2	14,731	1,894	11.4
Walworth	Low	8,336	7,793	- 543	- 6.3	8,448	- 655	- 7.1
	Medium	3,593	5,540	1,947	54.2	3,762	1,778	32.1
	High	8	75	67	837.5	8	67	89.3
	Total	11,937	13,408	1,471	12.3	12,218	1,190	8.9
Washington	Low	5,272	8,029	2,757	52.3	5,272	2,757	34.3
	Medium	2,019	3,362	1,343	66.5	2,395	967	28.8
	High	104	134	30	28.8	112	22	16.4
	Total	7,395	11,525	4,130	55.8	7,779	3,746	32.5
Waukesha	Low	27,817	34,258	6,441	23.2	28,821	5,437	15.9
	Medium	5,418	8,353	2,935	54.2	7,090	1,263	15.1
	High	219	667	448	204.6	227	440	66.0
	Total	33,454	43,278	9,824	29.4	36,138	7,140	16.5
Region	Low	76,152	87,635	11,483	15.1	79,251	8,384	9.6
	Medium	31,596	43,230	11,634	36.8	38,345	4,885	11.3
	High	21,471	25,401	3,930	18.3	22,525	2,876	11.3
	Total	129,219	156,266	27,047	20.9	140,121	16,145	10.3

[a] *Residential density classifications adopted during the initial land use study may be defined in terms of the number of dwelling units per net residential acre, with the net residential area including only land actually devoted to residential use. The net residential density classes are as follows: low—0.2 to 2.2 units per acre, medium—2.3 to 6.9 units per acre, and high—7.0 to 17.9 units per acre.*

[b] *Residential lands under development have been included in the same density classification as the adjacent fully developed residential lands.*

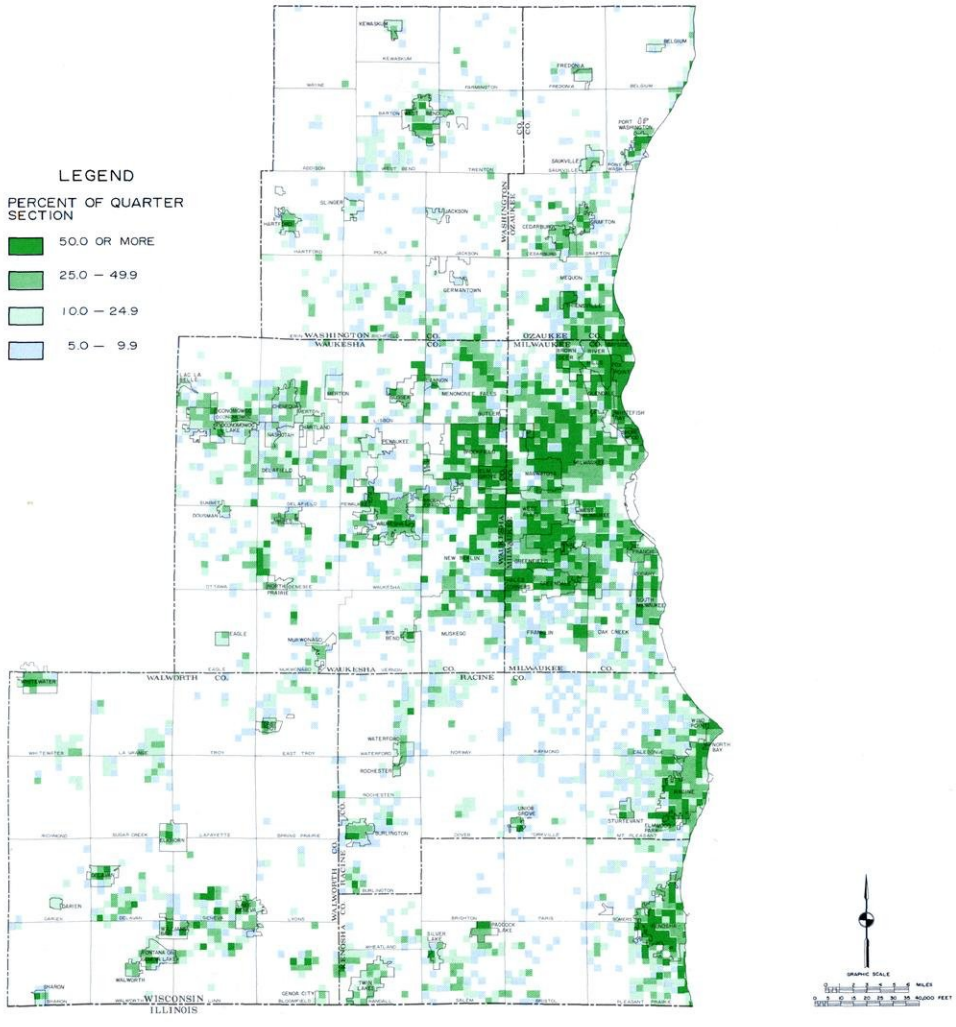
[c] *1970 existing land use minus 1970 planned land use.*

[d] *Absolute variance as a percent of 1970 existing land use.*

Source: SEWRPC.

Map 46

RESIDENTIAL LAND USE IN THE REGION: 1970

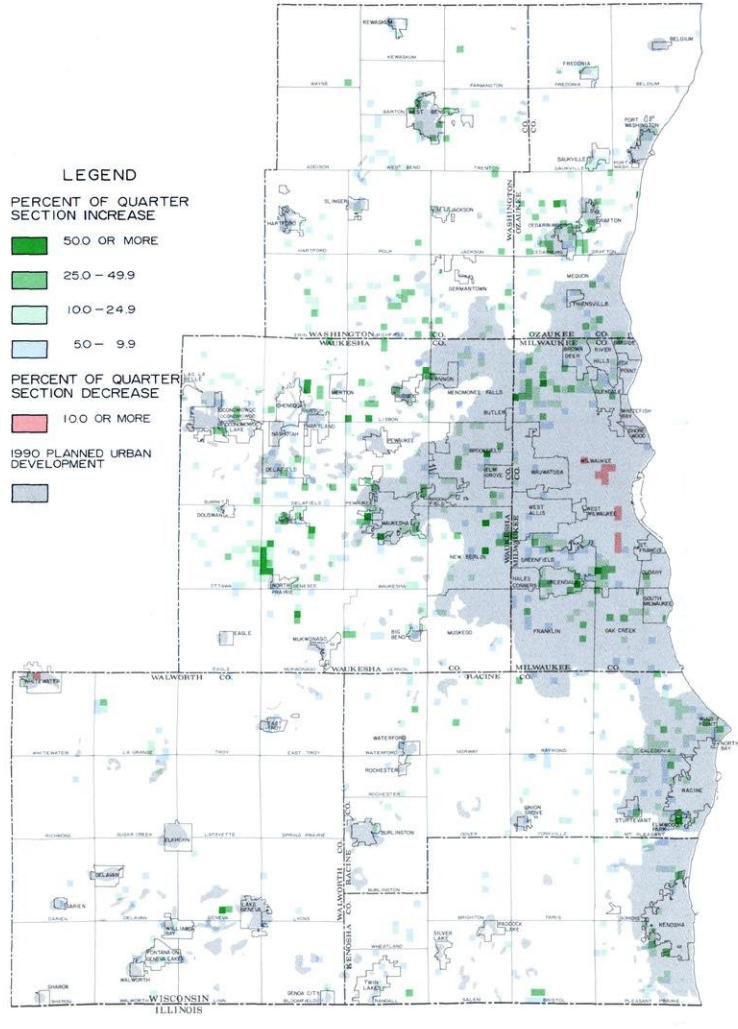


About 156,000 acres, or 48 percent of the total area devoted to urban use within the Region, and 9 percent of the total area of the Region, were developed for residential use in 1970. Single-family detached residences represented the predominant type of residential use, with land devoted to single-family housing comprising about 78 percent of all residential land area in the Region, down slightly from 81 percent in 1963. The heavy concentration of residential land use in the Milwaukee, Kenosha, and Racine metropolitan areas is evidenced on this map. Scattered concentrations of residential use are also apparent in and around long-established urban centers in the outlying areas of the Region, and around the many inland lakes of the Region.

Source: SEWRPC.

Map 47

CHANGE IN RESIDENTIAL LAND USE IN THE REGION: 1963-1970



Residential land use in the Region increased by about 27,000 acres between 1963 and 1970, or by nearly 21 percent. About one-half of this total increase occurred in Waukesha and Washington Counties. The total amount of residential land in 1970 is greater by about 16,100 acres, or by 10 percent, than that proposed for residential use in the 1970 stage of the adopted 1990 regional land use plan. This development of land for residential purposes at a rate faster than that proposed under the adopted regional land use plan is directly related to the continued proliferation of low-density residential development contrary to recommendations contained in the plan. Furthermore, only about 40 percent of the amount of land actually developed for residential purposes between 1963 and 1970 was served by public sanitary sewerage facilities as recommended in the plan. The diffusion of residential development beyond the 1990 growth limits recommended in the plan is clearly evident on the above map, particularly in southwestern Waukesha and southern Ozaukee and Washington Counties.

Source: SEWRPC.

tered concentrations of residential land development are also apparent in and around the Cities of Cedarburg and Port Washington and the Villages of Grafton and Thiensville in Ozaukee County; the City of Burlington in Racine County; the Cities of Delavan, 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.

Map 46 also indicates extensive residential land in areas which are substantially removed from these existing concentrations. Much of this dispersed development is situated around the Region's rivers, lakes, and woodlands, which provide an attractive setting for residential uses. The diffused nature of existing residential land use in southeastern Wisconsin is indicated by the fact that of a total of 10,800 U. S. Public Land Survey quarter sections in the Region, only 1,072, or about 10 percent, contain no residential land uses.

As previously stated, the adopted regional land use plan recommended encouraging new urban growth in areas contiguous to existing urban centers which can be readily served by essential public utilities. From analysis of Map 47, it is evident that although much of the residential land developed between 1963 and 1970 was located near existing urban centers, a substantial portion occurred in outlying rural areas to which extension of public utilities would be extremely costly, if not totally unrealistic. Of the total 18,827 acres actually developed for residential purposes in the Region between 1963 and 1970, only 7,437 acres, or about 40 percent, were served by public sewerage facilities (see Table 70).[7]

[7] *The increase of 18,827 acres represents the increment in fully developed residential land between 1963 and 1970, excluding the increase in residential land under development.*

As could be expected, a large proportion (about 83 percent) of all residential land developed in Milwaukee County between 1963 and 1970 was provided with public sanitary sewer service. Less than half of all new residential land developed between 1963 and 1970, however, was served by public sewerage facilities within each of the remaining counties, with the actual proportions ranging from less than 20 percent in Washington County to 43 percent in Racine County. The continued concentration of residential development in areas of the Region not presently served by public water supply and sanitary sewerage facilities may be expected to intensify problems of declining groundwater levels and of water pollution, and may ultimately require the construction of new utility systems.

As indicated in the introductory section of this chapter, another important recommendation contained in the adopted regional land use plan is that the primary environmental corridors of the Region be preserved in an essentially rural state. These corridors contain all of the lakes and streams and associated undeveloped shorelands and floodlands; most of the best remaining woodlands, wetlands, and wildlife habitat areas; and the best remaining potential park and outdoor recreation sites in the Region. Nevertheless, between 1963 and 1970, considerable residential development—2,972 acres—occurred within the Region's primary environmental corridors, representing a significant departure from regional plan recommendations.

While some of the new residential land was developed with lot sizes of five acres or more, and therefore was in conformance with the plan standards for the preservation of environmental corridors, much of the new residential development did occur on smaller lot sizes. Furthermore, while a certain amount of this development may have

Table 70

PROVISION OF PUBLIC SANITARY SEWER SERVICE TO RESIDENTIAL LAND DEVELOPED IN THE REGION BY COUNTY: 1963-1970

County	Residential Land Developed[a] Between 1963 and 1970					
	Served by Sanitary Sewerage Facilities		Not Served by Sanitary Sewerage Facilities		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	330	29.4	793	70.6	1,123	100.0
Milwaukee	2,633	83.0	541	17.0	3,174	100.0
Ozaukee	788	42.2	1,081	57.8	1,869	100.0
Racine	1,092	43.2	1,434	56.8	2,526	100.0
Walworth	220	20.1	876	79.9	1,096	100.0
Washington	375	18.0	1,706	82.0	2,081	100.0
Waukesha	1,999	28.7	4,959	71.3	6,958	100.0
Region	7,437	39.5	11,390	60.5	18,827	100.0

[a] *Excludes new residential land under development.*

Source: SEWRPC.

been intended for seasonal recreational use, the ease and frequency with which seasonal homes are converted to year-round use may suddenly change the character of the development, resulting in serious environmental problems. The continued development of residential land around the inland lakes and streams, and in woodland and wetland areas, if improperly planned, may be expected to reduce the recreational and aesthetic value of the Region's natural resource base, and create major environmental problems.[8]

Between 1963 and 1970, residential land development also encroached significantly into prime agricultural areas, the most highly productive farmlands remaining in the Region. The adopted regional land use plan recommends the protection and preservation of most remaining prime agricultural lands in southeastern Wisconsin, both for economic reasons as well as to assure the future wholesomeness and natural beauty of the Region. Nevertheless, between 1963 and 1970, 5,303 acres of land in prime agricultural areas of the Region were converted to residential use, substantially more than the total amount of urban development—2,150 acres—proposed in prime agricultural areas under the adopted plan during this period. Furthermore, it should be noted that of the total residential development occurring in prime agricultural lands between 1963 and 1970, only 530 acres, or 10 percent, were located in prime agricultural areas which were proposed to be converted to urban uses by 1990.

The spatial distribution of residential development within the Region, as indicated on Maps 46 and 47, reflects another type of land use development problem. Experience indicates that, in recent years, land development has tended 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 part in anticipation of an increased tax base. An urban development potential is imputed to adjacent lands, and the speculative value of these lands rises. These lands are then often assessed at the speculative value based on the imputed urban potential. Land developers seeking additional low-cost land bypass these "high-priced" areas in favor of cheaper land still further removed, and the cycle repeats itself.

Examples of the "leapfrog" development pattern are clearly evident in Figure 49. This kind of development leaves in its wake incomplete neighborhoods requiring extensive urban services which can be provided only in a costly and inefficient manner. 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.

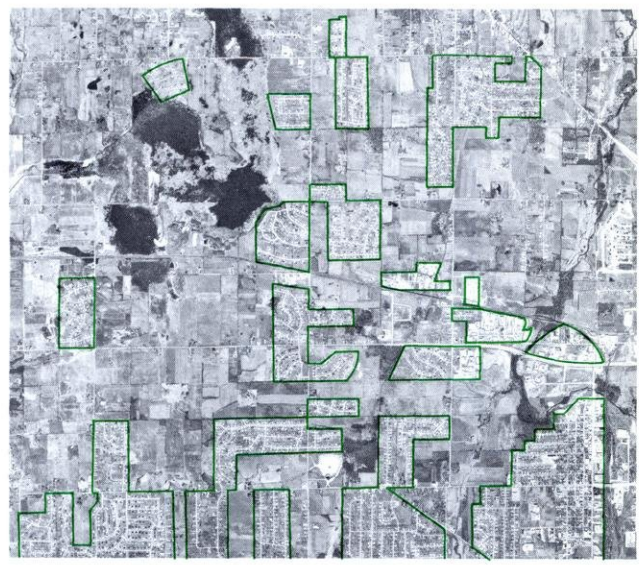
Commerical Land Use

The commercial land use category includes all retail and service type commercial uses, including both local and regional shopping centers, highway oriented commercial centers, and professional and executive offices, but excluding off-street parking of more than 10 spaces. At the time of the land use inventory in 1970, 6,517 acres of land were devoted to commercial land uses in southeastern Wisconsin. Almost two-thirds of this total was located in Milwaukee and Waukesha Counties (see Table 71). From Map 48, it is clear that commercial development is dependent upon accessibility as well as population concentration. The axial pattern of commercial land use closely approximates the pattern of certain highways as well as major concentrations of residential land.

As further indicated in Table 71, between 1963 and 1970 the amount of commercial land in the Region increased by 758 acres, or 13 percent. Waukesha County experienced the largest absolute and relative increase in commercial land, with its increase of 364 acres representing almost half of the total increment in commercial land. Racine County experienced a net loss of commercial land between 1963 and 1970 due to the abandonment and conversion to agricultural use of a 127-acre amusement park. The spatial distribution of land developed for commercial uses within the Region between 1963 and 1970 is shown on Map 49. The concentration of new commercial development in Milwaukee County and the rapidly urbanizing eastern half of Waukesha County is evident from this map.

Figure 49

TYPICAL EXAMPLE OF LEAP FROG DEVELOPMENT IN THE REGION



Source: SEWRPC.

[8] *See Chapter V of this report for a more complete discussion of urban development in general and residential development in particular within the Region's primary environmental corridors.*

Table 71

COMMERCIAL LAND USE IN THE REGION BY COUNTY: 1963 and 1970

County	Commercial Land Use[a]					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	453	7.9	504	7.7	51	11.3
Milwaukee	2,591	45.0	2,875	44.1	284	11.0
Ozaukee	307	5.3	330	5.1	23	7.5
Racine	641	11.1	575	8.8	- 66	- 10.3
Walworth	546	9.5	593	9.1	47	8.6
Washington	244	4.2	299	4.6	55	22.5
Waukesha	977	17.0	1,341	20.6	364	37.3
Region	5,759	100.0	6,517	100.0	758	13.2

[a] *Excludes off-street parking of more than 10 spaces.*

Source: SEWRPC.

It is interesting to compare the amount of commercial land in the Region in 1970 with the amount of land recommended for commercial use under the 1970 stage of the adopted regional land use plan. In the preparation of the initial land use plan, the estimated future land requirements for off-street parking were included in the estimated requirement for the land use—commercial, industrial, or governmental and institutional—to which the parking was related. In order to meaningfully compare the 1970 land development with that recommended under the adopted regional land use plan, all existing off-street parking areas have been allocated to the major land use categories—commercial, industrial, or governmental and institutional—to which the parking is related.

Table 72 compares the 1970 commercial land, including related off-street parking, with the amount of land recommended for commercial use under the 1970 stage of the adopted regional land use plan. It is evident from Table 72 that, for the Region overall, commercial land development from 1963 to 1970 occurred at a considerably faster rate than proposed in the recommended plan.

Under the recommended plan, 7,569 acres of land were proposed to be devoted to commercial uses by 1970. This proposed amount is 1,895 acres, or 20 percent, less than the actual 9,464 acres recorded in the 1970 regional land use inventory. In Ozaukee County, the actual increase in commercial development closely approximated the proposed increment. For each of the remaining six counties, the proposed commercial land area was considerably lower than the existing commercial acreage in 1970, with the variances ranging from a low of 6 percent in Racine County to a high of 26 percent in Waukesha County. These variances appear large, especially in view of the fact that the 1970 population forecasts on which the plan is based have been found to be higher than the actual 1970 population.

Table 72

COMPARISON OF EXISTING AND PLANNED COMMERCIAL LAND USE[a] IN THE REGION BY COUNTY: 1970

County	1970 Commercial Land Use			
	Existing (Acres)	Planned (Acres)	Variance Between Existing and Planned Land Use	
			Acres[b]	Percent[c]
Kenosha	723	610	113	15.6
Milwaukee	4,499	3,414	1,085	24.1
Ozaukee	401	399	2	0.5
Racine	874	826	48	5.5
Walworth	726	654	72	9.9
Washington	404	313	91	22.5
Waukesha	1,837	1,353	484	26.3
Region	9,464	7,569	1,895	20.0

[a] *Includes related off-street parking.*

[b] *1970 existing land use minus 1970 planned land use.*

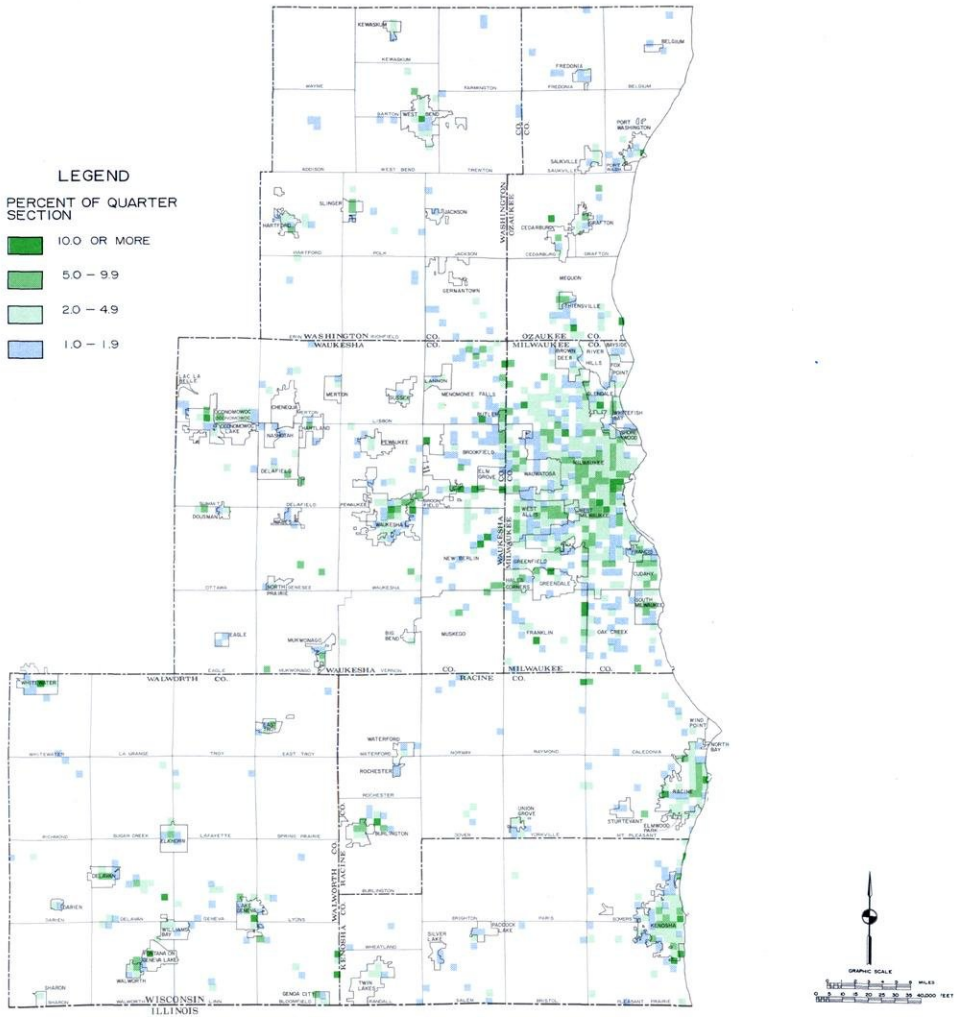
[c] *Absolute variance as a percent of 1970 existing land use.*

Source: SEWRPC.

It should be understood, however, that the planned increase in commercial land between 1963 and 1970 was intended to meet only the needs of the forecast population in the Region through 1970. On the other hand, actual commercial land development is generally undertaken with an orientation toward potential market demand and future service areas as well as toward existing demand and service areas. Many commercial areas in the

Map 48

COMMERCIAL LAND USE IN THE REGION: 1970

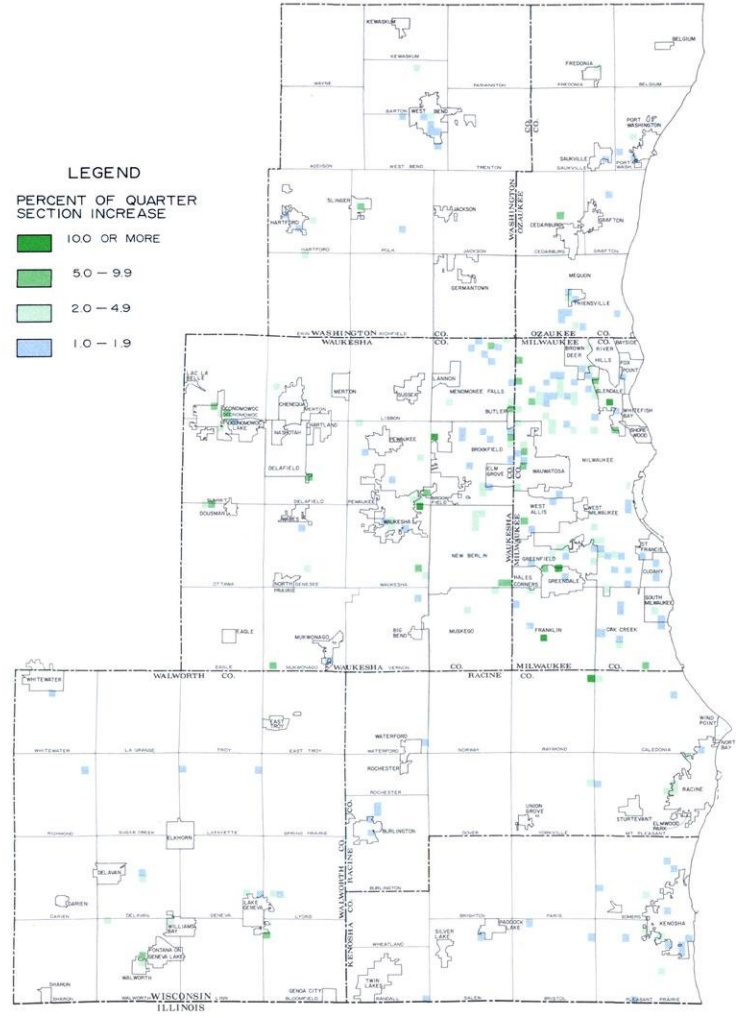


There were about 6,500 acres of land devoted to commercial land uses in southeastern Wisconsin in 1970, or 2 percent of the total area devoted to urban use and 0.4 percent of the total area of the Region. This relatively small amount of commercial land serves the needs of a resident population of about 1.8 million persons. About 44 percent of the regional total of commercial land is located in Milwaukee County, with an additional 21 percent located in Waukesha County. From an examination of the above map, it is clear that the location of commercial development is dependent upon accessibility to good transportation facilities, as well as upon proximity to population concentration. The axial pattern of commercial land use closely approximates the pattern of major highways, as well as of major concentrations of residential land use.

Source: SEWRPC .

Map 49

CHANGE IN COMMERCIAL LAND USE IN THE REGION: 1963-1970



Between 1963 and 1970, commercial land use in the Region increased by about 760 acres, or by about 13 percent. Much of the new commercial development occurred in Milwaukee County and in the rapidly urbanizing eastern one-half of Waukesha County.

Source: SEWRPC.

Region have been developed at a scale necessary to accommodate substantial future increases in demand. Because of such development, it is not surprising to find that the 1970 amount of commercial land in the Region substantially exceeds that proposed under the 1970 stage of the adopted regional land use plan.

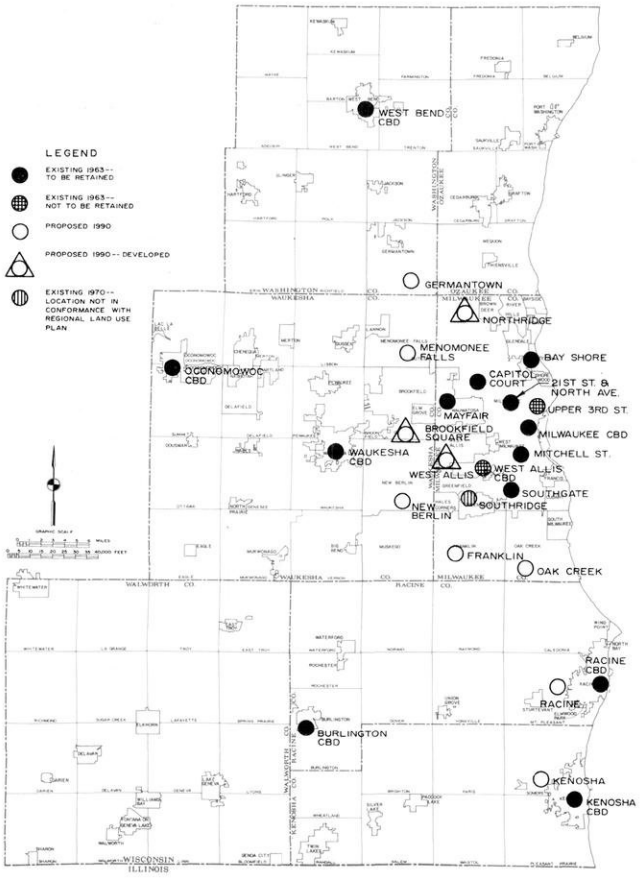
The incremental commercial land development proposed under the adopted regional land use plan includes land to be developed for locally oriented commercial uses as well as land for major commercial centers with a regional service orientation. Locally oriented commercial uses are considered "followers" of residential development, and 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. Because of their profound impact on urban development patterns, major commercial centers must be treated explicitly in any regional planning effort. The adopted regional land use plan recommends that 23 major retail and service centers be maintained or provided to serve the needs of the Region through 1990. The location of the existing and proposed major retail and service centers is shown on Map 50.

Thirteen major retail and service centers existed when the initial land use plan was being prepared and were proposed to be retained. Two additional sites were identified as declining regional centers not to be retained. Ten centers of at least 70 acres each were to be newly developed by 1990. Of the ten sites, three—Brookfield Square, Northridge, and West Allis-West—were developed and operating by 1972. Of the remaining seven sites, five have been properly zoned for future commercial development in local zoning ordinances. No incompatible urban development has occurred within the two designated regional commercial centers which have not yet been zoned for future commercial use. A summary of the 1972 status of the ten major retail and service centers proposed under the initial land use plan is presented in Table 73.

It should be noted that a major retail and service center has been developed at a site in the Village of Greendale not identified for such development in the adopted regional land use plan. The center, known as the Southridge Shopping Center, is located approximately three miles from the location recommended for such a center in the City of Franklin, and approximately four miles from the location recommended for such a center in the City of New Berlin. It is recognized that the Southridge Center has a service area that overlaps the service areas of nearby major retail and service centers, and that the development of the Southridge Center will probably affect the future development of both the proposed Franklin and New Berlin centers. It is possible that the Franklin and New Berlin centers will have to be reduced in scope from regional to community level retail and service centers.

Map 50

STATUS OF PLANNED 1990 MAJOR RETAIL AND SERVICE CENTERS IN THE REGION: 1972



The adopted regional land use plan recommends that 23 major retail and service centers be provided to serve the needs of the Region through 1990. Thirteen of these centers existed when the plan was being prepared and are to be retained. Ten centers, having a site area of at least 70 acres each, were to be newly developed by 1990. By the end of 1972, three of these ten centers had been developed at the locations recommended in the plan. A fourth major center had also been developed but at a location about three miles from that recommended in the plan. The development of this fourth center will affect the future development of at least two of the remaining six centers proposed in the plan—the Franklin and New Berlin Centers, and will require reconsideration of the need for and location of these centers.

Source: SEWRPC.

In the 1963 and 1972 SEWRPC travel inventories, considerable information was obtained concerning the amount, purpose, and specific origins and destinations of trips within the Region on an average weekday. Utilizing this information, the number of shopping trips made to the various internal traffic analysis zones within the Region was determined, together with the zones of origin of these trips. Major commercial areas were identified as those traffic analysis zones which received more than 4,000 shopping trips. These areas are identified in Table 74.

Table 73

IMPLEMENTATION STATUS OF MAJOR RETAIL AND SERVICE CENTERS RECOMMENDED IN THE ADOPTED REGIONAL LAND USE PLAN: 1972

Name of Proposed Major Retail and Service Center	Location	Implementation Status
Kenosha-West	Town of Somers Kenosha County (STH 31, STH 43)	Site reserved for commercial use in local zoning ordinance
Franklin	City of Franklin Milwaukee County (USH 45, STH 100, STH 36)	Site included in an adopted neighborhood development plan and properly zoned for commercial use
Granville	City of Milwaukee Milwaukee County (STH 100, STH 181)	Site developed as the Northridge Shopping Center
Oak Creek	City of Oak Creek Milwaukee County (USH 41, STH 100)	Site not yet zoned for commercial use; no incompatible development on site
West Allis	City of West Allis Milwaukee County (STH 100, W. National Avenue)	Site nearly fully developed as a major strip commercial area
Racine-West	City of Racine Racine County (STH 11, STH 31)	Site acquired for construction of major shopping center
Germantown	Village of Germantown Washington County (Mequon Road, Division Road)	Site designated for commercial use in local land use plan; site placed in holding zone; no incompatible development on site
Brookfield	City of Brookfield Waukesha County (IH 94, USH 18, Moorland-Pilgrim Roads)	Site developed as the Brookfield Square Shopping Center
Menomonee Falls	Village of Menomonee Falls Waukesha County (W. Good Hope Road, Pilgrim Road)	Site reserved for commercial use in local zoning ordinance
New Berlin	City of New Berlin Waukesha County (STH 15, Moorland Road)	Site not yet zoned for commercial use; no incompatible development on site

Source: SEWRPC.

From analysis of Table 74, it is apparent that some of the older established commercial areas experienced a decline in the number of shopping trips between 1963 and 1972, while certain shopping areas which did not exist in 1963 attracted large portions of all shopping trips made in the Region in 1972. Most of the older established downtown commercial areas—including downtown Kenosha, Milwaukee, Racine, Waukesha, and West Allis—attracted fewer shopping trips in 1972 than in 1963. Conversely, large numbers of shopping trips were generated by new commercial areas such as Brookfield Square, Southridge, and other regional commercial sites in suburban areas.

Industrial Land Use

The industrial land use category includes all manufacturing activities, wholesaling offices, and warehouse and storage areas, but excludes related off-street parking of more than 10 spaces. In 1970, the Region contained 10,039 acres of land devoted to industrial uses. Although industrial development comprises only 0.6 percent of the total area of the Region, the spatial distribution of this land use category is of major importance, since almost 40 percent of the Region's labor force finds employment in these industrial areas. Almost one-half of all industrial land area in southeastern Wisconsin is located in Milwaukee County. Map 51 shows this concentration of industrial development in Milwaukee County, particularly along the highly industrialized Menomonee River Valley. Concentrations of industrial land are also evident in and around the Cities of Kenosha and Racine and in many outlying communities.

Between the 1963 land use inventory and the 1970 reinventory, the industrial land base of the Region increased by 1,871 acres or nearly 23 percent (see Table 75). The largest absolute and relative increases occurred in Waukesha County, which gained 567 acres of industrial development for an increase of 59 percent. Industrial

Table 74

NUMBER OF SHOPPING TRIPS AND AVERAGE TRAVEL TIME TO MAJOR COMMERCIAL AREAS IN THE REGION: 1963 and 1972

1972 Rank	Number of Shopping Trips[a]		Major Commercial Area[b]	Number of Contributing Traffic Analysis Zones		Average Travel Time (Minutes)[c]	
	1972	1963		1972	1963	1972	1963
1	16,232	18,242	Capitol Court (Milwaukee)	103	129	11.7	10.4
2	16,072	341	Brookfield Square	136	3	16.2	11.5
3	15,795	0	Southridge (Greendale-Greenfield)	132	0	16.2	0
4	12,604	11,252	Bayshore (Glendale)	74	69	11.0	9.6
5	12,391	16,262	Downtown Milwaukee	74	105	21.0	22.1
6	11,985	16,393	Southgate-Point Loomis (Milwaukee)	82	111	12.8	12.5
7	11,237	8,873	Elmwood Plaza (Racine)	39	62	10.0	11.5
8	11,155	6,253	Washington Square (Racine)	31	44	8.1	9.8
9	9,305	5,607	Pershing Plaza (Kenosha)	35	28	9.6	8.3
10	8,418	8,865	Mayfair (Wauwatosa)	94	125	14.1	14.2
11	7,942	153	K-Mart—Target (S. 27th Street and W. Layton Avenue—Milwaukee)	61	2	9.8	4.0
12	7,291	117	Treasure Island-Target (124th Street and W. Capitol Drive—Brookfield-Wauwatosa)	77	3	12.9	7.7
13	6,489	3,824	Community Discount Center (Kenosha)	26	24	8.2	7.3
14	6,154	2,692	Rapids Shopping Plaza (Racine)	28	29	8.7	7.5
15	5,891	5,008	Times Square (Milwaukee)	46	43	11.5	8.6
16	5,666	5,288	Hales Corners Shopping Center	60	44	10.8	10.3
17	5,447	6,809	Downtown Kenosha	24	47	12.1	13.1
18	5,428	7,562	Downtown Waukesha	44	65	11.6	10.7
19	4,927	6,252	Downtown West Allis	41	40	13.6	9.5
20	4,665	1,638	Downtown Burlington	30	33	12.1	12.3
21	4,374	3,033	Spartan-Atlantic—Kohl's (S. 27th Street-Milwaukee)	41	32	10.3	12.6
22	4,257	5,347	GEX (Milwaukee)	36	38	8.8	8.0
23	4,186	570	Grant Plaza (South Milwaukee)	32	7	7.0	4.3
24	4,170	9,562	Mitchell Street (Milwaukee)	45	88	15.8	14.8
25	4,103	936	K-Mart (Mayfair Road-Wauwatosa)	35	10	11.6	8.3
26	4,002	3,182	River Bend Shopping Center (West Allis)	20	20	6.5	7.0
27	3,466	6,333	N. 21st Street and W. North Avenue (Milwaukee)	32	64	15.6	15.1
28	3,863	6,031	S. 13th Street and W. Forest Home Avenue (Milwaukee)	31	63	13.2	14.3
29	3,830	5,936	Downtown Racine	24	44	14.5	12.5
30	1,053	4,138	Arlans and Northland Shopping Center (Milwaukee)	15	37	12.6	13.0

[a] *Trips shown are total shopping trips.*

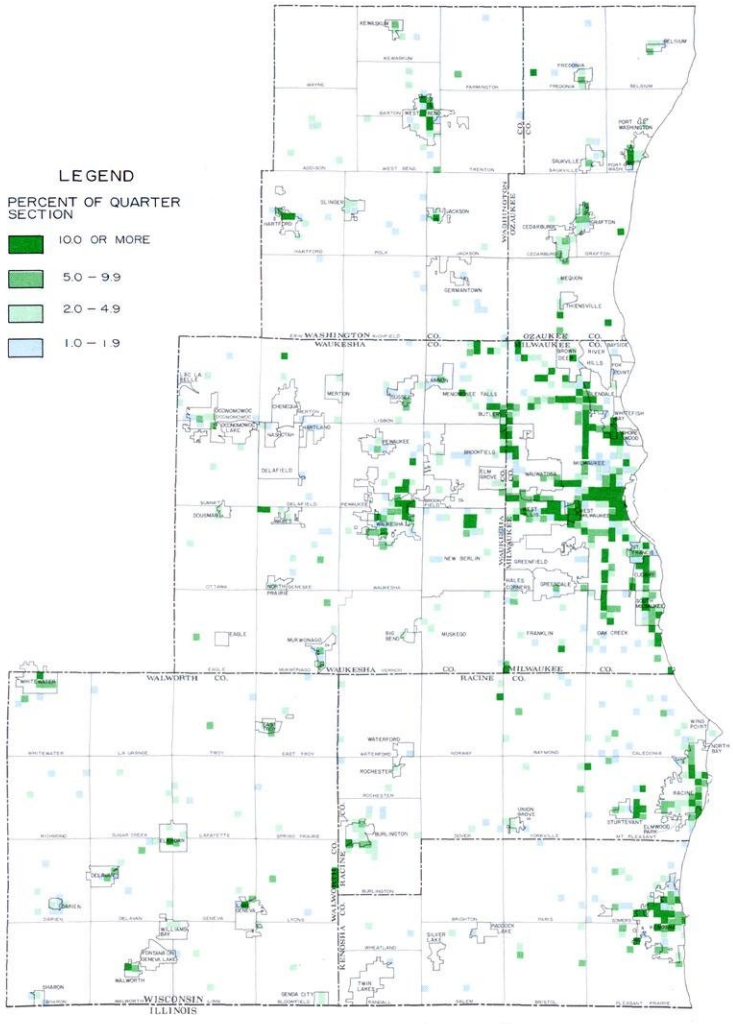
[b] *The commercial outlets listed may not be the only, or even the largest, shopping trip attractor in the area.*

[c] *Average travel time was determined from interzonal 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.

Map 51

INDUSTRIAL LAND USE IN THE REGION: 1970

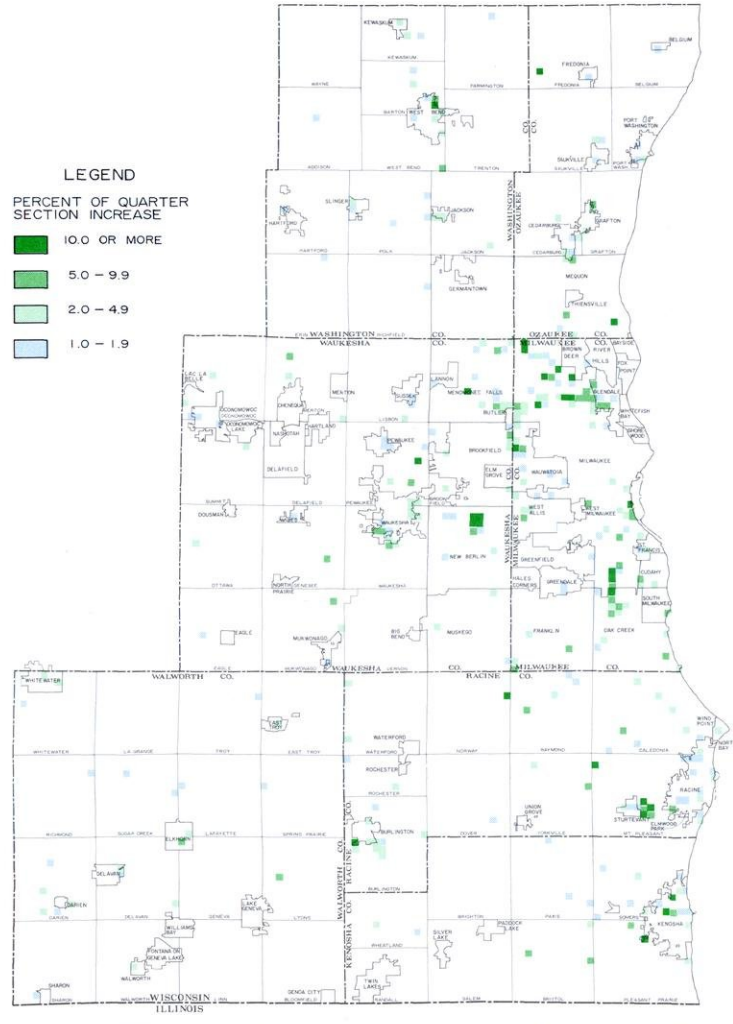


About 10,000 acres of land, or 3 percent of the total land area devoted to urban use and 0.6 percent of the total area of the Region, were devoted to industrial land uses in 1970. Such uses include manufacturing activities, wholesaling, warehouses, and storage yards. Nearly one-half of all industrial land in the Region is located in Milwaukee County. About 40 percent of the regional labor force finds employment in the establishments occupying this industrial land.

Source: SEWRPC.

Map 52

CHANGE IN INDUSTRIAL LAND USE IN THE REGION: 1963-1970



Between 1963 and 1970, industrial land use in the Region increased by nearly 1,900 acres, or approximately 23 percent. Among the seven counties, the largest increase of industrial land between 1963 and 1970 occurred in Waukesha County, which gained about 570 acres of industrial development, representing an increase of nearly 60 percent. Industrial land development also occurred at relatively high rates in both Ozaukee and Racine Counties, where industrial acreage increased in each case by more than 40 percent.

Source: SEWRPC.

Table 75

INDUSTRIAL LAND USE IN THE REGION BY COUNTY: 1963 and 1970

County	Industrial Land Use[a]					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	685	8.4	811	8.1	126	18.4
Milwaukee	4,415	54.1	4,899	48.8	484	11.0
Ozaukee	313	3.8	444	4.4	131	41.9
Racine	749	9.2	1,099	11.0	350	46.7
Walworth	730	8.9	827	8.2	97	13.3
Washington	318	3.9	434	4.3	116	36.5
Waukesha	958	11.7	1,525	15.2	567	59.2
Region	8,168	100.0	10,039	100.0	1,871	22.9

[a] *Excludes off-street parking of more than 10 spaces.*

Source: SEWRPC.

land development also occurred at relatively high rates in Ozaukee and Racine Counties, where the industrial acreage increased by 42 percent and 47 percent, respectively. The spatial distribution of land developed for industrial purposes within the Region between 1963 and 1970 is shown on Map 52.

Table 76 compares 1970 industrial development, adjusted to include related off-street parking, with the amount of land recommended for industrial purposes under the 1970 stage of the adopted regional land use plan.[9] As indicated in this table, industrial land development within the Region between 1963 and 1970 occurred at a somewhat slower rate than is proposed under the adopted regional land use plan. The regional land use plan recommends that 12,412 acres of land be devoted to industrial uses by 1970. The industrial land area proposed under the 1970 stage of the plan is greater by 1,039 acres, or 9 percent, than the actual 1970 industrial acreage in the Region. The greatest relative variance between the existing and planned industrial land areas occurs in Kenosha County, where the planned industrial area of 1,372 acres is 510 acres, or 59 percent, above the existing area of 862 acres. The smallest variance occurred in Walworth County, where the planned area of 870 acres is 6 acres, or 0.7 percent, greater than the existing industrial area.

[9] *In the preparation of the initial land use plan, the estimated future land requirements for off-street parking were included in the estimated requirement for the land use—commercial, industrial, or governmental and institutional—to which the parking is related. Therefore, in order to facilitate a meaningful comparison of the 1970 land development within these major categories with that recommended under the adopted regional land use plan, all existing off-street parking areas have been allocated to the major land use categories—commercial, industrial, or governmental and institutional—to which the parking is related.*

Table 76

COMPARISON OF EXISTING AND PLANNED INDUSTRIAL LAND USE IN THE REGION BY COUNTY: 1970

County	1970 Industrial Land Use[a]			
	Existing (Acres)	Planned (Acres)	Variance Between Existing and Planned Land Use	
			Acres[b]	Percent[c]
Kenosha	862	1,372	- 510	- 59.2
Milwaukee	5,642	6,269	- 627	- 11.1
Ozaukee	516	391	125	24.2
Racine	1,275	1,643	- 368	- 28.9
Walworth	864	870	- 6	- 0.7
Washington	506	406	100	19.8
Waukesha	1,708	1,461	247	14.5
Region	11,373	12,412	- 1,039	- 9.1

[a] *Includes related off-street parking.*

[b] *1970 existing land use minus 1970 planned land use.*

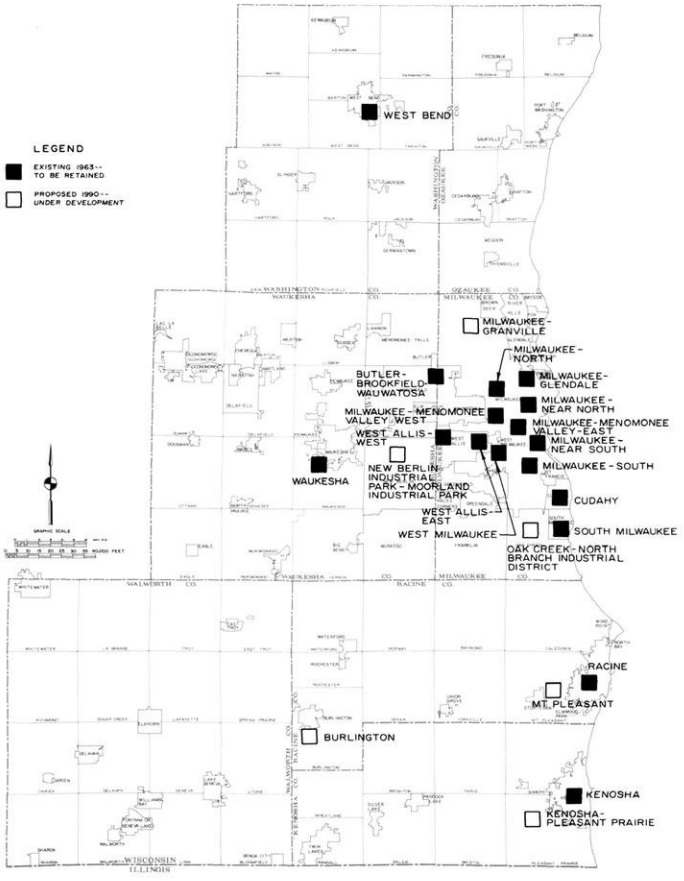
[c] *Absolute variance as a percent of 1970 existing land use.*

Source: SEWRPC.

Under the adopted regional land use plan, more than 70 percent of all incremental industrial land development through 1990 would occur in major existing or proposed industrial centers. The balance would occur in smaller industrial areas within local communities. As indicated on Map 53, there were 17 major industrial areas in the Region in 1963, all of which were recommended to be retained as major industrial areas through 1990. In addition to providing for the expansion and improvement

Map 53

STATUS OF PLANNED 1990 MAJOR INDUSTRIAL CENTERS IN THE REGION: 1972



The adopted regional land use plan recommends that 23 major industrial centers be provided to serve the needs of the Region through 1990. Seventeen of these existed in 1963 and were to be retained and enlarged. Six of these were to be newly developed by 1990 each having an area of at least 640 acres. By the end of 1972, significant industrial development had occurred at each of the six designated sites, with about 6,400 acres of land at the six sites developed or set aside for industrial land use and nearly 1,400 acres actually developed for industrial purposes.

Source: SEWRPC.

of these existing major industrial areas, the plan also proposed to add six new major industrial centers at sites which meet the full array of criteria for such development, including ready accessibility to high-speed, all-weather arterial highways, soils which are suitable for industrial development; adequate power and water supply; sanitary sewer service and storm water drainage; reasonable access to airport and railway facilities; and ready access from residential areas.

The new industrial centers proposed under the initial land use plan are located in or adjacent to the Cities of Burlington, Kenosha, Milwaukee, New Berlin, Oak Creek, and Racine. A total of 6,430 acres of land have either been developed for industrial land use, prepared for such development, or set aside for such use in the local zoning ordinance at the six designated sites. Of this total, 1,389 acres were actually developed for industrial and related land uses. The 1972 status of each of the six proposed industrial centers is presented in Table 77.

Because of the high proportion of industrial employment in the regional labor force, analysis of industrial work trips 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, major industrial areas were identified as those traffic analysis zones which received more than 2,500 work trips. These areas are indicated in Table 78. It should be noted that the manufacturing plants listed in the table are merely intended to be descriptive of the industrial area, and are not necessarily the only employment center in the area described.

The amount, variety, and location of future industrial areas in the Region will depend on many important factors. One of these 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 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.

Governmental and Institutional Land Use

The land areas devoted to governmental and institutional uses were classified 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, it was classified as regional. If such service emphasis was oriented toward a single community or neighborhood, except for high schools, it was classified as local. Regional uses include colleges and universities, high schools, large central libraries, museums, hospitals, nursing homes, county courthouses, welfare agencies, military installations, and others. Local uses include elementary schools, churches, branch libraries, fire stations, as well as city, village, and town halls.

In 1970, 16,618 acres of land in southeastern Wisconsin were devoted to governmental and institutional uses, representing 1 percent of the total area of the Region. Governmental and institutional land with a local service orientation comprised 5,479 acres, or 33 percent of this category. The large balance of governmental and institutional land had a regional orientation. The widespread dispersion of governmental and institutional land uses throughout the Region is apparent on Map 54.

As indicated in Table 79, 3,140 acres of land were developed for governmental and institutional uses between 1963 and 1970 representing a relative increase of 23 per-

Table 77

IMPLEMENTATION STATUS OF MAJOR INDUSTRIAL CENTERS RECOMMENDED IN THE ADOPTED REGIONAL LAND USE PLAN: 1972

Recommended Major Industrial Center		Implementation Status	
Name	Location	Acres Designated and Reserved	Acres Developed for Industrial-Related Land Use
Kenosha-West	City of Kenosha Town of Pleasant Prairie Kenosha County	930	125
Granville	City of Milwaukee Milwaukee County	1,460	170
Oak Creek	City of Oak Creek Milwaukee County	1,270	268
Burlington	City of Burlington Town of Burlington Racine County	840	97
Racine-West	Town of Mt. Pleasant Racine County	900	179
New Berlin	City of New Berlin Waukesha County	1,030	550

Source: SEWRPC.

Table 78

NUMBER OF WORK TRIPS AND AVERAGE TRAVEL TIME TO MAJOR INDUSTRIAL AREAS IN THE REGION: 1963 and 1972

1972 Rank	Number of Work Trips[a]		Major Industrial Area[b]	Number of Contributing Zones		Average Travel Time (Minutes)[c]	
	1972	1963		1972	1963	1972	1963
1	8,678	11,271	American Motors (Kenosha)	216	744	6.3	3.1
2	8,024	8,885	Allen Bradley Co. (Milwaukee)	191	246	11.9	10.6
3	7,865	8,530	A. O. Smith (Milwaukee)	179	293	10.3	8.8
4	5,541	2,671	Briggs and Stratton Corporation (Wauwatosa)	130	100	16.9	13.8
5	5,377	11,366	Allis Chalmers (West Allis)	138	387	15.8	9.7
6	5,073	14,250	American Motors (Milwaukee)	127	449	18.0	9.1
7	4,476	5,072	Square D Co.-Milprint Co. (Milwaukee)	107	178	17.2	12.4
8	3,539	4,557	Master Lock Co.-T. L. Smith Co. (Milwaukee)	77	153	12.6	11.6
9	3,417	3,537	Joseph Schlitz Brewing Co. (Milwaukee)	78	115	20.3	14.3
10	3,406	1,796	Inland Ryerson (Milwaukee)	81	71	17.9	19.0
11	3,313	3,566	Evinrude Motors (Milwaukee)	90	139	16.2	11.7
12	3,104	3,706	J. I. Case Co. (Racine)	66	295	8.3	2.4
13	2,948	382	Waxdale (Mt. Pleasant)	67	39	5.7	7.5
14	2,894	5,411	A. C. Spark Plug (Oak Creek)	76	198	18.1	18.2
15	2,868	4,985	Ladish Co. (Cudahy)	72	138	11.4	9.8
16	2,838	3,045	Harnischfeger Corporation (West Milwaukee)	68	109	18.8	15.7
17	2,646	2,252	Marquette Cement Co. (Milwaukee)	62	82	18.2	17.7

[a] *Total work trips to manufacturing land use as reported in the 1963 and 1972 SEWRPC origin and destination surveys.*

[b] *The industrial plant listed may not be the only, or even the largest, work trip attractor in the area.*

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

Source: SEWRPC.

Table 79

GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION BY COUNTY: 1963 and 1970

County	Governmental and Institutional Land Use[a]					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	957	7.1	1,324	8.0	367	38.3
Milwaukee	6,494	48.2	7,490	45.1	996	15.3
Ozaukee	718	5.3	940	5.6	222	30.9
Racine	1,360	10.1	1,744	10.5	384	28.2
Walworth	980	7.3	1,192	7.2	212	21.6
Washington	687	5.1	919	5.5	232	33.8
Waukesha	2,282	16.9	3,009	18.1	727	31.9
Region	13,478	100.0	16,618	100.0	3,140	23.3

[a] *Excludes off-street parking of more than 10 spaces.*

Source: SEWRPC.

cent. On a county basis, the highest absolute increases in governmental and institutional acreage occurred in Milwaukee County (996 acres) and Waukesha County (727 acres). In fact, the increase in governmental and institutional land use in these two counties represents well over half of the total increment in this land use category in the Region between 1963 and 1970. On a relative basis, however, it was found that the lowest percentage increase in governmental and institutional lands between 1963 and 1970 occurred in Milwaukee County (15 percent) while the highest percentage increase occurred in Kenosha County (38 percent). The spatial distribution of land developed for governmental and institutional purposes between 1963 and 1970 within the Region is shown on Map 55.

Table 80 compares the 1970 governmental and institutional land, adjusted to include related off-street parking, with the amount of land recommended for this use category under the 1970 stage of the adopted regional land use plan.[10] Between 1963 and 1970, the development of governmental and institutional land occurred at a somewhat higher rate than proposed under the adopted regional land use plan. Thus, as indicated in Table 80, the 16,303 acres proposed to be developed for governmental and institutional uses in the Region by 1970 are 1,575 acres, or 9 percent, lower than the existing land use base of 17,878 acres. The highest absolute variances occurred in Waukesha County, where the existing governmental and institutional land base was 502 acres greater than proposed by the 1970 stage of the plan. The absolute variances between proposed and existing governmental and institutional land use was less than 300 acres in each of the remaining six counties in 1970. On a percentage basis, the variance between the proposed and existing governmental and institutional land base ranged from a low of 2 percent in Milwaukee County to a high of 19 percent in Washington County.

[10] *Ibid, footnote 9.*

Table 80

COMPARISON OF EXISTING AND PLANNED GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION BY COUNTY: 1970

County	1970 Governmental and Institutional Land Use[a]			
	Existing (Acres)	Planned (Acres)	Variance Between Existing and Planned Land Use	
			Acres[b]	Percent[c]
Kenosha	1,435	1,174	261	18.2
Milwaukee	8,008	7,884	124	1.5
Ozaukee	1,004	876	128	12.7
Racine	1,871	1,632	239	12.8
Walworth	1,252	1,119	133	10.6
Washington	994	806	188	18.9
Waukesha	3,314	2,812	502	15.1
Region	17,878	16,303	1,575	8.8

[a] *Includes related off-street parking.*

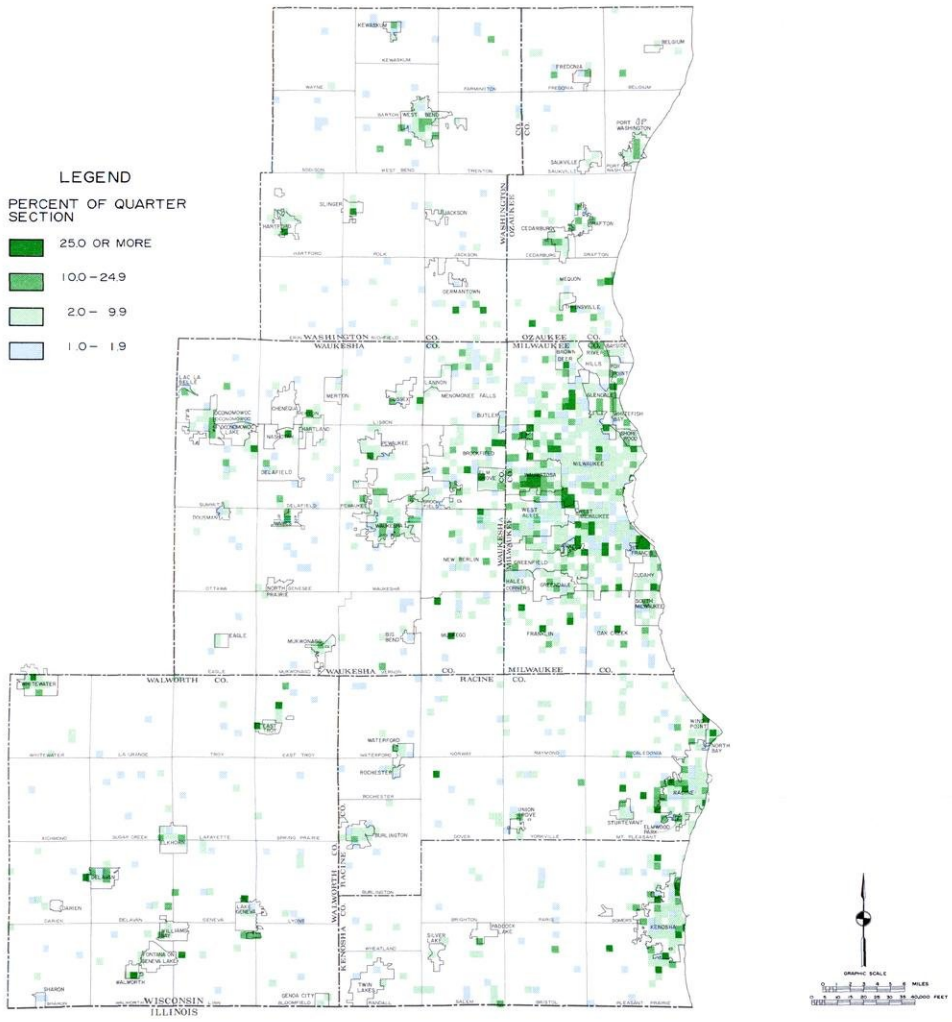
[b] *1970 existing land use minus 1970 planned land use.*

[c] *Absolute variance as a percent of 1970 existing land use.*

Source: SEWRPC.

Map 54

GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION: 1970

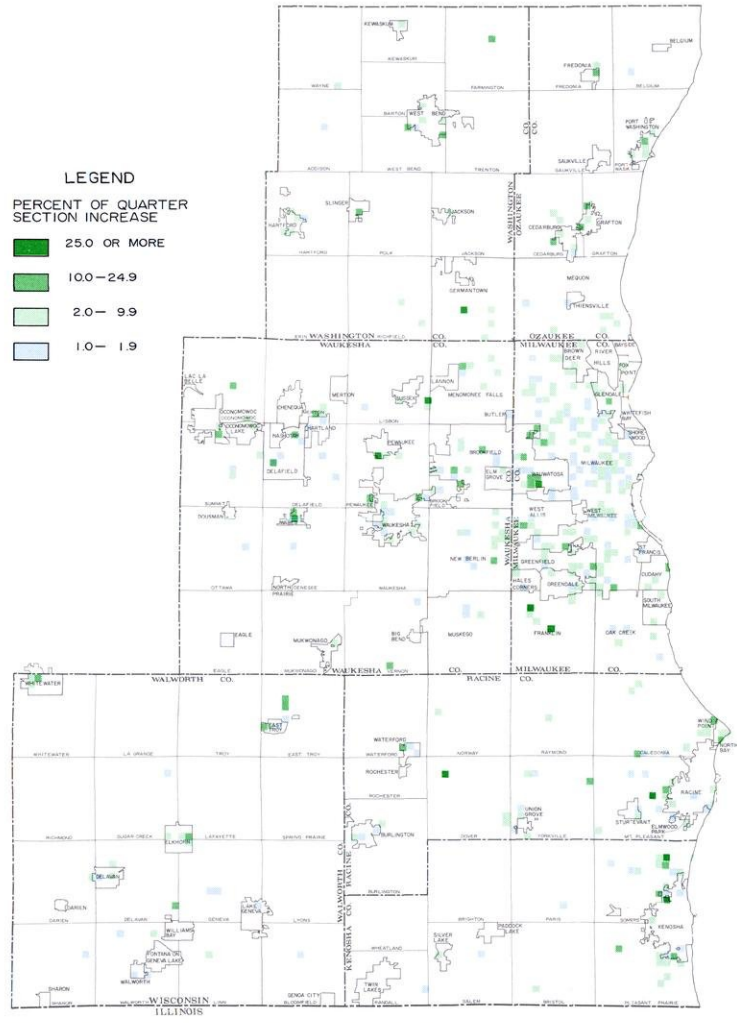


Lands devoted to governmental and institutional uses accounted for about 16,600 acres in the Region in 1970, or 5 percent of the total land area devoted to urban use and 1 percent of the total area of the Region. While there is a heavy concentration of governmental and institutional land in the major population centers of the Region, the diffused pattern evidenced on the above map indicates that such uses are common in the outlying rural portions of the Region as well.

Source: SEWRPC.

Map 55

CHANGE IN GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION: 1963-1970



Lands devoted to governmental and institutional uses within the Region increased by about 3,100 acres, or by 23 percent, between 1963 and 1970. About one-half of this increase occurred in Milwaukee and Waukesha Counties combined. About 59 percent of the increase in governmental and institutional land during this period consisted of governmental and institutional uses having a regional or areawide service orientation, with the balance having a local or community service orientation.

Source: SEWRPC.

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; communication 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.

Transportation and related activities are inherently large consumers of land. Next to residential land, the transportation, communication, and utility land use category is the most extensive type of urban development in the Region. At the time of the regional land use inventory in 1970, a total of 109,407 acres, representing 6 percent of the total land area of the Region, were devoted to transportation, communication, and utility uses. The magnitude of this land use category ranged from a low of 8,054 acres in Ozaukee County to a high of more than 35,000 acres in Milwaukee County (see Table 81).

Because of their supportive nature, lands devoted to transportation, communication, and utility uses are closely associated with urban development, with the greatest concentration occurring in the urban centers. For example, a relatively large proportion of all land has been developed for transportation and related purposes within the largest cities of the Region—Milwaukee, 32 percent; Racine, 30 percent; and Kenosha, 23 percent. The concentration of transportation, communication, and utility land use in the urban centers of the Region is apparent on Map 56.

As further indicated in Table 81, lands devoted to transportation, communication, and utility uses in the Region increased 9,354 acres, or 9 percent, between 1963 and 1970. Milwaukee County experienced the largest absolute increase in this land use category, gaining 3,034 acres of transportation and related lands, with 43 percent of this increase consisting of freeway right-of-way. Conversely, Kenosha County experienced a small net increase of only 141 acres of transportation and related lands, due primarily to the abandonment for transportation use of railroad right-of-way by the Chicago, North Shore, and Milwaukee Railroad. The spatial distribution of land developed for transportation and related uses between 1963 and 1970 is shown on Map 57. Major highway construction projects undertaken between 1963 and 1970 are clearly reflected in the linear patterns of this map.

Table 82 presents a comparison of the 1970 transportation, communication, and utility lands, adjusted to exclude off-street parking areas of more than 10 spaces, with the amount of land recommended for this land use category under the 1970 stage of the adopted regional land use plan. In the preparation of the initial regional land use plan, the estimated future land requirements for off-street parking were included in the estimated requirement for the major land use to which the parking is related, and were excluded from the transportation, communication, and utility category. Accordingly, in order to facilitate a meaningful comparison of 1970 transportation and related land development and that proposed under the land use plan, off-street parking areas have been extracted from the transportation and related category.

As indicated in Table 82, growth in lands used for transportation, communication, and utility purposes between 1963 and 1970 occurred substantially as proposed by the adopted regional land use plan. Thus, under the recommended plan, 100,171 acres were proposed to be developed for transportation and related uses by 1970.

Table 81

TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE REGION BY COUNTY: 1963 and 1970

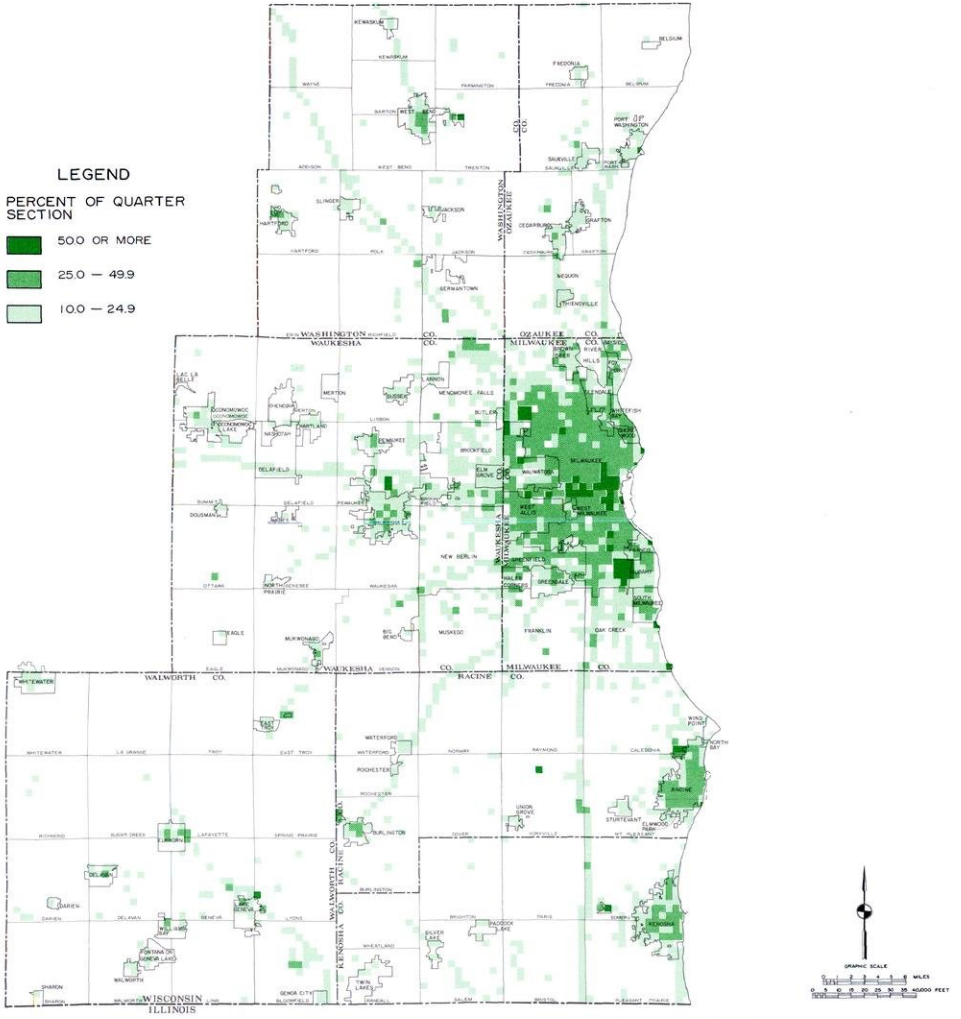
County	Transportation, Communication, and Utility Land Use					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	8,786	8.8	8,927	8.1	141	1.6
Milwaukee	32,397	32.4	35,431	32.4	3,034	9.4
Ozaukee	7,198	7.2	8,054	7.4	856	11.9
Racine	11,561	11.5	12,442	11.4	881	7.6
Walworth	10,884	10.9	12,020	11.0	1,136	10.4
Washington	10,534	10.5	11,286	10.3	752	7.1
Waukesha	18,693	18.7	21,247	19.4	2,554	13.7
Region	100,053	100.0	109,407	100.0	9,354	9.3

[a] *Includes off-street parking of more than 10 acres.*

Source: SEWRPC.

Map 56

TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE REGION: 1970

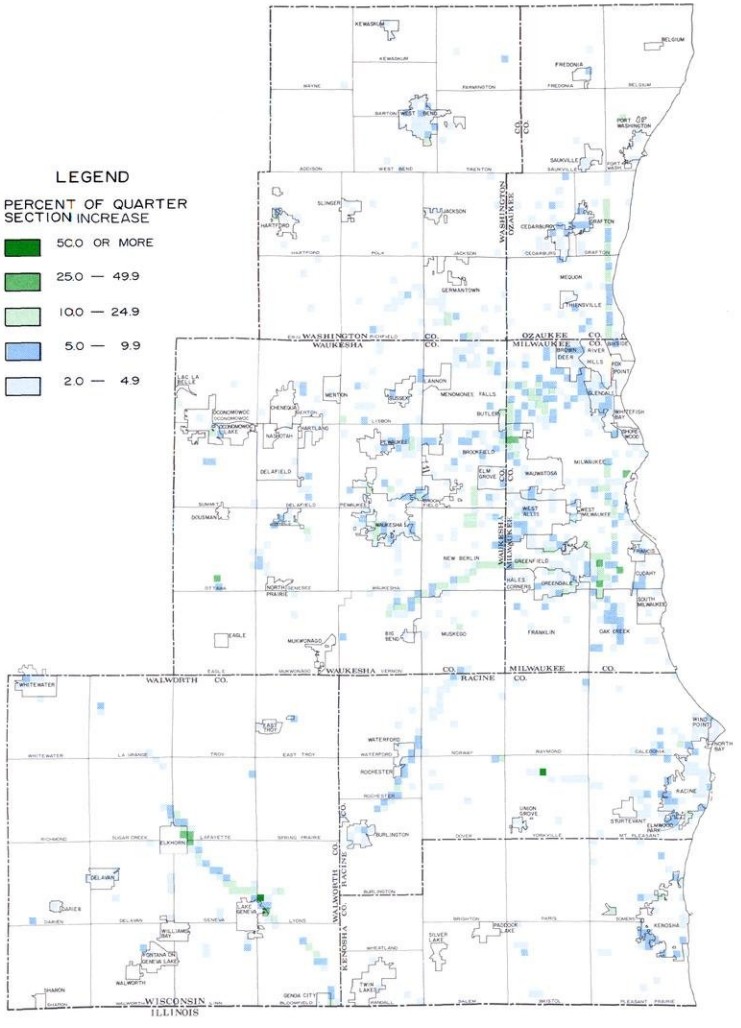


Transportation and related land uses are inherently large consumers of land, and next to the residential land use category, the transportation, communication, and utility land use category represents the most extensive type of urban development in the Region. At the time of the regional land use inventory in 1970, about 109,400 acres of land, representing 33 percent of the total land area devoted to urban use and 6 percent of the total area of the Region, were devoted to transportation, communication, and utility uses. Because of their supportive nature, lands devoted to transportation, communication, and utility uses are closely associated with other urban land uses, with the greatest concentration of these uses occurring in the urban centers of the Region.

Source: SEWRPC.

Map 57

CHANGE IN TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE REGION: 1963-1970



Lands devoted to transportation, communication, and utility land uses in the Region increased from about 100,000 acres in 1963 to about 109,400 acres in 1970, an increase of about 9,400 acres, or 9 percent. The pattern of increase is distributed throughout the Region, as shown on the above map, with much of the increase due to minor street construction in the newly developing areas of the Region, as well as new highway and utility line construction throughout the urban and rural areas of the Region.

Source: SEWRPC.

This proposed amount is 2,776 acres, or 3 percent, less than the actual 102,947 acres of transportation and related lands recorded in the 1970 land use inventory. On a county basis, the relative variances between the existing and proposed transportation, communication, and utility land areas were very small in Milwaukee and Racine Counties, and ranged from 4 percent to 8 percent for the remaining counties.

Table 82

COMPARISON OF EXISTING AND PLANNED TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE REGION BY COUNTY: 1970

County	1970 Transportation, Communication, and Utility Land Use[a]			
	Existing (Acres)	Planned (Acres)	Variance Between Existing and Planned Land Use	
			Acres[b]	Percent[c]
Kenosha	8,487	8,875	- 388	- 4.6
Milwaukee	32,003	31,720	283	0.9
Ozaukee	7,824	7,383	441	5.6
Racine	11,784	11,720	64	0.5
Walworth	11,742	10,824	918	7.8
Washington	10,998	10,538	460	4.2
Waukesha	20,109	19,111	998	5.0
Region	102,947	100,171	2,776	2.7

[a] *Excludes off-street parking.*

[b] *1970 existing land use minus 1970 planned land use.*

[c] *Absolute variance as a percent of 1970 existing land use.*

Source: SEWRPC.

Recreational Land Use

The active recreational land use category includes lands actually devoted to recreational uses such as playgrounds, parks, golf courses, zoos, campgrounds and picnic areas, and marinas. In conducting the land use inventories, all recreational facilities were further classified as public and nonpublic.

The 1970 regional land use inventory reported a total of 28,996 acres of active recreational lands in southeastern Wisconsin, representing 2 percent of the total area of the Region. Public recreational areas comprised 13,373 acres, or 46 percent of this total. As indicated on Map 58, major concentrations of recreational lands occur in the Kenosha, Milwaukee, and Racine metropolitan areas as well as in many of the Region's smaller urban centers. Concentrations of active recreational land are also evident around many lakes, streams, and woodland areas in the outlying parts of the Region.

Between 1963 and 1970, the amount of recreational land in the Region increased substantially. Thus, as indicated in Table 83, lands devoted to active recreational use in the Region increased by 5,448 acres, or 23 percent, during this period. Among the seven counties, the largest absolute increases in active recreational lands between 1963 and 1970 occurred in Walworth County (1,404 acres) and Waukesha County (1,369 acres), with the increase in these two counties comprising approximately one-half of the total regional increment of active recreational land. The smallest increase in active recreational land, 318 acres, occurred in Ozaukee County. On a relative basis, the increases in active recreational land among the seven counties ranged from 10 percent in Milwaukee County to nearly 49 percent in Walworth County. The unusually high rate of recreational land developed in Walworth County reflects to some extent the increasing demand for outdoor recreational facilities emanating from the Chicago metropolitan area. The spatial distribution of the changes in active recreational lands between 1963 and 1970 within the Region is shown on Map 59.

Table 83

RECREATIONAL LAND USE IN THE REGION BY COUNTY: 1963 and 1970

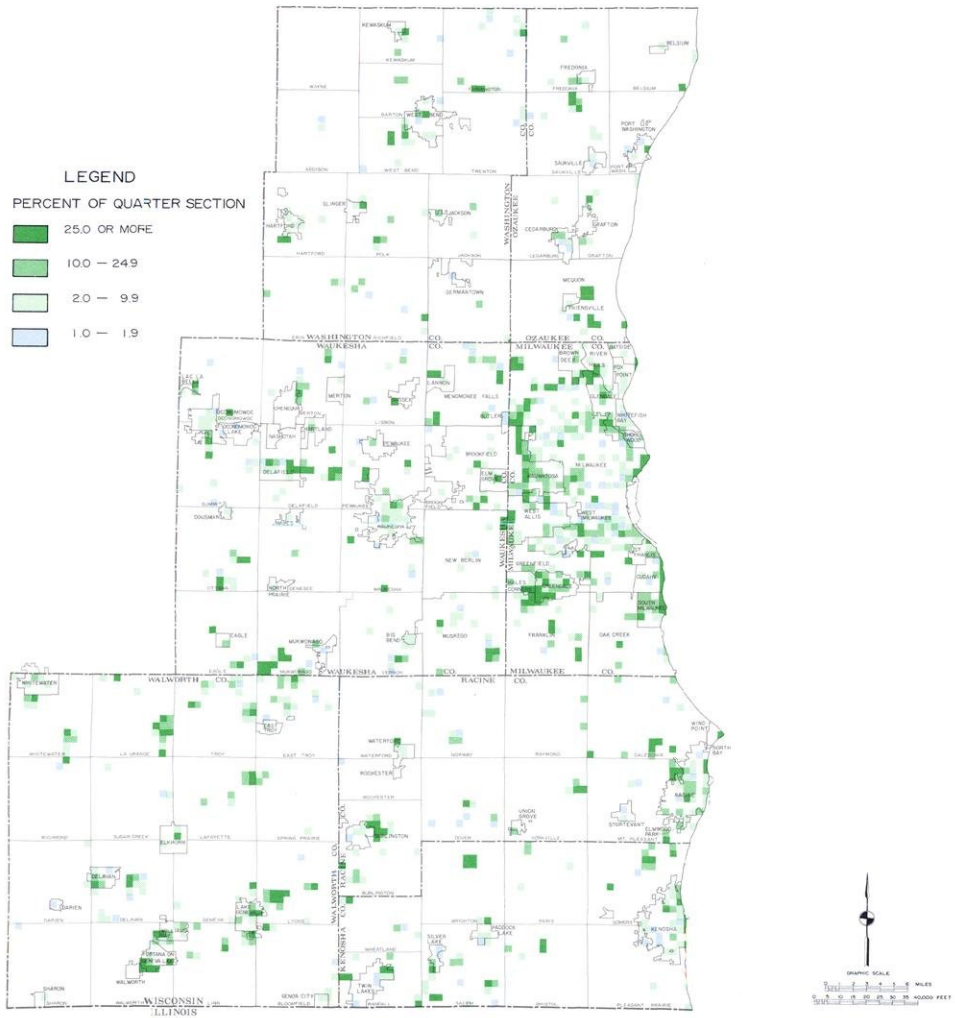
County	Recreational Land Use[a]					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	2,099	8.9	2,672	9.2	573	27.3
Milwaukee	9,040	38.4	9,924	34.2	884	9.8
Ozaukee	1,339	5.7	1,657	5.7	318	23.7
Racine	2,119	9.0	2,585	8.9	466	22.0
Walworth	2,871	12.2	4,275	14.8	1,404	48.9
Washington	1,230	5.2	1,664	5.7	434	35.3
Waukesha	4,850	20.6	6,219	21.5	1,369	28.2
Region	23,548	100.0	28,996	100.0	5,448	23.1

[a] *Includes only those areas intensively used for recreational purposes.*

Source: SEWRPC.

Map 58

RECREATIONAL LAND USE IN THE REGION: 1970

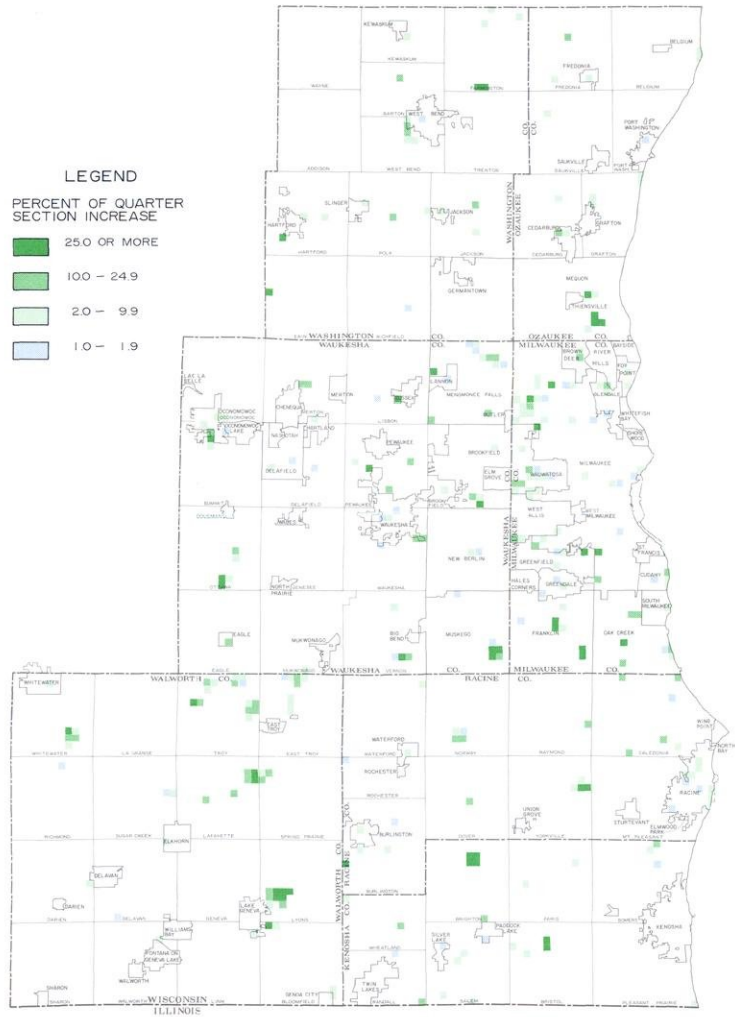


There were about 29,000 acres of land devoted to active recreational use within the Region in 1970. This represents nearly 2 percent of the total area of the Region. Major concentrations of active recreational land are found in the Kenosha, Milwaukee, and Racine metropolitan areas, as well as in many of the Region's smaller urban centers. Concentrations of active recreational lands are also evident around and along many lakes and streams in the outlying, more rural portions of the Region.

Source: SEWRPC.

Map 59

CHANGE IN RECREATIONAL LAND USE IN THE REGION: 1963-1970



The amount of land devoted to recreational land use in the Region increased by about 5,400 acres from 1963 to 1970. Major new recreational areas created through this increase are evident on this map, particularly major public park and parkway development in Milwaukee County; major public park development in Kenosha, Racine, and Waukesha Counties; and major private recreational development in Walworth County.

Source: SEWRPC.

In addition to delineating lands which are actually devoted to active recreational uses, the regional land use inventories also recorded the amount of lands which are contained within or lie adjacent to an active recreational land area, and which, although not part of the active recreational land area per se, are related to, or otherwise enhance the value of, the active recreational land. The extent of the total recreational site areas within the Region is presented on a county basis for 1963 and 1970 in Table 84.

In terms of the total site area, there were 54,556 acres of recreational and related land in the Region in 1970, compared to only 33,732 acres in 1963, indicating a dramatic increase of 20,824 acres, or 62 percent, in this land use. Among the seven counties, the largest absolute increase in recreational site area (4,717 acres) occurred in Walworth County, and the smallest absolute increase (1,590 acres) occurred in Ozaukee County. On a relative basis, recreational site areas almost doubled in Ozaukee and Walworth Counties. The highest proportionate increase (181 percent) in the Region occurred in Washington County.

In the preparation of the initial regional land use plan, only the future requirement for public recreational land use was determined. Because the number, size, and location of new nonpublic recreational areas are generally unknown until the development is imminent, such areas cannot be anticipated and included in any regional plan, although sites particularly well suited to such use can be identified and recommendations made for their protection. The actual and planned increases in public recreational areas (total site area) between 1963 and 1970 are compared in Table 85.

Between 1963 and 1970, the development of public recreational and related lands occurred at a considerably higher rate than proposed under the adopted regional land use plan. As indicated in Table 85, the actual increment of public recreational land in the Region (10,402 acres) was greater by 4,513 acres than the planned increase of 5,889 acres. The actual increase in public recreational lands exceeded the proposed increase within each county of the Region with the exception of Kenosha and Walworth Counties. Among the five remaining counties, the difference between the actual and planned increments ranged from 92 acres in Ozaukee to almost 3,000 acres in Milwaukee.

In comparison to the proposed increment in public recreational lands between 1963 and 1970, the actual increase may appear large. It is important to recognize, however, that the planned increment was intended to meet only the recreational needs of the forecast population in the Region for 1970. On the other hand, because of the general irreversibility of the more intensive types of urban land development, it is desirable to preserve, as soon as possible, those lands which are best suited to meet the long-range recreational needs of the regional population through 1990 and beyond. The rapid development of public recreational areas between 1963 and 1970 acts to ensure the satisfaction of these long-range recreational land requirements. In this regard, the substantial development of public recreational and related lands in Milwaukee County is especially encouraging in view of the high demand for parkland generated by an existing population of more than one million people, and the relatively small number of potential park areas remaining within the county.

Table 84

TOTAL RECREATIONAL SITE AREA IN THE REGION: 1963 and 1970

County	Recreational Site Area[a]					
	1963		1970		Change: 1963-1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent
Kenosha	3,144	9.3	5,052	9.3	1,908	60.7
Milwaukee	12,453	36.9	16,397	30.0	3,944	31.7
Ozaukee	1,669	5.0	3,259	6.0	1,590	95.3
Racine	2,476	7.3	4,430	8.1	1,954	78.9
Walworth	5,262	15.6	9,979	18.3	4,717	89.6
Washington	2,135	6.3	6,006	11.0	3,871	181.3
Waukesha	6,593	19.6	9,433	17.3	2,840	43.1
Region	33,732	100.0	54,556	100.0	20,824	61.7

[a] *Includes public and private recreation areas.*

Source: SEWRPC.

Table 85

COMPARISON OF ACTUAL AND PLANNED INCREMENTS IN PUBLIC RECREATIONAL SITE AREAS IN THE REGION BY COUNTY: 1963-1970

County	Increment in Public Recreational Site Area Between 1963 and 1970 (Acres)		
	Actual	Planned	Difference[a]
Kenosha	83	702	- 619
Milwaukee	3,536	576	2,960
Ozaukee	1,057	965	92
Racine.	1,722	575	1,147
Walworth.	346	1,329	- 983
Washington . . .	1,398	885	513
Waukesha.	2,260	857	1,403
Region	10,402	5,889	4,513

[a] *Actual minus planned increment.*

Source: SEWRPC.

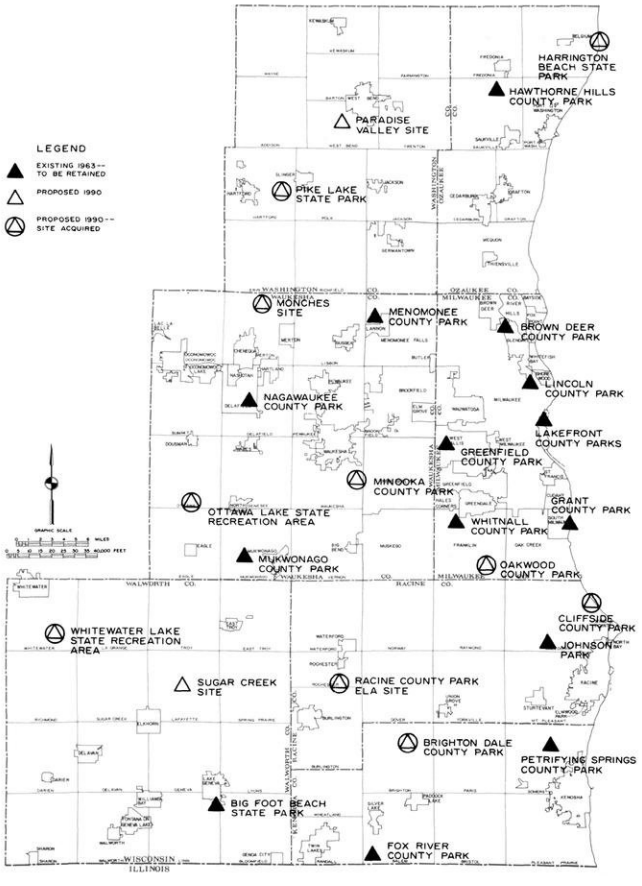
The incremental recreational land development proposed under the adopted regional land use plan includes land for additional locally oriented public park and outdoor recreation areas as well as for major public regional recreation sites. Approximately 61 percent of the total increment of 8,700 acres of public recreational land proposed under the initial land use plan for 1990 would be developed as major regional park areas. The acquisition of these regional park and recreation sites for public use must be a major consideration in any assessment of plan implementation progress.

The adopted regional land use plan recommends that 26 major regional parks be provided or maintained in the Region by 1990. Fourteen of these areas were already publicly owned, fully or partially developed, and to a varied extent in use when the regional land use plan was being proposed, and were recommended to be retained. Twelve additional sites were recommended for immediate preservation and future development as major regional parks. Each of the proposed regional parks is recommended to have a minimum area of 250 acres, and is to be located where high-value recreational resources suitable for multi-purpose recreational use are found. The location of the 26 existing and proposed regional park sites in southeastern Wisconsin is shown on Map 60.

The 1972 status of the 12 additional regional park sites proposed under the initial land use plan is summarized in Table 86. From analysis of this table, it is apparent that good progress has been made in establishing new regional parks at the recommended sites, with nine of the 12 proposed sites totally or partially acquired by public agencies and seven of these nine sites open for public use by 1972. Perhaps the most significant of these new regional park sites is the Harrington Beach State Park, developed by the Wisconsin Department of Natural Resources at the Quarry Lake potential park site, which was identified in a 1964 Commission inventory as the best remaining potential park site in the Region.

Map 60

STATUS OF PLANNED 1990 MAJOR PUBLIC OUTDOOR RECREATION AREAS IN THE REGION: 1972



The adopted regional land use plan recommends that 26 major public outdoor recreation areas of regional significance be provided to serve the needs of the Region through 1990. Fourteen of these areas were already publicly owned, fully or partially developed, and, to a varied extent, in use when the plan was being prepared, and are to be retained. Twelve were newly proposed areas requiring public acquisition of at least 250 acres of land for recreational development and use. By the end of 1972, nine of the 12 new regional park sites, totaling 3,651 acres, had been acquired by public agencies, with significant development having been undertaken at seven of the nine sites. In addition, 194 acres of the proposed Monches Park site was acquired by the Waukesha County Park and Planning Commission in 1973.

Source: SEWRPC.

The three remaining sites which need acquisition by public agencies are the Sugar Creek site in the Town of LaFayette, Walworth County, which was recommended in the adopted Fox River watershed plan to be purchased and developed by the Wisconsin Department of Natural Resources as a state park; the Paradise Valley site in the Town of West Bend, Washington County, which was recommended in the Milwaukee River watershed plan for purchase and development by the county or the Wisconsin Department of Natural Resources as a major outdoor recreation area; and the Monches site in the

Table 86

IMPLEMENTATION STATUS OF MAJOR PUBLIC OUTDOOR RECREATION AREAS RECOMMENDED IN THE ADOPTED REGIONAL LAND USE PLAN: 1972

Recommended Major Public Outdoor Recreation Area		Implementation Status				
		Site Acquisition				
Location	Acres	Yes or No	Acres	Agency Responsible	Site Name	Site Development to Date
Abandoned Bong Air Base Town of Brighton Kenosha County	360	Yes	360	Kenosha County Park Commission	Brighton Dale County Park	200-acre golf course.
Root River City of Franklin Milwaukee County	460	Yes	400	Milwaukee County Park Commission	Oakwood County Park	278-acre park and golf course adjacent to Root River Parkway.
Quarry Lake-Lake Michigan Town of Belgium Ozaukee County	620	Yes	634	Wisconsin Department of Natural Resources	Harrington Beach State Park	Under development.
Lake Michigan Town of Caledonia Racine County	280	Yes	220	Racine County Highway and Park Commission	Cliffside Park	None to date.
Fox River[a] Racine County	250	Yes	240	Racine County Highway and Park Commission	Ela Park Site	None to date.
Sugar Creek Town of LaFayette Walworth County	770	No	--	--	--	--
Rice Lake Town of Whitewater Walworth County	550	Yes	550	Wisconsin Department of Natural Resources	Whitewater Lake State Recreation Area	192-acre recreation area developed for use, including camping.
Paradise Valley Town of West Bend Washington County	350	No	--	--	--	--
Pike Lake Town of Hartford Washington County	520	Yes	692	Wisconsin Department of Natural Resources	Pike Lake State Park	30-acre recreation area developed for use, including camping.
Monches Town of Merton Waukesha County	465	No[b]	--	--	--	--
Ottawa Lake Town of Ottawa Waukesha County	245	Yes	245	Wisconsin Department of Natural Resources	Ottawa Lake State Recreation Area	About 75 acres developed for use, including camping.
Waukesha Town of Waukesha Waukesha County	300	Yes	310	Waukesha County Park and Planning Commission	Minooka Park	210 acres developed for use, including picnic areas and nature trails.

[a] *The Ela Site replaces the Tichigan Lake regional park site initially proposed and shown on the 1990 regional land use plan and relocated as a major recommendation in the Commission's Fox River Watershed Planning Program.*

[b] *In 1973 the Waukesha County Park and Planning Commission began acquisition of the Monches park site.*

Source: SEWRPC.

Town of Merton, Waukesha County.[11] Fortunately, no urban development has yet intruded into these remaining regional park sites which would render them lost for future public recreational use. It is essential, therefore, that action be taken now by appropriate public agencies to acquire these sites for future use before urban development renders them lost for public park purposes.

It should be noted that three other park sites not identified for development as major regional park facilities in the adopted regional land use plan have been acquired for such development. Bender Park, a 323-acre site in the City of Oak Creek in Milwaukee County, has been acquired by Milwaukee County. Silver Lake Park, a 243-acre site in the Town of Salem, Kenosha County, has been acquired by Kenosha County. Finally, Mee-kwon Park, a 235-acre site in the City of Mequon, Ozaukee County, has been acquired by Ozaukee County. These three sites represent valuable additions to the existing recreational lands, and will supplement those facilities already designated as regional park sites.

Open Lands

The open lands category includes three major types of land use: woodlands, water and wetlands, and unused and other open land. As indicated in Table 87, there were 353,136 acres of open lands in the Region at the time of the regional land use inventory in 1970. More than half of this total, 51 percent, was comprised of water and wetlands. Woodlands accounted for another 36 percent, and 13 percent consisted of unused and other open lands.

Woodlands: This land use category includes areas of one acre or more which are covered with trees, or heavy brush, including tree farms. There were approximately 125,286 acres of woodlands in southeastern Wisconsin at the time of the land use inventory in 1970, representing 7 percent of the total area of the Region. Waukesha County had the largest amount of woodlands in 1970, containing 32,597 acres, or 26 percent of the regional total for this category (see Table 88). Large tracts of woodland areas were also found in Walworth and Washington Counties. In fact, Walworth, Washington, and Waukesha Counties together accounted for almost three-fourths of all woodland areas in the Region in 1970. The 1970 spatial distribution of woodlands within southeastern Wisconsin is shown on Map 29 in Chapter V of this report.

Between 1963 and 1970, there were both decreases in woodlands in certain areas of the Region, due largely to the conversion of woodlands to intensive urban and agricultural land uses, as well as increases in woodlands as a result of reforestation activities. The overall effect of these changes is a net loss of 5,131 acres of woodlands, representing a decrease of about 4 percent from the 1963 level. Among the seven counties, the largest net losses in woodlands occurred in Waukesha (1,885 acres) and Walworth (995 acres), with the losses in these counties representing 56 percent of the total regional decrease in woodland areas. Milwaukee County experienced the smallest loss in woodlands—242 acres—between 1963 and 1970. The spatial distribution of the changes in woodland areas within the Region between 1963 and 1970 is shown on Map 30 in Chapter V of this report.

Woodland areas generally represent a ready land reserve for urban expansion, often providing a highly desirable aesthetic attraction for residential development in particular. Indeed, under the adopted regional land use plan, approximately 3,100 acres of woodlands were proposed to be converted to urban uses between 1963 and 1970. Most of this acreage consists of individual woodlots, located directly in the path of urban growth, which are generally insufficient in size or quality to warrant permanent preservation. As indicated in Table 88, the conversion of woodland areas for urban uses has occurred at a rate slightly higher than proposed. Thus, the regional

[11] *Approximately 194 acres of the Monches Park site were acquired by the Waukesha County Park and Planning Commission in 1973. There has been no site development to date.*

Table 87

OPEN LANDS IN THE REGION: 1963 and 1970

Open Land Category	Existing Open Lands					
	1963		1970		Change: 1963-1970	
	Acres	Percent of All Open Lands	Acres	Percent of All Open Lands	Acres	Percent
Woodlands	130,417	36.5	125,286	35.5	- 5,131	- 3.9
Water and Wetlands	182,474	51.1	180,830	51.2	- 1,644	- 0.9
Unused Lands and Other[a]	44,099	12.4	47,020	13.3	2,921	6.6
Total Open Lands	356,990	100.0	353,136	100.0	- 3,854	- 1.1

[a] *Includes unused lands, quarries, and landfill sites.*

Source: SEWRPC.

Table 88

WOODLAND ACREAGE IN THE REGION BY COUNTY: EXISTING 1963 and 1970 AND PLANNED 1970

County	Woodlands								
	Existing				Change: 1963-1970		Planned 1970 (Acres)	Variance Between Existing and Planned Acreage: 1970	
	1963		1970						
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent		Acres[a]	Percent[b]
Kenosha	9,616	7.4	9,112	7.3	- 504	- 5.2	9,382	- 270	- 3.0
Milwaukee	3,455	2.6	3,213	2.6	- 242	- 7.0	3,186	27	0.8
Ozaukee	8,550	6.6	8,272	6.6	- 278	- 3.3	8,097	175	2.1
Racine	13,709	10.5	12,927	10.3	- 782	- 5.7	13,443	- 516	- 4.0
Walworth	32,750	25.1	31,755	25.3	- 995	- 3.0	31,967	- 212	- 0.7
Washington	27,855	21.4	27,410	21.9	- 445	- 1.6	27,475	- 65	- 0.2
Waukesha	34,482	26.4	32,597	26.0	- 1,885	- 5.5	33,801	- 1,204	- 3.7
Region	130,417	100.0	125,286	100.0	- 5,131	- 3.9	127,351	- 2,065	- 1.6

[a] *1970 existing acreage minus 1970 planned acreage.*

[b] *Absolute variance as a percent of 1970 existing acreage.*

Source: SEWRPC.

land use plan recommends that woodlands comprise 127,351 acres of land within the Region in 1970, which is higher by 2,065 acres, or nearly 2 percent, than the 1970 woodland area. The variances between the existing and the proposed woodland areas were very small—less than 1 percent—in Milwaukee, Walworth, and Washington Counties, and ranged from 2 to 4 percent for the remaining four counties in the Region.

The remaining forest areas have very obvious and important direct values as wildlife habitat, aesthetic settings for urban development, areas for nature study, scientific areas, and for outdoor recreation. They also have indirect and 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 groundwater recharge. These values will be destroyed, together with the forest areas themselves, unless measures are taken to preserve the relatively few remaining forest areas in the Region.

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; and open lands which are intermittently covered with water or which are wet due to a high water table. Water and wetland areas are an important element of the natural resource base, providing opportunities for recreation and contributing to the ecological balance of the Region in many ways. At the time of the regional land use inventory in 1970, there were 180,830 acres of water and wetland areas in the Region. Of this total, 48,052 acres, or 27 percent, actually consisted of surface water. The remaining 132,778 acres consisted of swampland, marshes, and other wetland areas.

The spatial distribution of water and wetlands in the Region is shown on Map 31, Chapter V of this report. This map clearly indicates the presence of inland lakes, rivers, and streams, together with the floodplains 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. Map 31 also reflects the extensive urban development in the Kenosha, Milwaukee, and Racine metropolitan areas and the accompanying land fill operation and drainage improvements. Milwaukee County in particular contains a very limited amount of water and wetland areas. Its total of 4,207 acres of water and wetlands comprises only 2 percent of the regional total.

The extent of water and wetlands in an area may change slightly over time as a result of drainage and landfill operations as well as construction of new impoundment areas. Furthermore, variations in rainfall may cause the boundaries of certain wetland areas to change slightly between two points in time. For these reasons, water and wetlands increased in certain areas of the Region and decreased in other areas between 1963 and 1970. The overall effect of these changes was a net decrease of 1,644 acres, or approximately 1 percent, in the water and wetlands category (see Table 89). There was a net decrease in the water and wetlands category in each county of the Region between 1963 and 1970 with the exception of Racine, with the net losses ranging from only four acres in Walworth County to 1,082 acres in Waukesha County.

Although the areal extent of water and wetlands in the Region remained essentially unchanged between 1963

Table 89

WATER AND WETLAND ACREAGE IN THE REGION BY COUNTY: EXISTING 1963 AND 1970 AND PLANNED 1970

County	Water and Wetlands								
	Existing				Change: 1963-1970		Planned 1970 (Acres)	Variance Between Existing and Planned Acreage: 1970	
	1963		1970						
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent		Acres[a]	Percent[b]
Kenosha	19,584	10.7	19,445	10.8	- 139	- 0.7	19,471	- 26	- 0.1
Milwaukee	4,522	2.5	4,207	2.3	- 315	- 7.0	4,474	- 267	- 6.3
Ozaukee	15,083	8.3	14,879	8.2	- 204	- 1.4	14,988	- 109	- 0.7
Racine	17,218	9.4	17,712	9.8	494	2.9	17,145	567	3.2
Walworth	39,164	21.5	39,160	21.7	- 4	--[c]	39,112	48	0.1
Washington	36,032	19.7	35,638	19.7	- 394	- 1.1	35,823	- 185	- 0.5
Waukesha	50,871	27.9	49,789	27.5	- 1,082	- 2.1	50,841	- 1,052	- 2.1
Region	182,474	100.0	180,830	100.0	- 1,644	- 0.9	181,854	- 1,024	- 0.6

[a] *1970 existing acreage minus 1970 planned acreage.*

[b] *Absolute variance as a percent of 1970 existing acreage.*

[c] *Less than 0.1 percent.*

Source: SEWRPC.

and 1970, the quality of the Region's lakes and streams has not shown significant improvement. Water quality can degenerate as a result of excessive nutrient loads from malfunctioning or improperly placed septic systems, inadequate operation of waste treatment facilities, careless agricultural practices, and inadequate soil conservation practices. Lakes and streams are also adversely affected by the excessive development of lakeshore and riverine areas in combination with the filling of peripheral wetlands. These processes remove valuable nutrient and sediment traps while adding nutrient and sediment sources.

Water quality data collected as part of two major Commission watershed studies indicate that many of the major lakes of southeastern Wisconsin are being degraded as a result of man's activities to the point where they now have, or soon will have, little or no value for recreational purposes, as desirable locations for properly planned and controlled lake-oriented residential development, or even as aesthetic assets in the Region. Many miles of major streams in the Region are being degraded as a result of wastewater treatment and disposal practices such that they are unsafe for most recreational activities and have a greatly reduced aesthetic value. The continued deterioration of water quality resulting from the increasing intensity of urban development is an important consideration in the reevaluation of the regional land use plan.[12]

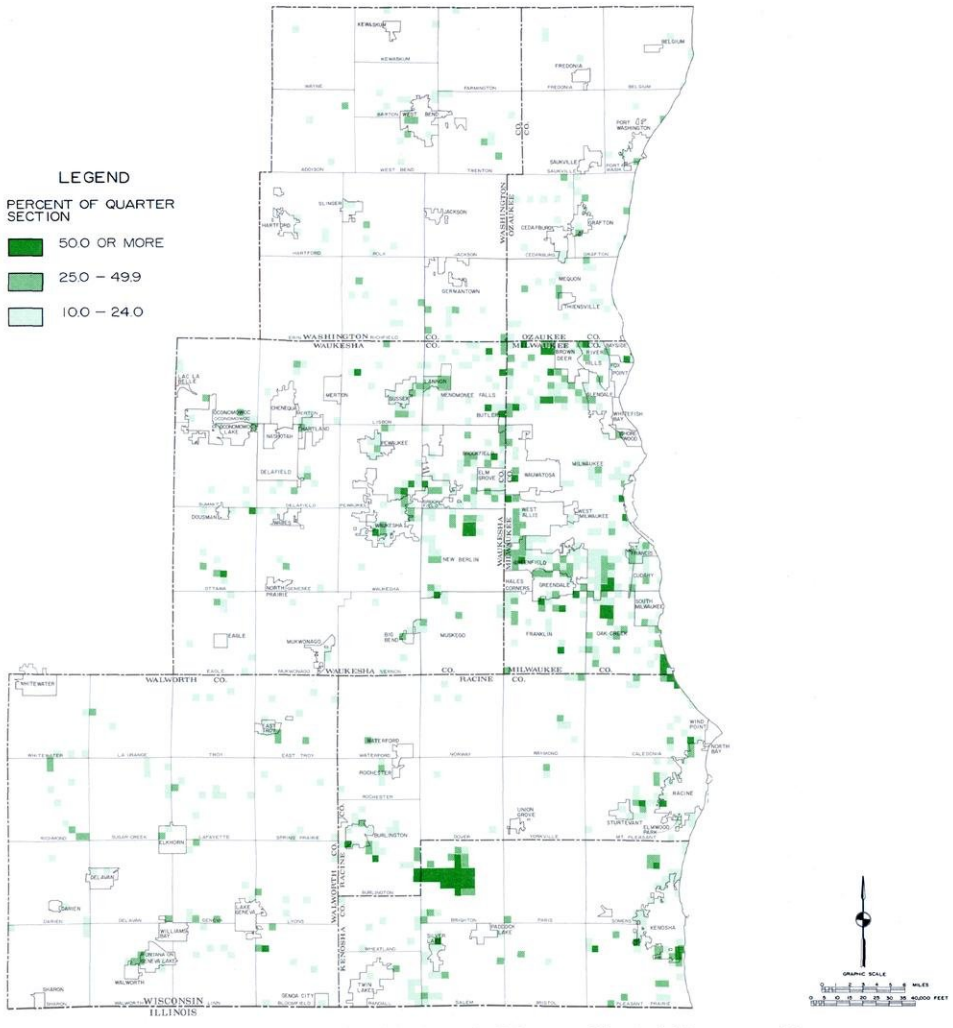
Unused and Other Open Lands: This land use category includes unused lands which are not devoted to urban uses, cropped, or grazed; and lands devoted to temporary uses such as open pits for trash or garbage disposal and quarries, either operating or nonoperating. At the time of the regional land use inventory in 1970, there were 47,020 acres of land in this category in southeastern Wisconsin, representing nearly 3 percent of the total land area of the Region. Unused land accounted for a vast majority—82 percent— of this land use category in 1970. Land devoted to quarrying operations represented an additional 15 percent, and lands used for sanitary landfill comprised the small balance, 3 percent. The 1970 spatial distribution of unused and other open land in the Region is shown on Map 61. In Kenosha County, the presence of the abandoned Richard I. Bong Air Force Base is clearly evident. Many former agricultural lands located in the urban fringe of the Milwaukee metropolitan area appear as clusters of unused land awaiting conversion to urban uses.

Between 1963 and 1970, there were increases in unused and other open lands in certain areas of the Region and decreases in other areas. The net effect of these changes was an increase of 2,921 acres in the unused and other open lands category. Milwaukee County experienced a net loss of 2,506 acres of land in this category, as many unused land areas delineated in the 1963 inventory were developed for urban uses by 1970. There was a net increase in the unused and other open lands category in each of the remaining counties. The largest increase, 1,927 acres, occurred in Waukesha County. The spatial distribution of the changes in the unused and other open lands category is shown on Map 62.

[12] *A more detailed discussion of water quality in southeastern Wisconsin is presented in Chapter V of this report.*

Map 61

UNUSED LANDS, LANDFILL SITES, AND QUARRIES IN THE REGION: 1970

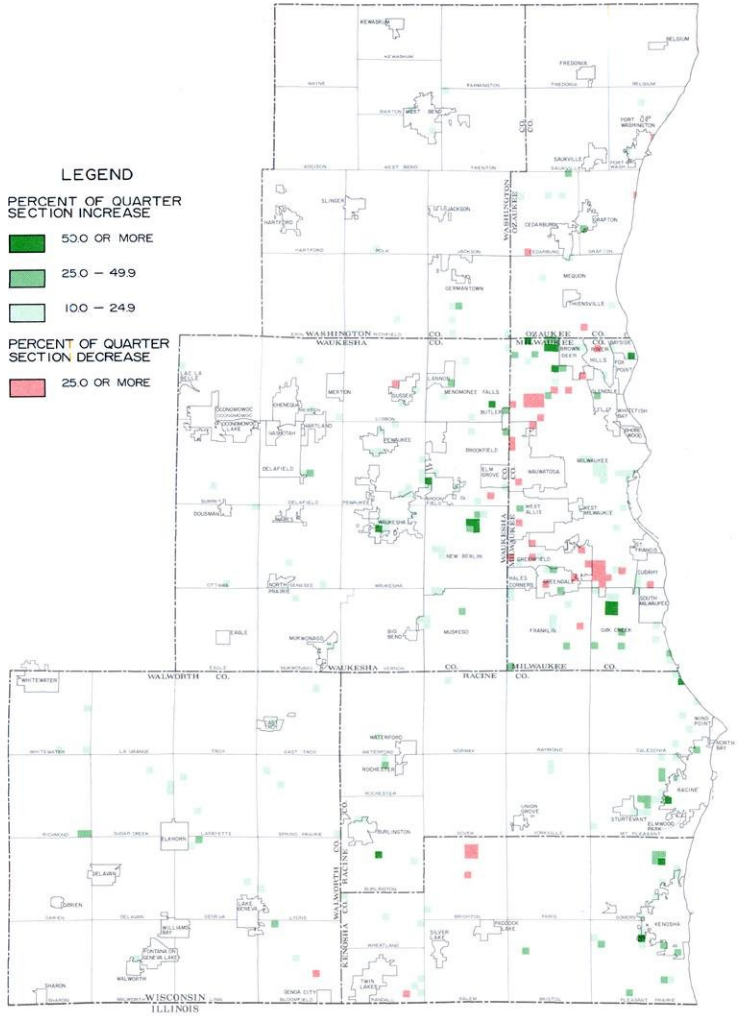


The 1970 regional land use inventory identified about 47,000 acres of land which were used for sanitary landfill purposes, for quarrying operations, or which were simply unused at the time of the inventory. Unused land, that is, land which is not devoted to urban uses, cropped or grazed, nor identified as woodlands or wetlands, accounted for the vast majority of this land use acreage in 1970—about 82 percent. Land devoted to quarrying operations represented an additional 15 percent, and land used for sanitary landfill comprised the small balance, 3 percent.

Source: SEWRPC.

Map 62

CHANGE IN UNUSED LANDS, LANDFILL SITES, AND QUARRIES IN THE REGION: 1963-1970



Between 1963 and 1970 there was a net increase of about 2,900 acres of unused and other open lands in the Region. Milwaukee County experienced a net loss of about 2,500 acres of land in this category, since many unused land areas identified in the 1963 land use inventory were developed for urban uses by 1970. There was a net increase in the unused and other open lands category within each of the remaining counties of the Region between 1963 and 1970.

Source: SEWRPC.

Table 90

UNUSED AND OTHER OPEN LANDS IN THE REGION BY COUNTY: EXISTING 1963 AND 1970 AND PLANNED 1970

County	Unused and Other Open Land								
	Existing				Change: 1963-1970		Planned 1970 (Acres)	Variance Between Existing and Planned Acreage: 1970	
	1963		1970						
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent		Acres[a]	Percent[b]
Kenosha	7,245	16.4	7,898	16.8	653	9.0	6,763	1,135	14.4
Milwaukee	15,292	34.7	12,786	27.2	- 2,506	- 16.4	10,131	2,655	20.8
Ozaukee	2,176	4.9	2,625	5.6	449	20.6	2,013	612	23.3
Racine	3,157	7.2	4,645	9.9	1,488	47.1	2,750	1,895	40.8
Walworth	4,426	10.0	5,008	10.6	582	13.1	4,218	790	15.8
Washington	2,765	6.3	3,093	6.6	328	11.9	2,592	501	16.2
Waukesha	9,038	20.5	10,965	23.3	1,927	21.3	8,404	2,561	23.4
Region	44,099	100.0	47,020	100.0	2,921	6.6	36,871	10,149	21.6

[a] *1970 existing acreage minus 1970 planned acreage.*

[b] *Absolute variance as a percent of 1970 existing acreage.*

Source: SEWRPC.

As further shown in Table 90, under the adopted regional land use plan the amount of unused and other open land in the Region would have decreased by 7,228 acres between 1963 and 1970 as new urban development occurred. Because of the observed net increase in this land use category during this period, however, the amount of unused and other open lands in the Region proposed under the 1970 stage of the plan is lower by 10,149 acres, or 22 percent, than the 1970 amount of unused and other open land.

Agricultural Land

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 agricultural land use.

Agriculture is the singularly largest land use in the Region, with 60 percent of the total area of the Region devoted to this use in 1970. This land use activity, comprised principally of dairy, livestock, and field crop farms, presently generates more than $113 million of income. The average farm size in the Region is 147 acres, somewhat smaller than the state average of 183 acres.[13]

Table 91 indicates the distribution of farmland within the Region by county. Walworth County ranks first in land devoted to agricultural uses, containing 25 percent of the total regional agricultural land. Waukesha County ranks second and Washington County third. Highly urbanized Milwaukee County still contains approximately 28,607 acres of agricultural land, about 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 area of the City of Milwaukee.

The spatial distribution of agricultural land is shown on Map 63. Major concentrations of agricultural land use occur in northeastern Ozaukee County and in east central Racine and Kenosha Counties. More scattered concentrations occur in Waukesha and Washington Counties. Milwaukee County has only a few intensively farmed quarter sections remaining.

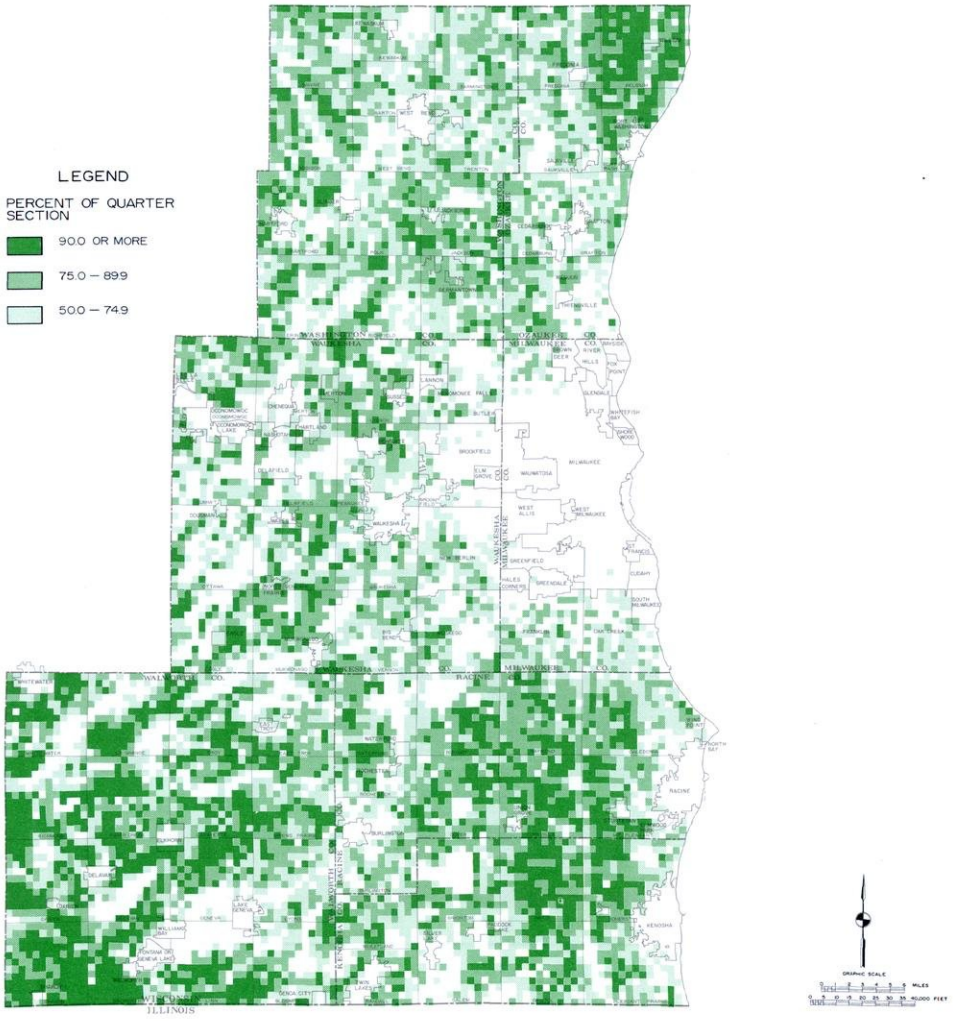
Between 1963 and 1970, substantial urban development occurred in many areas previously used for agricultural purposes. Due largely to this conversion of farmland to urban land uses, the agricultural land use base of the Region declined by 43,679 acres, or 4 percent, between 1963 and 1970, representing an average annual loss of 6,240 acres, or 9.8 square miles, during this period. Each county experienced significant losses of agricultural lands between 1963 and 1970, with the absolute changes ranging from 2,824 acres in Kenosha County to 14,365 acres in Waukesha County. The unusually large loss of agricultural lands in Waukesha County reflects a rapid increase of residential and related urban development during this period.

The spatial distribution of these changes in agricultural land use is shown on Map 64. Large decreases in farmland are evident along the rural-urban fringes of the Kenosha, Milwaukee, and Racine metropolitan areas. The dispersed

[13] *Information concerning farm income and farm sizes was extracted from the 1969 Census of Agriculture conducted by the U. S. Bureau of the Census.*

Map 63

AGRICULTURAL LAND USE IN THE REGION: 1970

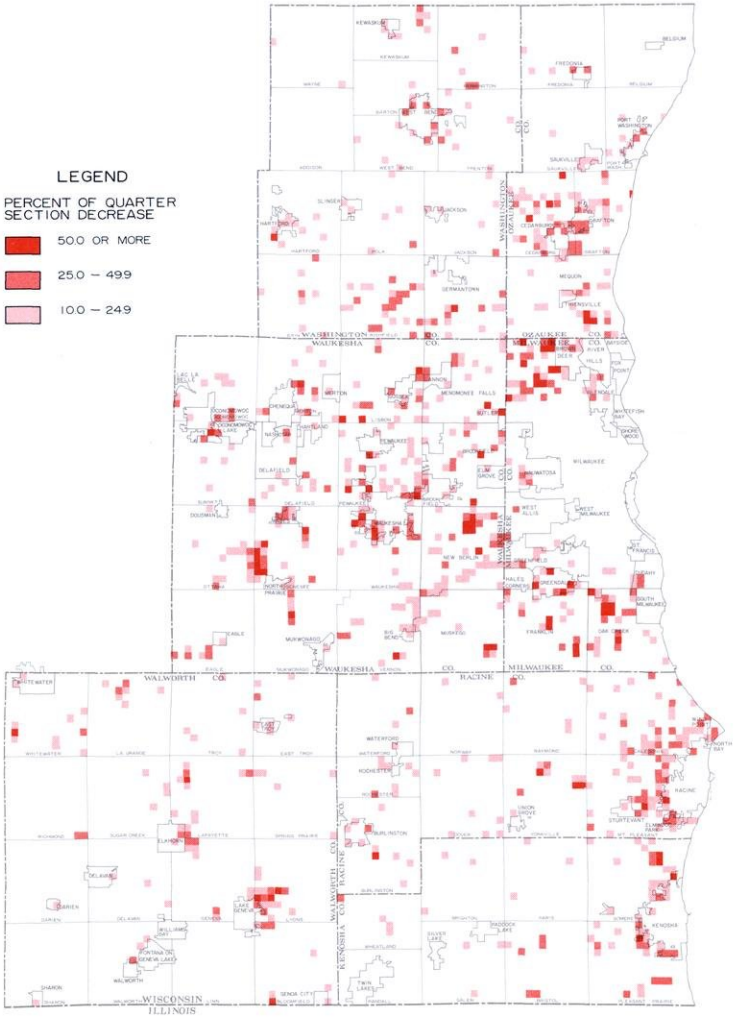


Land devoted to agricultural uses, including cropland, pastureland, orchards, nurseries, and fowl and fur farms, totaled about 1,040,100 acres in 1970, or about 60 percent of the total area of the Region. Major concentrations of agricultural land use occur in northeastern Ozaukee County, in central and southeastern Walworth County, and in east-central Racine and Kenosha Counties. Other more scattered concentrations occur in Waukesha and Washington Counties.

Source: SEWRPC.

Map 64

CHANGE IN AGRICULTURAL LAND USE IN THE REGION: 1963-1970



Between 1963 and 1970 a substantial amount of agricultural land was converted to urban use. Due largely to this conversion to urban use, agricultural land use in the Region declined by about 43,700 acres, or by 4 percent, representing an average loss of about 6,200 acres, or 10 square miles per year, during this period.

Source: SEWRPC.

Table 91

AGRICULTURAL LAND USE IN THE REGION BY COUNTY: EXISTING 1963 AND 1970 AND PLANNED 1970

County	Agricultural Land Use								
	Existing								
	1963		1970		Change: 1963-1970		Planned 1970 (Acres)	Variance Between Existing and Planned Acreage: 1970	
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent		Acres[a]	Percent[b]
Kenosha	116,754	10.8	113,930	11.0	- 2,824	- 2.4	114,532	- 602	- 0.5
Milwaukee	34,870	3.2	28,607	2.7	- 6,263	- 18.0	31,797	- 3,190	- 11.2
Ozaukee	105,126	9.7	100,491	9.7	- 4,635	- 4.4	103,341	- 2,850	- 2.8
Racine	153,641	14.2	147,207	14.1	- 6,434	- 4.2	151,026	- 3,819	- 2.6
Walworth	265,694	24.5	261,744	25.2	- 3,950	- 1.5	264,987	- 3,243	- 1.2
Washington	191,674	17.7	186,466	17.9	- 5,208	- 2.7	190,919	- 4,453	- 2.4
Waukesha	216,041	19.9	201,676	19.4	- 14,365	- 6.6	212,057	- 10,381	- 5.1
Region	1,083,800	100.0	1,040,121	100.0	- 43,679	- 4.0	1,068,659	- 28,538	- 2.7

[a] *1970 existing acreage minus 1970 planned acreage.*

[b] *Absolute variance as a percent of 1970 existing acreage.*

Source: SEWRPC.

pattern of losses in farmland in the outlying areas of the Region, also apparent on Map 64, is largely a result of the diffused nature of residential and related urban land development discussed earlier in this chapter.

Agricultural lands within the Region serve as a land reserve for urban expansion necessitated by growth in the regional population. The adopted regional land use plan recommends the conversion of 15,141 acres of agricultural land to urban use between 1963 and 1970, which is considerably less than the actual loss in agricultural lands during this period. In fact, the agricultural land base proposed under the 1970 stage of the regional land use plan—1,068,659 acres—is greater by 28,538 acres, or 3 percent, than the existing agricultural acreage of 1,040,121 in the Region in 1970.

It should be noted that agricultural lands have been converted to urban land uses above the rate suggested under the adopted regional land use plan, despite the fact that the regional population has not increased as fast as suggested by the population forecast on which future urban land requirements were based. A major reason for this accelerated conversion is the development of residential lands in a highly diffused pattern at lower densities than proposed under the adopted land use plan.

A major recommendation of the adopted regional land use plan is the preservation in essentially agricultural use of most of the remaining prime agricultural lands of southeastern Wisconsin, the most productive farming areas of the Region. Gross prime agricultural land includes all land use, both urban and rural, within the prime agricultural land configurations delineated on Map 65.[14] For the purposes of this discussion, however, attention is focused on net prime agricultural lands, that is, lands which are actually used as farmland and which have been determined to be highly productive for agricultural purposes on the basis of soils, the size and extent of the area farmed, and the historical capability of the area to consistently produce better than average crop yields. The preservation of these prime agricultural lands is necessary for economic reasons as well as to maintain the natural beauty and unique cultural heritage of southeastern Wisconsin, thereby ensuring the future environmental wholesomeness of the Region.

In 1970, net prime agricultural lands covered about 405,200 acres, or 24 percent of the area of the Region (see Table 92). Over 112,000 acres, or almost 28 percent of prime agricultural lands in the Region, are located in

[14] *The gross prime agricultural areas of the Region include about 467,700 acres of land, of which approximately 446,500 acres are recommended for preservation under the adopted regional land use plan. The portion of the gross prime agricultural area of the Region which is actually farmed is termed the net prime agricultural land. Net prime agricultural lands comprised 405,204 acres, or 87 percent, of the gross prime agricultural area of the Region in 1970. The balance included woodlands, water and wetlands, and other open lands, as well as various types of urban development within the gross prime agricultural areas.*

Table 92

NET PRIME AGRICULTURAL LAND IN THE REGION BY COUNTY
EXISTING 1963 AND 1970 AND PLANNED 1970

County	Net Prime Agricultural Land[a]								
	Existing				Change: 1963-1970		Planned 1970 (Acres)	Variance Between Existing and Planned Acreage: 1970	
	1963		1970						
	Acres	Percent of Region	Acres	Percent of Region	Acres	Percent		Acres[b]	Percent[c]
Kenosha	67,014	16.2	66,055	16.3	- 959	- 1.4	66,427	- 372	- 0.6
Milwaukee	7,976	2.0	7,165	1.8	- 811	- 10.2	7,285	- 120	- 1.7
Ozaukee	38,161	9.2	37,112	9.2	- 1,049	- 2.7	37,949	- 837	- 2.3
Racine	71,392	17.3	69,129	17.1	- 2,263	- 3.2	71,087	- 1,958	- 2.8
Walworth	113,018	27.3	112,463	27.7	- 555	- 0.5	113,018	- 555	- 0.5
Washington	50,153	12.1	49,537	12.2	- 616	- 1.2	50,082	- 545	- 1.1
Waukesha	65,871	15.9	63,743	15.7	- 2,128	- 3.2	65,589	- 1,846	- 2.9
Region	413,585	100.0	405,204	100.0	- 8,381	- 2.0	411,437	- 6,233	- 1.5

[a] *Net prime agricultural lands include that portion of the gross prime agricultural area of the Region which is actually farmed. Woodlands, water and wetlands, and other lands, as well as the various types of urban development within the gross prime agricultural area, are excluded from the net prime agricultural acreage.*

[b] *1970 existing acreage minus 1970 planned acreage.*

[c] *Absolute variance as a percent of 1970 existing acreage.*

Source: SEWRPC.

Walworth County. Significant quantities of prime agricultural lands also exist in Kenosha, Racine, and Waukesha Counties, each of which contained more than 60,000 acres of prime agricultural land in 1970. Milwaukee County, with approximately 7,200 acres, had less than 2 percent of regional prime agricultural acreage in 1970.

Between 1963 and 1970, the net prime agricultural acreage in the Region decreased by 8,381 acres, or about 2 percent, due primarily to new urban land development. The losses of prime agricultural land were largest in Racine County (2,263 acres) and Waukesha County (2,128 acres). The loss in these two counties comprised more than half of the total decline in prime agricultural land in the Region during this time. The reduction in prime agricultural land was less than 1,000 acres for each of the other counties except Ozaukee County, which experienced a loss of 1,049 acres.

While the adopted regional land use plan seeks to minimize urban land uses in the Region's prime agricultural areas, it does recognize that some urban development within these highly productive farmlands is inevitable due to the increasing land requirements of a growing urban population. The initial land use plan anticipated a loss of approximately 2,150 acres of prime agricultural land between 1963 and 1970. The prime agricultural lands which the plan proposed to convert to urban use were generally committed to urban development as early as 1963, due to their proximity to existing and expanding concentrations of urban uses and the prior commitment of heavy capital investments in utility systems.

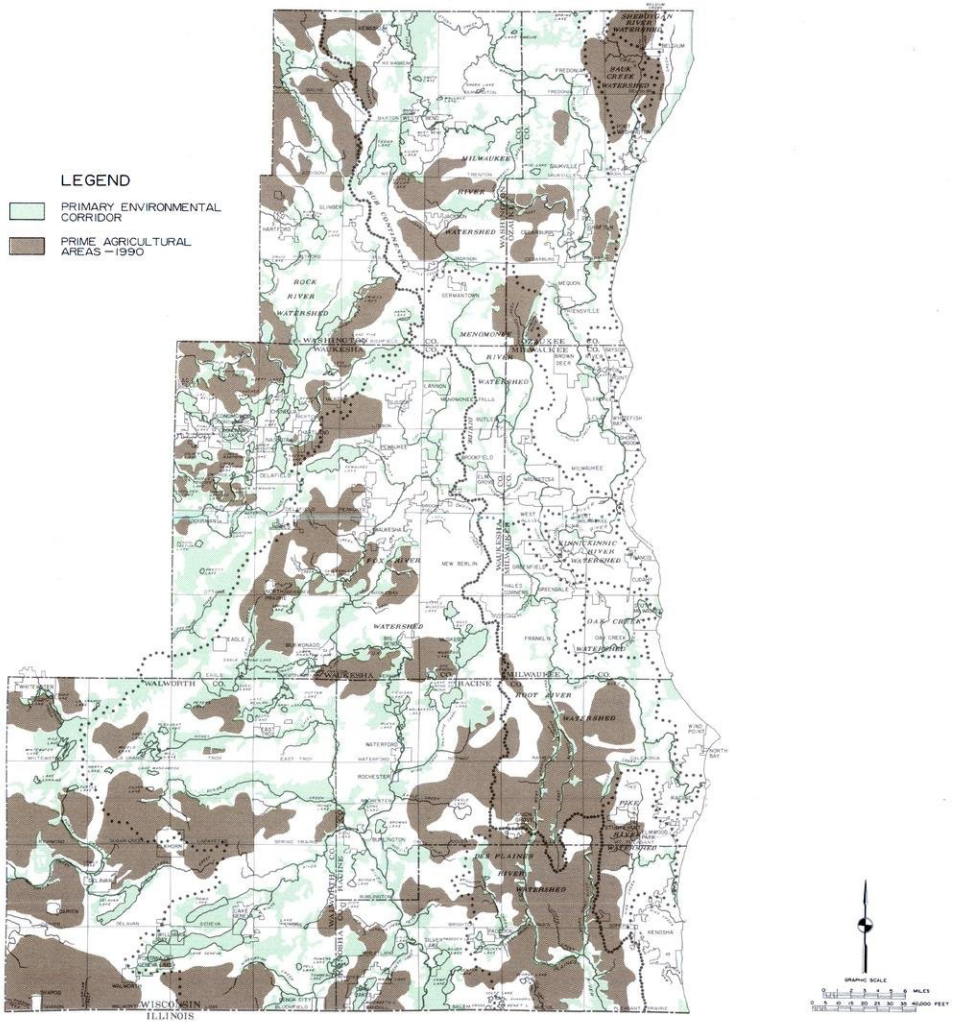
From further analysis of Table 92, it is evident that the conversion of net prime agricultural land to urban use in southeastern Wisconsin has occurred at a somewhat higher rate than proposed under the adopted plan. Thus, 1970 total prime agricultural lands (405,204 acres) are lower by 6,233 acres, or about 2 percent, than the planned amount of 411,437 acres. It is significant that the decrease of prime agricultural land between 1963 and 1970 was not only greater than anticipated, but much of the loss in such lands occurred in areas which were substantially removed from existing urban areas (see Map 66).

While it is apparent that prime agricultural lands have been and are continuing to be converted to urban uses, some communities in the Region, cognizant of the resource value of such lands, have instituted zoning at the local level to preserve prime agricultural lands in their agricultural state. Analysis of community zoning ordinances revealed that of the 446,460 acres of prime agricultural lands in the Region which have been recommended for preservation under the adopted regional land use plan, 60,807 acres, or about 14 percent, have actually been reserved for agricultural use through exclusive agricultural zoning.[15]

[15] *Ibid, footnote 14.*

Map 65

PRIME AGRICULTURAL AREAS IN THE REGION

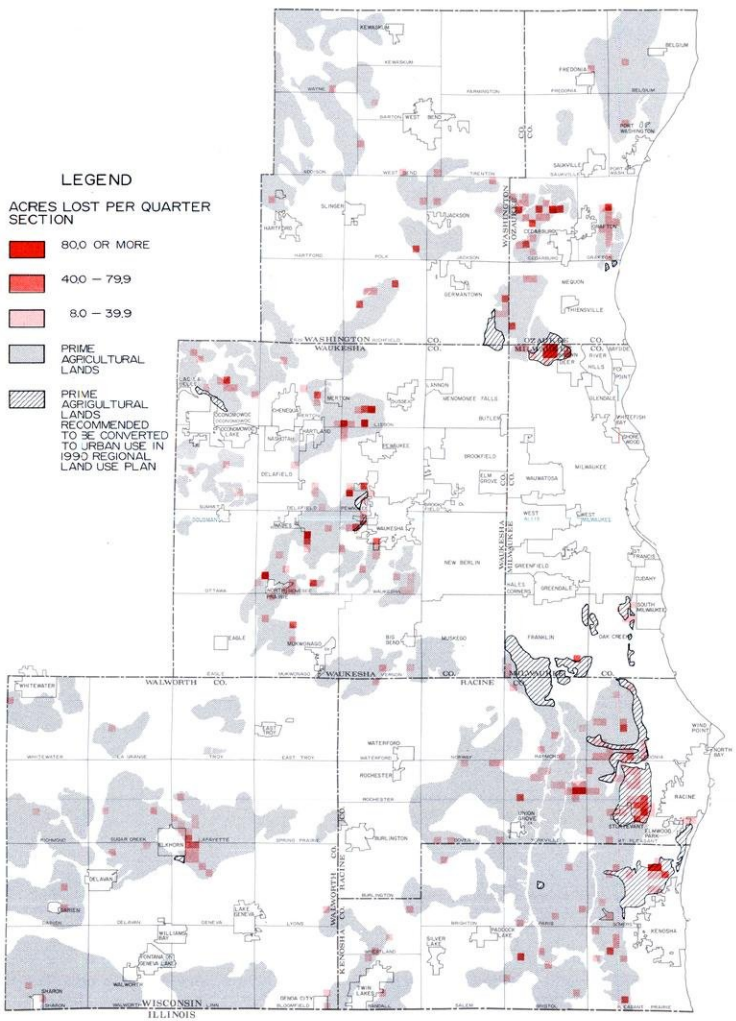


A major recommendation of the adopted regional land use plan is the preservation in agricultural use of most of the remaining prime agricultural lands of southeastern Wisconsin, the most productive farming areas of the Region. Gross prime agricultural land includes all land uses, both urban and rural, located within the prime agricultural areas delineated on the above map. The gross prime agricultural areas of the Region include about 467,700 acres of land, of which approximately 446,460 acres, or 95 percent, are recommended for preservation under the adopted regional land use plan. The portion of the gross prime agricultural area of the Region which is actually farmed is termed net prime agricultural land. Net prime agricultural lands comprised about 405,200 acres, or 87 percent of the gross prime agricultural area of the Region, in 1970.

Source: SEWRPC.

Map 66

LOSS OF PRIME AGRICULTURAL LAND IN THE REGION: 1963-1970



The conversion of prime agricultural land to urban use in southeastern Wisconsin occurred at a higher rate from 1963 to 1970 than proposed under the adopted regional land use plan. Between 1963 and 1970, the net prime agricultural acreage in the Region decreased by about 8,400 acres, or 2 percent, compared to an anticipated loss of about 2,150 acres, or 0.5 percent, during this time. It is significant that the decrease of prime agricultural land between 1963 and 1970 was not only greater than anticipated, but much of the loss in such lands occurred in areas which were located at considerable distances from existing urban areas and, therefore, not recommended for conversion to urban use even by 1990.

Source: SEWRPC.

Exclusive agricultural zoning prohibits noncompatible urban uses, especially extensive residential development, and thereby assists in minimizing the unsightly, expensive, and inefficient urban sprawl development patterns which are so detrimental to the Region's natural resource base. Preservation of prime agricultural lands through exclusive agricultural zoning will not only assure the continued economical provision of agricultural products within the Region, but it will also assist in providing a wholesome future regional environment. A detailed discussion of exclusive agricultural zoning in the prime agricultural areas of the Region is presented in Chapter VII of this report.

SUMMARY

This chapter has presented information concerning the type, intensity, and spatial distribution of 1970 land use within southeastern Wisconsin, as well as a description of changes in the amount and location of major land uses between 1963 and 1970, with emphasis on the relationship between actual development over the last decade and that recommended under the adopted regional land use plan. The following findings have particular significance for regional land use and transportation planning, especially in regard to the reevaluation of the adopted regional land use-transportation plan and the revision of this plan as warranted under the plan reevaluation process.

1. Although urban development within the Region has been continuous since 1850, the character of this development has changed dramatically since 1950. The earlier form of compact, concentric urban development has been supplanted by a highly diffused pattern of areawide development. Between 1950 and 1970, a 47 percent increase in urban population was accompanied by a 188 percent increase in land committed to urban use. The conversion of land to urban uses occurred at a rate of about 16 square miles per year between 1950 and 1963. Since 1963, this rate of conversion has approximated eight square miles per year. The proportionate increase in urban land (17 percent) was still larger than the proportionate increase in the urban population (6 percent) between 1963 and 1970.

2. The spread of urban development in southeastern Wisconsin has been accompanied by a marked reduction in the urban population density of the developed portions of the Region, which dropped from over 11,300 persons per square mile in 1920 to approximately 4,800 persons per square mile in 1963 and about 4,350 persons per square mile in 1970. It should be noted, however, that urban population densities declined at a considerably faster rate between 1950 and 1963 than between 1963 and 1970. Thus, between 1950 and 1963 the urban population density of the Region experienced an average annual decrease of about 288 persons per square mile, or 3 percent, substantially higher than the average annual decrease of about 65 persons per square mile, or 1 percent, during the following seven-year period.

3. Urban land uses within the Region increased from a total of 340 square miles, or about 13 percent of the total area of the Region, in 1963 to 397 square miles, or 15 percent of the total area of the Region, in 1970. The greatest proportion of the urban land is devoted to residential use. Nonurban land uses occupied about 85 percent of the total area of the Region in 1970, a decrease of about 2 percent since 1963. The greatest portion of these nonurban lands were devoted to agricultural use.

4. The urban type land use occupying the greatest area is residential, which presently accounts for 156,266 acres, or 9 percent of the total area of the Region. Between 1963 and 1970, the amount of residential land in the Region increased by 27,047 acres, or 21 percent, considerably greater than that proposed under the adopted regional land use plan. Under this plan, 140,121 acres are proposed to be devoted to residential uses by 1970, which is 16,145 acres, or 10 percent, less than the existing residential acreage recorded in the 1970 land use inventory. This development at a faster rate than proposed under the adopted plan is directly related to the continued proliferation of diffused low-density residential development during this period, contrary to recommendations embodied in the plan.

5. The adopted regional land use plan recommended encouraging new urban growth to occur in areas contiguous to the existing urban centers of the Region which can be readily served by essential public facilities. Although much residential land developed between 1963 and 1970 was located near existing urban areas, a substantial portion of new residential development occurred in outlying rural areas of the Region to which the extension of public utilities would be extremely costly if not totally unrealistic. In this regard, of the total land area actually developed for residential purposes in the Region between 1963 and 1970, only 40 percent was actually served by public sewerage facilities. As could be expected, a large proportion—about 83 percent—of all residential land developed in Milwaukee County between 1963 and 1970 was provided with public sanitary sewer service. However, less than half of all new residential land developed between 1963 and 1970 was served by public sewer facilities within each of the remaining counties of the Region. The actual proportions ranged from less than 20 percent in Washington County to 43 percent in Racine County. The continued concentration of residential development in areas of the Region not presently readily served by public water supply and sanitary sewerage facilities may be expected to intensify problems of declining groundwater levels and of water pollution, and

may ultimately require the construction of new utility systems.

6. Significant growth also occurred within each of the other major urban land categories between 1963 and 1970. The relative rates of increase for other types of urban land use are as follows: commercial—13 percent; industrial—23 percent; governmental and institutional—23 percent; transportation, communication, and utilities—9 percent; and active recreational—23 percent. Analysis of recent development trends in relation to regional plan recommendations revealed that, between 1963 and 1970, the development of land for commercial, governmental and institutional, transportation, and recreational uses occurred at a somewhat higher rate than that proposed under the adopted regional land use plan. Conversely, the development of industrial land occurred at a slower rate than anticipated under the adopted plan.

7. Substantial progress has been made relative to the preservation and development of land within the major activity centers identified on the adopted regional land use plan, that is, the major outdoor park and recreation sites, major retail and service centers, and major industrial areas. In this respect, good progress has been made in establishing new regional park and outdoor recreation areas at sites recommended by the adopted plan, with nine of the 12 new sites fully or partially acquired by public agencies and seven of these nine open for public use by 1972.[16] In addition, three of the ten new major retail and service centers proposed under the adopted plan have been developed and are in operation. Five of the remaining recommended sites have been reserved for future commercial development in local zoning ordinances. Furthermore, each of the six new industrial areas proposed under the adopted plan has been reserved for future industrial development through local zoning. All six were under some stage of development in 1972.

8. Approximately 1,393,257 acres, or 81 percent of the total area of the Region, are devoted to nonurban land uses. Open lands, consisting of woodlands, water and wetlands, and unused lands, accounted for 353,136 acres, or 25 percent, of all nonurban land in the Region. Between 1963 and 1970 there was a net loss of more than 3,800 acres of open lands, due primarily to the conversion of woodlands to urban land uses. Agricultural land comprises approximately 75 percent of all nonurban land in the Region. Indeed, agriculture is the largest land use in southeastern Wisconsin, accounting for 1,040,121 acres, or 60 percent of the total area of the Region. Between 1963 and 1970, substantial urban development occurred in many areas of the Region previously used for agricultural purposes. Due largely to this conversion, the agricultural land use base of the Region declined by 43,679 acres, or 4 percent, between 1963 and 1970, a considerably greater loss than the reduction of 15,141 acres suggested under the adopted regional land use plan. A major reason for this accelerated conversion of agricultural land to urban land uses is the continued development of urban land uses in a highly diffused pattern at lower densities than proposed under the adopted plan.

9. A major objective of the adopted regional land use plan is the preservation in agricultural use of most of the remaining prime agricultural lands in southeastern Wisconsin, the most productive farming areas of the Region. The preservation of these prime agricultural lands is necessary for economic reasons, as well as to ensure the overall wholesomeness of the future regional environment. In 1970 there were 405,204 acres of net prime agricultural land in southeastern Wisconsin, representing 39 percent of all agricultural land in the Region. Between 1963 and 1970, the net prime agricultural acreage decreased by 8,381 acres, or about 2 percent, somewhat greater than the reduction of 2,148 acres proposed under the adopted regional plan.

In evaluating progress toward regional land use plan implementation, attention should be focused on the most important and essential plan elements, exercising care to avoid becoming lost in plan details whose effects are not regionally significant. The regional land use plan may be considered to be largely achieved if the primary environmental corridors of the Region are protected from incompatible urban development; if most of the remaining prime agricultural lands in the Region are preserved in essentially agricultural use; if the major regional park and outdoor recreation areas are acquired for public use; if future residential development within the Region approximates the density and spatial distribution pattern recommended in the plan; and if the major activity centers—that is, the major shopping and industrial centers—approximate the scale and spatial location recommended by the plan.

Based on a comparison of recent development trends with the regional development objectives in the adopted regional land use plan, it would appear that the most significant progress toward regional land use plan implementation has been the acquisition and development of nine of the 12 new major regional park and outdoor recreation areas proposed under the adopted plan, as well as land preservation and development within the 10 new planned major retail and service centers and the six new major industrial centers.

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[16] *It should be noted that one of the three remaining recommended regional park sites, the Monches Park site located in the Town of Merton, was partially acquired by the Waukesha County Park and Planning Commission in 1973.*

The acquisition for public use of all but three of the proposed regional park sites by various government agencies since the adoption of the initial land use plan has served to preserve the best remaining park and outdoor recreation areas in the Region from encroachment by incompatible land use, thereby ensuring satisfaction of the long-range recreational needs of the regional population. Major commercial and industrial centers have a significant impact on travel patterns and urban growth within any region. Because of the profound influence of these major commercial and industrial centers on development patterns within the Region, the preservation through local zoning and the actual development of land for commercial and industrial uses within most of the recommended major activity centers since the adoption of the regional plan represents an important plan implementation action.

Conversely, the most significant departure from the adopted regional land use plan is the continued proliferation of residential land uses in a highly diffused pattern at lower than recommended densities, resulting in the creation of incomplete neighborhoods for which the provision of essential urban facilities and services will be costly and inefficient. This diffused pattern in outlying areas also has a major influence on the amount of land devoted to other urban and nonurban uses. Thus, new residential development in formerly rural areas of the Region requires a concomitant increase in lands devoted to commercial, transportation, governmental and institutional, and other supportive uses. The resultant diffused pattern of urban development breaks up economical farming areas and reduces the amount and quality of wildlife habitat. In particular, the loss of prime agricultural land between 1963 and 1970 can be traced largely to the diffused nature of residential and supportive urban land development in outlying areas.

Factors contributing to the diffusion of urban development and the associated decline in urban population densities include the widespread availability of electric power and telephone service, the practicality of an onsite sewage disposal and water supply made possible by the septic tank and electrically powered well, and the development of "all weather" highway facilities and the attendant use of the automobile for mass transportation. Before the widespread availability of the automobile, limited transportation facilities served to constrain to some extent the spread of residential development and other forms of urban land use.

Increasingly quick and convenient automobile travel, however, has effectively expanded the supply of developable lands, reducing the need for the intensive urban land development patterns of the past. Residents can now enjoy many of the amenities of rural life, and still 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.

The analysis of changes in land use between 1963 and 1970 indicates a continuation, although at a reduced rate, of the change from the traditional intensive urban growth patterns to highly diffused development pattern, with urban growth penetrating areas which until 1950 were basically rural. Future land development patterns within the Region depend, to a great extent, on the future scale and character of demographic and economic activity in the Region. However, as indicated in Chapter IV of this report, future trends in many of the socio-economic variables which most significantly affect growth and urbanization are uncertain at the present time. As a result, while the diffusion of urban growth may be expected to continue in the foreseeable future, the long-range pattern of urban development within the Region is not clearly evident at this time.

Chapter VII

COMMUNITY PLANS AND LAND USE REGULATORY ORDINANCES

INTRODUCTION

Under the initial regional land use-transportation study, an inventory was conducted of local community plans and zoning ordinances as of 1964 in order to provide a proper understanding of local community development objectives at that time, and of the effects those objectives would have upon regional development. Such an understanding was, and still is, essential to the formulation of practicable and implementable regional land use and transportation plans. Local land use plans and zoning ordinances, when adopted in accordance with Wisconsin statutory provisions, probably represent the best available expression of local community development 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 and/or the zoning ordinances and zoning district maps.

When viewed in a regional context, knowledge of local community plans and land use regulatory ordinances becomes an important basis for synthesizing and testing ultimate regional land use and transportation proposals. The need to recognize and incorporate local development objectives into regional development plans 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 local as well as regional development objectives wherever possible, and therefore be more readily accepted and implemented by local communities.

The adoption of the 1990 regional land use and transportation plans in December 1966 was accompanied by a series of plan implementation recommendations directed at the local communities in the Region. Of particular importance are recommendations directed at the revision of local zoning and other land use control ordinances to reflect, as appropriate, the regional land use and transportation plan recommendations. The Commission and its staff in the years following plan adoption worked diligently with many local communities in the Region, upon request, to carry out the regional plan recommendations through appropriate adjustments to local land use control ordinances.

In light of this activity, and in light of other local planning and land use control activity to which the Commission may not have been a direct party, it is appropriate that the local community plans and land use control ordinances in the Region again be inventoried to ascertain the extent to which local communities in the Region may have adjusted their plans and ordinances to reflect regional plan recommendations, or perhaps to reflect changing community development objectives at variance with regional plan recommendations. An understanding of such changes is essential to the preparation and testing of alternative regional land use and transportation plan proposals for the year 2000.

Accordingly, this chapter contains a brief review of the 1990 regional land use and transportation plan implementation recommendations with respect to local plans and land use control ordinances. Following this review, the chapter contains a brief description of the procedures followed in, and the findings of, an extensive reinventory of the existing land use plans, zoning ordinances and zoning district maps, and other related land use control ordinances of the 154 local units of government in the Region. The changes in land use that would occur if the development proposals now expressed in the local land use plans and land use control ordinances were fully carried out are analyzed, and significant relationships identified. In addition, and in more specific terms, the extent to which local communities in the Region have specifically adjusted their local plans and land use control ordinances to reflect specific regional land use and transportation plan implementation recommendations is identified.

SELECTED 1990 REGIONAL LAND USE AND TRANSPORTATION PLAN IMPLEMENTATION RECOMMENDATIONS—A REVIEW

Before presenting the results of the reinventory of community plans and land use regulatory ordinances in the Region, it is appropriate to briefly review the specific plan implementation recommendations set forth in the 1990 regional land use and transportation plans, with particular emphasis upon those major specific recommendations relating to land use regulations.[1] These recommendations may be summarized as follows:

1. It was recommended that, as appropriate, local communities prepare community and neighborhood unit development plans that would refine and detail the regional land use and transportation plans.

2. It was recommended that all local communities review and update their zoning ordinances in

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[1] *For a complete discussion of the plan implementation recommendations pertaining to the 1990 regional land use and transportation plans, see SEWRPC Planning Report No. 7, The Regional Land Use-Transportation Study, Volume Three, Recommended Regional Land Use-Transportation Plans—1990, Chapter VII, "Plan Implementation."*

order to reflect the general urban and rural land use development pattern shown on the 1990 regional land use plan map. Those areas recommended for residential development in the plan were to be placed in exclusive residential districts and related to the development densities indicated on the recommended plan. Those areas shown on the plan map as devoted to agricultural use were to be placed in an exclusive agricultural use district. Such a district would permit only agricultural use, with dwellings accessory to the basic agricultural uses. The primary environmental corridors shown on the plan map, as well as significant resource areas lying outside the corridors, were to be placed in appropriate zoning districts to reflect the character of the specific resource values to be protected. These districts would include conservancy districts, including floodland districts; park districts; exclusive agricultural districts; or large estate-type residential use districts. Special shoreland zoning regulations were proposed to supplement the foregoing basic zoning district recommendations. Finally, the major regional centers shown on the plan, including major retail and service, industrial, and park and recreational sites, were recommended to be placed in appropriate exclusive use districts so as to be preserved and protected for the recommended type of land use development.

3. It was recommended that, as appropriate, the county soil and water conservation districts within the Region formulate proposed soil and water conservation regulations and hold the necessary public hearings and referenda thereon, relating such regulations to the basic land and natural resource elements identified in the regional land use plan.

4. It was recommended that all counties except Milwaukee County and such communities as appropriate in the Region adopt sanitary or other health-related regulations that directly incorporate the detailed operational regional soil survey findings and interpretations to effect a more proper regulation of the installation of onsite septic tank soil absorption sewage disposal systems.

5. It was recommended that, as appropriate, all units of government in the Region prepare and adopt official maps to reserve recommended regional park sites, as well as selected park and drainageway areas contained in the primary envrionmental corridors.

6. It was recommended that, upon complction of corridor refinement and precise centerline location studies, local units of government in the Region prepare and adopt official maps to reserve the rights-of-way necessary for all proposed freeways as identified on the regional transportation plan.

The foregoing represent the primary plan implementation recommendations contained in the adopted regional land use and transportation plans that relate directly to local land use control ordinances. In addition, a series of relatively minor, supportive plan implementation recommendations were made to supplement the major recommendations. These include appropriate traffic, parking, and access restrictions; exclusive highway service districts; highway sign controls in local zoning ordinances; and inclusion of parkland dedication requirements in local land subdivision regulations.

COMMUNITY PLANS AND ORDINANCES INVENTORY

As an integral part of its ongoing comprehensive planning program, the Commission maintains a file of all local community planning documents and land use control ordinances. This file was initially established in the early 1960s, and was utilized as a basis for the community plans and zoning inventory conducted as part of the initial regional land use-transportation study.[2] In its role as a center for the coordination of planning and plan implementation activities in the Region, the Commission receives copies of new local planning documents and land use control ordinances as they are prepared and adopted by local units of government in the Region. These materials are added to the base file established in the early 1960s. In some cases, the Commission staff may actually assist in the preparation of the plan or the land use control ordinance, and therefore is intimately aware of the existence and content of such planning documents.

In order to assure that a complete file of community planning documents and ordinances exists to provide a base for analysis of local community land use development objectives, the Commission in 1971 and 1972 conducted a complete reinventory of all local plans and land use control ordinances. This inventory consisted of a review of all materials in the Commission community files, a personal interview by a Commission staff member of a responsible local official—in most cases the municipal clerk—to complete an inventory form relating to community planning and land use control documents, a review of the results of that inventory form against the contents of the Commission community files, and a request to the municipality to provide copies of any relevant planning and land use control documents that the Commission did not yet have in its files.[3] Obtaining up-to-date zoning district maps from all local units of government in the Region was of particular importance.

The planning and zoning information collected from the local units of government was carefully analyzed in order

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[2] *See SEWRPC Planning Report No. 7, The Regional Land Use-Transportation Study, Volume One, Inventory Findings—1963, Chapter VI, "Community Plans and Zoning."*

[3] *See SEWRPC Form PRD 14-70, "Inventory of Local Planning and Related Regulatory Devices in Southeastern Wisconsin," on file at the Commission offices.*

to meet the needs of the continuing regional land use-transportation study. All local community planning documents were identified and collected, and a determination was made as to whether or not a community had formally adopted a comprehensive or master plan, or a land use element of such a plan, pursuant to the provisions set forth in Section 62.23(7) of the Wisconsin Statutes. In addition, all local land use zoning district categories were identified.

In the initial SEWRPC community plans and zoning inventory conducted in 1964, it was decided to utilize adopted community land use plans as the basis for extracting the land use development objectives for that particular community, rather than the local zoning ordinance and zoning district maps. This decision was made because the adopted local plans were believed to provide a more accurate representation of long-range community development objectives. Of the 146 cities, villages, and towns existing in the Region in 1964, 15 indicated they had formally adopted comprehensive plans or land use elements thereof. Accordingly, the quantitative data presented in SEWRPC Planning Report No. 7 in the local plans and zoning inventory reflected the utilization of locally adopted plans for those 15 communities, rather than the corresponding local zoning ordinances.

In conducting the 1972 inventory of community plans and land use control ordinances, it was determined to utilize zoning ordinances and zoning district maps exclusively for the qualitative analysis of local land use development objectives in the Region. This determination was made because it was found in some instances that communities indicating adoption of local land use plans in the 1964 inventory had not, in fact, formally adopted such plans, or even if they had, they had not necessarily changed their zoning ordinances and zoning district maps to reflect staged development in accordance with such plans.

Thus, while in a few rare instances it may be soundly assumed that adopted community comprehensive, master, or land use plans represent the best expression of long-range community development objectives, it is apparent that in practice and reality the overwhelming majority of communities view their zoning ordinances and zoning district maps as the singularly best expression of their own community's long-range land use development objectives. Consequently, to provide a uniform and convenient method of quantifying local land use development objectives, it was determined in the 1972 reinventory of community plans and zoning ordinances to utilize exclusively the zoning ordinances and zoning district maps in any qualitative analyses relating to long-range community development objectives.[4]

Accordingly, in the 1972 reinventory, independent analyses were made with respect to community development plans and with respect to community zoning ordinances. All quantitative data relating to community development objectives, however, were derived strictly from zoning ordinances and zoning district maps. As in the 1964 inventory, a regional zoning district classification system was developed in order to reduce the many local zoning district maps to a common, uniform, areawide basis suitable for regional planning analysis. This classification system is set forth in Appendix C. It not only permits analyses of the local zoning data for regional planning purposes without losing locally established density patterns, but also permits individual communities to analyze local land use zoning proposals in light of areawide land use demands. The classification system is compatible with the land use classifications utilized in the preparation of the 1990 regional land use plan, and recognizes standards established for sanitary sewer and water supply services at varying development densities.

All zoning district categories were converted to the regional classification system and their boundaries delineated on SEWRPC 1" = 2000' scale county base maps.[5] The land use zoning information so mapped was then quantified by U. S. Public Land Survey section, and the areas devoted to each category measured, tabulated, and transferred to a medium permitting machine processing and analyzing. From the 1" = 2000' scale county base maps, a composite map of local zoning districts was prepared on a SEWRPC 1" = 8000' scale regional base map. This map is reproduced as Map 68. For comparison purposes, Map 67 represents a composite of local zoning districts in 1964.

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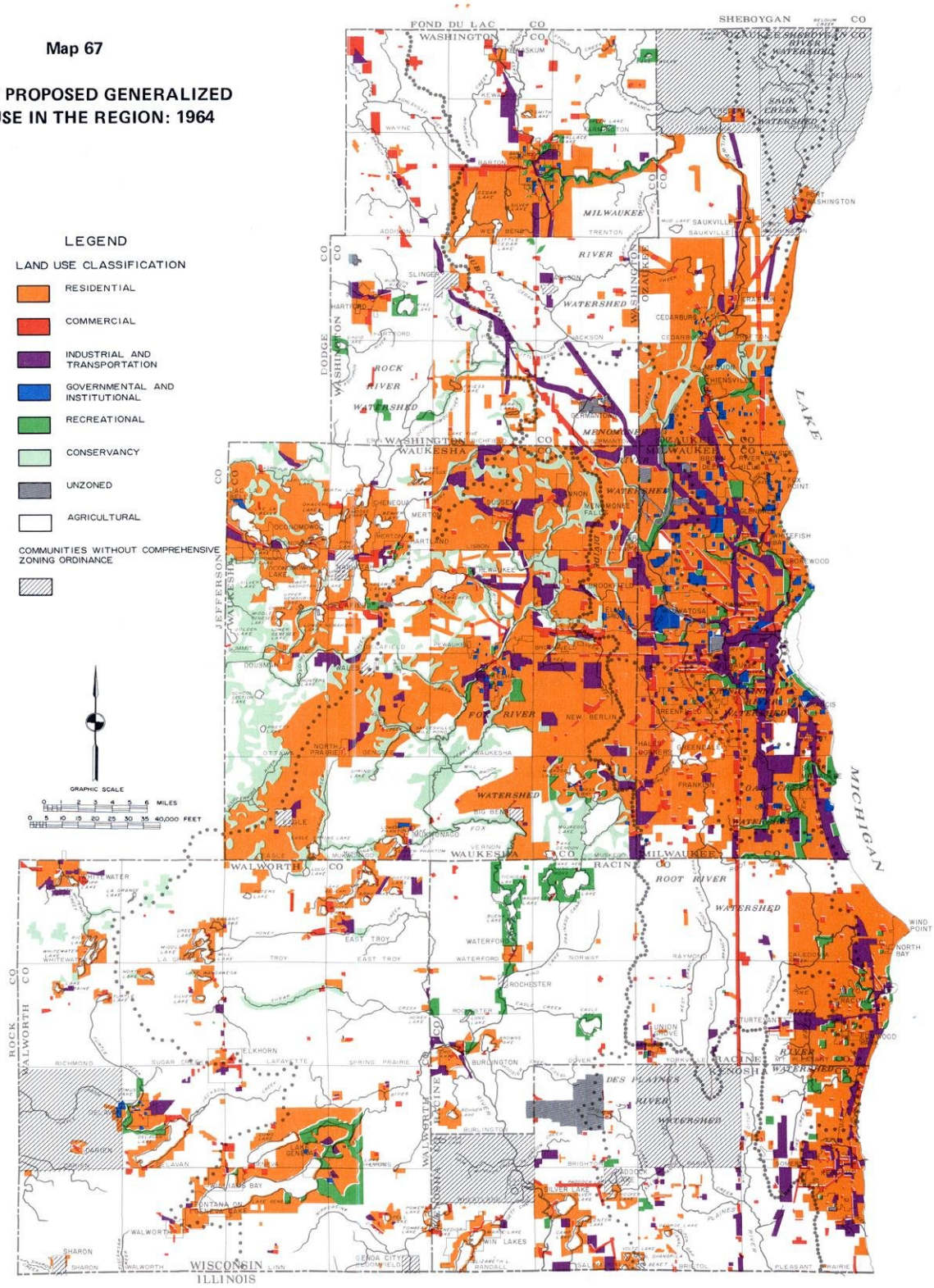
[4] *It is recognized that the quantitative data presented in this chapter, since they have been derived solely from the local community zoning ordinances and zoning district maps, are not strictly comparable to the 1964 quantitative data which were based in part upon utilization of adopted community plans and in part upon utilization of community zoning ordinances and zoning district maps. However, since most of the 15 instances of land use plan data utilization in the 1964 inventory consist of small villages or cities or the larger, already substantially developed cities in the Region, since collectively the 15 communities comprised in 1964 only about 10 percent of the area of the Region, and since the majority of land in such communities is generally fully developed for urban land use purposes, resulting in situations where either the community land use plans or the zoning district maps would reflect, in the main, existing land use development, it is believed that any quantitative differences due to the utilization of 15 local land use plans in 1964 rather than the 15 local zoning ordinances are relatively minor, and would not, therefore, significantly affect the comparisons of the quantitative data over time on a regional and county basis.*

[5] *In 1964, the conversion to a regional classification system was accomplished on SEWRPC 1" = 4000' scale county base maps. The 1" = 2000' scale map was utilized in the 1972 inventory effort because it made possible a more precise delineation of local zoning district boundaries, and further enabled the direct correlation of the local zoning data with other regional planning data, also mapped at a scale of 1" = 2000'.*

Map 67

LOCALLY PROPOSED GENERALIZED LAND USE IN THE REGION: 1964

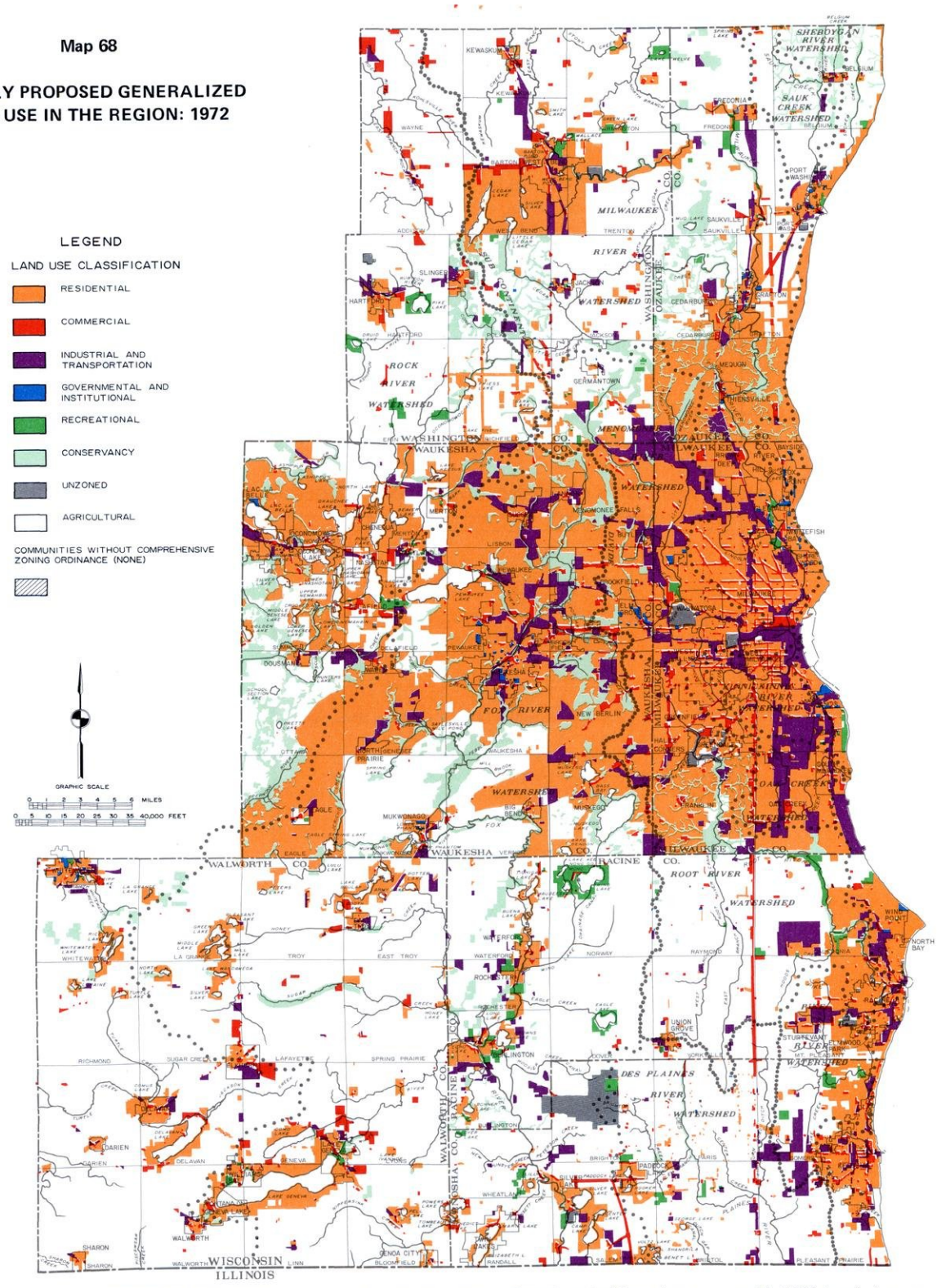


The land use development proposals of the local communities in the Region in 1964 are collectively shown on the above map. In general, the development objectives reflected in the local land use proposals indicated in 1964 a local desire for the continuation of the low-density urban development pattern prevalent in the Region during the 1950 to 1963 period. The development pattern shown is characterized by widespread residential zoning, encompassing in some cases entire townships; extensive strip commercial and industrial zoning; and a conspicuous lack in many areas of conservancy zoning aimed at protecting the natural resource base. The adopted 1990 regional land use plan recommended that these local land use development objectives be modified in order to provide for overall urban development densities greater than envisioned in the local land use plans and zoning ordinances, to ensure that new urban development would not intrude into environmentally significant areas, and to ensure that new urban development would be located so as to be capable of being readily served by essential public services and facilities, such as centralized sanitary sewer and water supply services.

Source: SEWRPC.

Map 68

LOCALLY PROPOSED GENERALIZED LAND USE IN THE REGION: 1972



By 1972 the land use development proposals of the local communities in the Region had been significantly revised from those expressed in 1964, largely in accordance with recommendations set forth in the adopted regional land use plan. All 17 communities in the Region which were unzoned in 1964 had adopted land use zoning ordinances by 1972. In addition, considerable comprehensive rezoning activity occurred during the 1964-1972 period. The results of these new zoning and comprehensive rezoning efforts are evident when the above map is compared with Map 67. Particularly significant are changes in accordance with recommendations in the adopted regional land use plan from residential zoning to agricultural zoning; reductions in strip commercial and strip industrial zoning; the establishment of new conservancy zoning districts; changes in permitted urban residential densities; and the very significant establishment of floodland zoning districts. While the composite locally proposed land development pattern cannot yet be said to fully approximate the land development pattern recommended in the adopted regional land use plan, it can be said that significant progress toward this end has been made in the relatively short time since plan adoption.

Source: SEWRPC.

INVENTORY FINDINGS

Community Plans

The adopted 1990 regional land use plan recognized that amendments, extensions, additions, and refinements to the regional land use plan would be forthcoming not only from the work of the SEWRPC under the continuing regional land use-transportation study and under related regional planning programs, such as the comprehensive watershed studies, but also from local planning programs which, of necessity, must be based in greater detail and result in greater refinement of the regional plans.

The formulation of such local comprehensive or master plans, or the land use elements of such plans, should be properly undertaken within the context of an adopted regional land use plan. The community master plan should set forth recommendations for all aspects of municipal development, including the general location, character, and extent of streets and highways, roadways, walks, bridges, viaducts, parking areas, tunnels, public places and areas, parks, parkways and playgrounds, sites for schools and other public buildings and structures, airports, pierhead and bulkhead lines, waterways, and routes for railroads and buses; the general location and extent of storm and sanitary sewers, water conduits, and other utilities, whether privately or publicly owned; the location, character, and extent of neighborhood units and community centers; the general character, extent, and layout of the replatting of older blighted areas; and the comprehensive zoning plan related to the comprehensive community land use plan.

Such community comprehensive or master plans have been prepared for 45 of the 146 local units of government in the Region in 1972 (see Table 93 and Map 69).

Table 93

LOCAL COMPREHENSIVE PLANS INCLUDING LAND USE ELEMENT IN THE REGION BY COUNTY: 1972

Community	Plan Document	Year Plan Completed	Year Plan Adopted	Relationship to Adopted 1990 Regional Land Use Plan
KENOSHA COUNTY				
Kenosha Urban Planning District (City of Kenosha, Towns of Pleasant Prairie and Somers)	"A Comprehensive Plan for the Kenosha Planning District," SEWRPC	1967	Kenosha: 1968	Refines and details regional land use plan.
MILWAUKEE COUNTY				
City of Franklin	"A Comprehensive Plan for Franklin, Wisconsin," William S. Lawrence and Associates	1965	--	Completed prior to preparation of regional land use plan.
City of Milwaukee	"City of Milwaukee Master Plan," City of Milwaukee Department of City Development	1956	1956	Completed prior to preparation of regional land use plan.
City of Oak Creek[a]	"City of Oak Creek Comprehensive Plan," Carl L. Gardner & Associates, Inc.	1959	1964	Completed prior to preparation of regional land use plan.
City of St. Francis	"Master Plan, St. Francis, Wisconsin," Mead and Hunt	1963	--	Completed prior to preparation of regional land use plan.
City of South Milwaukee	"South Milwaukee Comprehensive Plan Report," Maynard Meyer and Associates	1963	--	Completed prior to preparation of regional land use plan.
Village of Brown Deer	"Village of Brown Deer Master Plan," Carl L. Gardner & Associates, Inc.	1965	1965	Completed prior to preparation of regional land use plan.
Village of Greendale	"Master Plan—Village of Greendale," Jahnke and Jahnke Associates, Inc.	1962	1964	Completed prior to preparation of regional land use plan.
Village of River Hills	"Comprehensive Plan, Village of River Hills," H. C. Webster & Son	1957	1958	Completed prior to preparation of regional land use plan.
OZAUKEE COUNTY				
City of Cedarburg	"General Plan for Community Development, Cedarburg," Nelson & Associates	1961	--	Completed prior to preparation of regional land use plan.
City of Mequon	"General Plan for Community Development, Mequon, Wisconsin," Nelson & Associates	1960	1961	Completed prior to preparation of regional land use plan.
City of Port Washington	"General Plan Studies, City of Port Washington," Nelson & Associates	1962	--	Completed prior to preparation of regional land use plan.
Village of Grafton	"A Master Plan for Grafton, Wisconsin," Donohue & Associates, Inc.	1965	--	Completed prior to preparation of regional land use plan.
Village of Saukville	"Comprehensive Plan for Village of Saukville," Max E. Anderson Associates	1971	--	Refines and details regional land use plan.
RACINE COUNTY[b]				
Racine Urban Planning District (City of Racine; Villages of Elmwood Park, North Bay, Sturtevant, and Wind Point; Towns of Caledonia and Mt. Pleasant)	"A Comprehensive Plan for the Racine Urban Planning District," SEWRPC	1971	--	Refines and details regional land use plan.
City of Burlington	"Burlington, Wisconsin, Master Plan," Mead and Hunt	1960	--	Completed prior to preparation of regional land use plan.
Village of Union Grove	"Union Grove, Wisconsin, Comprehensive Planning Program," Wisconsin Department of Local Affairs and Development	1968	1968	Refines and details regional land use plan.

Table 93 (continued)

Community	Plan Document	Year Plan Completed	Year Plan Adopted	Relationship to Adopted 1990 Regional Land Use Plan
WALWORTH COUNTY				
City of Delavan	"Delavan, Wisconsin, Master Plan," Kincaid and Associates, Inc.	1962	--	Completed prior to preparation of regional land use plan.
City of Lake Geneva	"A Master Plan for the City of Lake Geneva, Wisconsin," Carl L. Gardner & Associates, Inc.	1968	--	Refines and details regional land use plan.
City of Whitewater	"Whitewater Comprehensive Plan," Maynard Meyer and Associates	1968	--	Refines and details regional land use plan.
Village of East Troy	"A Comprehensive Plan for the Village of East Troy," Wisconsin Department of Local Affairs and Development	1971	--	Refines and details regional land use plan.
Village of Fontana	"Fontana Comprehensive Planning Program," Wisconsin Department of Resource Development	1968	--	Refines and details regional land use plan.
Village of Genoa City	"Genoa City Comprehensive Planning Program," Wisconsin Department of Resource Development	1965	--	Refines and details regional land use plan.
Village of Walworth	"Walworth, Wisconsin, Comprehensive Planning Program," Wisconsin Department of Resource Development	1965	--	Completed prior to preparation of regional land use plan.
Village of Williams Bay	"Williams Bay Plan—1964," Maynard Meyer and Associates	1964	--	Completed prior to preparation of regional land use plan.
Village of Sharon	"Sharon, Wisconsin, Comprehensive Planning Program," Wisconsin Department of Resource Development	1965	--	Refines and details regional land use plan.
WASHINGTON COUNTY				
City of West Bend	"Master Plan, West Bend, Wisconsin," Mead and Hunt	1963	--	Completed prior to preparation of regional land use plan.
Village of Germantown	"Germantown, Wisconsin, Comprehensive Plan," Tec-Search, Inc.	1969	1969	Refines and details regional land use plan.
Village of Slinger	"Village of Slinger, Wisconsin, Comprehensive Plan Report," Scheftell and Nill	1960	--	Completed prior to preparation of regional land use plan.
WAUKESHA COUNTY				
City of Brookfield	"A Comprehensive Plan Report for the City of Brookfield, Wisconsin," Stanton & Rockwell	1959	--	Completed prior to preparation of regional land use plan.
City of Muskego	"General Plan for Community Development," Nelson & Associates	1963	1963	Completed prior to preparation of regional land use plan.
City of New Berlin	"Development Plan, New Berlin, Wisconsin," City Planning Associates, Inc.	1961	1962	Completed prior to preparation of regional land use plan.
City of Oconomowoc	"A Master Plan for the City of Oconomowoc, Wisconsin," Elmer Krieger, City Plan Consultant	1971	--	Refines and details regional land use plan.
City of Waukesha	"City Plan for Waukesha, Wisconsin," Ladislas Segoe and Associates	1957	1957	Completed prior to preparation of regional land use plan.
Village of Butler	"A Master Plan for the Village of Butler, Wisconsin," Carl L. Gardner & Associates, Inc.	1966	--	Completed prior to preparation of regional land use plan.
Village of Mukwonago	"Mukwonago, Wisconsin, Comprehensive Planning Program," Wisconsin Department of Local Affairs and Development	1969	--	Refines and details regional land use plan.
Village of Pewaukee	"Village of Pewaukee Comprehensive Master Plan Report," Maynard Meyer and Associates	1963	--	Completed prior to preparation of regional land use plan.

[a] *Comprehensive plan revision completed in 1973. See "Comprehensive Plan 1973, City of Oak Creek, Wisconsin," Barton-Aschman Associates, Inc.*

[b] *In 1974 the SEWRPC prepared a land use plan for the Town of Raymond. See SEWRPC Community Assistance Planning Report No. 2, Alternative Land Use and Sanitary Sewerage System Plans for the Town of Raymond—1990.*

Source: SEWRPC.

These plans cover an area of about 611 square miles, or about 23 percent of the area of the Region. Of this total, 24 community plans were prepared prior to the preparation and adoption of the 1990 regional land use plan, and thus were not prepared within the context of that regional plan element. To the extent possible, however, the development objectives expressed in such plans were incorporated into the 1990 regional land use plan. Plans for the remaining 21 communities were prepared concurrently with or since preparation and adoption of the regional land use plan, and thus represent community planning efforts which have been conducted within the context of an established regional land use planning effort. Plans for 10 of these 21 communities were actually prepared by the Commission in two major urban district planning progams—for the Racine and Kenosha areas—

conducted at the request of the local units of government concerned.[6] The remaining 11 community plans prepared within the context of the regional land use plan constituted individual planning efforts for cities, villages, and towns throughout the Region.

Although the Wisconsin Statutes provide a mandate to local plan commissions to prepare and adopt community comprehensive or master plans, it is significant that only 12 of the 45 completed such plans have been adopted to date by the local plan commissions. Nine of the 12 local adoptions were for community plans prepared prior to preparation and adoption of the regional land use plan, while the remaining three—Kenosha, Union Grove, and Germantown—represent plan adoption actions taken with respect to community plans prepared within the context of the adopted regional land use plan.

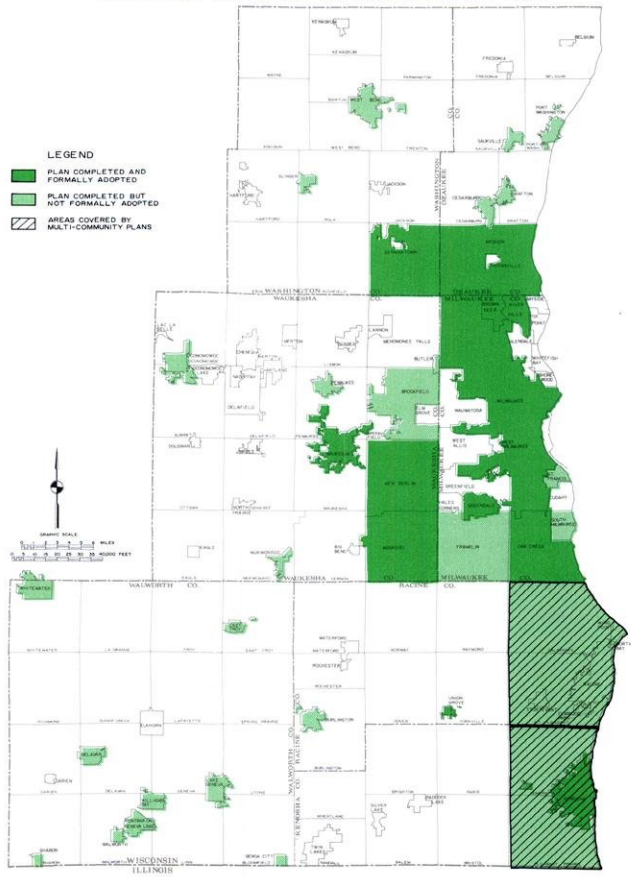
The Commission believes that community comprehensive or master plans or components thereof should be formally adopted by the local plan commission and, desirably, endorsed by the local governing body. Not only do the Wisconsin Statutes provide in Section 62.23(2) that the local plan commissions shall make and adopt a master plan, but various implementing actions which may be highly desirable depend upon formal adoption for their validity. For example, Section 236.13 of the Wisconsin Statutes provides that local communities may, in reviewing preliminary subdivision plats, utilize as a basis for denial a finding that the plat does not conform with a duly adopted local master plan. Hence, master or comprehensive plans, no matter how well prepared, are of greatly reduced value in plan implementation actions, particularly with respect to difficult and controversial situations such as subdivision plats located beyond a planned urban area, if they are not formally adopted by the local plan commissions. Ideally, a local plan commission would adopt the regional land use plan and other applicable regional plan elements, and then prepare and adopt within the context of such regional plan elements a local comprehensive plan that refines, details, and adds to the regional plan recommendations.

In addition to the preparation of local community master or comprehensive plans, the Commission has recommended that its constituent local units of government consider the preparation of precise neighborhood unit development plans.[7] Such plans represent the ultimate in community land use planning with respect to the level of precision and detail. Precise neighborhood unit development plans delineate desirable collector and land access street patterns, and locate the commercial, institutional, and recreational facilities needed to support residential development. Such plans also specify the amount, types, densities, and locations of the various kinds of residential land uses.

To date, only three communities in the Region—the Cities of Franklin and Oak Creek in Milwaukee County and the City of Racine in Racine County—have actually

Map 69

COMPLETED AND ADOPTED LOCAL COMPREHENSIVE PLANS INCLUDING LAND USE ELEMENT IN THE REGION: 1972



Comprehensive community development plans had been completed by 1972 for 45 of the 146 local units of government in the Region. These plans cover an area of about 611 square miles, or 23 percent of the area of the Region. Such plans are essential to extend, refine, and add to the adopted regional plan elements. It is significant, however, that only 12 of the 45 completed local community plans have been formally adopted by local plan commissions. Formal adoption of plans is highly desirable not only to assure a common understanding among all concerned of development objectives, but also because certain important plan implementation actions, such as land subdivision control depend for their validity in part upon a finding of conformance to or conflict with a formally adopted plan.

Source: SEWRPC.

[6] *See SEWRPC Planning Report No. 10, A Comprehensive Plan for the Kenosha Planning District, Volume One, Inventory Findings, Forecasts, and Recommended Plans, and Volume Two, Implementation Devices; and SEWRPC Planning Report No. 14, A Comprehensive Plan for the Racine Urban Planning District, Volume One, Inventory Findings and Forecasts, Volume Two, The Recommended Comprehensive Plan, and Volume Three, Model Plan Implementation Ordinances.*

[7] *For a discussion of the neighborhood unit concept and the recommended procedures for carrying out such planning, see SEWRPC Planning Report No. 7, The Regional Land Use-Transportation Study, Volume Three, Recommended Regional Land Use-Transportation Plans—1990, Appendix D.*

adopted such precise plans. The City of Franklin has adopted such plans for three neighborhoods, the City of Oak Creek for four neighborhoods, and the City of Racine for one neighborhood.[8] In addition, neighborhood plans are under preparation in the Cities of Burlington, Cedarburg, Delavan, Kenosha, Hartford, Racine, and West Bend and the Villages of Germantown and Sussex. Several communities in the Region, including the Cities of Cudahy, Milwaukee, and South Milwaukee and the Villages of Fredonia and Mukwonago, have also conducted studies relating to some aspect of neighborhood plan development, particularly future street layout.

Community Zoning Ordinances—General[9]

The adopted 1990 regional land use plan recognized that land use zoning ordinances and accompanying zoning district maps represent one of the most important and significant tools available to local units of government in implementing the recommendations contained in the plan. In 1964, the local zoning inventory revealed that 129, or 88 percent, of the 146 cities, villages, and towns in the Region had adopted a zoning ordinance and zoning district map. By 1972, all 146 cities, villages, and towns had adopted such an ordinance and map, reflecting a recognition on the part of 17 additional communities that zoning ordinances are an essential tool to guide land use development (see Map 70).[10]

In addition to the creation of new zoning ordinances in the 17 communities not having such ordinances in 1964, there has been considerable comprehensive rezoning activity in the Region that in many cases has been designed in whole or in part to carry out the regional land use plan recommendations. Of particular significance are the major new zoning or comprehensive rezoning actions undertaken by the Town of Paris in Kenosha County, the Towns of Cedarburg and Saukville in Ozaukee County, the City of Franklin in Milwaukee County, and Towns of Caledonia and Waterford in Racine County, the Towns of Polk and Jackson and the Villages of Germantown and Kewaskum in Washington County, and the City of New Berlin in Waukesha County. Taken together, the new and substantially revised zoning ordinances have resulted in significant zoning changes in these and other communities, as can be seen by comparing Maps 67 and 68.

With respect to significant rural and natural resource-oriented zoning efforts, new exclusive use agricultural zoning districts[11] have been created and utilized at least to some extent in the Town of Paris in Kenosha County; the Towns of Belgium, Cedarburg, and Saukville in Ozaukee County; the Towns of Caledonia, Raymond, and Waterford in Racine County; and the Towns of Jackson and Polk in Washington County. New conservancy zoning districts have been created and applied in the Town of Paris in Kenosha County; the Towns of Belgium, Cedarburg, Fredonia, and Saukville in Ozaukee County; the Towns of Burlington, Caledonia, Raymond, Rochester, and Waterford in Racine County; the Village of Germantown and the Town of Polk in Washington County; and the City of New Berlin in Waukesha County.

With respect to zoning for urban land use development, comparison of Maps 67 and 68 reveals a significant reduction in residential zoning in the Town of Cedarburg in Ozaukee County; a significant reduction in strip commercial and industrial zoning in the Village of Germantown in Washington County; and significant changes in residential densities to reflect regional land use plan recommendations in the City of Franklin in Milwaukee County, the Town of Caledonia in Racine County, and the City of New Berlin in Waukesha County.

Communities in the Region that have utilized the SEWRPC model zoning ordinance as the basis for establishing new or comprehensively revised local zoning ordinance are shown on Map 71. At the county level these include the Washington County and Racine County comprehensive zoning ordinances, and the Racine County, Kenosha County, and Walworth County floodland and shoreland zoning ordinances. At the town level these include new zoning ordinances for the Towns of Belgium, Cedarburg, Fredonia, and Saukville in Ozaukee County and Jackson and Polk in Washington County. At the city and village level these include new zoning ordi-

[8] *Neighborhood plans have been adopted in the City of Franklin for the Mission Hills East, Riverview West, and Hillcrest Neighborhoods; neighborhood plans have been adopted in the City of Oak Creek for the Shepard Hills, Forest Hills, Chapel Hills, and Carrolton Estates Neighborhoods; and a neighborhood plan has been adopted in the City of Racine for the Southside Revitalization Area.*

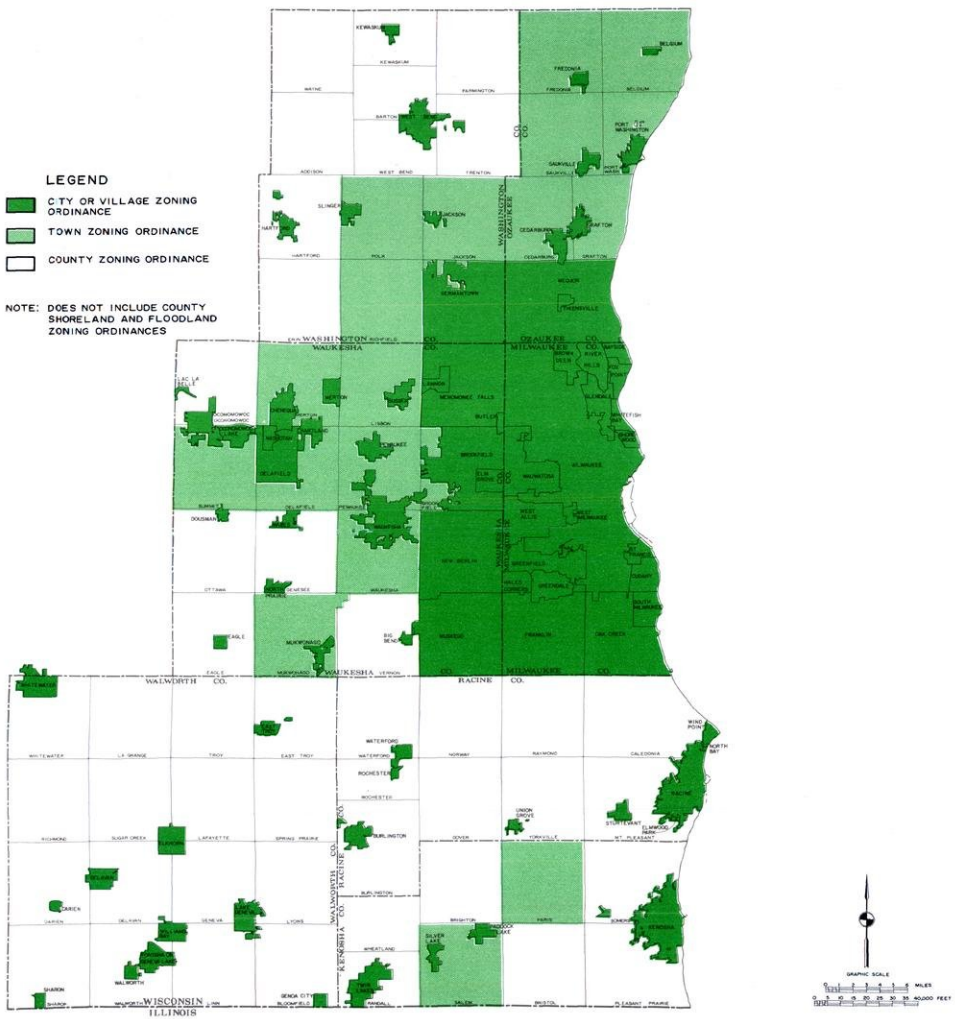
[9] *The discussion in this section of the chapter is based upon zoning ordinances and district maps in effect in 1972. It is recognized that significant comprehensive rezoning efforts have been completed since 1972 or were underway in 1974. These include rezoning efforts applicable to the Towns of Dover, Norway, Yorkville, and Mt. Pleasant in Racine County; the Towns of Somers, Pleasant Prairie, Bristol, Brighton, Wheatland, and Randall in Kenosha County; and all 16 towns in Walworth County. When completed, these comprehensive rezoning efforts will contribute substantially to attainment of the land use development objectives expressed in the adopted regional land use plan.*

[10] *The 17 communities are the Village of Paddock Lake and the Towns of Paris and Wheatland in Kenosha County; the Village of Belgium and the Towns of Belgium, Fredonia, and Port Washington in Ozaukee County; the Village of Rochester in Racine County; the Villages of Genoa City and Sharon and the Town of Darien in Walworth County; the Villages of Jackson and Slinger in Washington County; and the Villages of Big Bend, Eagle, Nashotah, and Wales in Waukesha County. As discussed later in this chapter, significant activity has also taken place in the adoption of county floodland and shoreland overlay zoning ordinances. The current discussion includes only comprehensive county and community zoning ordinances.*

[11] *Exclusive use agricultural zoning districts are defined as those providing for a minimum lot or farm size of at least five acres.*

Map 70

ZONING ORDINANCES IN THE REGION: 1972

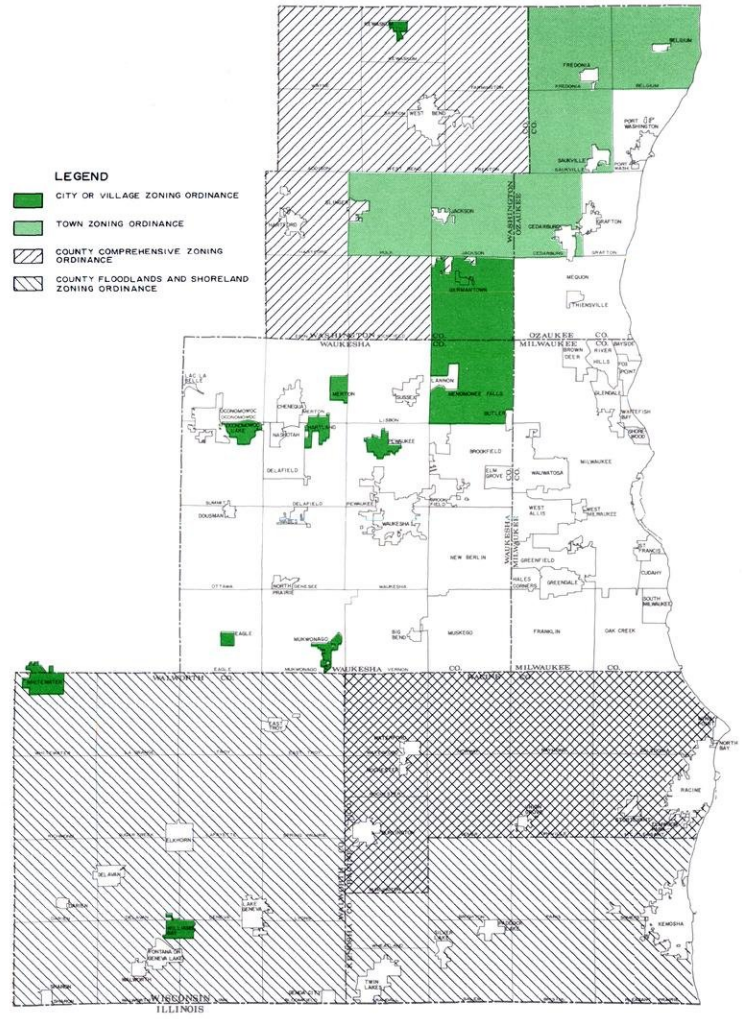


In 1964 all but 17 communities in the Region, or about 12 percent of the 146 cities, villages, and towns, had adopted a comprehensive zoning ordinance. By 1972 all 17 of the previously unzoned communities had acted to adopt new comprehensive zoning ordinances. Accordingly, the entire Southeastern Wisconsin Region is now subject to locally enacted land use zoning restrictions. The above map identifies those towns within the Region which utilize a local zoning ordinance, and those which utilize a county zoning ordinance. Ozaukee County is still the only county in the Region which does not have a county comprehensive zoning ordinance.

Source: SEWRPC.

Map 71

ZONING ORDINANCES IN THE REGION BASED UPON THE SEWRPC MODEL ZONING ORDINANCE: 1972



The above map identifies those communities in the Region that have utilized the Commission's model zoning ordinance as a basis for establishing new or comprehensively revised local zoning ordinances. The SEWRPC model zoning ordinance, which was published in 1964, has been utilized as a basis for the establishment of new or comprehensively revised zoning ordinances in four counties, six towns, ten villages, and one city, covering a combined area of 1,740 square miles, or 63 percent of the total area of the Region.

Source: SEWRPC.

nances for the City of Whitewater and Village of Williams Bay in Walworth County; the Villages of Germantown and Kewaskum in Washington County; and the Villages of Eagle, Hartland, Menomonee Falls, Merton, Mukwonago, Oconomowoc Lake, and Pewaukee in Waukesha County. Each of these new local zoning ordinances includes exclusive use districts[12] for all major land uses, as well as traffic, parking, and access restrictions and other regulations to provide for capacity protection of recommended freeways and standard arterial highways.

While the foregoing zoning activity may be described in total as a significant movement toward a more rational zoning and land use development pattern in the Region, it is important to note that in some areas there has been little overall zoning change to more closely approximate land use development patterns as envisioned in the adopted regional land use plan. In particular, the rural areas in Waukesha County continue to exhibit a significant pattern of low-density residential zoning in excess of that needed to accommodate future urban growth. Waukesha County in 1972 had a population of about 245,000 persons residing on about 77 square miles of residentially zoned land, reflecting a residential density of nearly 3,200 persons per square mile. If this same density were assumed to occur on the remaining undeveloped residentially zoned land—about 218 square miles—nearly 695,000 additional persons could be accommodated, or nearly three times the existing population.

In addition to this and other problems related to gross overzoning, an analysis of the district use regulations indicates that certain zoning districts continue to permit land uses quite different from those implied by the district title. An example of this is the continued widespread use of agricultural districts which, while permitting desirable agricultural and open space land uses, continue to permit areawide residential land use development on lots less than five acres in size and often at higher densities than corresponding residential districts in the same local ordinance. Of the approximately 1,538 square miles of land zoned for agriculture in 1972, only 236 square miles, or about 15 percent, were properly zoned to prohibit incompatible residential development.

[12]*The phrase "exclusive use district" should be carefully distinguished from the phrase "exclusionary zoning." An exclusive use zoning district is one which permits only one major type of land use, such as residential, commercial, industrial, or agricultural. An exclusive use agricultural district, for example, would permit only agricultural uses as a matter of right, with farm residences being considered accessory to the principal agricultural use. The phrase "exclusionary zoning" is frequently used to describe situations where a local community utilizes the zoning power, and in particular such zoning restrictions as minimum lot and building sizes and residential structure types, in an attempt to ensure the construction, typically, of large, relatively expensive, single-family homes, and thereby either consciously or inadvertently exclude from the community those with relatively low incomes.*

Similarly, there are a number of recreational zoning districts that imply that the areas so zoned are intended primarily for recreational use, when in fact they are intended to permit low-density residential development around inland lake areas. Several significant rezoning movements were underway in the Region at the time of the 1972 inventory which, if completed, will greatly change the character of the aforementioned zoning problems. These include two major countywide rezoning efforts, one in Walworth County and one in Kenosha County. Other towns, particularly in Ozaukee and Washington Counties, have also indicated a desire to proceed with more stringent zoning patterns in order to provide for a more rational urban and rural land use development pattern.

In order to properly assess the areawide effects of the long-range land use development objectives implicit in the 1972 local zoning ordinances, and to compare such effects with those found in the 1964 inventory, it was again necessary to provide a uniform basis of comparison between existing and proposed land uses. As in 1964, the principal adjustment required in 1972 to render existing land uses comparable to proposed land uses, as the latter are expressed in local community zoning ordinances, was to allocate existing street, highway, and off-street parking acreages to their principal associated uses. In addition, the 15 major categories of the regional zoning district classification system and the 10 major categories of the existing land use classification system (see Appendix D) were each regrouped into seven reasonable comparable categories. All seven categories for both existing and proposed land uses were then measured and tabulated separately by county and summarized for the Region as a whole.

Proposed Land Uses—Overview: The spatial distribution of all future land uses within the Region, as proposed by locally adopted zoning ordinances, is shown on Map 68. This map provides a generalized picture of land use within the Region as it would exist if all of the currently adopted local zoning ordinances were enforced and the districted areas fully developed. For comparison purposes, the equivalent picture of proposed land uses as reflected in local plans and zoning ordinances in 1964 is shown on Map 67. Table 94 provides a quantitative comparison of existing and proposed land uses by major land use category for 1964 and 1972, and includes the proposed land use changes, or increments, in each land use category for each year, thus permitting a direct comparison of the changes in proposed land uses reflected by zoning ordinance adoptions and revisions from 1964 to 1972.

With respect to residential land use, the incremental changes proposed by the local zoning ordinances would collectively increase the stock of residential land by about 256,000 acres, or about 136 percent over the existing area devoted to residential development. It is significant to note that the gross amount of land actually zoned for residential land use increased only slightly during the 1964-1972 time period, despite an increase of about 30,000 acres in lands actually used for residential purposes. The 1972 increment in residential land use

Table 94

EXISTING AND PROPOSED LAND USE IN THE REGION: 1964 and 1972

Land Use	1964					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Residential	158,765	9.2	443,906	25.8	285,141	180
Commercial	8,006	0.5	31,516	1.8	23,510	294
Industrial	11,319	0.7	70,479	4.1	59,160	523
Governmental and Institutional	18,587	1.1	10,699	0.6	- 7,888	- 42
Recreational	23,944	1.4	31,297	1.8	7,353	31
Agricultural	1,114,096	64.7	895,847	52.1	- 218,249	- 20
All Other[c]	386,289	22.4	237,262	13.8	- 149,027	- 52
Total	1,721,006[d]	100.0	1,721,006	100.0	--	--

Land Use	1972					
	Existing[e]		Proposed[f]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Residential	188,943	11.0	445,383	25.8	256,440	136
Commercial	10,873	0.6	40,115	2.3	29,242	269
Industrial	13,149	0.8	83,807	4.9	70,658	537
Governmental and Institutional	21,892	1.3	3,169	0.2	- 18,723	- 86
Recreational	29,947	1.7	19,708	1.2	- 10,239	- 34
Agricultural	1,073,627	62.4	984,570	57.2	- 89,057	- 8
All Other[c]	382,669	22.2	144,348	8.4	- 238,321	- 62
Total	1,721,100[d]	100.0	1,721,100	100.0	--	--

Land Use	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Residential	30,178	19	1,477	--[g]	- 28,701	- 10
Commercial	2,867	36	8,599	27	5,732	24
Industrial	1,830	16	13,328	19	11,498	19
Governmental and Institutional	3,305	18	- 7,530	- 70	- 10,835	- 137
Recreational	6,003	25	- 11,589	- 37	- 17,592	- 239
Agricultural	- 40,469	- 4	88,723	10	129,192	59
All Other[c]	- 3,620	- 1	- 92,914	- 39	- 89,294	- 60
Total	94[d]	--[g]	94[d]	--[g]	--	--

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

[b] *Proposed by local communities in land use plans and zoning ordinances, 1964. The data presented herein for the residential, agricultural, and "all other" categories differ slightly from those presented in SEWRPC Planning Report No. 7, Volume One. The differences are due solely to corrections of minor errors made initially in the 1964 data files.*

[c] *With respect to land use, includes woodlands, wetlands, water, unused lands, quarries, and all transportation, communication, and utility uses except streets, highways, and off-street parking. With respect to zoning, includes conservancy districts, open land districts, and unzoned lands.*

[d] *Difference in total land area due to Lake Michigan landfills.*

[e] *Adapted from 1970 SEWRPC land use inventory.*

[f] *Proposed by local communities in zoning ordinances, 1972.*

[g] *Less than 0.5 percent.*

Source: SEWRPC.

is thus about 29,000 acres less than the increment in residential land use determined in 1964, representing a 10 percent reduction.

The relatively stable nature of residential land use zoning over this period, despite increases in the stock of residential land use, may be largely attributed to the comprehensive rezoning efforts undertaken during the interim period by several towns in the Region, and reflect in particular the imposition of exclusive agricultural land use and conservancy zoning districts in several communities throughout the Region. A reduction in the gross amount of land actually zoned for residential land use may be expected in future years as more communities in rural areas recognize the importance of establishing exclusive use districts, in particular, those related to agriculturally and environmentally significant lands.

With respect to commercial and industrial land use zoning, local communities in the Region collectively rezoned substantially more area for industrial and commercial purposes from 1964 to 1972 than was actually developed for such purposes during that same period. About 2,900 acres of land were developed for commercial land use purposes during the period, while nearly 8,600 acres of land were rezoned for commercial land use. Similarly, about 1,800 acres of land were actually developed for industrial purposes during that period, whereas local communities rezoned about 13,000 acres of land for that use. Hence, it may be concluded that, with respect to the Region as a whole, zoning for commercial and industrial development continues to exceed actual needs, reflecting at least in part a desire on the part of local units of government to attract land uses which have significant implications for tax base development.

To accommodate the proposed increments in residential, commercial, and industrial land uses, the local units of government in the Region propose to reduce the stock of land for other land uses. Of particular significance are reductions in lands used for agricultural and "all other" uses, predominantly including open, unused lands and woodlands. It is significant to note, however, that the proposed reduction in the stock of agricultural land was far less in 1972 than it was in 1964, reflecting again the imposition of new and revised zoning ordinances in the rural areas of the Region that concentrate on providing exclusive agricultural use districts. In 1964, the local zoning proposals, if carried out, would have resulted in a decrease in agricultural land use of about 218,000 acres. By 1972, that decrease had been reduced to about 89,000 acres.

With respect to recreational land use, the proposed acreage would decrease by about 10,000 acres, or 34 percent, if the local zoning proposals are carried out. This comparison is clouded, however, by the failure of many local communities to provide a zoning district category for exclusive recreational use, permitting instead all types of recreational land uses in many other zoning districts. In addition, the continued use in some portions of the Region of a "recreational" zoning category applied to lakeshore-oriented, low-density residential development further clouds the comparison. Hence, it is extremely difficult to draw meaningful comparisons between existing and proposed recreational land uses.

Proposed Residential Land Use: The residential land use category includes, with respect to existing land use, all residential lands as identified in the SEWRPC 1970 land use inventory, together with their associated supporting street, highway, and off-street parking areas. With respect to proposed land use, the residential land use category includes all residentially zoned lands as identified in the SEWRPC 1972 community zoning inventory. Not included with respect to proposed land use in the residential land use category are those lands which may be zoned agricultural but actually permit residential development. Hence, the comparison between existing and proposed residential land uses may be considered to be conservative, since substantial amounts of new residential development could occur in many local agriculturally zoned areas.

Table 95 provides a comparison of existing and zoned residential land use by county for 1964 and 1972, as well as the changes that would occur in this land use category within the Region if the local residential development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of residential land use in the Region as proposed in the locally adopted zoning ordinances in 1964 and 1972 is shown on Map 72.

The amount of additional residential land proposed for development by local communities in the Region in 1972 is about 256,000 acres, or about 136 percent more than the total area actually in residential use in 1972. The gross amount of land zoned for residential use increased only slightly during the 1964-1972 period, despite an actual increase in residential land use of about 30,000 acres. Thus, while the total residential stock of the Region continued to increase during the 1964-1972 period, the amount of proposed residential land use remained relatively stable, reflecting significant new and revised zoning ordinances prepared in substantial compliance with the regional land use plan recommendations, that is, ordinances which include exclusive agricultural and conservancy zoning districts.

Most of the reductions in the incremental proposed residential land uses occurred in Ozaukee, Racine, and Walworth Counties, where from 5,000 to 6,000 acres per county were rezoned to other, more appropriate land uses. Such rezoning from residential to other land uses nearly offset the rezonings to residential land uses in the remaining counties. As in 1964, the largest area zoned for future residential use is in Waukesha County, where about 139,000 acres have been zoned for residential use above and beyond that already in such use, representing an increase over the existing stock of residential land of about 283 percent.

As shown in Table 95, there were about 189,000 acres of existing residential land in 1972, representing about 295 square miles. The population of the Region in 1972

Table 95

EXISTING AND PROPOSED RESIDENTIAL LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 Residential Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	14,052	8.9	21,873	4.9	7,821	56
Milwaukee	57,231	36.0	95,623	21.5	38,392	67
Ozaukee	10,271	6.5	45,067	10.2	34,796	339
Racine	16,094	10.1	34,768	7.8	18,674	116
Walworth	14,028	8.8	35,792	8.1	21,764	155
Washington	8,372	5.3	31,240	7.0	22,868	273
Waukesha	38,717	24.4	179,543	40.5	140,826	364
Region	158,765	100.0	443,906	100.0	285,141	180

County	1972 Residential Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	15,721	8.3	21,193	4.7	5,472	35
Milwaukee	62,358	33.0	103,623	23.3	41,265	66
Ozaukee	13,569	7.2	39,895	8.9	26,326	194
Racine	19,664	10.4	28,937	6.5	9,273	47
Walworth	15,740	8.3	29,846	6.7	14,106	90
Washington	12,578	6.7	33,220	7.5	20,642	164
Waukesha	49,313	26.1	188,669	42.4	139,356	283
Region	188,943	100.0	445,383	100.0	256,440	136

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	1,669	12	- 680	- 3	- 2,349	- 30
Milwaukee	5,127	9	8,000	8	2,873	7
Ozaukee	3,298	32	- 5,172	- 11	- 8,470	- 24
Racine	3,570	22	- 5,831	- 17	- 9,401	- 50
Walworth	1,712	12	- 5,946	- 17	- 7,658	- 35
Washington	4,206	50	1,980	6	- 2,226	- 10
Waukesha	10,596	27	9,126	5	- 1,470	- 1
Region	30,178	19	1,477	--[e]	- 28,701	- 10

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

[d] *Proposed by local communities in zoning ordinances, 1972.*

[e] *Less than 0.5 percent.*

Source: SEWRPC.

was estimated at about 1.8 million persons. Thus, the overall residential density in the Region is about 6,140 persons per square mile of residential land. Also as shown in Table 95, there are about 256,000 acres of land zoned for residential land use above and beyond that already in use. This represents about 401 square miles of land. If this proposed residential area were to be developed and were to reflect existing density patterns, it would house an incremental regional population of nearly 2.5 million persons. At the current rate of population growth in the Region—about 27,300 persons annually—it would take about 90 years to fully absorb all the proposed residential areas.

Proposed Commercial Land Use: With respect to existing land use, the commercial land use category includes all commercial and service lands as identified in the SEWRPC 1970 land use inventory, together with their associated supporting street, highway, and off-street parking areas. With respect to proposed land use, the commercial land use category includes all retail, service, and other commercially zoned lands as identified in the SEWRPC 1972 community zoning inventory. Table 96 provides a comparison of existing and zoned commercial land use by county for the years 1964 and 1972, as well as the changes that would occur in this land use category within the Region if the local commercial development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of commercial land in the Region as proposed in the locally adopted zoning ordinances in 1964 and 1972 is shown on Map 73.

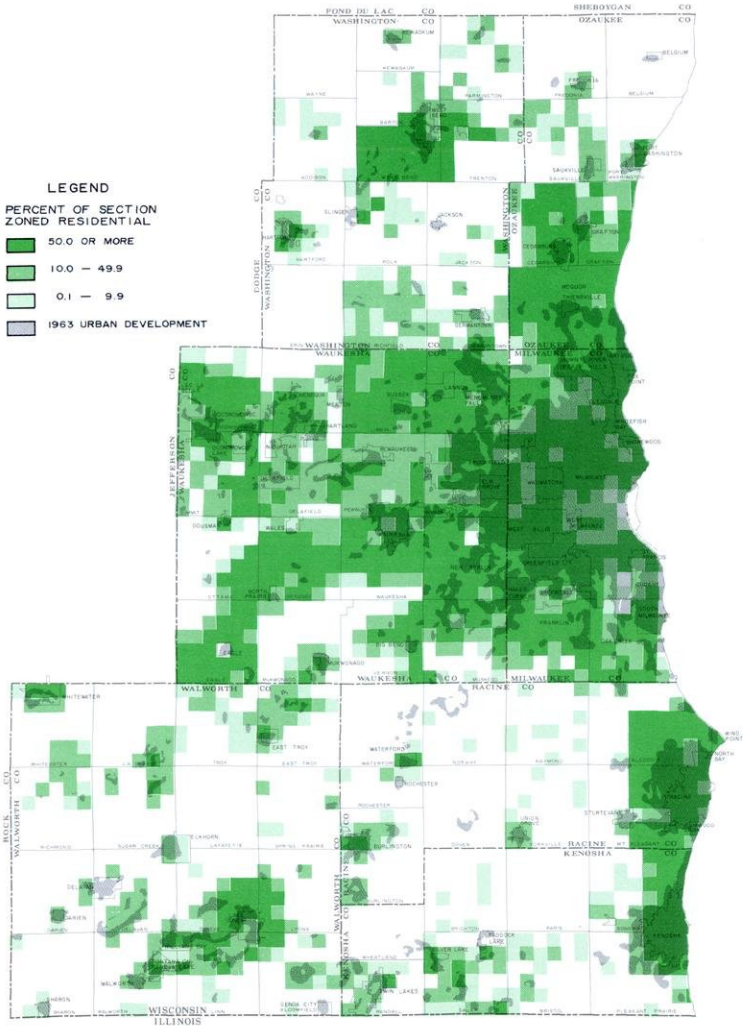
The amount of additional commercial land proposed for development by local communities in the Region in 1972 was about 29,000 acres, or about 269 percent more than the total area actually in commercial use in 1972. This increment is about 5,700 acres more than the increment revealed by the 1964 inventory, and is in addition to an actual increase in commercial land use of about 2,900 acres. Taken together, the change in the increment plus the change in existing commercial land use stock represents an increase in commercially zoned lands from 1964 to 1972 of about 8,600 acres, and reflects a continuing trend toward overzoning for commercial land use within the Region. The bulk of the increase in the commercially zoned land occurred in Kenosha, Milwaukee, and Walworth Counties, where from nearly 1,300 to 3,400 acres per county were zoned to commercial land use.

Proposed Industrial Land Use: The industrial land use category includes, with respect to existing land use, all lands identified for manufacturing, wholesaling, and storage uses in the SEWRPC 1970 land use inventory, together with their associated supporting street, highway, and off-street parking areas. With respect to proposed land use, the industrial land use category includes all industrially zoned lands as identified in the SEWRPC 1972 community zoning inventory. Table 97 provides a comparison of existing and zoned industrial land use by county for 1964 and 1972, as well as the changes that would occur in this land use category within the Region if local industrial development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of the industrial land use in the Region as proposed in the locally adopted zoning ordinances in 1964 and 1972 is shown on Map 74.

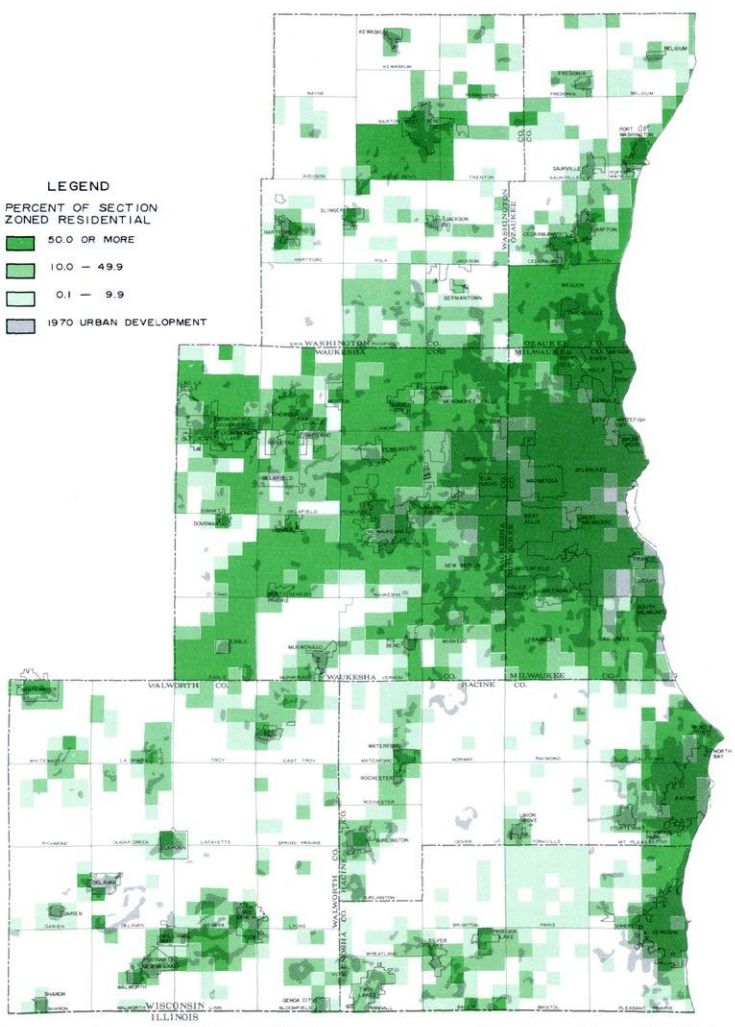
Map 72

LOCALLY PROPOSED RESIDENTIAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



The above maps identify the future spatial distribution of residential land use in the Region as proposed in locally adopted zoning ordinances in 1964 and 1972. The gross amount of land zoned for residential land use increased only slightly during the 1964-1972 period, despite an actual increase in residential land use of about 30,000 acres. Substantial reductions in proposed residential land uses over the period were made in Ozaukee, Walworth, and Racine Counties, where from 5,000 to 6,000 acres per county were rezoned to other more appropriate land uses. Such rezoning nearly offset the rezoning to residential land uses in the remaining counties. Although some progress was made toward a reduction in the gross amount of land zoned for residential use from 1964 to 1972, there remain in the Region about 400 square miles of land zoned for residential land use above and beyond that already in such use. If this proposed residential area were to be developed at the middle of the SEWRPC medium density residential development category—6,500 persons per square mile—it could house about 2.5 million persons. There remains, then, a need to further reduce the gross amount of land actually zoned for residential use to bring such amounts of land more nearly into balance with anticipated regional growth, to encourage a more desirable urban settlement pattern, and to protect the underlying and sustaining natural resource base.

Source: SEWRPC.

Table 96

EXISTING AND PROPOSED COMMERCIAL LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 Commercial Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	579	7.2	3,255	10.3	2,676	462
Milwaukee . . .	3,995	49.9	7,030	22.3	3,035	76
Ozaukee	375	4.7	1,949	6.2	1,574	420
Racine	823	10.3	3,258	10.3	2,435	296
Walworth. . . .	673	8.4	2,866	9.1	2,193	326
Washington . .	303	3.8	7,508	23.8	7,205	2,378
Waukesha . . .	1,258	15.7	5,650	18.0	4,392	349
Region	8,006	100.0	31,516	100.0	23,510	294

County	1972 Commercial Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	765	7.0	4,589	11.4	3,824	500
Milwaukee . . .	5,448	50.1	10,397	25.9	4,949	91
Ozaukee	445	4.1	2,086	5.2	1,641	369
Racine	981	9.0	3,740	9.3	2,759	281
Walworth. . . .	818	7.5	5,838	14.6	5,020	614
Washington . .	429	3.9	6,960	17.4	6,531	1,522
Waukesha . . .	1,987	18.4	6,505	16.2	4,518	227
Region	10,873	100.0	40,115	100.0	29,242	269

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	186	32	1,334	41	1,148	43
Milwaukee . . .	1,453	36	3,367	48	1,914	63
Ozaukee	70	19	137	7	67	4
Racine	158	19	482	15	324	13
Walworth. . . .	145	22	2,972	104	2,827	129
Washington . .	126	42	-548	-7	-674	-9
Waukesha . . .	729	58	855	15	126	3
Region	2,867	36	8,599	27	5,732	24

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

[d] *Proposed by local communities in zoning ordinances, 1972.*

Source: SEWRPC.

Table 97

EXISTING AND PROPOSED INDUSTRIAL LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 Industrial Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	914	8.1	7,493	10.6	6,579	720
Milwaukee . . .	6,693	59.1	23,657	33.6	16,964	253
Ozaukee	383	3.4	3,799	5.4	3,416	892
Racine	976	8.6	5,364	7.6	4,388	450
Walworth. . . .	808	7.1	3,316	4.7	2,508	310
Washington . .	401	3.6	8,005	11.4	7,604	1,896
Waukesha . . .	1,144	10.1	18,845	26.7	17,701	1,547
Region	11,319	100.0	70,479	100.0	59,160	523

County	1972 Industrial Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	960	7.3	7,856	9.4	6,896	718
Milwaukee . . .	7,062	53.7	27,904	33.3	20,842	295
Ozaukee	559	4.3	5,469	6.5	4,910	878
Racine	1,411	10.7	9,642	11.5	8,231	583
Walworth. . . .	882	6.7	3,528	4.2	2,646	300
Washington . .	534	4.1	7,586	9.1	7,052	1,320
Waukesha . . .	1,741	13.2	21,822	26.0	20,081	1,153
Region	13,149	100.0	83,807	100.0	70,658	537

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	46	5	363	5	317	5
Milwaukee . . .	369	6	4,247	18	3,878	23
Ozaukee	176	46	1,670	44	1,494	44
Racine	435	44	4,278	80	3,843	88
Walworth. . . .	74	9	212	6	138	6
Washington . .	133	33	-419	-5	-552	-7
Waukesha . . .	597	52	2,977	16	2,380	13
Region	1,830	16	13,328	19	11,498	19

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

[d] *Proposed by local communities in zoning ordinances, 1972.*

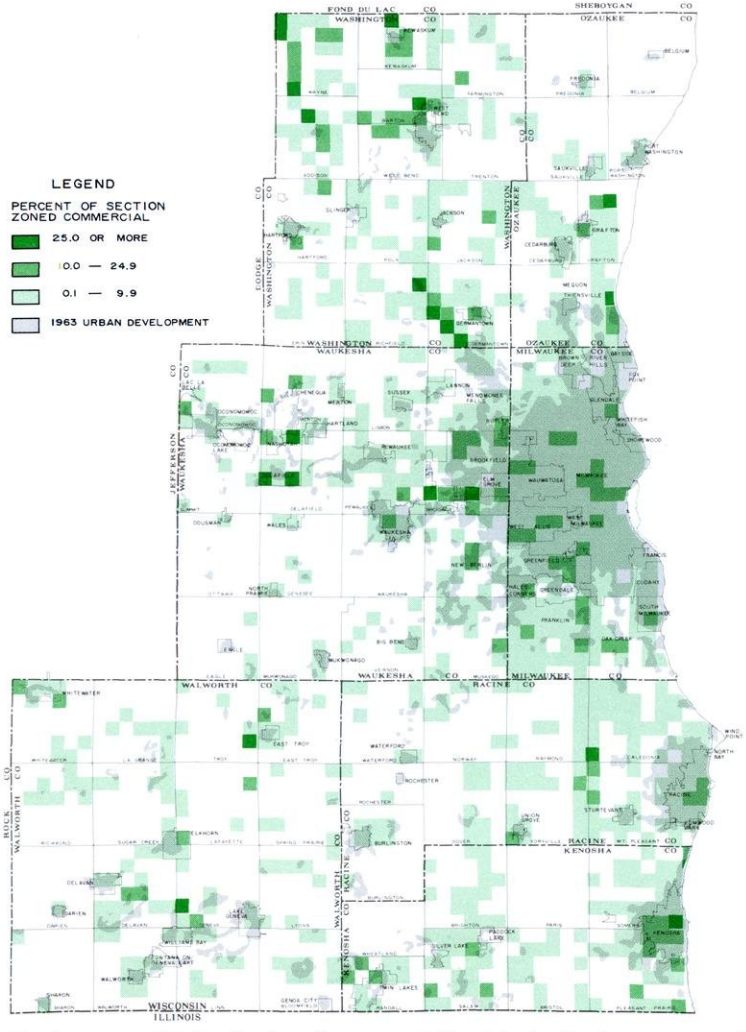
Source: SEWRPC.

The additional industrial land proposed for development by local communities in the Region in 1972 is about 71,000 acres, or about 537 percent more than the total area actually in industrial use in 1972. This increment is about 11,500 acres more than the increment revealed by the 1964 inventory, and is in addition to an actual increase in industrial land use of about 1,800 acres. Taken together, the change in the increment plus the change in the existing land use stock represents an increase in industrially zoned land from 1964 to 1972 of about 13,300 acres, and reflects a continuing trend for overzoning for industrial land use within the Region. The bulk of the increase in the incremental proposed industrial land use occurred in Milwaukee, Ozaukee, Racine, and Waukesha Counties, where from 1,600 to nearly 4,300 acres per county were rezoned to industrial land use.

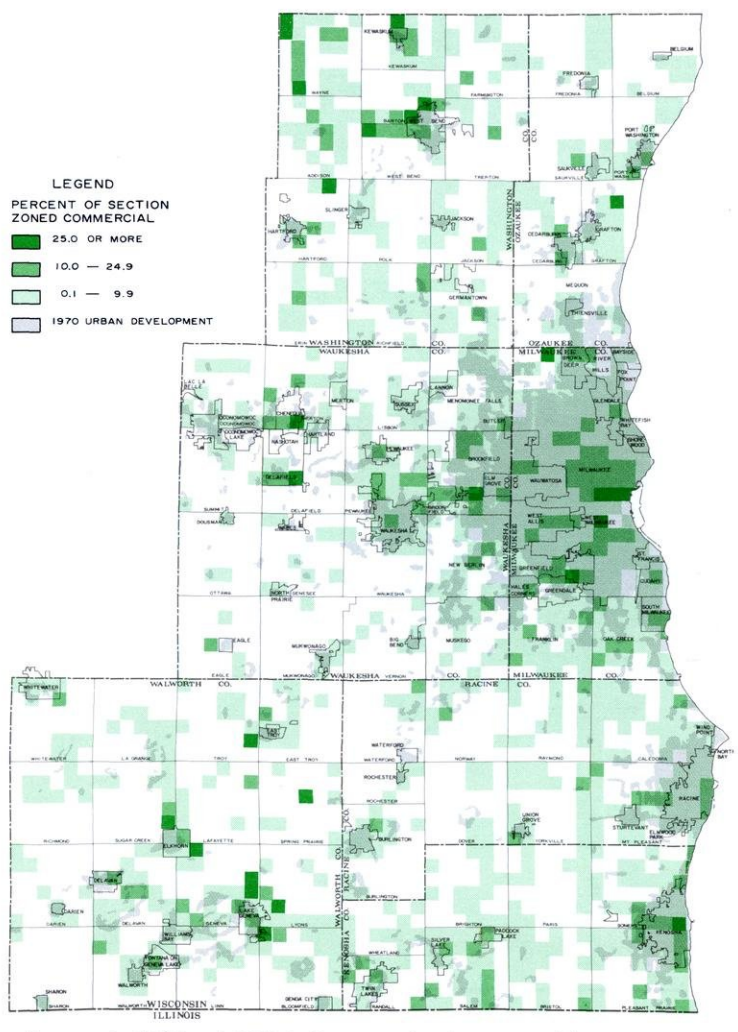
Map 73

LOCALLY PROPOSED COMMERCIAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



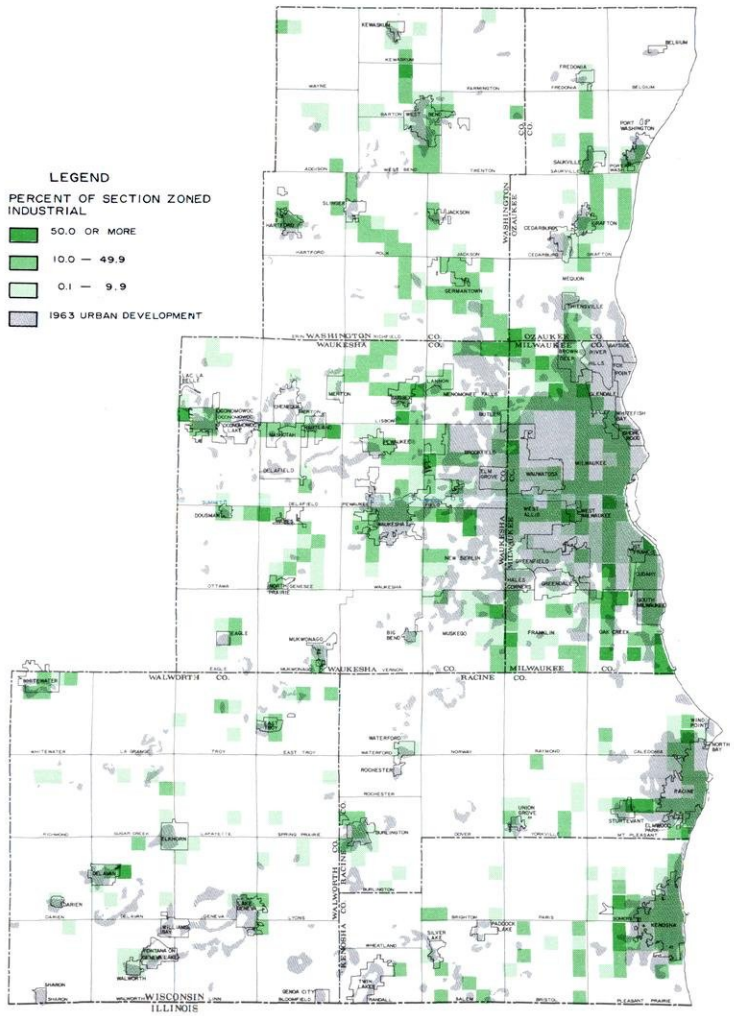
The future spatial distribution of commercial land in the Region as proposed in locally adopted zoning ordinances in 1964 and 1972 is shown on the above maps. There was an actual increase in commercially zoned lands from 1964 to 1972 of about 8,600 acres, compared to an actual increase in commercial land use during the same period of about 2,900 acres. The bulk of this increase in zoned land occurred in Kenosha, Milwaukee, and Walworth Counties, where from 1,300 to 3,400 acres per county were rezoned to commercial land use during the eight-year period. While some individual communities took steps to reduce the amount of land zoned for commercial use, particularly in strips along highways, in general the trend toward overzoning for commercial land use continued within the Region.

Source: SEWRPC.

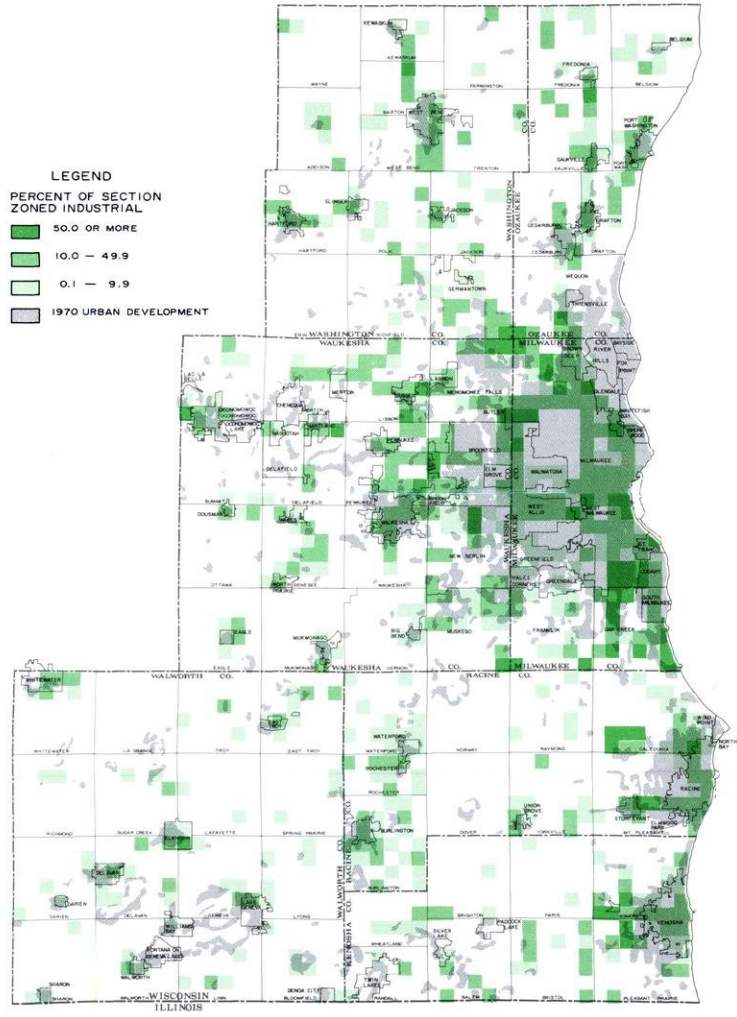
Map 74

LOCALLY PROPOSED INDUSTRIAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



The future spatial distribution of industrial land use in the Region as proposed by zoning ordinances in 1964 and 1972 is shown on the above maps. From 1964 to 1972, about 13,300 acres of land were rezoned for industrial purposes throughout the Region, with most of the increase occurring in Milwaukee, Ozaukee, Racine, and Waukesha Counties. During the same period, the actual increase in industrial land use in the Region was about 1,800 acres. In general, the trend toward overzoning for industrial use continued within the Region.

Source: SEWRPC.

Proposed Governmental and Institutional Land Use: The governmental and institutional land use category includes, with respect to existing land use, all governmental and institutional lands as identified in the SEWRPC 1970 land use inventory, together with their associated supporting street, highway, and off-street parking areas. With respect to proposed land use, the governmental and institutional land use category includes all lands zoned for governmental and institutional purposes, as identified in the SEWRPC 1972 community zoning inventory. Table 98 provides a comparison of existing and zoned governmental and institutional land use by county for the years 1964 and 1972, as well as the changes that would occur in this land use category within the Region if the local governmental and institutional development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of governmental and institutional land in the Region, as proposed in the locally adopted zoning ordinances in 1964 and 1972, is shown on Map 75.

The proposed governmental and institutional acreage in the Region would decrease by nearly 19,000 acres, or 86 percent, if the local zoning proposals are carried out. Many communities do not provide a zoning district category for exclusive governmental and institutional land use, but rather permit all types of governmental and institutional uses in many of their other zoning districts. The Commission has recommended in its model zoning ordinance[13] that, at least with respect to the major governmental and institutional land uses, communities in the Region attempt to provide an exclusive governmental and institutional zoning district. Until most communities in the Region actually implement this recommendation, no meaningful comparisons between existing and proposed governmental and institutional land uses can be made.[14]

Proposed Recreational Land Use: The recreational land use category includes, with respect to existing land use, all outdoor recreational lands as identified in the SEWRPC 1970 land use inventory, together with their associated supporting street, highway, and off-street parking areas. With respect to proposed land use, the recreational land use category includes all recreationally zoned lands as identified in the SEWRPC 1972 community zoning inventory. Table 99 provides a comparison of existing and zoned recreational land use by county for the years 1964 and 1972, as well as changes that would occur in this land use category within the Region if the local recreational development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of recreational land in the Region as proposed in the locally adopted zoning ordinances in 1964 and 1972 is shown on Map 76.

[13] *See SEWRPC Planning Guide No. 3, Zoning Guide.*

[14] *It should be noted that the changes in the governmental and institutional land use increment from 1964 to 1972 reflected in Table 98 in Milwaukee, Ozaukee, and Waukesha Counties largely reflect the utilization of local land use zoning ordinances in several communities in those counties in 1972, as opposed to the use of locally adopted land use plans in 1964. Such changes do not, therefore, necessarily reflect actual changes in governmental and institutional land use zoning during the period involved.*

Table 98

EXISTING AND PROPOSED GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION BY COUNTY: 1964 and 1972

County	1964 Governmental and Institutional Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	1,233	6.6	5	0.1	-1,228	-100
Milwaukee	9,872	53.1	7,797	72.9	-2,075	-21
Ozaukee	830	4.5	1,125	10.6	295	36
Racine	1,765	9.5	--	--	-1,765	-100
Walworth	1,204	6.5	340	3.1	-864	-72
Washington	833	4.5	416	3.8	-417	-50
Waukesha	2,850	15.3	1,016	9.5	-1,834	-64
Region	18,587	100.0	10,699	100.0	-7,888	-42

County	1972 Governmental and Institutional Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	1,606	7.3	32	1.0	-1,574	-98
Milwaukee	10,771	49.2	1,285	40.5	-9,486	-88
Ozaukee	1,080	4.9	369	11.6	-711	-66
Racine	2,196	10.0	192	6.1	-2,004	-91
Walworth	1,446	6.6	279	8.9	-1,167	-81
Washington	1,085	5.0	71	2.2	-1,014	-93
Waukesha	3,708	17.0	941	29.7	-2,767	-75
Region	21,892	100.0	3,169	100.0	-18,723	-86

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	373	30	27	540	-346	-28
Milwaukee	899	9	-6,512	-84	-7,411	-357
Ozaukee	250	30	-756	-67	-1,006	-341
Racine	431	24	192	--	-239	-14
Walworth	242	20	-61	-18	-303	-35
Washington	252	30	-345	-83	-597	-143
Waukesha	858	30	-75	-7	-933	-51
Region	3,305	18	-7,530	-70	-10,835	-137

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

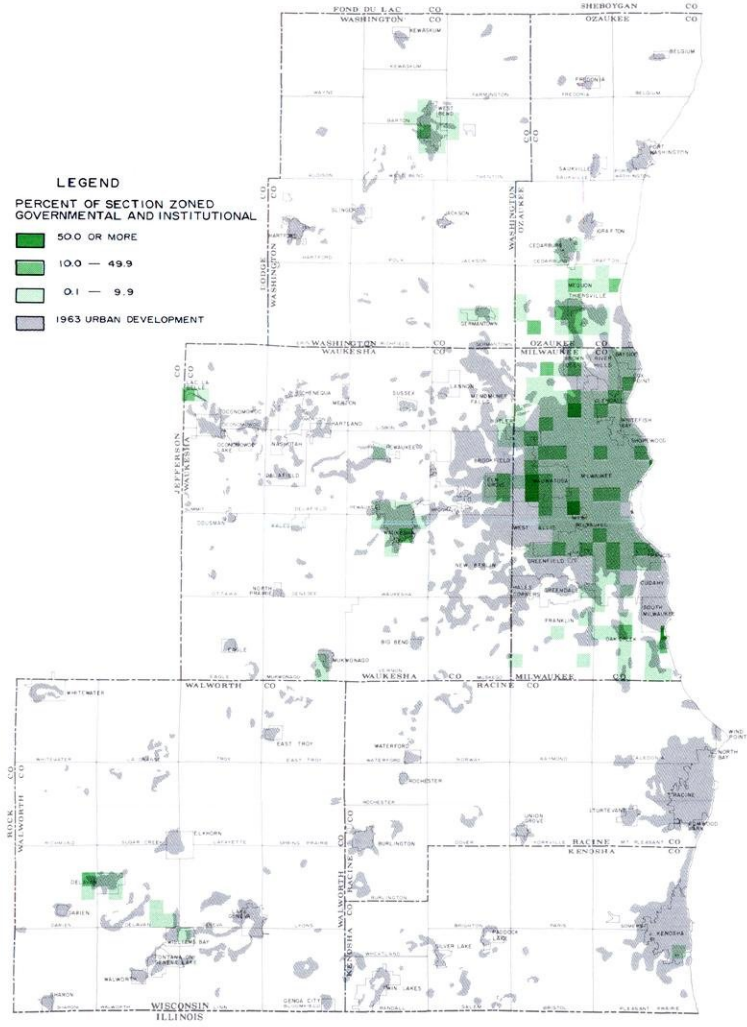
[d] *Proposed by local communities in zoning ordinances, 1972.*

Source: SEWRPC.

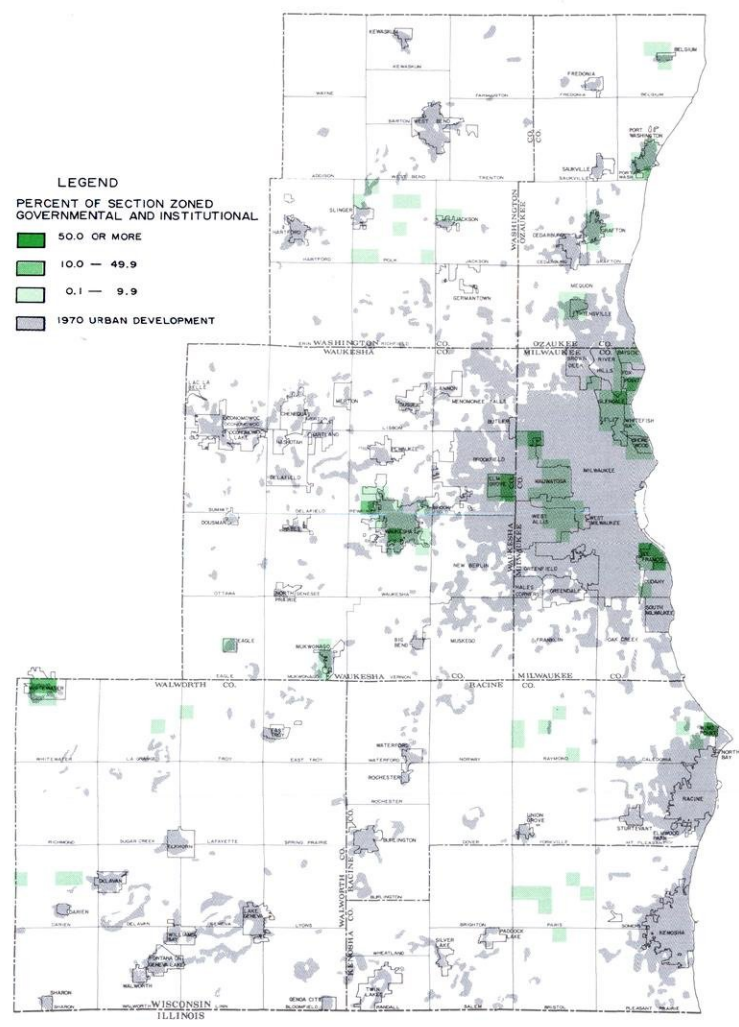
Map 75

LOCALLY PROPOSED GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



The future spatial distribution of governmental and institutional land uses as proposed by communities in the Region in 1964 and 1972 is shown on the above maps. Together, local governments have zoned only about 3,200 acres of land for governmental and institutional use in 1972, compared with about 10,700 acres in 1964. In both years, the amount of land zoned for governmental and institutional land use is less than that actually in use, since many communities do not include within their zoning ordinance use districts for exclusive governmental and institutional land use, as recommended by the Commission in its model zoning ordinance.

Source: SEWRPC.

Table 99

EXISTING AND PROPOSED RECREATIONAL LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 Recreational Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	2,148	9.0	1,337	4.3	- 811	- 38
Milwaukee	9,119	38.1	8,711	27.8	- 408	- 4
Ozaukee	1,374	5.7	1,340	4.3	- 34	- 2
Racine	2,150	9.0	7,765	24.8	5,615	261
Walworth	2,922	12.2	5,449	17.4	2,527	86
Washington	1,253	5.2	4,266	13.6	3,013	240
Waukesha	4,978	20.8	2,429	7.8	- 2,549	- 51
Region	23,944	100.0	31,297	100.0	7,353	31

County	1972 Recreational Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	2,760	9.2	2,848	14.5	88	3
Milwaukee	10,271	34.3	1,083	5.6	- 9,188	- 89
Ozaukee	1,712	5.7	1,348	6.8	- 364	- 21
Racine	2,643	8.9	5,863	29.7	3,220	122
Walworth	4,372	14.6	1,659	8.4	- 2,713	- 62
Washington	1,713	5.7	6,001	30.4	4,288	250
Waukesha	6,476	21.6	906	4.6	- 5,570	- 86
Region	29,947	100.0	19,708	100.0	- 10,239	- 34

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	612	28	1,511	113	899	111
Milwaukee	1,152	13	- 7,628	- 88	- 8,780	- 2,151
Ozaukee	338	25	8	1	- 330	- 971
Racine	493	23	- 1,902	- 24	- 2,395	- 43
Walworth	1,450	50	- 3,790	- 70	- 5,240	- 207
Washington	460	37	1,735	41	1,275	42
Waukesha	1,498	30	- 1,523	- 63	- 3,021	- 119
Region	6,003	25	- 11,589	- 37	- 17,592	- 239

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

[d] *Proposed by local communities in zoning ordinances, 1972.*

Source: SEWRPC.

The proposed recreational acreage in the Region would decrease by about 10,000 acres, or about 34 percent, if the local zoning proposals are carried out. As in the case of the governmental and institutional land use category, many communities do not provide a zoning district category for exclusive recreational land use, but rather permit all types of recreational land uses in many of their other zoning districts. The Commission has recommended, at least with respect to the major outdoor recreational land uses, that communities in the Region attempt to provide an exclusive park and outdoor recreation district, applying that district to both public and private outdoor recreation uses. In addition, the recreational zoning category is further confused by the continued utilization in some portions of the Region of the term "recreational" in a zoning district title, when in fact the zoning district is intended to be applied, and is indeed applied, to existing and proposed future lakeshore-oriented, low-density residential development. Until most communities in the Region actually create and utilize a park and outdoor recreation zoning district, and until the old style residential-recreational zoning districts are converted to reflect their true intent, no meaningful comparisons between existing and proposed recreational land uses can be made.[15]

Proposed Agricultural Land Use: The agricultural land use category includes, with respect to existing land use, all agricultural lands as identified in the SEWRPC 1970 land use inventory, together with their associated supporting street and highway areas. With respect to proposed land use, the agricultural land use category includes all agriculturally zoned lands as identified in the SEWRPC 1972 community zoning inventory. Table 100 provides a comparison of existing and zoned agricultural land use by county for 1964 and 1972, as well as the changes that would occur in this category if the local agricultural development proposals, as reflected on the local zoning district maps, were to be fully carried out. The future spatial distribution of agricultural land use within the Region as proposed in the locally adopted zoning ordinance in 1964 and 1972 is shown on Map 77.

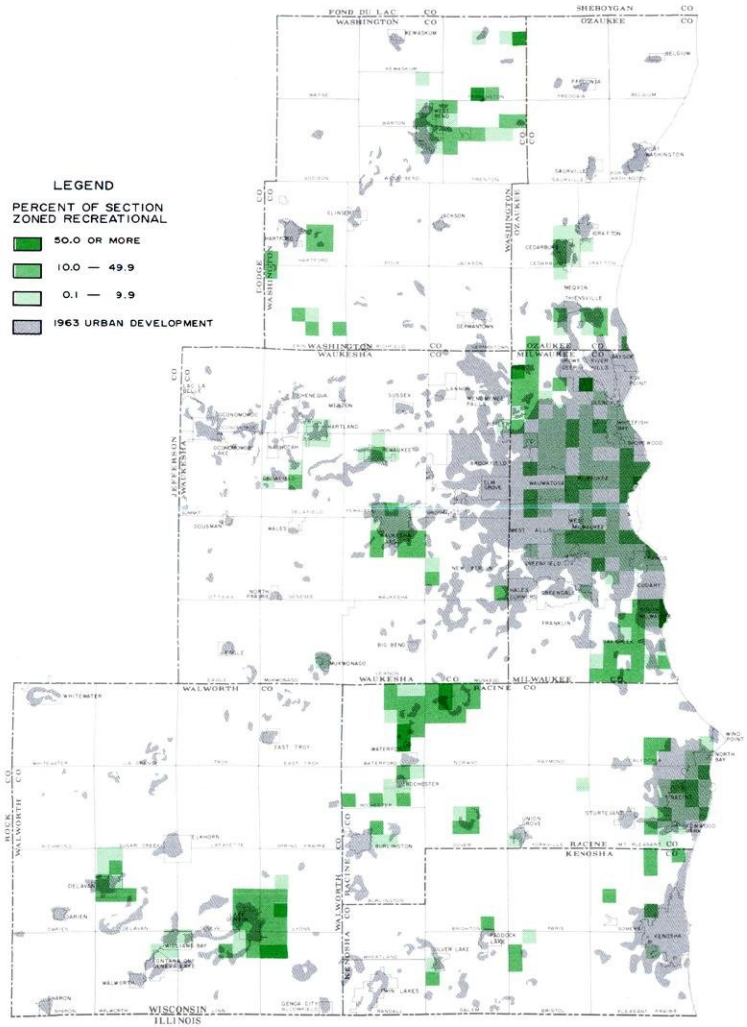
If local zoning proposals are carried out, about 89,000 acres, or 8 percent, of the existing 1972 agricultural acreage within the Region would be converted to other uses. This total, however, is substantially less than the projected loss of about 218,000 acres of agricultural lands in 1964, and largely reflects the imposition of new exclusive agricultural use zoning districts in several towns in the Region not previously zoned, and in other towns in the Region which accomplished comprehensive rezoning from 1964 to 1972. A total of about 129,000 acres that were either unzoned or zoned for land uses other than agricultural in 1964 had been rezoned to agricultural land uses by 1972. The most significant such changes occurred in Kenosha, Ozaukee, and Walworth Counties where large amounts of previously unzoned lands were rezoned for agricultural purposes.

[15] *It should be noted that some of the changes in the recreational land use increment from 1964 to 1972 reflected in Table 99, particularly in Milwaukee, Walworth, and Waukesha Counties, largely reflect the utilization of local land use zoning ordinances in several communities in those counties in 1972, as opposed to the use of locally adopted land use plans in 1964. Such changes do not, therefore, necessarily reflect actual changes in recreational land use zoning during the period involved.*

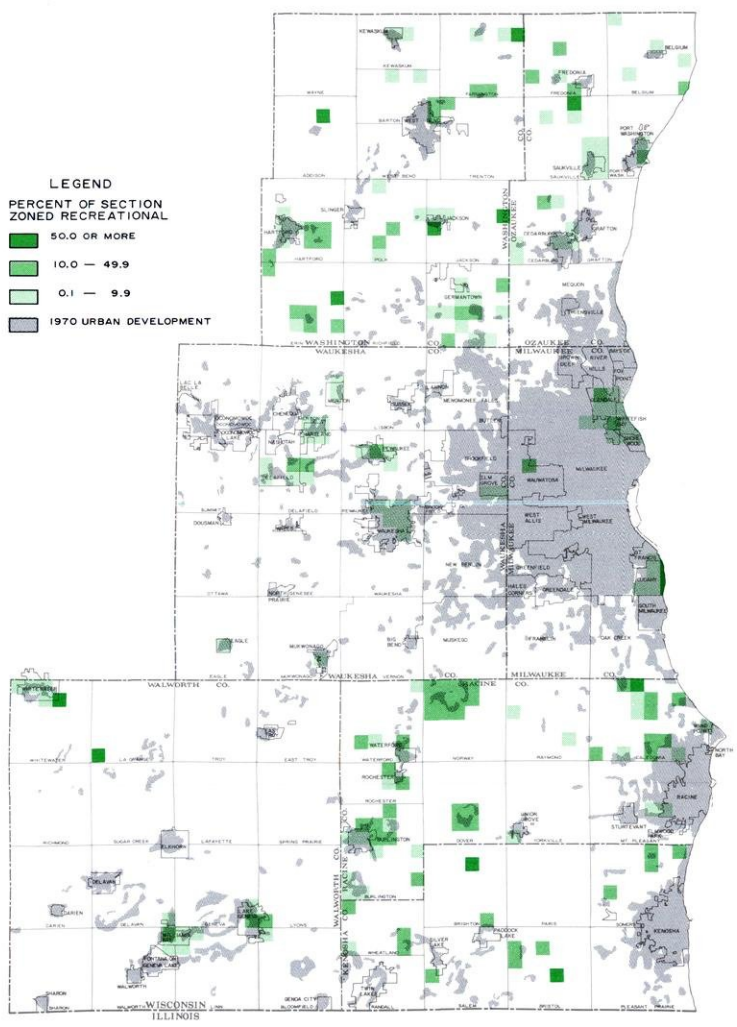
Map 76

LOCALLY PROPOSED RECREATIONAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



The future spatial distribution of recreational land use in the Region as proposed in locally adopted zoning ordinances in 1964 and 1972 is shown on the above maps. Together, local governments have zoned about 19,700 acres of land for recreational use in 1972, compared with about 31,300 acres in 1964. The amount of land zoned for recreational land use is currently less than actually in use, since many communities do not include within their zoning ordinance an exclusive use district for recreational land use, as recommended by the Commission in its model zoning ordinance.

Source: SEWRPC.

Table 100

EXISTING AND PROPOSED AGRICULTURAL LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 Agricultural Land Use					
	Existing[a]		Proposed[b]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	120,101	10.8	95,525	10.7	- 24,576	- 20
Milwaukee	36,855	3.3	7,929	0.9	- 28,926	- 78
Ozaukee	108,468	9.7	32,321	3.6	- 76,147	- 70
Racine	157,917	14.2	160,874	18.0	2,957	2
Walworth	270,714	24.3	281,465	31.4	10,751	4
Washington	197,306	17.7	219,679	24.5	22,373	11
Waukesha	222,735	20.0	98,054	10.9	- 124,681	- 56
Region	1,114,096	100.0	895,847	100.0	- 218,249	- 20

County	1972 Agricultural Land Use					
	Existing[c]		Proposed[d]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	117,419	10.9	132,728	13.5	15,309	13
Milwaukee	30,746	2.9	1,914	0.2	- 28,832	- 94
Ozaukee	104,376	9.7	83,884	8.5	- 20,492	- 20
Racine	151,969	14.2	158,984	16.1	7,015	5
Walworth	267,321	24.9	309,272	31.4	41,951	16
Washington	192,495	17.9	207,512	21.1	15,017	8
Waukesha	209,301	19.5	90,276	9.2	- 119,025	- 57
Region	1,073,627	100.0	984,570	100.0	- 89,057	- 8

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	- 2,682	- 2	37,203	39	39,885	162
Milwaukee	- 6,109	- 17	- 6,015	- 76	94	--[e]
Ozaukee	- 4,092	- 4	51,563	160	55,655	73
Racine	- 5,948	- 4	- 1,890	- 1	4,058	137
Walworth	- 3,393	- 1	27,807	10	31,200	290
Washington	- 4,811	- 2	- 12,167	- 6	- 7,356	- 33
Waukesha	- 13,434	- 6	- 7,778	- 8	5,656	5
Region	- 40,469	- 4	88,723	10	129,192	59

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

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

[c] *Adapted from 1970 SEWRPC land use inventory.*

[d] *Proposed by local communities in zoning ordinances, 1972.*

[e] *Less than 0.5 percent.*

Source: SEWRPC.

Proposed "All Other" Land Uses: The "all other" land use category includes all existing or zoned land uses which could not be meaningfully compared separately. These include woodlands; water and wetlands; open and unused lands; unplanned and unzoned lands; conservancy districts; and all transportation, communication, and utility uses except streets, highways, and off-street parking. Table 101 provides a comparison of the existing and zoned "all other" land uses by county for 1964 and 1972, as well as the changes that would occur in this land use category within the Region if the local zoning proposals are carried out.

Table 101

EXISTING AND PROPOSED "ALL OTHER" LAND USE IN THE REGION BY COUNTY: 1964 AND 1972

County	1964 "All Other" Land Uses[a]					
	Existing[b]		Proposed[c]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	39,068	10.1	48,607	20.5	9,539	24
Milwaukee	31,229	8.1	4,247	1.8	- 26,982	- 86
Ozaukee	28,312	7.3	64,412	27.1	36,100	128
Racine	37,821	9.8	5,517	2.3	- 32,304	- 85
Walworth	79,631	20.6	40,752	17.2	- 38,879	- 49
Washington	70,264	18.2	7,618	3.2	- 62,646	- 89
Waukesha	99,964	25.9	66,109	27.9	- 33,855	- 34
Region	386,289	100.0	237,262	100.0	- 149,027	- 39

County	1972 "All Other" Land Uses[a]					
	Existing[d]		Proposed[e]		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent Change
Kenosha	38,869	10.2	8,854	6.1	- 30,015	- 77
Milwaukee	28,408	7.4	8,861	6.1	- 19,547	- 69
Ozaukee	28,272	7.4	16,962	11.8	- 11,310	- 40
Racine	38,697	10.1	10,203	7.1	- 28,494	- 74
Walworth	79,403	20.7	19,560	13.6	- 59,843	- 75
Washington	69,900	18.3	17,383	12.0	- 52,517	- 75
Waukesha	99,120	25.9	62,525	43.3	- 36,595	- 37
Region	382,669	100.0	144,348	100.0	- 238,321	- 62

County	Change: 1964-1972					
	Existing		Proposed		Increment	
	Acres	Percent	Acres	Percent	Acres	Percent
Kenosha	- 199	- 1	- 39,753	- 82	-39,554	- 415
Milwaukee	- 2,821	- 9	4,614	109	7,435	28
Ozaukee	- 40	--[f]	- 47,450	- 74	- 47,410	- 131
Racine	876	2	4,686	85	3,810	12
Walworth	- 228	--[f]	- 21,192	- 52	- 20,964	- 54
Washington	- 364	- 1	9,765	128	10,129	16
Waukesha	- 844	- 1	- 3,584	- 5	- 2,740	- 8
Region	- 3,620	- 1	- 92,914	- 39	- 89,294	- 60

[a] *With respect to land use, includes woodlands, wetlands, water, unused lands, quarries, and all other transportation, communication, and utility uses except streets, highways, and off-street parking. With respect to zoning, includes conservancy districts, open land districts, and unzoned lands.*

[b] *Adapted from 1963 SEWRPC land use inventory.*

[c] *Proposed by local communities in land use plans and zoning ordinances, 1964.*

[d] *Adapted from 1970 SEWRPC land use inventory.*

[e] *Proposed by local communities in zoning ordinances, 1972.*

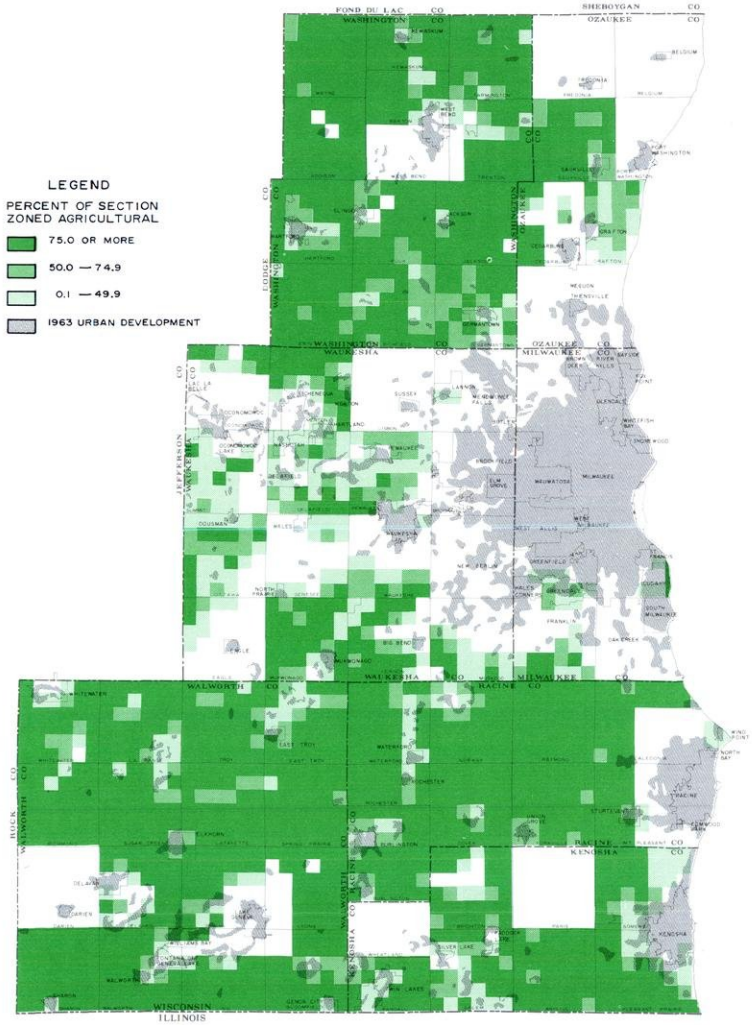
[f] *Percent change negligible.*

Source: SEWRPC.

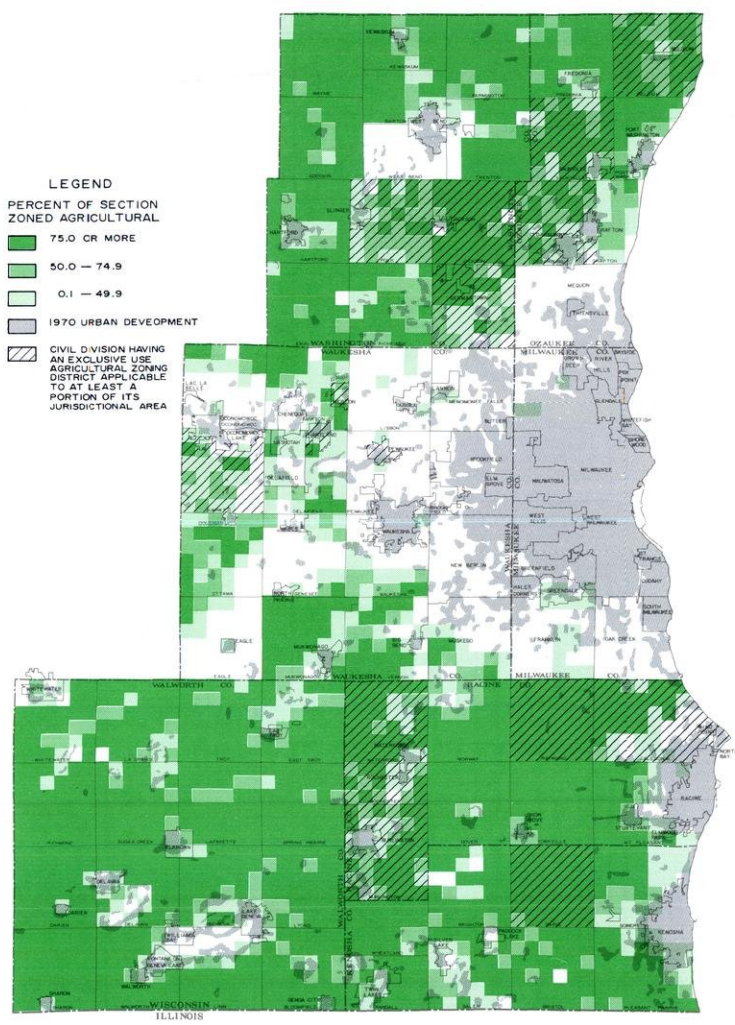
Map 77

LOCALLY PROPOSED AGRICULTURAL LAND USE IN THE REGION: 1964 and 1972

1964



1972



The spatial distribution of locally proposed agricultural land use in the Region for 1964 and 1972 is shown on the above maps. Together, local governments have zoned nearly 985,000 acres of land for agricultural use in 1972, a significant increase over the 1964 level of about 896,000 acres. In large part, this increase is a result of the enactment of new comprehensive zoning ordinances in those towns throughout the Region that had no zoning in 1964. Those 17 local communities having an exclusive agricultural zoning district within their zoning ordinance in 1972 are also identified on the above map. No communities had such a zoning district in 1964, indicating that substantial progress has been made since that time in converting the old style agricultural zoning districts, which were not exclusive and which permitted nonfarm related residential development, to the Commission-recommended exclusive use agricultural zoning districts which prohibit nonfarm-related residential development.

Source: SEWRPC.

The future spatial distribution of one of the more significant land use proposals contained in the "all other" category—the conservancy district—is shown for 1964 and 1972 on Map 78. Whereas in 1964 nearly all of the locally zoned conservancy lands were located in Waukesha County, by 1972 significant amounts of conservancy zoned lands had appeared in Ozaukee and Washington Counties, as well as lesser amounts in Kenosha, Milwaukee, and Racine Counties.

The amount of acreage devoted to "all other" land uses in the Region would decrease by about 238,000 acres, or 62 percent, if the land use proposals in the local zoning ordinances were carried out. It should be noted that the substantial changes in the increment in this land use category reflected in Table 101 for Kenosha, Ozaukee, and Walworth Counties largely result from major new zoning efforts in towns that were previously unzoned. Significant amounts of unzoned land included in 1964 in the "all other" land use category have, as a result of such new zoning, been placed in other land use categories, particularly agricultural land use.

Community Zoning Ordinances—Specific in Relation to Major Regional Land Use Plan Elements

As noted earlier, the adopted 1990 regional land use plan included a series of specific plan implementation recommendations relating to local community zoning ordinances. Since the regional land use plan was intended to be a "controlled existing trend" land use plan under which the effects of the private land market in shaping the regional settlement pattern would be modified by local land use controls, the plan viewed the zoning ordinance as one of the most important plan implementation devices available. The preceding discussion in this chapter provided a general overview of the changes in community zoning ordinances and zoning district maps during the 1964 to 1972 period. This section of the chapter will deal more specifically with zoning ordinance changes directly related to the major land use zoning recommendations contained in the adopted 1990 regional land use plan. These include zoning for the proper spatial locations of residential areas; for the preservation and protection of prime agricultural lands; for the preservation and protection of primary environmental corridors; and for the preservation and protection of the major regional centers, including regional retail and service, industrial, and outdoor recreational sites.

Residential Areas: The adopted regional land use plan recommended that, as appropriate and in accordance with staged development in a community, those areas shown on the plan as devoted predominantly to low, medium, and high density residential use be placed in exclusive residential use zoning districts. The recommended residential development densities shown on the plan can be achieved within each neighborhood unit by various combinations of lot sizes per dwelling unit and various housing structure types. Each residential development density specified on the plan encompasses a density range, and accordingly, provides for considerable flexibility in the selection of local residential land use regulations while permitting attainment of the regional development objectives. Accordingly, the plan recommended that existing and platted residential areas, as well as those areas that have immediate residential development potential and are capable of being economically served by municipal utilities and facilities such as sanitary sewer, public water supply, and schools, be placed in exclusive residential districts and be related, ideally, through the preparation of precise neighborhood unit development plans and local zoning controls enacted in accordance with such plans, to the residential densities indicated on the plan map. It was further recommended that the balance of the residential land use areas recommended for development by 1990 be placed either in exclusive agricultural use districts or residential holding zones to be held for future development at such time as the local community can economically and efficiently extend the essential municipal utilities and facilities to the proposed development area.

In order to provide a gross measure of the extent to which the local communities in the Region have carried out this specific zoning recommendation, an analysis was conducted of the change in residentially zoned areas with respect to two specific subareas of the Region. The first subarea is that for which public sanitary sewer service was available in 1970 as approximated by U. S. Public Land Survey section. The remaining area of the Region, also approximated by U. S. Public Land Survey section, constitutes the second subarea for analysis purposes. The results of this analysis are presented in Table 102. Changes in residential zoning outside of the 1970 sewered area are identified on Map 79.

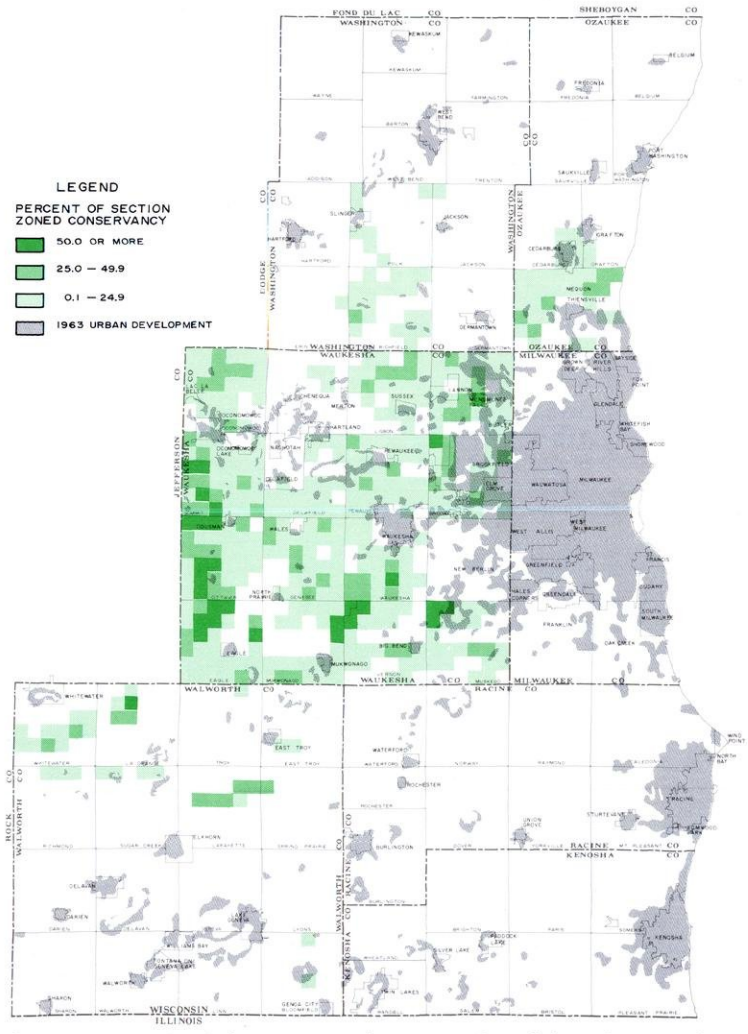
With respect to that area of the Region served by public sanitary sewers in 1970, there were about 190,000 acres of residentially zoned lands in 1964. By 1972 there were about 197,000 acres of residentially zoned lands, representing an increase of approximately 7,500 acres, or 4 percent. Most of the incremental residentially zoned area occurred in Milwaukee County. With respect to that area beyond the limits of the 1970 sewered area, the total lands zoned for residential use declined from approximately 254,000 acres in 1964 to approximately 248,000 acres in 1972, a decline of about 6,000 acres, or about 2 percent. All of the decline was registered in Ozaukee, Racine, and Walworth Counties. In the case of Ozaukee and Racine Counties, it may be largely attributed to comprehensive rezonings conducted by several towns in each of those two counties. With respect to Walworth County, the decline may be largely attributed to the utilization of local zoning ordinances to determine future proposed land uses rather than local land use plans, particularly in the Lake Geneva area of the county.

Nearly 2,000 acres of land were rezoned to residential use during the time involved in Milwaukee County. Since all of Milwaukee County is planned to be served by sanitary sewers by 1990, it may be assumed that these rezoned lands lie within the future sewer service area and will be served by public sanitary sewers when developed. In Kenosha and Washington Counties, only very small amounts of land were actually rezoned to residential land use beyond the area served by public sanitary sewers in 1970. In Waukesha County, however, nearly 7,200

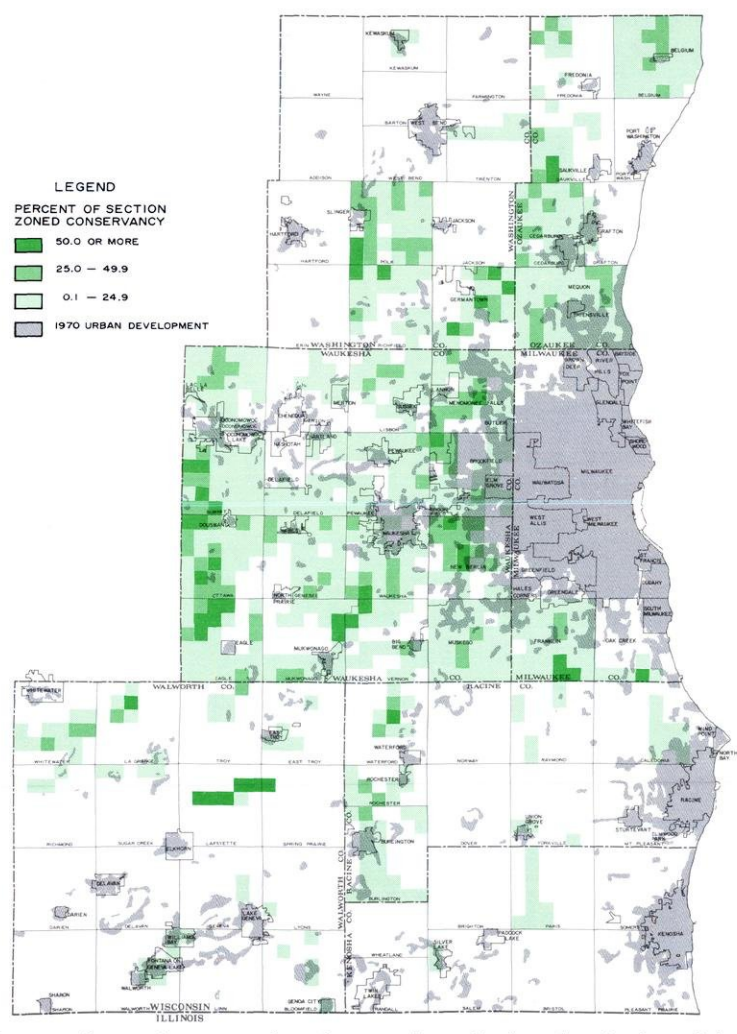
Map 78

LOCALLY PROPOSED CONSERVANCY LAND USE IN THE REGION: 1964 and 1972

1964



1972



Conservancy zoning is important to the preservation of the primary environmental corridors of the Region, as well as to the preservation of scattered woodlands and wetlands not lying within such corridors. In 1964, conservancy zoning was largely confined to townships throughout Waukesha County, as well as a few scattered townships in Ozaukee, Washington, and Walworth Counties. Together, the local conservancy zoning in that year amounted to about 57,000 acres of land. By 1972, the use of the conservancy zoning had spread throughout the Region to include significant areas of Kenosha, Ozaukee, Racine, Washington, and Waukesha Counties. Together, local communities in the Region have placed nearly 87,000 acres of land in conservancy districts, representing an increase of 30,000 acres, or 53 percent, over the 1964 level.

Source: SEWRPC.

Table 102

CHANGE IN RESIDENTIALLY ZONED AREAS IN THE REGION BY COUNTY AND 1970 SEWERED AREA: 1964-1972

County	Residential Zoning Within 1970 Sewered Area				Residential Zoning Beyond 1970 Sewered Area				Total Residential Zoning			
	1964 (Acres)	1972 (Acres)	Change 1964-1972 Acres	Change 1964-1972 Percent	1964 (Acres)	1972 (Acres)	Change 1964-1972 Acres	Change 1964-1972 Percent	1964 (Acres)	1972 (Acres)	Change 1964-1972 Acres	Change 1964-1972 Percent
Kenosha	14,153	12,752	- 1,401	- 9.9	7,720	8,440	720	9.3	21,873	21,192	- 681	- 3.1
Milwaukee . . .	82,074	88,097	6,023	7.3	13,549	15,526	1,977	14.6	95,623	103,623	8,000	8.4
Ozaukee	17,742	17,537	- 205	- 1.2	27,325	22,358	- 4,967	- 18.2	45,067	39,895	- 5,172	- 11.5
Racine.	22,862	22,007	- 855	- 3.7	11,906	6,930	- 4,976	- 41.8	34,768	28,937	- 5,831	- 16.8
Walworth. . . .	9,573	9,965	392	4.1	26,219	19,881	- 6,338	- 24.2	35,792	29,846	- 5,946	- 16.6
Washington . .	7,227	8,849	1,622	22.4	24,013	24,371	358	1.5	31,240	33,220	1,980	6.3
Waukesha. . . .	36,201	38,128	1,927	5.3	143,342	150,541	7,199	5.0	179,543	188,669	9,126	5.1
Region	189,832	197,335	7,503	4.0	254,074	248,047	- 6,027	- 2.4	443,906	445,382	1,476	0.3

Source: SEWRPC.

acres of land were rezoned to residential use in areas not currently served by public sanitary sewers. In general, except for Waukesha County, the local units of government in the Region collectively rezoned relatively little area to residential use from 1964 to 1972 with respect to that portion of the Region not served by public sanitary sewers in 1970.

Prime Agricultural Areas: The regional land use plan recommended that those areas on the plan map devoted to agricultural use, and particularly those lands identified in the planning report as prime agricultural lands, be placed in an exclusive agricultural use district which would permit only agricultural uses. It was recognized, however, that some existing very low density residential colonies and scattered commercial and industrial developments would have to be accommodated in these areas by properly located zoning districts. Similarly, small wood lots and wetlands which are found within the prime agricultural areas would properly be placed in resource conservation districts.

There were in 1963 approximately 467,700 acres of gross prime agricultural lands in the Region. The adopted regional plan recognized that about 21,300 acres of such lands located adjacent to existing urban areas were committed to urban development as early as 1963 because of the prior commitment of heavy capital investments in utility extensions. The remaining approximately 446,400 acres were recommended for preservation in permanent agricultural use through the zoning techniques noted above.

All local zoning ordinances in the Region were reviewed to determine the extent to which exclusive agricultural or similar protective zoning districts have been created since plan adoption, and the spatial extent to which these zones have been utilized to protect the delineated prime agricultural areas. The results of this review and accompanying analysis are summarized in Table 103 and on Map 80.

Table 103

PRIME AGRICULTURAL LANDS PROPERLY PROTECTED THROUGH LOCAL ZONING IN THE REGION BY COUNTY: 1972

County	Recommended 1990 Prime Agricultural Lands[a] to be Preserved		Prime Agricultural Lands Properly Protected Through Local Zoning: 1972	
	Acres	Percent of Total	Acres	Percent
Kenosha	71,677	16.1	18,702	26
Milwaukee . . .	4,513	1.0	--	--
Ozaukee	42,989	9.6	19,844	46
Racine.	75,246	16.9	2,364	3
Walworth. . . .	122,154	27.4	--	--
Washington . .	55,570	12.4	12,644	23
Waukesha. . . .	74,311	16.6	6,986	9
Region	446,460	100.0	60,540	14

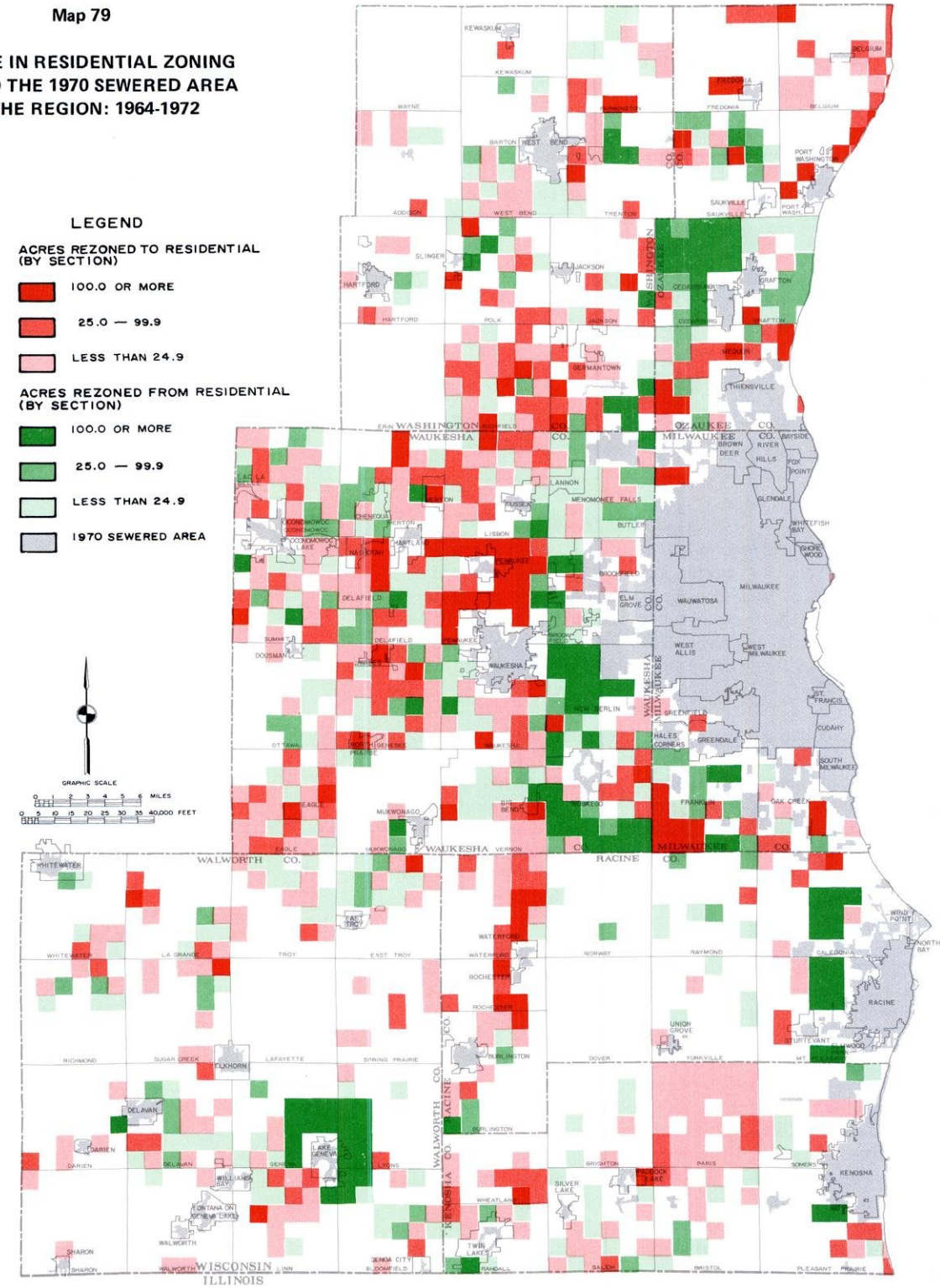
[a] *Gross prime agricultural lands.*

Source: SEWRPC.

The analysis revealed that local communities have placed about 60,500 acres of prime agricultural lands, or about 14 percent of the total prime agricultural land area recommended to be preserved, into zoning districts which properly protect the underlying resource base. Nearly 20,000 acres of prime agricultural land in Ozaukee County, representing about 46 percent of the total area of such land in the county, have been properly zoned by the local communities in that county. Much of this acreage is concentrated in the Town of Belgium, which in 1966 established an exclusive agricultural use district with a 20-acre farm size minimum. Additional communities in Ozaukee County which established proper zoning

Map 79

CHANGE IN RESIDENTIAL ZONING BEYOND THE 1970 SEWERED AREA IN THE REGION: 1964-1972

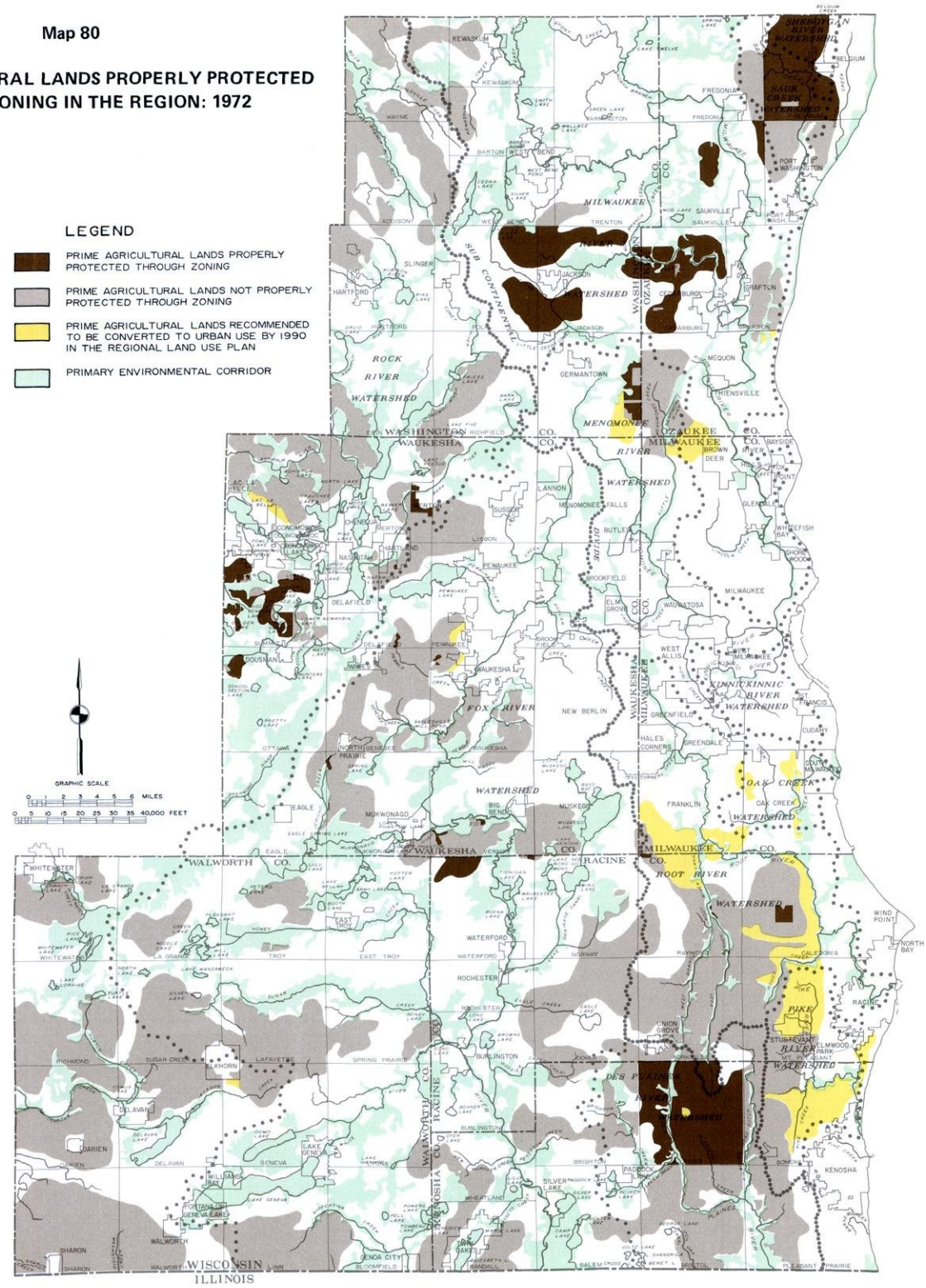


The adopted regional land use plan recommended that local communities relate their residential zoning decisions to the urban area delineations identified on the regional land use plan map. In particular, the plan recommended that local communities not rezone land to residential use ahead of the availability of centralized sanitary sewer service. The above map identifies those portions of the Region that were served by public sanitary sewer in 1970, as well as changes in residential zoning made in unsewered areas from 1964 to 1972. The total amount of land zoned for residential use in the unsewered portion of the Region actually declined by 6,000 acres, or about 2 percent, from 254,000 acres in 1964 to 248,000 acres in 1972. This decline was largely registered in Ozaukee, Racine, and Walworth Counties, with small increases in Kenosha and Washington Counties and a very large increase in Waukesha County.

Source: SEWRPC.

Map 80

PRIME AGRICULTURAL LANDS PROPERLY PROTECTED THROUGH ZONING IN THE REGION: 1972



The adopted 1990 regional land use plan recommended that about 446,400 acres of prime agricultural land be preserved in permanent agricultural use through the establishment of exclusive use agricultural zoning. By 1972 about 60,500 acres of prime agricultural land in the Region, or about 14 percent of the total, had been placed into zoning districts which properly protect this important element of the underlying and sustaining material resource base. The most significant amounts of such land are located in Ozaukee, Washington, and Kenosha Counties, with less significant amounts located in Racine and Waukesha Counties.

Source: SEWRPC.

districts for prime agricultural land protection include the Towns of Cedarburg and Saukville and the City of Mequon. Each of these has a zoning district with a five-acre lot or farm size minimum, the lowest minimum lot area designation considered to properly protect exclusive agricultural lands.

About 18,700 acres of prime agricultural land in Kenosha County have been properly preserved through zoning, representing 26 percent of the total area of such land in that county. All of this is located in the Town of Paris, which has established an exclusive agricultural use district with a 10-acre farm size minimum. Three communities in Washington County—the Towns of Jackson and Polk and the Village of Germantown—have established exclusive agricultural zoning districts. Together these districts are currently protecting about 12,600 acres of prime agricultural land, representing about 23 percent of the total area of such lands in Washington County.

Less significant amounts of exclusive agricultural zoning activity have taken place in Waukesha and Racine Counties. The Racine County zoning ordinance, which in 1972 was in effect in five of the nine Racine County towns, provides for several exclusive agricultural use districts, one of which provides for a 40-acre farm size minimum. As of 1972, these districts had been applied in the Towns of Caledonia, Raymond, and Waterford to a total area of about 2,400 acres. Finally, in Waukesha County exclusive agricultural use districts have been established in the Waukesha County floodland-shoreland zoning ordinance and in the Town of Summit. These districts have collectively been applied to nearly 7,000 acres of prime agricultural land, representing about 9 percent of the total area of such land in Waukesha County.

It should be noted that on August 13, 1974, the Walworth County Board of Supervisors adopted new Walworth County comprehensive and floodland and shoreland zoning ordinances. These ordinances contain a number of exclusive agricultural and resource-oriented conservation districts. Upon ratification of the comprehensive zoning ordinance by the towns in Walworth County, nearly all of the prime agricultural lands in that county, totally about 122,000 acres, will be properly zoned.

Primary Environmental Corridors: The primary environmental corridors shown on the adopted regional land use plan were recommended to be placed in several zoning districts as dictated by consideration of existing development, the character of the specific resource values to be protected in the corridor, and the attainment of the open space preservation and resource conservation objectives of the corridor. Of particular usefulness in properly protecting primary environmental corridor lands are conservancy districts, park and outdoor recreation districts, exclusive agricultural use districts, floodland districts, and estate-type residential use districts providing for lot sizes at least five acres in area.

The primary environmental corridors encompass about 341,500 acres, or about 20 percent of the total land and water area of the Region. In order to determine the extent to which local communities in the Region have acted to properly zone such lands, an analysis was made of all local zoning ordinances to determine the extent to which conservancy, park and outdoor recreation, estate-type residential, exclusive agricultural, and floodland zoning districts have been applied to protect the delineated primary environmental corridor lands.[16] The results of this analysis are summarized in Table 104 and on Map 81.

In total, about 130,000 acres of prime environmental corridor have been properly protected through local zoning in the Region, which represents about 38 percent of the total primary environmental area. The majority of such lands have been preserved through the widespread enactment in recent years of floodland zoning ordinances, which are discussed in more detail in a later section of this chapter. Most of the Region's primary environmental corridors encompass natural stream courses and their associated floodlands. Consequently, the enactment of sound floodland zoning ordinances in and of itself would go a long way toward the regional land use plan development objective of preserving such corridors in generally open space type land uses.

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[16] *Because of the extensive current floodland zoning activity in the Region, it was determined to update the inventory of local zoning ordinances to include all floodland zoning ordinances adopted through mid-1974. Such floodland ordinances are particularly important in preserving primary environmental corridor lands, and it was accordingly thought desirable to include all such ordinances in the analysis that had been placed into effect at the writing of this report, even though the base year of the community plans and zoning inventory was 1972.*

Table 104

PRIMARY ENVIRONMENTAL CORRIDOR LANDS PROPERLY PROTECTED THROUGH LOCAL ZONING IN THE REGION BY COUNTY: 1974

County	Recommended 1990 Primary Environmental Corridor to be Preserved[a]		Primary Environmental Corridor Properly Protected Through Local Zoning: 1974[b]	
	Acres	Percent of Total	Acres	Percent of Total
Kenosha	29,490	8.6	7,574	26
Milwaukee	14,779	4.3	2,899	20
Ozaukee	24,648	7.2	14,333	58
Racine	33,750	9.9	19,025	56
Walworth	88,527	25.9	26,540	30
Washington	56,286	16.5	7,884	14
Waukesha	94,051	27.6	51,835	55
Region	341,531	100.0	130,090	38

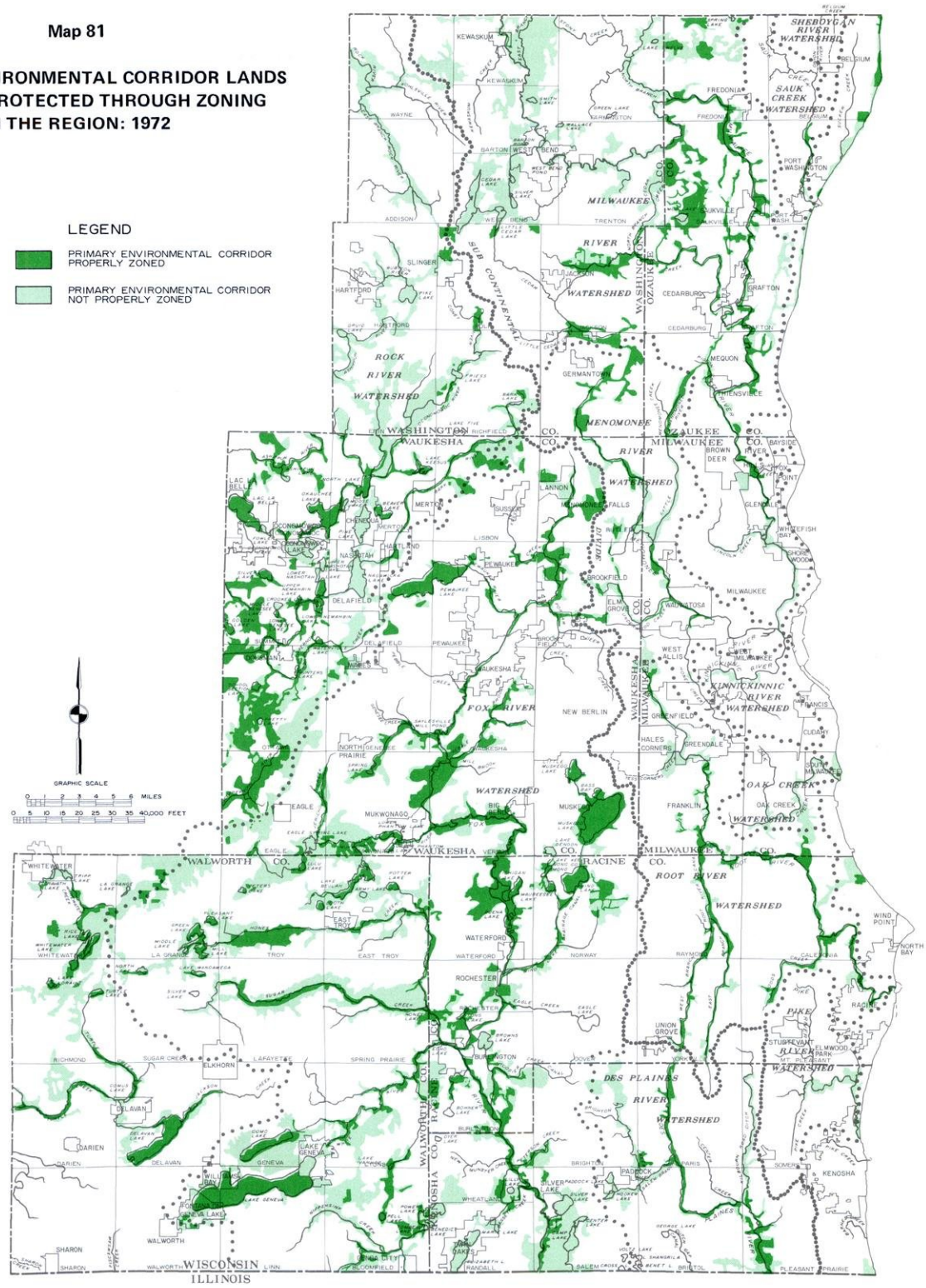
[a] *Gross corridor area.*

[b] *Surface water assumed to be protected even if not specifically zoned.*

Source: SEWRPC.

Map 81

PRIMARY ENVIRONMENTAL CORRIDOR LANDS PROPERLY PROTECTED THROUGH ZONING IN THE REGION: 1972



One of the most important recommendations contained in the 1990 regional land use plan related to the preservation of the primary environmental corridors of the Region in essentially natural open use. By 1972 about 130,000 acres of primary environmental corridor, representing about 38 percent of the total corridor area, had been protected from incompatible land use development through local zoning. The majority of such lands have been preserved through the widespread enactment of floodland zoning ordinances. Other zoning techniques which properly protect primary environmental corridor lands include exclusive park and outdoor recreational districts, conservancy districts, exclusive use agricultural districts, and very low density, estate type residential districts.

Source: SEWRPC.

While recent activity in floodland zoning has resulted in large part from a legislative mandate to the local units of government in Wisconsin to properly protect natural floodlands, which was included in the State Water Resources Act of 1966, it is significant to note that many local units of government in the Region had previously enacted wetland-conservancy zoning districts to protect at least some of the natural floodlands, and that other communities had begun steps on their own to enact proper floodland regulations. In addition to floodland zoning, a number of communities in the Region have enacted exclusive park and outdoor recreation districts, conservancy districts, exclusive agricultural districts, and estate-type residential districts, which also properly protect and preserve the primary environmental corridor land and water areas.

Ozaukee, Racine, and Waukesha Counties have acted to properly protect through zoning over one-half of the primary environmental corridor lands within those counties. Kenosha, Milwaukee, and Walworth Counties have acted to properly zone for the protection of 26, 20, and 30 percent, respectively, of the primary environmental corridor lands located in those counties. Since it has not to date enacted a county floodland zoning ordinance, Washington County has protected through zoning only about 14 percent of its primary environmental corridor lands.[17]

It should be noted that the foregoing analysis relates only to the protection of the primary environmental corridors through local zoning. As noted in Chapter V of this report, there are additional primary environmental corridor lands currently in public ownership, which may be zoned for incompatible land use development. Hence, the zoning analysis alone understates somewhat the total amount of primary environmental corridor that is actually protected and preserved from incompatible land use development.

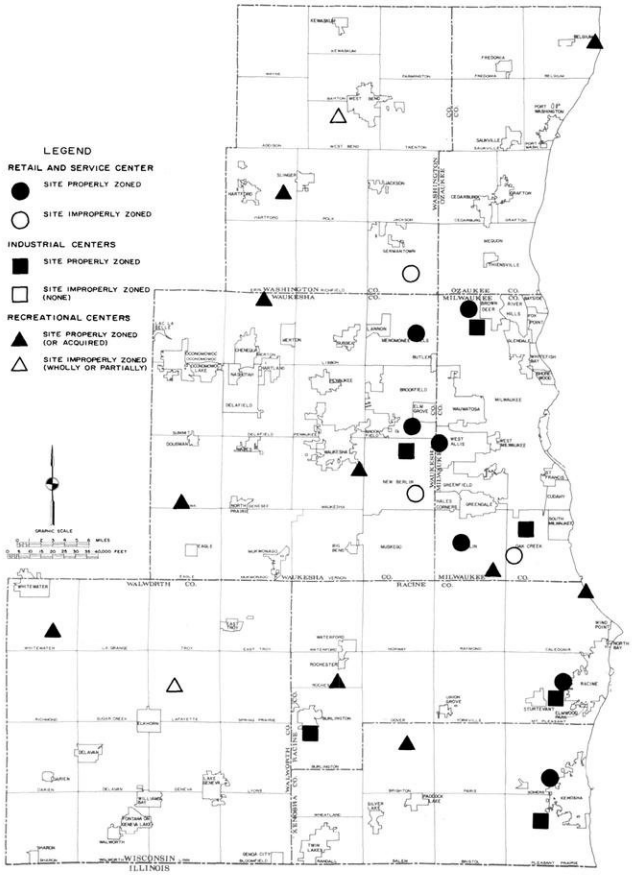
Major Regional Centers: The adopted 1990 regional land use plan identified, in a general manner, the locations of 10 new major retail and service sites to serve the Region, six new major industrial sites, and 12 new major regional outdoor recreation sites. The plan further recommended that local communities appropriately act to identify more precisely the location of such sites in local planning and zoning studies, and then properly zone those sites to ensure preservation for the intended use. Accordingly, an analysis was conducted to determine the extent to which this specific plan recommendation has been carried out to date (see Map 82).

With respect to the 10 new major retail and service centers, three—Brookfield, West Allis, and Granville—were precisely located, properly zoned, secured for development, and developed for major regional retail and service purposes by the end of 1972. Two additional centers—Kenosha-West and Racine-West—were precisely located in comprehensive community development plans prepared for the Kenosha and Racine Urban Planning Districts by the Commission, and have now been properly zoned for regional commercial use.

Two other sites—Franklin and Germantown—have been precisely located through the preparation of neighborhood unit development plans by the Commission for the communities involved, with the Franklin site already properly zoned and the Germantown site placed into a holding district for future rezoning to commercial use after public hearing and adoption of the neighborhood

Map 82

ZONING OF SITES FOR RECOMMENDED REGIONAL CENTERS: 1974



The adopted 1990 regional land use plan recommended that local communities act to properly zone those sites identified in the plan for new major retail and service, industrial, and outdoor recreational centers. As shown on the above map, eight of the 10 proposed new regional retail and service sites have been properly zoned, along with all six of the proposed new major industrial centers and ten of the 12 recommended regional outdoor recreation sites.

Source: SEWRPC.

[17] *The Washington County Park and Planning Commission is currently (1974) in the process of preparing a county floodland zoning ordinance which would greatly assist in properly carrying out the primary environmental corridor recommendations contained in the adopted regional land use plan.*

plan. One additional site—Menomonee Falls—was rezoned in 1973 by the Village of Menomonee Falls to a proper regional commercial zoning district designation. The two remaining sites—Oak Creek and New Berlin—have not as yet been rezoned for commercial development purposes, nor has any incompatible development taken place to prevent such rezoning.

With respect to the Oak Creek site, however, the new comprehensive plan for the City of Oak Creek, adopted on June 5, 1974 by the City Plan Commission, recommends that the proposed regional retail and service center for Oak Creek be located approximately one mile north of the site recommended in the 1990 regional land use plan in an area bounded by Puetz Road and the proposed Belt Freeway on the south, IH 94 on the east, Drexel Avenue on the north, and S. 27th Street on the west. This local decision by the City of Oak Creek has important ramifications in the regional land use-transportation plan reevaluation, particularly with respect to the impact of the new site on the design of the arterial street system, including the proposed Belt Freeway.

With respect to the six proposed new major industrial centers, all have been or are in the process of being more precisely located and delineated, and in general, have been properly zoned. Two of the six centers—Kenosha-West and Racine-West—have been precisely identified and delineated in the aforementioned comprehensive planning programs for the Kenosha and Racine Urban Planning Districts. Nearly all of the 930 acres of recommended major industrial district identified in the comprehensive plan for the Kenosha Planning District have been properly zoned. Similarly, all of the nearly 1,400 acres of the Racine-West industrial zone in the Town of Mt. Pleasant, as identified in the comprehensive plan for the Racine Urban Planning District, have been properly zoned.

Three additional centers—Granville, Oak Creek, and New Berlin—have been precisely identified and properly zoned by the Cities of Milwaukee, Oak Creek, and New Berlin, respectively, with over 1,400 acres zoned for industrial use at the Granville location, nearly 1,300 acres zoned for industrial use at the Oak Creek location, and about 1,000 acres zoned for industrial use at the New Berlin location. With respect to the sixth proposed regional industrial center—Burlington—the city has identified in a planning report[18] an area of approximately 1,200 acres as a major industrial center, of which approximately 300 acres are already properly zoned.

As indicated in Chapter VI of this report, nine of the 12 recommended regional outdoor recreation sites have already been acquired and at least partially developed by the various public agencies concerned. One of the three remaining sites—Monches in Waukesha County—has been partially acquired by the Waukesha County Park and Planning Commission, with about 200 acres of the proposed 440-acre park site now in public ownership. The remaining area of this site has not as yet been properly zoned. As currently zoned, urban residential development on lots of one acre would be permitted on the remaining portion of the site.

With respect to the Paradise Valley site in the Town of West Bend, Washington County, one of the two recommended sites not yet purchased for public use, the entire site is zoned to permit urban residential development on lots of one acre. Although the bulk of the site is currently used for private outdoor recreation purposes, there would be nothing to prevent the operator of the private recreational site to sell the land for development purposes and permit development to proceed in accordance with the current zoning.

Approximately 420 acres of the 770-acre Sugar Creek site in the Town of LaFayette, Walworth County, are zoned for conservancy use and thus are properly protected. The remaining 350 acres are zoned in an agricultural district that permits urban residential development on lots of one acre. The new Walworth County Zoning Ordinance, if ratified by the Town of LaFayette, would properly zone the entire site.

Special Land Use Regulations

In addition to the zoning recommendations discussed above, the adopted 1990 regional land use plan made several recommendations relating to the enactment of special land use regulations by local units of government. These include the enactment of special soil and water conservation regulations by the county soil and water conservation districts, the utilization of soils data to restrict installation of onsite soil absorption sewage disposal systems and prevent the improper division of land for such purposes, the enactment of floodland zoning regulations, and the enactment of shoreland zoning regulations.

Soil and Water Conservation Regulations: Chapter 92 of the Wisconsin Statutes permits county soil and water conservation districts to formulate proposed soil and water conservation regulations in order to conserve soil and water resources; control erosion; reduce stream pollution from agricultural sources; and promote good soil and water conservation practices, including the construction of upland water control structures such as terraces, terrace outlets, grassed waterways, erosion control dams, dikes, ponds, and diversion channels. It also permits the application of good land management practices, such as contour cultivating, contour stripcropping, and the seeding and planting of lands to special plants, trees, and grasses. Once such special regulations are formulated, the county district must hold a public hearing and conduct a referendum on the matter. If two-thirds of the land occupiers affected by the proposed regulations approve them, the district may recommend their adoption to the county board concerned. To date, no action has been taken within the Region by any of the soil and water conservation districts to carry out this regional land use plan recommendation.

[18] *See SEWRPC Community Assistance Planning Report No. 1, Residential, Commercial, and Industrial Neighborhoods, City of Burlington.*

Soil Restrictions: The regional land use plan recommended that the regional soil survey and accompanying interpretive analyses conducted and prepared by the U. S. Soil Conservation Service be utilized by local units of government to prohibit the installation of new onsite soil absorption septic tank systems on soils having very severe limitations for such use, and to severely restrict the installation of such systems on soils having severe limitations for such use. It was envisioned that the soil survey data could be directly incorporated into local health and sanitary codes and local subdivision control regulations to accomplish this development objective.

Considerable progress has been made in carrying out this important plan recommendation. As shown on Map 83, the soil regulatory concepts have been embodied in sanitary and health codes applicable to about 2,024 square miles, or about 76 percent of the area of the Region. The pioneer effort in this respect was the enactment of the Walworth County Sanitary Ordinance in 1966. This was followed by adoption of the Washington County Sanitary Ordinance, the Waukesha County Community Health Code, the Kenosha County Shoreland Sanitary Ordinance, the Ozaukee County Sanitary Ordinance, and the Town of Waterford Sanitary Ordinance.

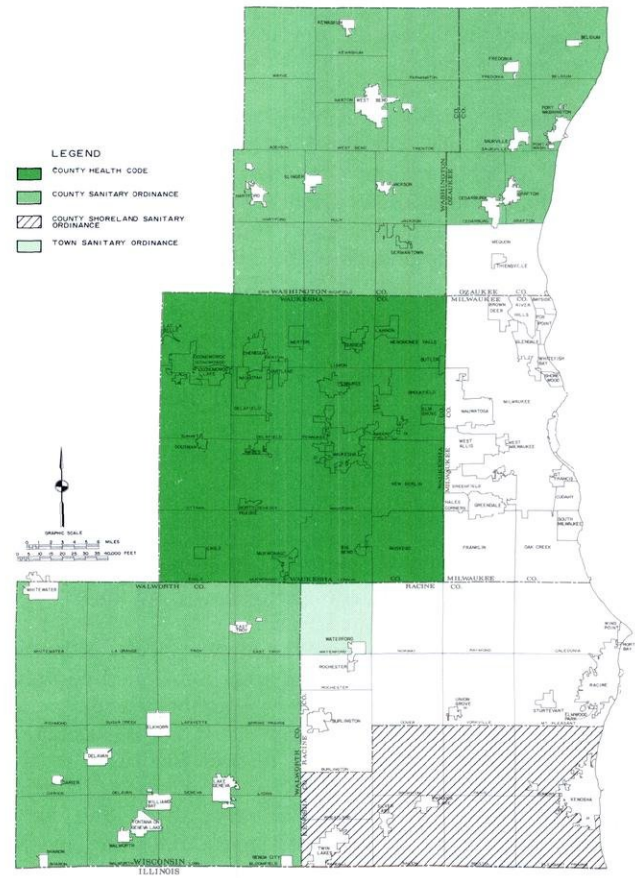
The enactment of such ordinances has had a considerable impact in curbing the abuse of the soil and water resources of the Region through the placement of septic tank systems in those areas of the Region where soil impermeability, high water tables, susceptibility to flooding, or steep slopes do not permit onsite soil absorption sewage disposal to take place properly. It is also important to note that, since adoption of the regional land use plan, the Wisconsin Department of Health and Social Services has taken action at the state level to amend appropriate sections of the Wisconsin Administrative Code to help assure that the abuse of the soil and water resources in the state that occurred from 1950 to 1963 is not continued. Many of the restrictions incorporated into the new state codes follow the local restrictions recommended by the Commission and included in the local sanitary and health codes enacted prior to the revision of the state codes.

In addition to the health and sanitary codes, the Commission recommended that local subdivision control ordinances include soil related regulations which would prohibit the improper division of land for urban development with septic tanks on soils having severe and very severe limitations for such use. As shown on Map 84, such soil restrictive clauses have been incorporated into new county subdivision control ordinances in Kenosha, Walworth, and Washington Counties, and into the local subdivision control ordinances in the Cities of Elkhorn and Muskego; the Villages of Eagle, Menomonee Falls, and Mukwonago; and the Towns of Merton, Polk, and Saukville. Together, these ordinances apply to about 1,296 square miles of land, or about 48 percent of the area of the Region.

Floodland Zoning: The regional land use plan recommended that local communities adopt special floodland zoning regulations designed to prohibit filling and development in natural floodlands, and to assure that new urban development does not indiscriminately occur in floodlands already developed for urban land use purposes. This basic recommendation was supplemented by more specific floodland zoning recommendations set forth in the adopted watershed plans for the Fox, Milwaukee, and Root River watersheds.

Map 83

SOIL RESTRICTIVE SANITARY AND HEALTH CODES IN THE REGION: 1972

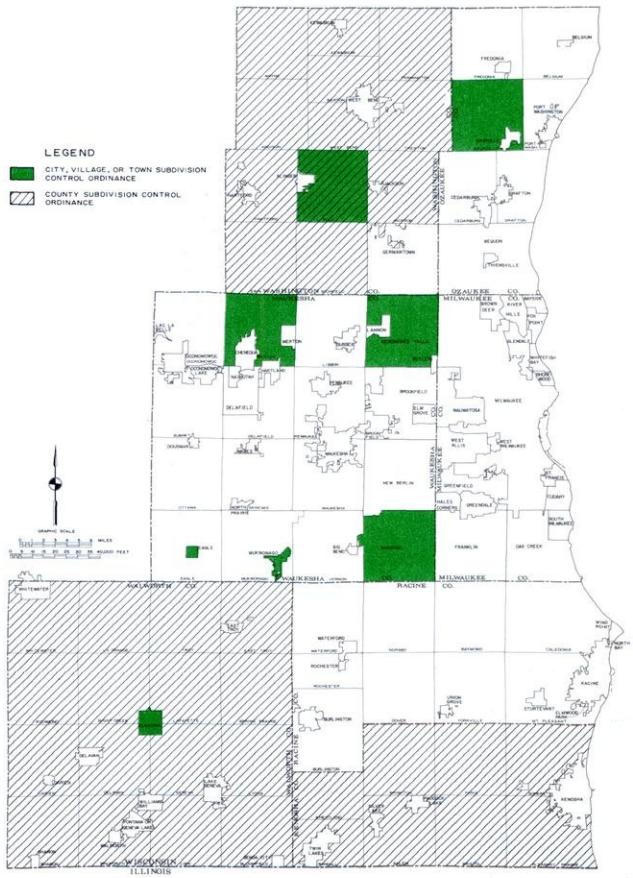


The adopted 1990 regional land use plan recommended that local communities utilize the detailed soil survey and accompanying interpretive analyses, prepared for the Commission by the U. S. Department of Agriculture, Soil Conservation Service under the initial regional land use-transportation planning effort, to regulate the installation of new onsite soil absorption septic tank sewage disposal systems. By 1972 such soil-related regulatory concepts had been embodied in sanitary and health codes applying to about 2,024 square miles, or about 76 percent of the area of the Region, as shown on the above map. The pioneer effort in this respect was the Walworth County Sanitary Ordinance enacted in 1966. The regulatory concepts expressed in that ordinance were then carried over into similar sanitary ordinances or health codes adopted in Washington County in 1969, Waukesha County in 1970, Kenosha County in 1970, and Ozaukee County in 1971.

Source: SEWRPC.

Map 84

SOIL RESTRICTIVE SUBDIVISION CONTROL ORDINANCES IN THE REGION: 1972

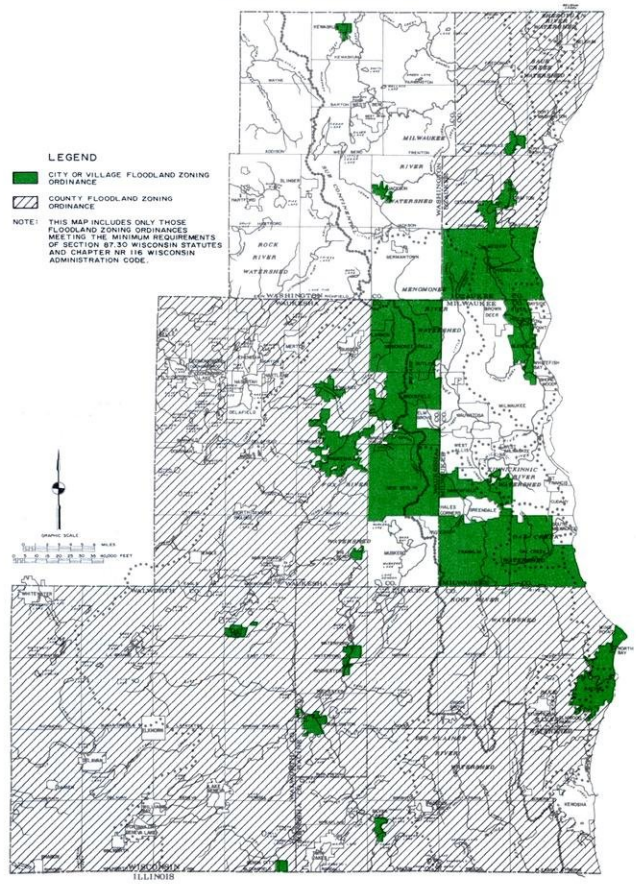


The adopted 1990 regional land use plan recommended that the detailed soil survey and accompanying interpretive analyses prepared for the Commission by the U. S. Department of Agriculture, Soil Conservation Service, under the initial required land use-transportation planning effort, be directly incorporated into local land subdivision control ordinances in order to prevent the subdivision of land poorly suited for urban development. By 1972 such soil restrictive clauses had been incorporated into subdivision control ordinances applying to about 1,296 square miles of land or about 48 percent of the area of the Region. Such soil restrictive regulations have been included in three countywide subdivision control ordinances, three town subdivision control ordinances, two city subdivision control ordinances, and three village subdivision control ordinances.

Source: SEWRPC.

Map 85

FLOODLAND ZONING ORDINANCES IN THE REGION: 1974



The adopted 1990 regional land use plan recommended that local communities adopt zoning regulations designed to prohibit the unwise filling and development of natural floodlands. In 1974, such ordinances had been adopted by five of the six counties in the Region having unincorporated land area, and by 27 cities and villages.

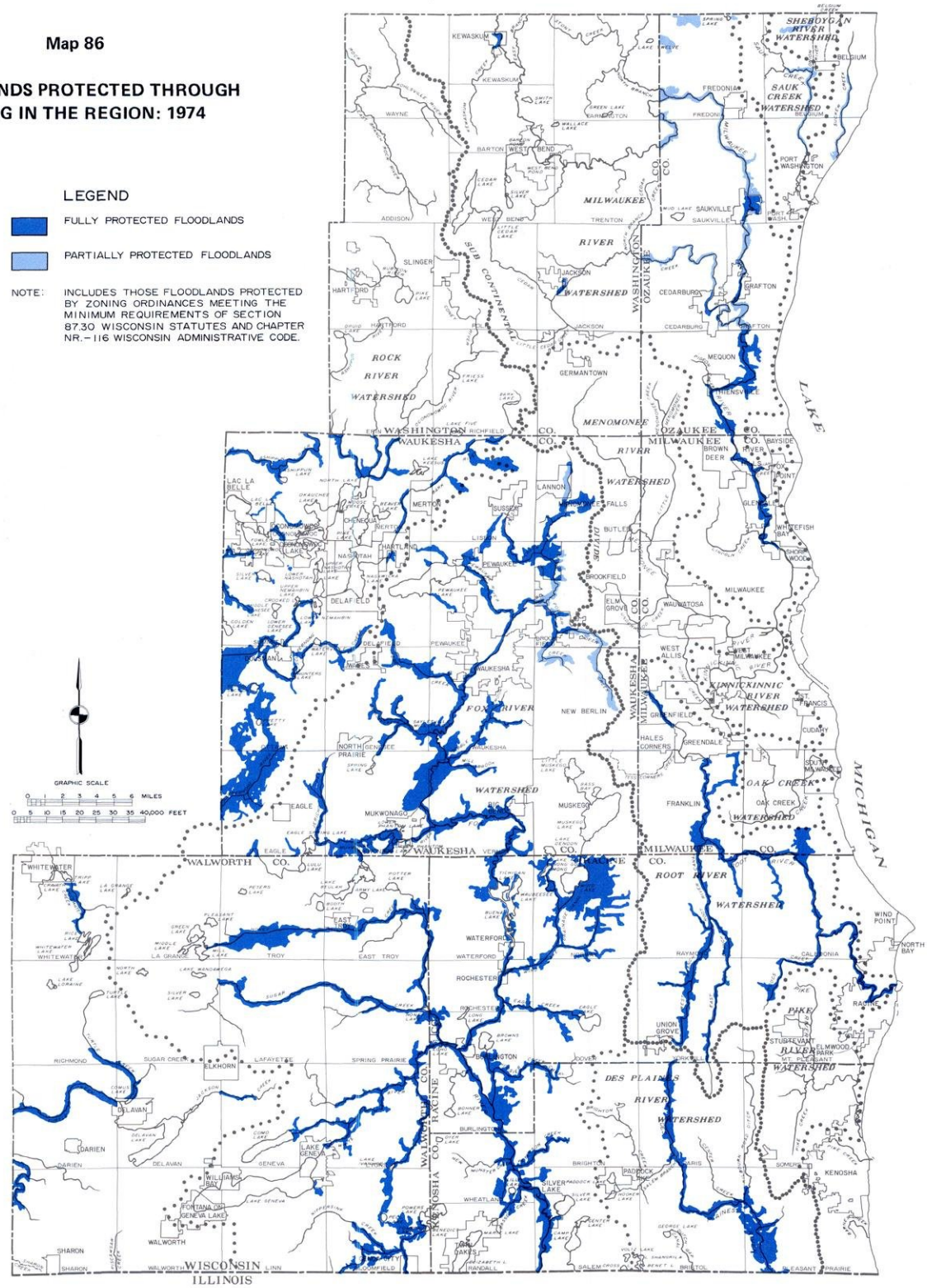
Source: SEWRPC.

As noted earlier in this chapter, considerable progress has been made to date in the enactment of local floodland zoning ordinances. The regional land use plan recommended that local communities adopt special floodland zoning regulations designed to prohibit filling and building in the natural floodlands, that is, the area contained within the 100-year recurrence interval flood hazard lines, and thus preserve not only the existing floodwater conveyance and storage capacities of the riverine areas, but also important associated elements of the natural resource base. The Root, Fox, and Milwaukee River watershed plans identify those stream reaches where urban development has already encroached on natural floodlands and destroyed those resource base elements that had existed on the floodland fringe. In those instances, the watershed plans recommended the adoption of an urban floodway that would recognize existing development and preserve the remaining floodwater conveyance capacity.

By 1974, floodland zoning ordinances had been adopted by five of the six counties in the Region having unincorporated land areas, by 12 of the 28 cities, and by 15 of the 54 villages (see Map 85). In all but four cases, these floodland zoning ordinances follow the plan recommendations, and thereby fully protect the remaining natural 100-year recurrence interval floodlands. In four cases—the Cities of Brookfield and New Berlin, the Village of Lannon, and the unincorporated areas of Ozaukee County—the existing floodland zoning ordinances, while

Map 86

FLOODLANDS PROTECTED THROUGH ZONING IN THE REGION: 1974



Those floodlands protected through zoning in the Region are shown on the above map. The widespread enactment of floodland zoning regulations since 1964 represents one of the most significant land use regulatory activities ever in the Region, and contributes substantially toward achieving the regional land use plan objective of protecting and preserving the primary environmental corridors in the Region in essentially open, natural uses. Floodland zoning fully protecting the undeveloped floodlands has been extended to about 416 miles of perennial stream channel, or about 36 percent of the total perennial stream channel in the Region. Floodland zoning partially protecting the undeveloped floodlands pertains to an additional 64 miles of perennial stream channel, or about 6 percent of the total perennial stream channel in the Region.

Source: SEWRPC.

meeting minimum state standards for the protection of floodwater conveyance capacity and abatement of potential flood damages, do not fully protect the natural floodlands because the ordinances permit filling and development along the floodland fringe. Collectively, those ordinances based upon Commission recommendations fully protect the undeveloped floodlands along about 416 miles of perennial stream channel, or about 36 percent of the total perennial stream channel in the Region. The ordinances in the four communities which only partially protect the undeveloped floodlands pertain to an additional 64 miles of perennial stream channel, or about 6 percent of the total perennial stream channel in the Region (see Map 86).

Shoreland Zoning: The regional land use plan recommended that all of the six counties in the Region having unincorporated area take specific action to enact county shoreland zoning ordinances as required under a legislative mandate also included in the State Water Resources Act of 1966. Such regulations would apply to statutorily defined shoreland areas—those areas lying within 1,000 feet of a lake and 300 feet of a river or stream or to the landward side of the floodplain if it extends beyond such distances. The basic purpose of shoreland zoning regulations is to assist in protecting and maintaining water quality. Shoreland zoning regulations include minimum lot areas to ensure against excessive lakeshore densities, restrictions against excessive cutting and filling that would contribute to shoreline erosion and the destruction of shoreline natural beauty, and restrictions against the installation of onsite sewage disposal systems in those portions of shorelands not well suited for such use. All six counties having unincorporated shoreland areas have acted to enact appropriate shoreland zoning regulations to properly carry out this recommendation (see Map 87).

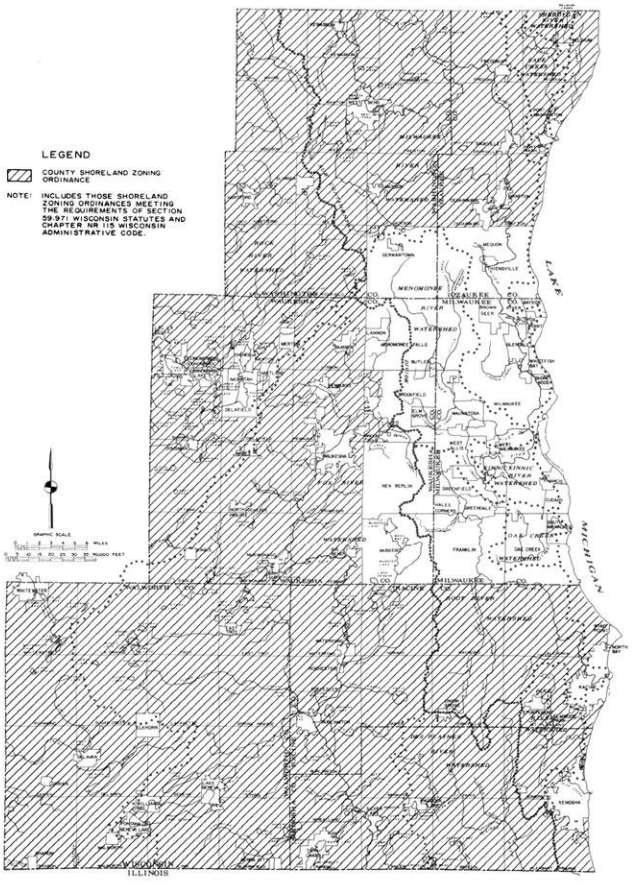
Subdivision Regulations

The adopted regional land use and transportation plans recommended that counties, cities, villages, and towns in the Region revise their existing or prepare new subdivision control ordinances in order to assist in the preservation and protection of recommended regional park sites and primary environmental corridor lands through the provision of parkland dedication and/or reservation provisions; assure that new urban development is placed in those areas where essential public facilities and services can be readily provided; assist in implementation of the regional transportation plan through regulations that assure dedication or reservation of proposed arterial street rights-of-way; and provide appropriate street and highway design standards as an aid in assuring protection of capacity with respect to all new streets and highways. The plan further recommended that such new and revised subdivision control ordinances be based upon or be similar to the SEWRPC Model Land Division Ordinances.[19]

[19]*See Appendix A, SEWRPC Planning Guide No. 1, Land Development Guide, November 1963.*

Map 87

COUNTY SHORELAND ZONING ORDINANCES IN THE REGION: 1974



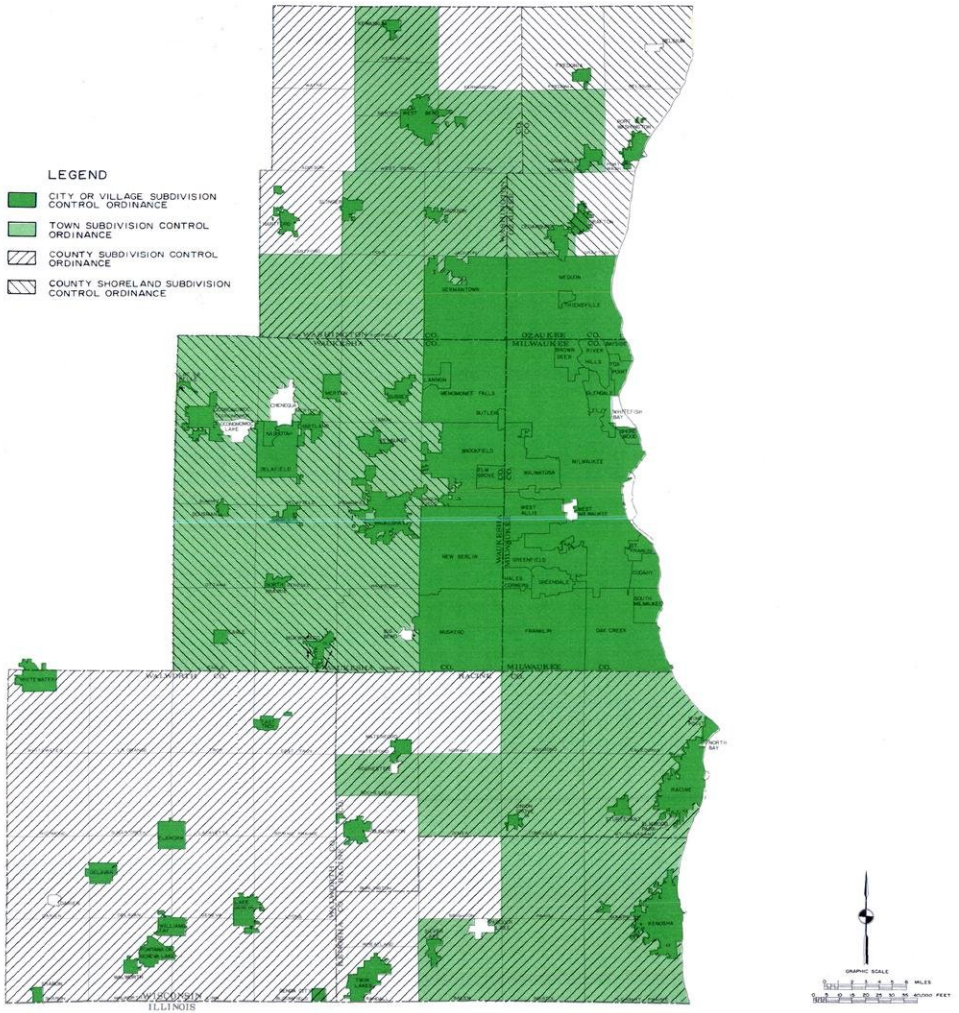
The adopted 1990 regional land use plan recommended that the six counties in the Region with unincorporated area enact county shoreland zoning ordinances to provide for the protection and proper development of lake and stream shorelands. By 1974, all six counties having unincorporated area had enacted such ordinances, which include regulations to ensure against excessive lakeshore development densities, excessive cutting and filling, and the improper installation of septic tank sewage disposal systems.

Source: SEWRPC.

In 1964, local subdivision control ordinances existed in 66 cities and villages, 24 towns, and Racine County in the Region. Together, these ordinances applied to about 1,436 square miles of land, or about 54 percent of the area of the Region. By 1972, such subdivision control regulations existed in 69 cities and villages, 35 towns, and six counties, indicating that considerable activity in providing for new or revised subdivision control regulations had taken place in the interim, particularly with respect to the unincorporated areas of the Region (see Map 88). Together, these ordinances applied to about 2,554 square miles of land, or about 95 percent of the area of the Region.

Map 88

SUBDIVISION CONTROL ORDINANCES IN THE REGION: 1972

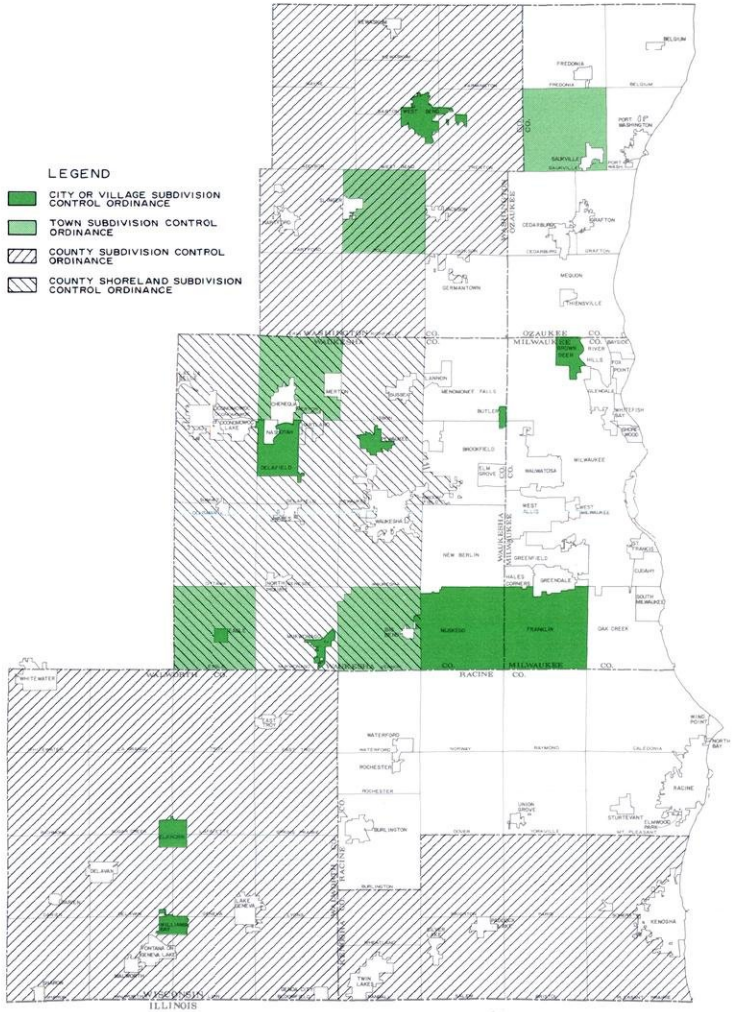


In 1964, local subdivision control ordinances existed in 66 cities and villages, 24 towns, and one county—Racine County—in the Region. By 1972, subdivision control regulations had been extended to cover 71 cities and villages, 35 towns, and six counties. As of 1972, subdivision control ordinances were in effect on about 2,550 square miles of land representing about 95 percent of the area of the Region.

Source: SEWRPC.

Map 89

SUBDIVISION CONTROL ORDINANCES IN THE REGION BASED UPON THE SEWRPC MODEL LAND DIVISION ORDINANCE: 1972



The adopted 1990 regional land use plan recommended that local communities revise their subdivision control ordinances, utilizing the SEWRPC model land division ordinance for such purpose. By 1972 the SEWRPC model land division ordinance had been utilized as the basis for four new county subdivision control ordinances, five new city subdivision control ordinances, six new village subdivision control ordinances, and five new town subdivision control ordinances. Each of these ordinances contains appropriate provisions for park and open space and right-of-way dedication and revision, as well as highway capacity protection. Together, these ordinances based upon the SEWRPC model apply to about 1,400 square miles of land, or over about one-half of the area of the Region.

Source: SEWRPC.

An analysis was conducted of all subdivision control ordinances in the Region to determine how many had been based upon or were very similar to the SEWRPC Model Land Division Ordinance. The results of that analysis are shown on Map 89. Four county subdivision control ordinances—the countywide subdivision control ordinances for Kenosha, Walworth, and Washington Counties and the county shoreland subdivision control ordinance for Waukesha County—have been based upon the SEWRPC Model Land Division Ordinance.

In addition, new or revised land division ordinances based upon the SEWRPC recommendations have been enacted in the Cities of Delafield, Elkhorn, Franklin, Muskego, and West Bend; the Villages of Brown Deer, Butler, Eagle, Mukwonago, Pewaukee, and Williams Bay; and the Towns of Eagle, Merton, Polk, Saukville, and Vernon. Each of these ordinances contains appropriate provisions for park and open space and right-of-way dedication and reservation, and highway capacity protection. Together, these ordinances apply to about 1,421 square miles of land, or about 53 percent of the area of the Region.

Official Mapping

The adopted regional land use and transportation plans included an important recommendation that local units of government in the Region take steps to prepare and adopt official maps pursuant to Section 62.23(6) of the Wisconsin Statutes. Ideally, such maps would be prepared based upon the standard Commission specifications for large-scale topographic base maps, as discussed in SEWRPC Planning Guide No. 2, Official Mapping Guide. Official maps are an important, historically underutilized plan implementation tool, particularly with respect to the mapping of right-of-way for future freeways and important arterial streets and highways, and with respect to the mapping of regional park sites and appropriate portions of the primary environmental corridors.

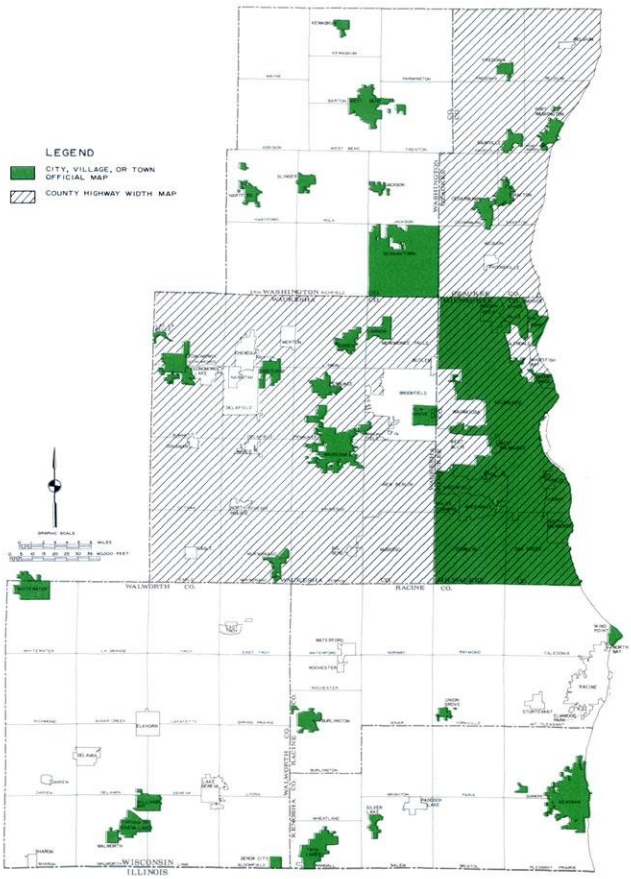
In 1964, 38 cities, villages, and towns in the Region reported the existence of formally adopted official maps. Milwaukee, Ozaukee, and Waukesha Counties also reported the existence of a county highway width map. Together, these maps applied to about 1,087 square miles of land, or about 40 percent of the area of the Region. By 1972 a total of 45 cities, villages, and towns reported the adoption of an official map, with no change in the number of county highway width maps in existence (see Map 90). Together, these maps apply to about 1,094 square miles, or about 41 percent of the area of the Region.

Four of the new official maps—for the Cities of Franklin and West Bend and the Villages of Mukwonago and Saukville—specifically provide right-of-way reservation for portions of proposed freeways. One of the new official maps—for the Village of Mukwonago—specifically includes delineated future parkways in order to protect the primary environmental corridor along the Mukwonago River. The official map remains, however, an underutilized tool for plan implementation. Not enough action has been devoted to amending the established official maps to provide for changes in alignment of, and rights-of-way for, arterial streets and highways as determined in the county jurisdictional highway system plans prepared for the counties in the Region by the Commission, and with respect to including proposed freeway rights-of-way on official maps as such rights-of-way are determined by the highway implementing agencies involved.

A significant problem in this latter respect is the inability of the highway implementing agencies to formally provide local units of government with the specific rights-of-way needed for future freeway facilities, even when known. These delays have been occasioned by legal constraints providing that final decisions on highway rights-of-way cannot be completed, formalized, and promulgated until all regulations relating to the prepara-

Map 90

OFFICIAL MAPS IN THE REGION: 1972



The adopted 1990 regional land use plan recommended that local communities take steps to prepare and adopt official maps in order to protect the rights-of-way of future freeways and arterial streets and highways, as well as the regional park sites and portions of the Region's primary environmental corridors. By 1972, a total of 45 cities, villages, and towns reported the adoption of such an official map, compared to 38 cities, villages, and towns in 1964. Together, the maps in 1972 apply to nearly 1,100 square miles, or about 41 percent of the area of the Region.

Source: SEWRPC.

tion of environmental impact statements and parkland taking statements have been completed and approved, a lengthy and time consuming procedure.

SUMMARY

This chapter has described the findings of the local community plans and land use regulatory ordinances inventory carried out for the base year 1972 under the continuing regional land use-transportation study. Such local plans and land use regulatory ordinances are essential to the formulation of practicable and implementable regional land use and transportation plans, since such local plans and ordinances probably represent the best available expression of local community development objectives. The analyses presented in the chapter relate in part to a comparison of the new 1972 inventory of local community plans and land use regulatory ordinances to the 1964 Commission inventory. Changes in regional land use development objectives as reflected in local zoning ordinance and zoning district map changes during 1964 to 1972 were identified and quantified. In addition, analyses in the chapter identify the extent to which local communities in the Region have specifically adjusted their local plans and land use control ordinances to reflect specific regional land use and transportation plan implementation recommendations. The major inventory findings are:

1. Community comprehensive or master plans have been prepared for 45 of the 146 local units of government in the Region in 1972. Of this total, 24 community plans were prepared prior to the preparation and adoption of the 1990 regional land use plan. Plans for the remaining 21 communities were prepared concurrently with or since preparation and adoption of the regional land use plan. Thus, the latter represent community planning efforts which have been conducted within the context of an established regional land use planning effort. Formal adoption of local comprehensive or master plans continues to lag, however, with only 12 of the 46 completed community plans formally adopted to date by the local plan commissions. The lack of formal adoption of community master or comprehensive plans can have important legal implications, particularly with respect to the review of subdivision plats in areas not recommended for urban development.

2. By 1972, all 146 cities, villages, and towns in the Region had adopted a zoning ordinance and a zoning district map, compared to 129 local zoning ordinances and zoning district maps in 1964. Particularly significant new zoning or comprehensive rezoning actions were taken since 1964 by the Town of Paris, Kenosha County; the Towns of Belgium, Cedarburg, and Saukville, Ozaukee County; the City of Franklin, Milwaukee County; the Towns of Caledonia and Waterford, Racine County; the Towns of Polk and Jackson and the Villages of Germantown and Kewaskum, Washington County; and the City of New Berlin, Waukesha County. Other major comprehensive rezoning programs were underway at the time of the 1972 inventory. Particularly significant among these are the comprehensive county rezoning programs in Kenosha and Walworth Counties.

3. The gross amount of land actually zoned for residential use increased only slightly during the 1964-1972 period, despite an increase of about 30,000 acres in lands actually used for residential purposes. The relatively stable nature of residential land use zoning over this period may be largely attributed to the comprehensive rezoning efforts undertaken by several towns in the Region. Of particular importance in this respect is the imposition of exclusive agricultural land use and conservancy zoning districts in several communities throughout the Region, which in part replaced obsolete residential zoning district classifications. Future reductions in the gross amount of land actually zoned for residential land use may be expected as more communities in rural areas recognize the importance of establishing exclusive use districts, in particular those related to agriculturally and environmentally significant lands. Despite this significant movement toward a more rational residential zoning pattern, in some areas there has been little overall zoning change to more closely approximate the residential land use development patterns envisioned in the adopted regional land use plan. In particular, the rural areas of Waukesha and Washington Counties continue to exhibit a significant pattern of low density residential zoning far in excess of that needed to accommodate future urban growth. For the Region as a whole, there is enough existing residentially zoned land to accommodate a population increase of nearly 2.5 million persons. At the current rate of annual population growth in the Region, it would take about 90 years to fully absorb all the proposed residential areas.

4. Widespread use of agricultural use districts that in fact indiscriminately permit residential subdivisions and scattered residential development on one- to three-acre lots continues in the Region. This latter type of urban development represents neither sound urban nor rural development, and can only contribute to increasing consumption of natural resources and increasing destruction of the natural resource base. Of the approximately 1,538 square miles of land zoned for agricultural use in 1972, only 236 square miles, or about 15 percent, were properly zoned to prohibit incompatible residential development.

5. About 8,600 acres of additional land in the Region were rezoned for commercial land use development purposes from 1964 to 1972. The bulk of the increase occurred in Kenosha, Milwaukee, and Walworth Counties. Similarly, about

13,300 acres of land were rezoned for industrial land use purposes during the same period, with most of this activity occurring in Milwaukee, Ozaukee, Racine, and Waukesha Counties. While some of this increase reflects rezoning of lands to accommodate the regional industrial and commercial centers recommended in the adopted regional land use plan, much of the commercial and industrial rezoning activity, when viewed in a regional context, continues to be based more on hope for increased tax base development than on the ability of the regional economy to generate a demand for the proposed land use changes in the reasonably foreseeable future.

6. Significant reductions in the planned loss of agricultural lands envisioned in local community zoning ordinances occurred from 1964 to 1972. If local development proposals are fully carried out, about 89,000 acres of existing agricultural lands would be converted to other uses, substantially less than the loss of about 218,000 acres of agricultural lands projected in 1964. This change largely reflects the imposition of new exclusive agricultural land use zoning districts in several towns in the Region not previously zoned and in other towns comprehensively rezoned during the period.

7. Local communities in the Region have enacted appropriate zoning to protect about 60,500 acres of prime agricultural lands in the Region. This total represents about 14 percent of the approximately 446,400 acres of gross prime agricultural lands recommended to be preserved in the adopted regional land use plan. Most of the prime agricultural lands now properly protected are found in Ozaukee, Kenosha, and Washington Counties, where the Towns of Belgium, Cedarburg, Saukville, Paris, Jackson, and Polk have all enacted exclusive agricultural zoning districts.

8. Local communities in the Region have acted to properly zone about 130,000 acres of primary environmental corridor, representing about 38 percent of the approximately 341,500 acres of primary environmental corridor recommended to be preserved and protected in the adopted regional land use plan. The bulk of the zoning activity properly protecting these corridors may be attributed to the extensive floodland zoning activity in the Region since regional land use plan adoption.

9. Local units of government in the Region have acted expeditiously to precisely locate nearly all of the recommended major retail and service, industrial, and outdoor recreation centers in the Region. Only three of the 10 recommended new major retail and service centers have yet to be properly zoned in local ordinances. All six of the new recommended regional industrial centers have been properly zoned. All but two of the 12 recommended new major outdoor recreational centers remain to be properly protected in local zoning ordinances.

10. Local units of government in the Region have acted in a significant way to incorporate soil restrictive regulations in sanitary, health, and subdivision ordinances, and thereby curb the very costly abuses to the soil and water resource base of the Region that occur when septic tank sewage disposal systems are placed in areas where they simply cannot function properly. Sanitary and health codes incorporating the regional soil survey data and interpretive analyses now apply to about 2,024 square miles, or about 76 percent of the area in the Region.

11. Floodland zoning ordinances have now been adopted by five of the six counties in the Region having unincorporated areas, and by 27 cities and villages. Together these floodland ordinances protect about 480 miles of perennial stream channel in the Region and 190 square miles of natural floodlands. When viewed collectively, this widespread enactment of floodland regulations is undoubtedly the most significant land use regulatory event in the Region. In related activity, all six counties having unincorporated land area have, as recommended, enacted shoreland zoning ordinances.

12. Considerable activity in providing for new or revised local subdivision control regulations has taken place since 1964, particularly with respect to the unincorporated areas of the Region. Four new county subdivision control ordinances and 10 new city, village, or town subdivision control ordinances have been based upon the Commission recommended Model Land Division Ordinance, and as such, contain appropriate provisions for park and open space dedication and reservation, right-of-way reservation and dedication, and highway capacity protection. Local subdivision control ordinances now apply to about 2,554 square miles of land, or about 95 percent of the area of the Region. In 1964, such ordinances applied to about 1,436 square miles of land, or only about 54 percent of the total area of the Region.

13. The official map remains an underutilized tool for plan implementation in the Region, although several new official maps have been prepared since 1964. Four new official maps specifically contain right-of-way provisions for proposed freeways, while one new official map specifically includes delineated parkways. Official maps now apply to about 1,094 square miles of land, or about 41 percent of the area of the Region, representing only a slight increase in the area covered since 1964.

Taken together, the foregoing inventory findings and analyses reveal that there has indeed been significant progress in the Region since 1964 in adjusting community plans and land use regulatory ordinances to reflect a more rational regional land use development pattern, and to thereby bring local land use development objectives more into accord with regional land use development objectives. Given the relatively short amount of time since regional land use plan adoption, this record may even be described as extraordinary. Much additional work, however, needs to be accomplished before it may be concluded that the local units of government in the Region totally embrace the areawide land use development concepts reflected in the 1990 regional land use plan. Of particular importance is the need to establish exclusive agricultural and natural resource-oriented zoning districts in more counties and towns, and effectively apply such districts to the prime agricultural lands and primary environmental corridors in the Region. In addition, zoning for commercial and industrial development must be brought more into accord with realistic demand for commercial and industrial land absorption. It may be concluded, however, that what has happened to date at the local level of government in terms of changing land use plans and regulatory ordinances does not preclude continued adherence to the key land use development recommendations and concepts expressed in the Commission's 1990 regional land use plan.

Chapter VIII

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 or lack of a transportation facility 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 the demand side of the transportation equation. Evaluation of demand is achieved through the travel inventories, while evaluation of supply 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 1972 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. This chapter also presents the changes which have occurred in the supply of and demand for these facilities from 1963, when inventories were conducted for the initial regional land use-transportation planning effort, to 1972, the plan reevaluation inventory year.

CLASSIFICATION AND SUPPLY 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 access of this traffic to the various land uses within the Region. In addition, it must serve as an important part of the urban storm water drainage system, the location for utilities serving both rural and urban development, and as open space for the admittance of light and air to building sites in density developed urban areas.

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 (see Figures 50 and 51). 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. Individual streets and highways do not serve travel independently in any major way. Rather, most travel involves movement through a network of streets and highways. It becomes necessary, then, to determine how this travel can be channelized within the network logically and efficiently. Functional classification defines the nature of this channelization process by defining the primary function which each street or highway should perform in serving the flow of travel through the total network.

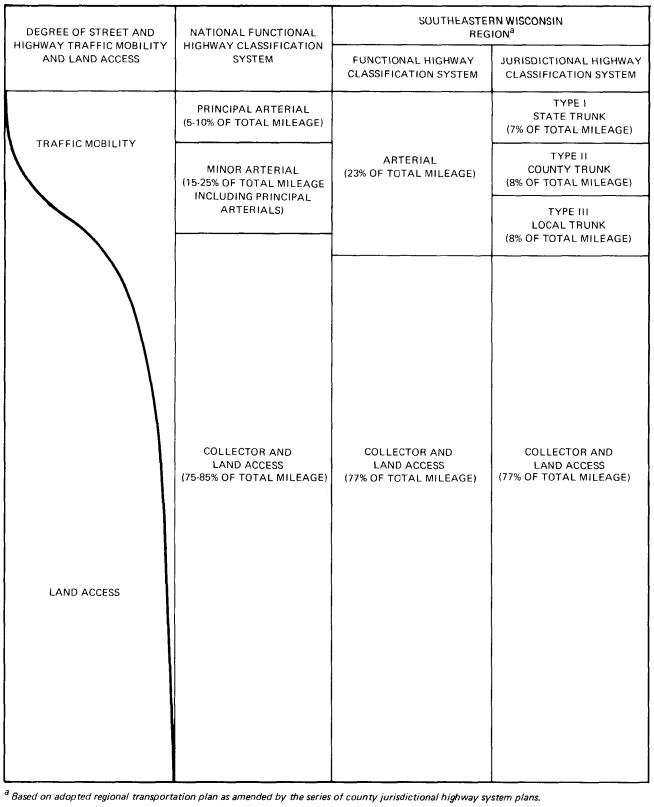
From a transportation system planning standpoint, at least three functional classifications of streets and highways should be recognized: arterial, collector, and local or land access. Arterials are defined as those streets and highways which are intended to serve the through movement of fast or heavy traffic, providing transportation service between two or more major subareas of the Region, between such subareas and points outside the Region, or through the Region. Together the arterials should form an integrated, areawide system, located and designed to properly carry the imposed traffic loadings. Freeways, expressways, and certain parkways, as well as standard arterial streets and highways,[2] all are types of

[1] *The term "level of service" refers to a qualitative description of such factors as travel speed, safety, convenience, and comfort.*

[2] *A freeway is defined as a divided arterial highway with full control of access and grade separations at all intersections. An expressway is 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 is 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, that is, with direct access to abutting property.*

Figure 50

RELATIONSHIP OF FUNCTIONAL HIGHWAY CLASSIFICATION SYSTEMS: URBAN AREAS

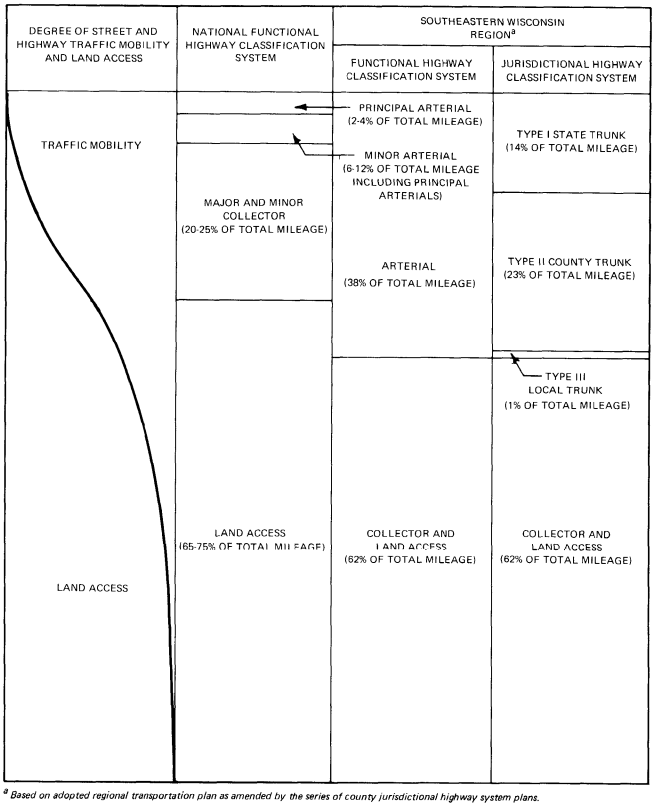


[a] Based on adopted regional transportation plan as amended by the series of county jurisdictional highway system plans.

Source: U. S. Department of Transportation, Federal Highway Administration; and SEWRPC.

Figure 51

RELATIONSHIP OF FUNCTIONAL HIGHWAY CLASSIFICATION SYSTEMS: RURAL AREAS



[a] Based on adopted regional transportation plan as amended by the series of county jurisdictional highway system plans.

Source: U. S. Department of Transportation, Federal Highway Administration; and SEWRPC.

facilities having special design characteristics 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 primarily as connections between the arterial system and the local 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. Local, minor, or land access streets are defined as those streets and highways which are intended to serve primarily as a means of access to abutting property.

Collector and local 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 and delineation of this arterial system is a prerequisite to any highway transportation system inventory for planning purposes.

The Wisconsin Department of Transportation has adopted a national functional highway classification system developed by the U. S. Department of Transportation, Federal Highway Administration, which functionally classifies each street and highway into one of five major types: principal arterial, minor arterial, major collector, minor collector, and local. This classification system and the interrelationship of each type within the total street and highway system is shown in Figures 50 and 51. The relationship between the functional classification developed by the Regional Planning Commission, which classifies each street and highway into only two major functional types—arterial, and collector and local, and the classification system utilized by the Wisconsin Department of Transportation, is also shown in Figures 50 and 51.

As shown in Figure 50, the functional classification of the street and highway system as developed by the

Regional Planning Commission and applied in the urban areas of the Region[3] provides results very similar to those sought by the national classification system with respect to the proportional division of the total system into arterial and collector and land access facilities. Within rural areas, as shown in Figure 51, the functional classification undertaken by the Regional Planning Commission includes, as part of the arterial street and highway system, certain facilities which in the national classification are functionally termed major collector facilities, although in fact these facilities are recognized as performing an arterial function. Indication of this recognition is clearly provided by the fact that the extensions into urban areas of the facilities classified as major and minor collectors in rural areas, under the application of the national classification system by the Wisconsin Department of Transportation, are classified as minor arterials.

The Regional Planning Commission first conducted a functional classification of all existing streets and highways in the Region in 1963 to identify those components of the total street and highway system which were actually serving as arterial and as collector and land access facilities. The results of the 1958 Wisconsin Highway Needs Determination Study were used as a basis for the necessary functional classification. 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—or minor civil division—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 public officials most 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.

A number of quantitative and qualitative characteristics which are indicative of the primary function of the street or highway were considered by the local officials in the conduct of the classification. The traffic characteristics considered most significant to the functional classification included traffic volume and type, operating speed, and average trip length. The physical characteristics of a facility considered most significant to functional classification included horizontal and vertical alignment, pavement width, and pavement type and strength, which together establish capacity and certain important operating characteristics. Also considered in identifying the existing functional classification of a street or highway was the relationship of the facility to the rest of the street and highway system. This included evaluation of such factors as system continuity and spacing and the impact of legal regulations on facility use.

Finally, land use service was an important consideration in identifying the functional classification of a street or highway. This included evaluation of the type, size, and spatial location of the land uses linked by various components of the total street and highway system. Thus, the functional classification of the existing regional street and highway system was accomplished by a careful, comparative evaluation of the traffic, physical, and land use service characteristics of the various facilities comprising the total street and highway system.

The three highest classes of facility used in the statewide study—expressway, major primary, and primary—were selected for inclusion in the 1963 existing regional arterial street and highway system, and this system was delineated on Commission base maps. Prints of the resulting arterial system map were 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 was reviewed and approved by the Technical Coordinating and Advisory Committee on Land Use-Transportation Planning. This identification of the arterial, collector, and land access facilities was further intensively reviewed, updated, and refined between 1963 and 1972 as part of the county jurisdictional highway planning programs, resulting in a sound, highly refined, functional classification of the streets and highways of the Region.

The 1972 reinventory of the existing street and highway system indicated that there were a total of 9,819 miles of streets and highways of all types open to traffic, an increase of 876 miles, or 10 percent, over 1963. As shown in Table 105, 3,119 miles, or 32 percent of this total, were classified as arterials in 1972 (see Maps 91 and 92). This represents a decrease in total arterial mileage of 69, or 2 percent, from 1963. This decrease occurred during a period when the freeway and expressway system mileage within the Region more than doubled, and was primarily the result of this freeway and expressway construction and the concomitant shifts in the function of parallel surface facilities from an arterial to a collector or land access function.

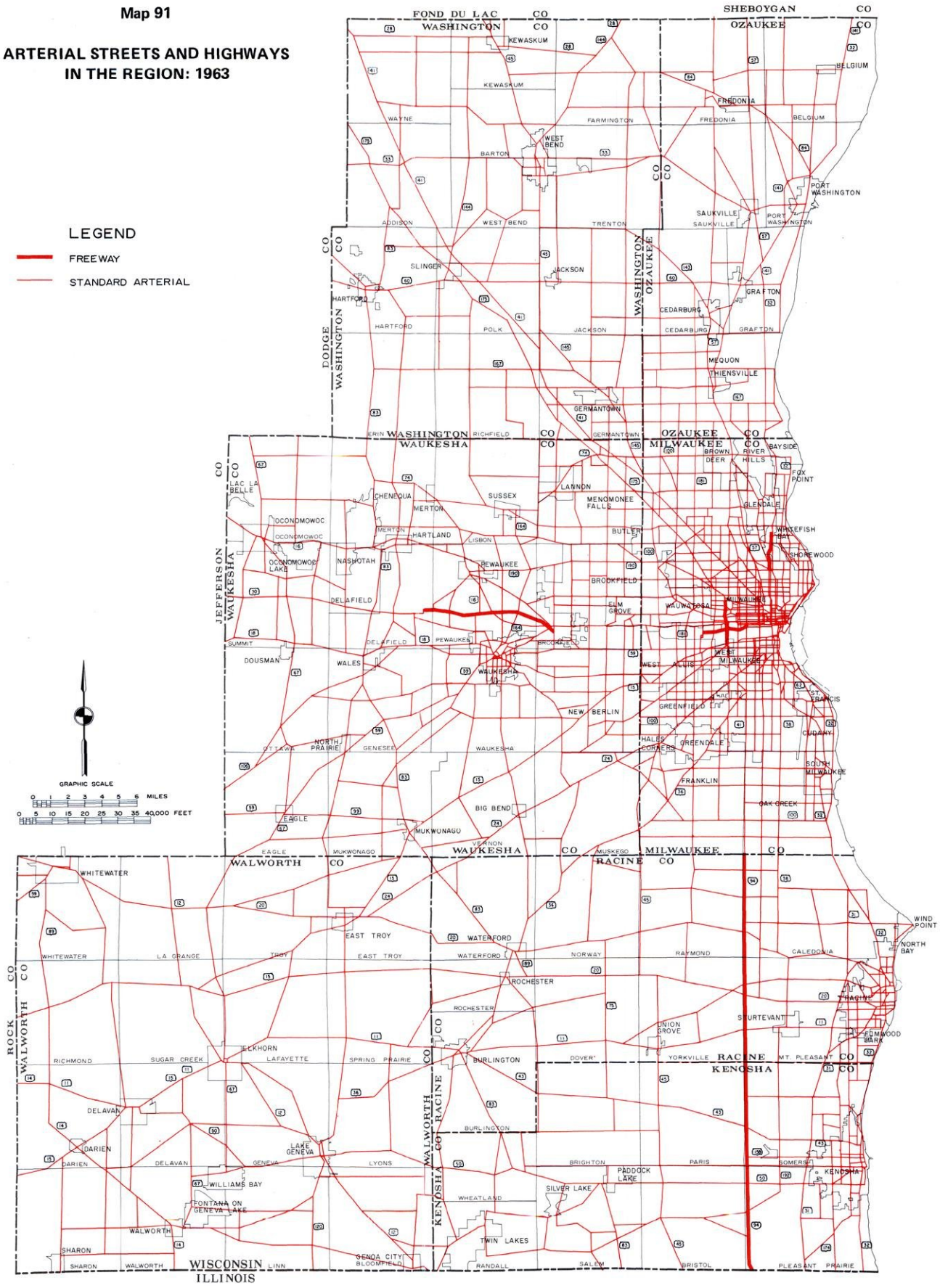
Jurisdictional Classification

Streets and highways may be classified according to jurisdiction as well as function, such classification being particularly important to plan implementation. Jurisdictional

[3] *The term urban as applied herein includes the urbanized areas as defined by the U. S. Bureau of the Census and which are, therefore, subject to the urban transportation planning requirements of Section 134, Title 23, the U. S. Code of Federal Regulations, and those urban places as defined by the U. S. Bureau of the Census which have a population of 5,000 or more. These areas, however, were modified for the purposes of functional classification to include such nonresidential urban uses located at the fringes of the census-defined urbanized areas and urban places as railroad yards, industrial areas, parks, airports, institutional areas, and cemeteries; to include such residential areas at the fringes of these areas having a population density of 1,000 persons per square mile or more; and to exclude such residential areas at the fringes of these areas having a population density of less than 1,000 persons per square mile.*

Map 91

ARTERIAL STREETS AND HIGHWAYS IN THE REGION: 1963

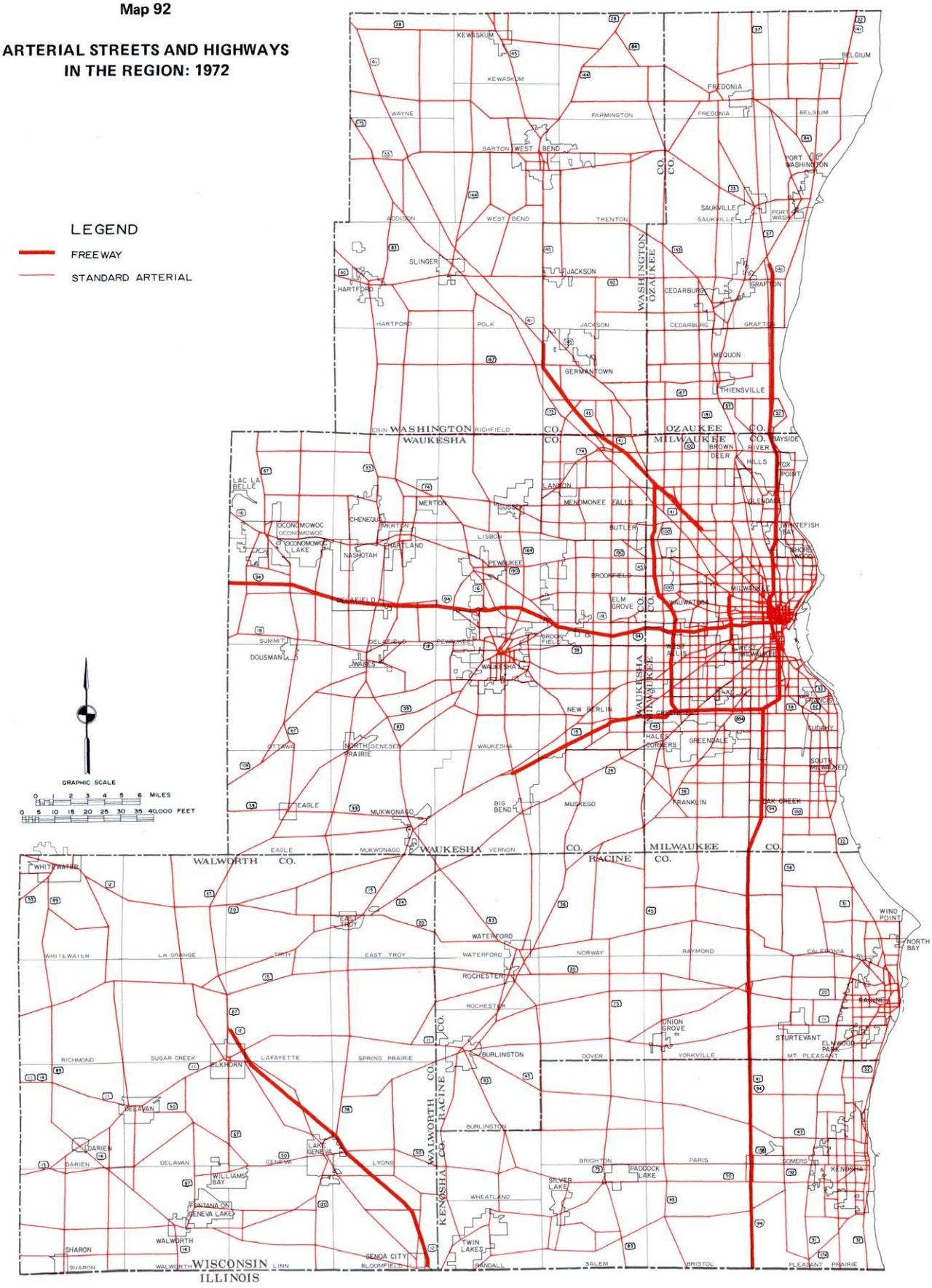


In 1963 there were a total of 8,943 miles of streets and highways of all kinds—arterial, collector, and land access—open to traffic within the Region, of which 3,188 miles, or 36 percent, were functioning as arterial streets and highways. Although the responsibility for the financing, construction, operation, and maintenance of these arterial facilities rests with one federal agency, one state agency, seven county units of government, and 147 local units of government within the Region, these facilities must form a single integrated system able to safely and efficiently serve the existing and probable future travel demands within the Region without regard to county and municipal boundary lines.

Source: SEWRPC.

Map 92

ARTERIAL STREETS AND HIGHWAYS IN THE REGION: 1972



By 1972 there were a total of 9,819 miles of streets and highways of all kinds open to traffic within the Region, of which 3,119 miles, or 32 percent, were functioning as arterial streets and highways. This represents a reduction of 69 miles, or about 2 percent, from the total arterial street and highway mileage existing in the Region in 1963. This reduction in the arterial street system was the result of refinements in the delineation of the arterial network under the county jurisdictional highway system planning programs. These refinements reflect, in part, the effects of new facility—particularly freeway—construction and, in part, a greater acceptance of the neighborhood unit concept in local planning with its important implications for the location and spacing of arterial street and highway facilities. The arterial facilities removed from the system in this process were reverted to collector or land access classification and use.

Source: SEWRPC.

Table 105

DISTRIBUTION OF STREET AND HIGHWAY MILEAGE IN THE REGION BY TYPE OF FACILITY AND COUNTY: 1963 and 1972

County	Mileage by Type of Facility - 1963						
	Arterial				Collector and Minor Streets	Total[a]	Arterial Miles As Percent of Total
	Freeway and Expressway	Freeway and Expressway Ramps	Other	Total			
Kenosha	12.4[b]	8.5	260.0	281.5	547.1	828.6	34.0
Milwaukee	18.6	17.3	755.6	791.5	1,642.6	2,434.1	32.5
Ozaukee	2.5	1.7	260.7	264.9	366.9	631.8	41.9
Racine	11.6[b]	6.9	332.8	351.3	632.4	983.7	35.7
Walworth	--	--	399.7	399.7	824.2	1,223.9	32.7
Washington	28.3	3.7	370.3	402.3	688.0	1,090.3	36.9
Waukesha	13.8	11.9	671.3	697.0	1,054.0	1,751.0	39.8
Region	87.2	50.0	3,051.0	3,188.2	5,755.2	8,943.4	35.6
Percent of Total	2.7	1.6	95.7	100.0	64.3	100.0	--

County	Mileage by Type of Facility - 1972						
	Arterial				Collector and Minor Streets	Total[a]	Arterial Miles As Percent of Total
	Freeway and Expressway	Freeway and Expressway Ramps	Other	Total			
Kenosha	12.0[b]	7.4	267.7	287.1	593.4	880.5	32.6
Milwaukee	64.5	61.5	669.7	795.7	1,851.7	2,647.4	30.1
Ozaukee	13.0	3.2	237.3	253.5	466.7	720.2	35.2
Racine	12.0[b]	6.0	337.4	355.4	728.0	1,083.4	32.8
Walworth	19.1	3.8	389.1	412.0	846.9	1,308.9	31.5
Washington	28.5	5.6	310.7	344.8	821.1	1,165.9	29.6
Waukesha	46.4	21.7	602.1	670.2	1,342.5	2,012.7	33.3
Region	195.5	109.2	2,814.0	3,118.7	6,700.3	9,819.0	31.8
Percent of Total	6.3	3.5	90.2	100.0	68.2	100.0	--

[a] *Total street and highway mileage does not include private streets and roads or roads in public park and institution lands.*

[b] *The arterial link data cards from which arterial street and highway mileage is computed were recoded in 1970 to more precisely determine actual freeway mileage within Kenosha and Racine Counties by recoding 0.4 mile of freeway from Kenosha County to Racine County.*

Source: Wisconsin Department of Transportation and SEWRPC.

classification establishes which level of government—state, county, or local—has or should have responsibility for the design, construction, maintenance, and operation of each segment of the total street and highway system. Jurisdictional classification is intended to group into subsystems all streets and highways serving similar functions and providing similar levels of service. Jurisdictional classification should, moreover, result in the assignment of the responsibility for each subsystem to the appropriate level of government having the greatest basic interest in, as well as the staff and fiscal resources to properly design, construct, maintain, and operate, the functional and design types of facilities involved.

The jurisdictional classification of the local street and highway system within the Region ideally should be related to the functional classification of that system, the state trunk highway system being comprised of essentially "high type" arterial streets and highways; the county trunk highway system being comprised of "intermediate type" arterials; and the local street and highway system being comprised of "low type" arterials

and of collector and land access facilities. Criteria for the functional subclassification of the total arterial street and highway system were developed by the Commission in cooperation with the federal, state, and local units and agencies of government concerned under the individual county jurisdictional highway planning programs conducted under the continuing regional land use-transportation study.

Three basic characteristics of the arterial facilities were utilized in the development of the criteria: trip service, land use service, and the operational characteristics of the facilities themselves. After considering such specific criteria as trip purpose and trip peaking, the Commission and the advisory committees selected trip length as the specific trip service criteria for functional subclassification of arterials. The specific land use service criteria selected were based upon the areawide significance of the land use activities to be connected and served by the various arterial subclassifications. The specific operational characteristic criteria were related to system continuity, facility spacing, traffic volume, traffic mobility, and land access.

The state trunk highway system should include all those routes within the Region which are intended to provide the highest level of traffic mobility—that is, which are intended to provide the highest operating speeds and lowest degree of traffic congestion, serving trips of the longest lengths, which provide the minimum degree of land access service; and which have regional or interregional continuity. The county trunk highway system should include all those routes which are intended to provide an intermediate level of traffic mobility and land access and which have intercommunity system continuity. The local trunk system should include all those routes which are intended to provide the lowest level of arterial traffic mobility and the highest degree of arterial land access service and which possess intracommunity system continuity.

The existing jurisdictional highway systems within the Region, however, are the result of a long evolutionary process influenced by many complex political, administrative, financial, and engineering considerations and constraints. Consequently, current jurisdictional classification does not always relate properly to function. The jurisdictional highway systems as they existed within the Region in 1972 are shown on Map 93. The state trunk highway system is comprised entirely of streets and highways functionally classified as arterials. The county trunk highway systems, however, currently include both arterial and nonarterial facilities. In addition, it is readily apparent that the county trunk highway systems have become fragmented, at least in parts of the Region, because of the removal of segments from the system within many villages and cities, and are no longer able to perform well as continuous subsystems.

Table 106 indicates the current mileage of each jurisdictional subsystem within the Region. About 1,259 miles, or 13 percent of the total street and highway system, were on the state trunk highway and connecting street system; about 1,435 miles, or 15 percent, were on the county trunk highway system; while the remaining 7,016 miles, or 72 percent, were under the jurisdiction of the cities, villages, and towns. Functionally, all 1,259 miles of state trunk highways were classified as arterials, while 998 miles, or 70 percent of the county trunk highways, and 752 miles, or 11 percent of the local streets and highways, were classified as arterials. The remaining 437 miles of county trunk highways and 6,264 miles of local streets and roads were classified as collector and local streets.

Federal Aid Classification

The total street and highway system of the Region can be further classified in terms of the federal aid systems which underlie the arterial street and highway system. By eliminating federal aid secondary system extensions into urban areas and by expanding the federal aid urban system, the Federal Aid Highway Act of 1973 caused significant realignment in the federal aid systems within the Region. Consequently, a base year of 1974 was used for the inventory and analyses of the existing federal aid systems within the Region.

Four federal aid systems were in existence as of September 1974: the federal aid interstate system, the federal aid primary system and its extension into urban areas, the federal aid secondary system, and the recently created federal aid urban system. The classification of the existing street and highway system by federal aid system is shown on Map 94 and is summarized in Table 107. About 1,204 miles of state trunk highways, or about 96 percent of all state trunk highways within the Region, are included in a federal aid system; about 909 miles of county trunk highways, or about 62 percent of all county trunk highways, are included in a federal aid system; and about 748 miles of local arterial streets and highways, or about 10 percent of the total local arterial street mileage, are included in a federal aid system.

Generally, only those streets and highways in the Region which are on a federal aid system are eligible to receive federal funds in partial support of needed improvements.[4] Ideally, federal funds should be available for the improvement of all streets and highways which together comprise the arterial system, since these facilities serve not only intracommunity travel but also intercommunity, intercounty, interregional, and interstate travel. Certain misalignments exist, however, and the existing federal aid systems in the Region are not fully congruent with the existing regional arterial street and highway system. This incongruance may be attributed in part to the location of federal aid routes on the alignment of existing nonarterial facilities that are proposed for future arterial designation and use in the adopted regional transportation plan (145 miles); in part to the location of federal aid routes on the alignment of proposed, but as yet unconstructed, arterial facilities included in the adopted regional transportation plan (226 miles); and in part to misalignments in which federal aid routes are located on existing facilities which are neither existing nor proposed arterials (91 miles).

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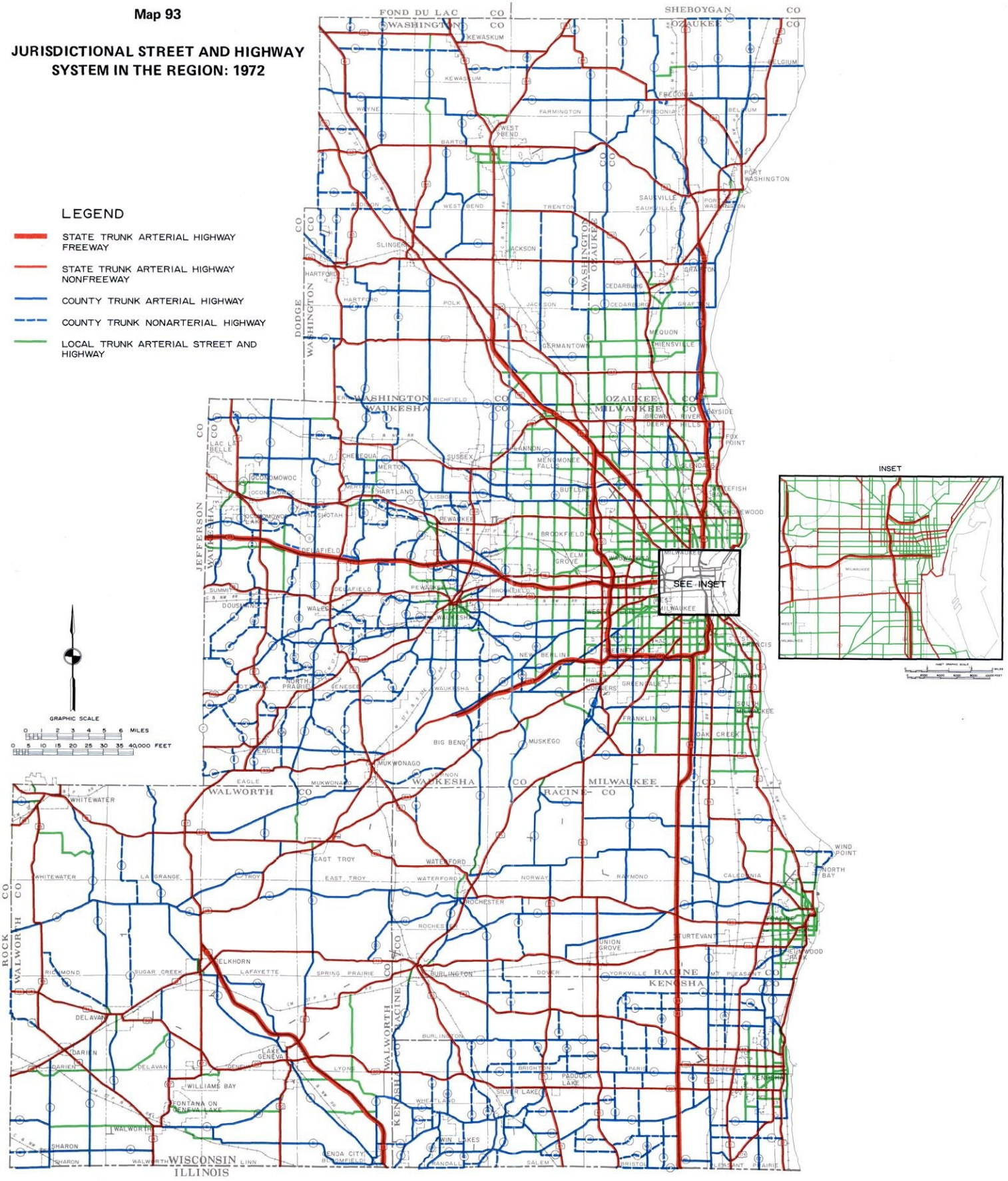
[4] *Exceptions to the general rule exist which permit federal funds to be spent for improvements of facilities which are not on a federal aid system. These improvements include, but are not limited to, replacement of bridges and elimination of high hazard locations and roadside obstacles.*

Map 93

JURISDICTIONAL STREET AND HIGHWAY SYSTEM IN THE REGION: 1972

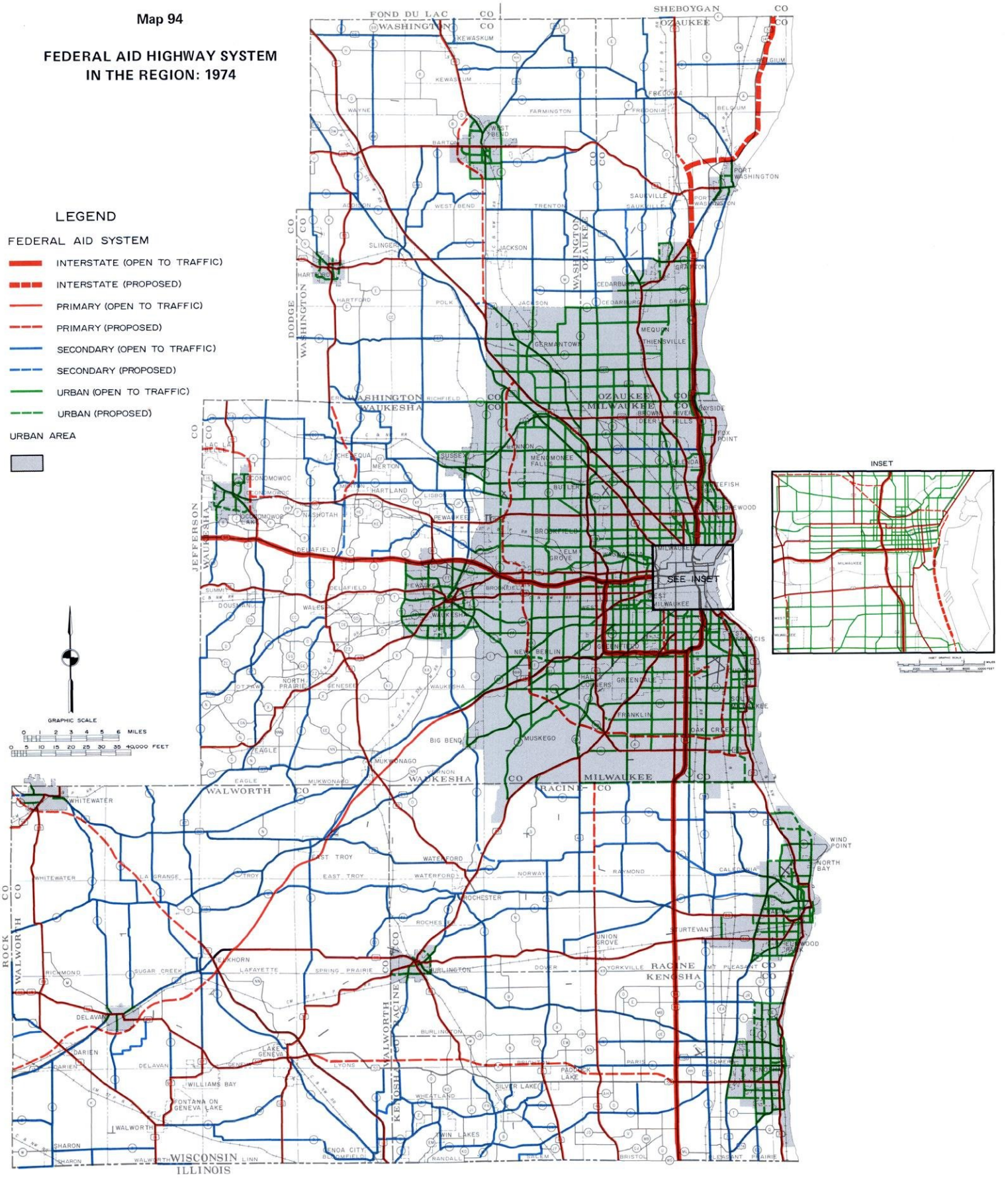


The jurisdictional classification of streets and highways identifies which level of government—state, county, or local—has responsibility for the design, construction, maintenance, and operation of each segment of the total street and highway system. Of the total 9,710 miles of streets and highways open to traffic within the Region in 1972, not including freeway ramps, 1,259 miles, or 13 percent, were classified as state trunk highways and connecting streets; 1,435 miles, or 15 percent, were classified as county trunk highways; and 7,016 miles, or 72 percent, were classified as local streets and highways. All state trunk highways and connecting streets were functionally classified as arterials, while 998 miles, or 70 percent of the county trunk highways, and 752 miles, or 11 percent of the local streets and highways, were classified as arterials. Because of the nature of local streets and highways and the piecemeal additions and deletions which have been made in the county trunk highway system over time, only the state trunk highway system constitutes a truly integrated arterial street and highway system within the Region.

Source: SEWRPC.

Map 94

FEDERAL AID HIGHWAY SYSTEM IN THE REGION: 1974



Streets and highways designated as part of the federal aid highway system are eligible for federal aid in partial support of their improvement. In 1974 there were about 3,087 miles of federal aid routes open to traffic within the Region, including 120 miles on the federal aid interstate system, 844 miles on the federal aid primary system, 961 miles on the federal aid secondary system, and 1,161 miles on the federal aid urban system. Federal participation in highway improvements should be focused on those facilities which comprise the arterial system, since these facilities serve not only intracommunity travel, but also intercommunity, intercounty, interregional, and interstate travel. Currently, misalignments of federal aid routes, that is, federal aid routes not located on existing or proposed arterial facilities, amount to about 91 miles, or less than 3 percent of the federal aid system.

Source: Wisconsin Department of Transportation and SEWRPC.

Table 106

DISTRIBUTION OF STREET AND HIGHWAY MILEAGE IN THE REGION BY JURISDICTION AND COUNTY: 1972

County	Existing Arterial (Miles)							Existing Nonarterial (Miles)			Total Miles
	State Trunk Highway		Frontage Roads and Ramps	Connecting Streets	County Trunk Highway	Local Trunk Highway	Total	County Trunk Highway	Local Trunk Highway	Total	
	Freeway	Nonfreeway									
Kenosha	12.0	99.4	7.4	12.0	127.4	28.9	279.7	138.4	455.0	593.4	880.5
Milwaukee . . .	63.8	96.6	61.5	93.2	68.9	411.7	734.2	6.7	1,845.0	1,851.7	2,647.4
Ozaukee	10.8	79.9	3.2	8.0	103.4	48.2	250.3	17.1	449.6	466.7	720.2
Racine	12.0	125.7	6.0	18.6	135.5	57.6	349.4	17.2	710.8	728.0	1,083.4
Walworth. . . .	19.1	157.3	3.8	13.8	167.7	49.4	408.2	25.1	871.8	896.9	1,308.9
Washington . .	6.8	172.4	5.6	8.1	127.2	24.7	339.2	62.7	758.4	821.1	1,165.9
Waukesha . . .	37.8	193.7	21.7	18.0	267.9	132.0	648.5	169.5	1,173.0	1,342.5	2,012.7
Region	162.3	925.0	109.2	171.7	998.0	752.5	3,009.5[a]	436.7[a]	6,263.6	6,700.3	9,819.0

[a] *The total mileage of arterial streets and highways as classified by jurisdiction does not include ramp and frontage roads attendant to the freeway system which are the responsibility of the State of Wisconsin but which are not considered within the mileage of the state trunk highway system.*

Source: Wisconsin Department of Transportation and SEWRPC.

Table 107

DISTRIBUTION OF STREET AND HIGHWAY MILEAGE IN THE REGION BY FEDERAL AID SYSTEM CLASSIFICATION, ARTERIAL STATUS, AND COUNTY: 1974

Status	County	Federal Aid														Nonfederal Aid				
		Federal Aid Interstate (Miles)	Federal Aid Primary (Miles)				Federal Aid Secondary (Miles)				Federal Aid Urban (Miles)									
		State Trunk Highway	State Trunk Highway	County Trunk Highway	Local Street	Total	State Trunk Highway	County Trunk Highway	Local Street	Total	State Trunk Highway	County Trunk Highway	Local Street	Total	Total	State Trunk Highway[a]	County Trunk Highway	Local Street	Total	Total Mileage[b]
On Existing Arterials	Kenosha . . .	12.07	39.09	--	--	39.09	40.92	60.98	--	101.90	13.13	11.58	22.29	47.00	200.06	18.18	54.84	6.61	79.63	279.69
	Milwaukee . .	44.69	153.91	--	--	153.91	--	5.39	--	5.39	52.71	63.51	382.36	498.58	702.57	2.70	--	28.94	31.64	734.21
	Ozaukee . . .	9.90	34.48	--	--	34.48	21.17	49.49	0.20	70.86	15.42	20.98	44.55	80.95	196.18	17.80	32.87	3.43	54.10	250.29
	Racine	12.02	92.40	--	--	92.40	39.52	99.33	--	138.85	12.38	12.87	50.13	75.38	318.65	--	23.30	7.47	30.77	349.42
	Walworth. . .	--	155.77	--	--	155.77	28.53	153.48	10.06	192.07	3.10	0.50	2.52	6.12	353.96	4.60	13.72	35.91	54.23	408.19
	Washington .	--	86.15	--	--	86.15	75.88	78.84	--	154.72	17.29	13.12	17.58	47.99	288.86	8.00	35.24	7.10	50.34	339.20
	Waukesha . .	24.66	141.14	--	--	141.14	47.61	107.21	6.84	161.66	29.76	105.15	101.82	236.73	564.19	4.70	55.54	24.07	84.31	648.50
	Total	103.34	702.94	--	--	702.94	253.63	554.72	17.10	825.45	143.79	227.71	621.25	992.75	2,624.48	55.98	215.51	113.53	385.02	3,009.50
On Existing Streets—Proposed Arterials	Kenosha . . .	--	--	--	--	--	--	12.95	--	12.95	--	0.56	9.36	9.92	22.87	--	--	--	--	22.87
	Milwaukee . .	--	--	--	--	--	--	--	--	--	--	9.54	--	9.54	9.54	--	--	--	--	9.54
	Ozaukee . . .	--	--	--	--	--	--	0.40	--	0.40	--	2.53	24.08	26.61	27.01	--	--	--	--	27.01
	Racine	--	--	--	--	--	--	--	--	--	--	--	10.78	10.78	10.78	--	--	--	--	10.78
	Walworth. . .	--	--	--	--	--	--	--	--	--	--	--	1.35	1.35	1.35	--	--	--	--	1.35
	Washington .	--	--	--	--	--	--	13.95	--	13.95	--	1.06	28.48	29.54	43.49	--	--	--	--	43.49
	Waukesha . .	--	--	--	--	--	--	10.10	--	10.10	--	--	19.93	19.93	30.03	--	--	--	--	30.03
	Total	--	--	--	--	--	--	37.40	--	37.40	--	13.69	93.98	107.67	145.07	--	--	--	--	145.07
On Existing Streets—Nonarterials (Misalignments)	Kenosha . . .	--	--	--	--	--	--	25.59	3.02	28.61	--	--	--	--	28.61	--	100.74	458.32	559.06	587.67
	Milwaukee . .	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.29	1,866.82	1,871.71	1,871.11
	Ozaukee . . .	--	--	--	--	--	--	--	7.69	7.69	--	--	--	--	7.69	--	13.34	435.76	449.10	456.79
	Racine	--	--	--	--	--	--	7.82	--	7.82	--	--	--	--	7.82	--	9.80	710.90	720.70	728.52
	Walworth. . .	--	--	--	--	--	--	25.10	3.42	28.52	--	--	--	--	28.52	--	14.28	890.18	904.46	932.98
	Washington .	--	--	--	--	--	--	10.04	--	10.04	--	--	--	--	10.04	--	38.61	751.95	790.56	800.60
	Waukesha . .	--	--	--	--	--	--	6.60	1.68	8.28	--	--	--	--	8.28	--	165.91	1,254.98	1,420.89	1,429.17
	Total	--	--	--	--	--	--	75.15	15.81	90.96	--	--	--	--	90.96	--	346.97	6,368.91	6,715.88	6,806.84
Subtotal—Existing Facilities	Kenosha . . .	12.07	39.09	--	--	39.09	40.92	99.52	3.02	143.46	13.13	12.14	31.65	56.92	251.54	18.18	155.58	464.93	638.69	890.23
	Milwaukee . .	44.69	153.91	--	--	153.91	--	5.39	--	5.39	52.71	73.05	382.36	508.12	712.11	2.70	4.29	1,895.76	1,902.75	2,614.86
	Ozaukee . . .	9.90	34.48	--	--	34.48	21.17	49.89	7.89	78.95	15.42	23.51	68.63	107.56	230.89	17.80	46.21	439.19	503.20	734.09
	Racine	12.02	92.40	--	--	92.40	39.52	107.15	--	146.67	12.38	12.87	60.91	86.16	337.25	--	33.10	718.37	751.47	1,088.72
	Walworth. . .	--	155.77	--	--	155.77	28.53	178.58	13.48	220.59	3.10	0.50	3.87	7.47	383.83	4.60	28.00	926.09	958.69	1,342.52
	Washington .	--	86.15	--	--	86.15	75.88	102.83	--	178.71	17.29	14.18	46.06	77.53	342.39	8.00	73.85	759.05	840.90	1,183.29
	Waukesha . .	24.66	141.14	--	--	141.14	47.61	123.91	8.52	180.04	29.76	105.15	121.75	256.66	602.50	4.70	221.45	1,279.05	1,505.20	2,107.70
	Total	103.34	702.94	--	--	702.94	253.63	667.27	32.91	953.81	143.79	241.40	715.23	1,100.42	2,860.51	55.98	562.48	6,482.44	7,100.90	9,961.41
On Proposed Arterials	Kenosha . . .	--	18.18	--	--	18.18	--	--	--	--	--	--	3.65	3.65	21.83	--	--	--	--	21.83
	Milwaukee . .	--	32.12	--	--	32.12	--	--	--	--	--	--	20.76	20.76	52.88	--	--	--	--	52.88
	Ozaukee . . .	17.20	--	--	--	--	--	--	--	--	--	--	4.55	4.55	21.75	--	--	--	--	21.75
	Racine	--	6.89	--	--	6.89[c]	--	2.27	--	2.27	--	--	9.85	9.85	19.01	--	--	--	--	19.01
	Walworth. . .	--	31.78	--	--	31.78	--	--	0.53	0.53	--	--	0.76	0.76	33.07	--	--	--	--	33.07
	Washington .	--	14.02	--	--	14.02	0.78	--	--	0.78	--	--	7.20	7.20	22.00	--	--	--	--	22.00
	Waukesha . .	--	37.88	--	--	37.88	3.89	--	--	3.89	--	--	14.02	14.02	55.79	--	--	--	--	55.79
	Total	17.20	140.87	--	--	140.87	4.67	2.27	0.53	7.47	--	--	60.79	60.79	226.33	--	--	--	--	226.33
Total	Kenosha . . .	12.07	57.27	--	--	57.27	40.92	99.52	3.02	143.46	13.13	12.14	35.30	60.57	273.37	18.18	155.58	464.93	638.69	912.06
	Milwaukee . .	44.69	186.03	--	--	186.03	--	5.39	--	5.39	52.71	73.05	403.12	528.88	764.99	2.70	4.29	1,895.76	1,902.75	2,667.74
	Ozaukee . . .	27.10	34.48	--	--	34.48	21.17	49.89	7.89	78.95	15.48	23.51	73.18	112.11	252.64	17.70	46.21	439.19	503.20	755.84
	Racine	12.02	99.29	--	--	99.29	39.52	109.42	--	148.94	12.38	12.87	70.76	96.01	356.26	--	33.10	718.37	751.47	1,107.73
	Walworth. . .	--	187.55	--	--	187.55	28.53	178.58	14.01	221.12	3.10	0.50	4.63	8.23	416.90	4.60	28.00	926.09	958.69	1,375.59
	Washington .	--	100.17	--	--	100.17	76.66	102.83	--	179.49	17.29	14.18	53.26	84.73	364.39	8.00	73.85	759.05	840.90	1,205.29
	Waukesha . .	24.66	179.02	--	--	179.02	51.50	123.91	8.52	183.93	29.76	105.15	135.77	270.68	658.29	4.70	221.45	1,279.05	1,505.20	2,163.49
	Total	120.54	843.81	--	--	843.81	258.30	669.54	33.44	961.28	143.79	241.40	776.02	1,161.21	3,086.84	55.88	562.48	6,482.44	7,100.90	10,187.74

[a] *Represents the travelled portion of a federal aid route in those cases where the officially designated federal aid route is on a new alignment.*

[b] *The total mileage of arterial streets and highways as classified by jurisdiction does not include ramp and frontage roads attendant to the freeway system which are the responsibility of the State of Wisconsin, but which are not considered within the mileage of the state trunk highway system and which are not included in federal aid mileage.*

Source: Wisconsin Department of Transportation and SEWRPC.

USE OF AND DEMAND FOR ARTERIAL STREETS AND HIGHWAYS

The arterial streets and highways constitute that portion of the total street and highway system which is explicitly considered in the regional transportation planning process. Determination of the supply of arterial streets and highways within the Region was accomplished by inventories of facility location and capacity. Identification of arterial facility location, achieved through the regional base mapping and functional classification process, revealed that the arterial street and highway system as it existed in the Region in 1972 was composed of a total of about 3,119 miles of facilities, ranging from eight-lane urban freeways to two-lane rural roads. The distribution of the existing arterial street and highway system mileage within the Region is summarized by county in Table 106, and its spatial arrangement is shown on Map 91. In 1972, freeways and expressways comprised less than 10 percent of the approximately 3,119 miles of arterial streets and highways, including all associated entrance and exit ramps.

Milwaukee County, with about 9 percent of the total area of the Region and approximately 59 percent of the population, contained about 41 percent of the total freeway, expressway, and associated ramp mileage, and approximately 25 percent of the total arterial mileage. No other county in the Region had more than 15 percent of the freeway and expressway system mileage, or more than 15 percent of the total arterial mileage except Waukesha County, which had approximately 21 percent of both freeway and expressway system mileage and total arterial mileage.

System Capacity

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 existing roadway and operating conditions. Such capacities may be relatively high but occur under conditions of heavy 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 level of service provided in terms of safety, operating speed, and freedom to maneuver, rather than full utilization of the facility.

It is this second measure of capacity, expressed in number of vehicles per 25 hours, that was selected for use in the regional 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 values selected are too high, subsequent comparisons with existing and future traffic volumes may indicate that improvements are not required and result in a congested, inefficient, and unsafe transportation system, attended by increased levels of noise and air pollution. If the values selected are 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 thus given to the determination of the design capacity values;[5] and these values were carefully reviewed and approved by the Technical Coordinating and Advisory Committee.

Except for freeway components, whose capacity is 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 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.[6]

These factors are used to determine relationships between approach pavement width and design capacity. Secondary capacity factors are then determined and used to modify the relationships initially established. These secondary factors include percent of average weekday traffic occurring in the peak hour (K factor), directional imbalance (D factor), signal setting, intersection approach gradient, turning movements, parking, commercial traffic, existence of separate lanes for turning movements, and the type of area and route.

In the SEWRPC capacity determination procedure, the full approach pavement width at intersections—assuming that no parking is permitted—together with the three primary capacity factors were 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 subarea; 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, 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) the percent of average daily traffic occurring in the peak hour equals 8 percent for freeways and expressways and 10 percent

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[5] *See "Capacity of Arterial Network Links," SEWRPC Technical Record, Vol. 2, No. 2.*

[6] *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.*

for all other arterials, 2) directional imbalance equals 60 percent in the dominant direction for arterials outside the Milwaukee central business district and 50 percent within that area, 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.

Using the design capacity curves illustrated in Figure 52, which reflect both the primary factors and the assumed secondary factors, a table of hourly capacity multipliers was developed (see Table 108). These multipliers were applied to the full approach pavement width minus two feet. The resulting capacity was then modified on the basis of the inventoried secondary factors as follows: 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.

In the inventory of existing street and highway system capacity, compilation of the necessary physical data, such as type of facility, intersection approach widths, presence of right or left turn lanes, intersection approach gradients, parking characteristics, and location with respect to urban area, was accomplished generally from secondary sources, and only when necessary from field surveys. Secondary capacity data sources included highway inventory data maintained by the Wisconsin Department of Transportation, Division of Highways; the street inventory maintained by the City of Milwaukee; and engineering data files maintained by engineering staffs and consulting firms employed by counties and municipalities within the Region. The capacity inventory data regarding the physical characteristics of transportation facilities were then analyzed, and traffic capacities, expressed in terms of vehicles per day, were defined for each link in the existing arterial system.[7]

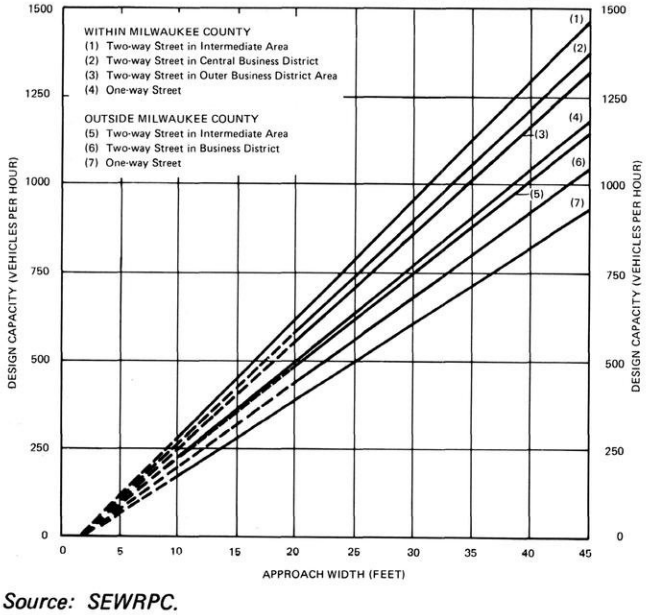
System Utilization

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 segment, or link, in the system. Traffic volume counting programs conducted by the Wisconsin Department of Transportation and by the County and City of Milwaukee on a regular, continuing basis 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 by counts taken by other local municipalities, as well as by the Commission itself. These programs, 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.

[7] *Comparison of the resulting traffic capacities with the capacities obtained utilizing the procedures outlined in Highway Research Board Special Report 87, Highway Capacity Manual-1965, indicates the results to be within 10 percent of each other.*

Figure 52

RELATIONSHIP BETWEEN APPROACH PAVEMENT WIDTH AND HOURLY DESIGN CAPACITIES OF ARTERIAL STREETS AND HIGHWAYS IN THE REGION



Source: SEWRPC.

Table 108

COMPUTED LINK DESIGN CAPACITIES FOR TYPICAL ARTERIALS IN THE REGION BY TYPE

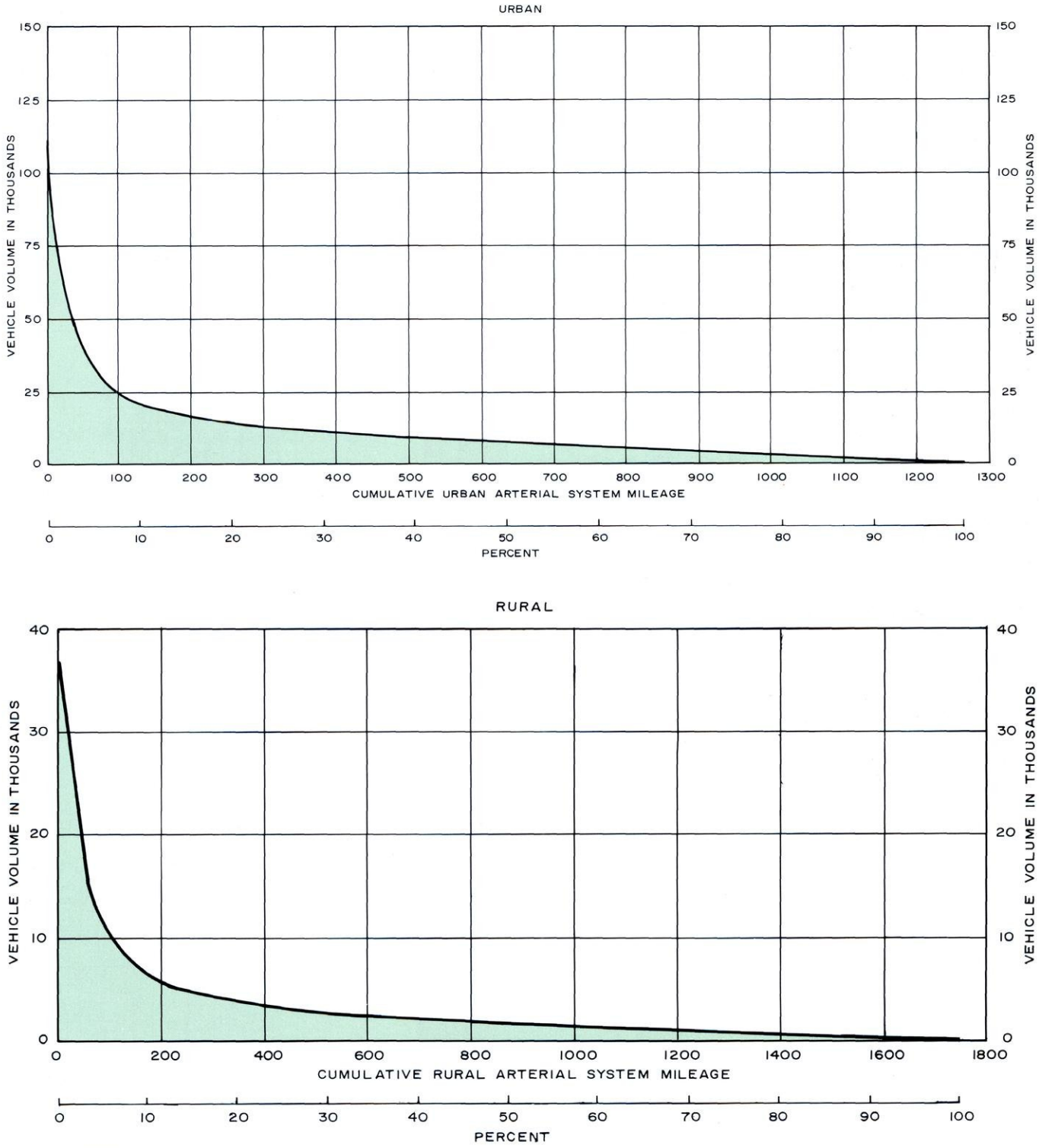
Type of Arterial Area		Total Pavement Width (Feet)	24-Hour Design Capacity[a]
Freeways			
Within Milwaukee County		72	85,000
Outside Milwaukee County		48	41,800
Other Arterials			
Two-way:	Downtown	50	14,900
	Intermediate	50	15,640
	Outlying	50	16,560
	Rural	48	17,160
One-way:	Downtown	36	10,540
	Intermediate	36	12,240

[a] *The 24-hour design capacity is based upon facility capacity at level of service C operating conditions during the peak hour.*

Source: SEWRPC.

Figure 53

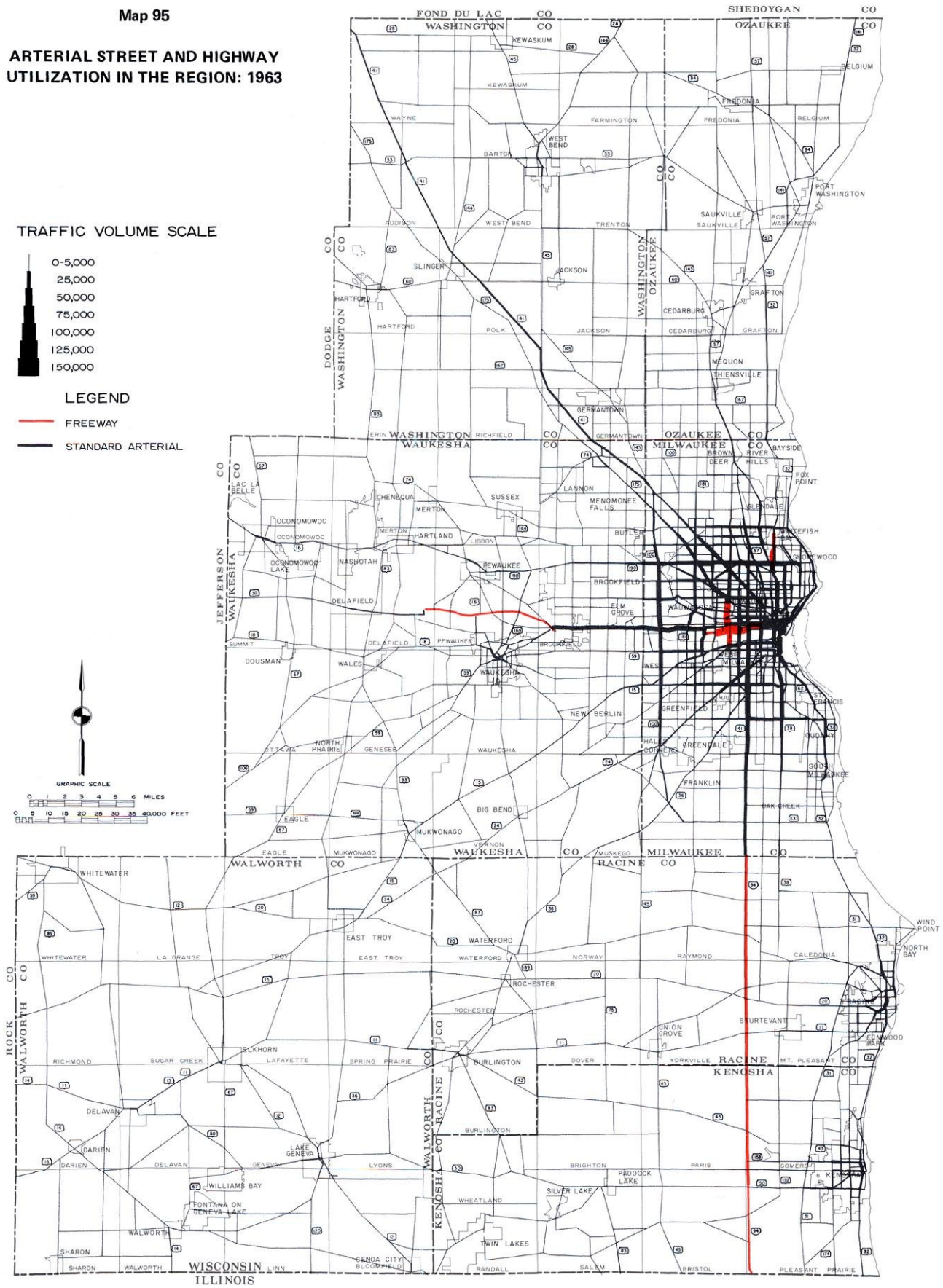
RELATIONSHIP BETWEEN AVERAGE WEEKDAY VEHICLE VOLUME AND CUMULATIVE URBAN AND RURAL ARTERIAL SYSTEM MILEAGE IN THE REGION: 1972



Source: SEWRPC.

Map 95

ARTERIAL STREET AND HIGHWAY UTILIZATION IN THE REGION: 1963

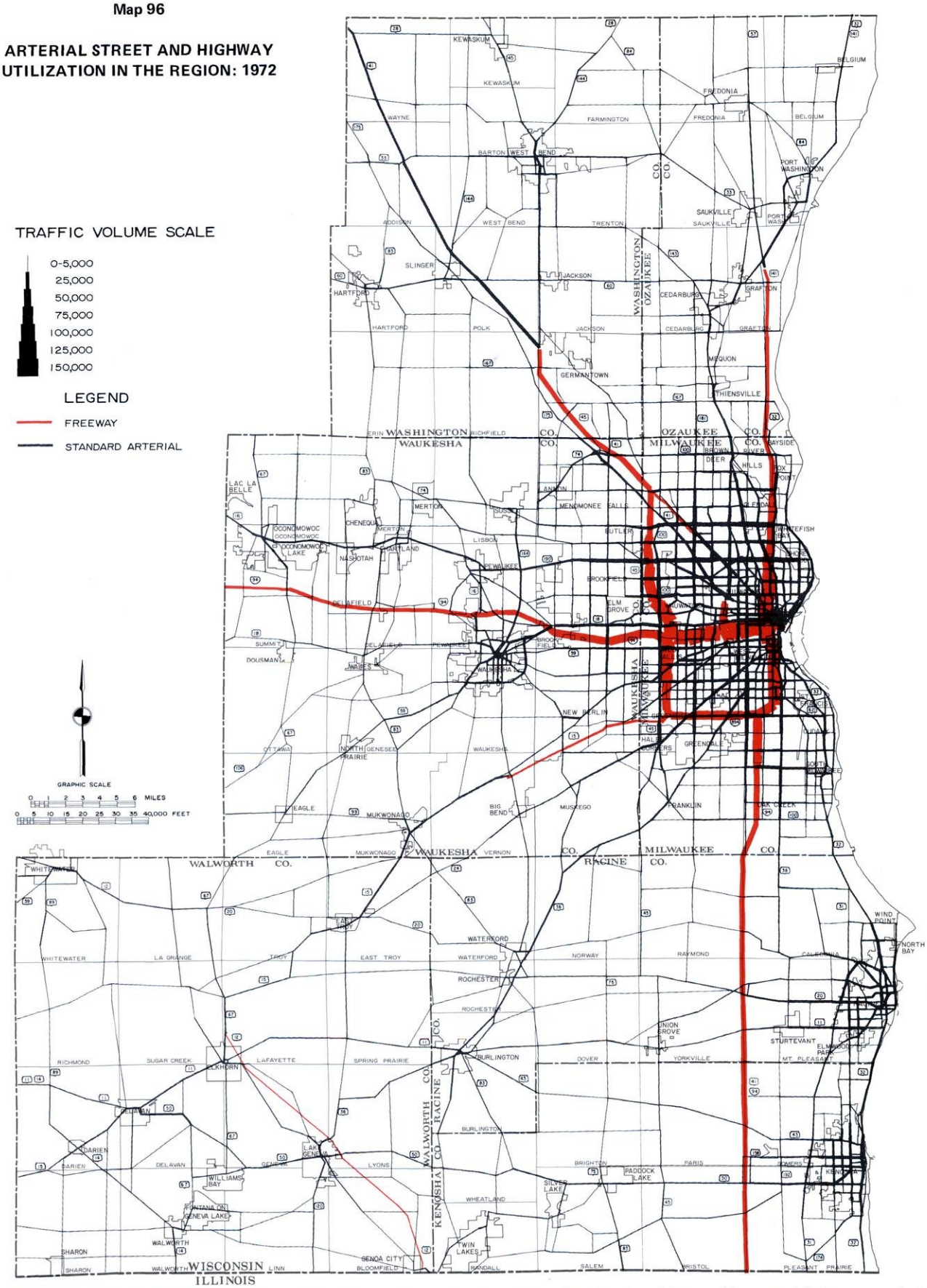


Average weekday traffic flows on the arterial street and highway system in the Region in 1963 are shown on the above map. This traffic flow pattern is largely representative of pre-freeway conditions in the Region, since very few miles of urban freeway were open to traffic in 1963. In the Milwaukee metropolitan area, very heavy traffic volumes occurred on such standard surface arterials as Bluemound Road, S. 27th Street, Capitol Drive, Fond du Lac Avenue, Appleton Avenue, Oklahoma Avenue, and STH 100, the former metropolitan bypass route.

Source: SEWRPC.

Map 96

ARTERIAL STREET AND HIGHWAY UTILIZATION IN THE REGION: 1972



By 1972, the regional freeway system had been developed to the point where significant changes in the utilization of the arterial street and highway system had occurred. The freeways had become highly efficient and immensely popular carriers of travel, as indicated by the heavy volumes of freeway travel shown on the above map. Significant reductions in traffic flows on facilities in the travel corridors served by newly constructed freeways have been effected, as shown by a comparison of the above map with Map 95. Traffic flows have been held at or actually reduced below 1963 levels, for example, on Bluemound Road, S. 27th Street, Oklahoma Avenue, and STH 100. Where freeways have not been built in accordance with adopted regional transportation plan recommendations, such as, for example, the Bay Freeway and Fond du Lac Freeway travel corridors, traffic volumes on the standard surface arterials have significantly increased.

Source: SEWRPC.

The complete nature of the traffic counting program made it possible to estimate with a high degree of accuracy the average weekday and peak-hour traffic flows on all segments of the arterial network and to calculate total vehicle miles of travel on the arterial street and highway system within the Region. As shown on Map 96 and presented in Figure 53, arterial streets and highways are most heavily utilized in the urban areas of the Region. In fact, as shown in Figure 53, over 43 percent of all urban arterial facilities have average weekday volumes of over 8,500 vehicles, while over 66 percent of all rural arterial facilities have average weekday volumes of less than 2,400 vehicles.

Significant changes have occurred in the location of the utilization of the arterial street and highway system as indicated by a comparison of the 1972 traffic flows on Map 96 with the 1963 traffic flows as depicted on Map 95. The changes in the system utilization result in part from new urban development and in part from the redistribution of traffic flows, which resulted from significant additions to the freeway system completed within the Region since 1963. The completed freeway segments carry heavy volumes of traffic, and have resulted in significant reductions in traffic flows on facilities paralleling the freeways and in significant increases in traffic flows on the arterial facilities serving the freeway interchanges.

The utilization of arterial streets and highways within the Region can also be expressed in terms of the total vehicle miles of travel occurring on the arterial street and highway system. In the Region, over 20.1 million vehicle miles of travel occurred on this system on an average weekday in 1972 (see Table 109). Most of this travel occurred within urban areas. Milwaukee County alone accounted for 54 percent of the total arterial vehicle miles of travel, and exhibited by far the most intensive

Table 109

ARTERIAL VEHICLE MILES OF TRAVEL IN THE REGION ON AN AVERAGE WEEKDAY BY COUNTY: 1963 and 1972

County	1963 Average Weekday Vehicle Miles of Travel (In Thousands)			
	Freeway and Expressway	Freeway and Expressway Ramps	Other Arterials	Total
Kenosha	202	2	734	938
Milwaukee	454	77	6,817	7,348
Ozaukee	18	2	464	484
Racine	202	1	922	1,125
Walworth	--	--	685	685
Washington	343	2	351	696
Waukesha	147	12	1,637	1,796
Region	1,366	96	11,610	13,072

County	1972 Average Weekday Vehicle Miles of Travel (In Thousands)				Increment (In Thousands) 1963 to 1972	
	Freeway and Expressway	Freeway and Expressway Ramps	Other Arterials	Total	Number	Percent
Kenosha	375	7	1,046	1,428	490	52.2
Milwaukee	3,635	342	6,718	10,695	3,347	45.5
Ozaukee	215	8	627	850	366	75.6
Racine	409	6	1,398	1,813	688	61.2
Walworth	54	2	817	873	188	27.4
Washington	187	3	961	1,151	455	65.4
Waukesha	930	40	2,344	3,314	1,518	84.5
Region	5,805	408	13,911	20,124	7,052	53.9

Source: Wisconsin Department of Transportation and SEWRPC.

use of the existing arterial street and highway system, with over 13,400 vehicle miles of travel per mile of arterial street and highway.

Table 109 indicates the changes in the distribution of the vehicle miles of travel which have occurred within the Region since 1963. The demand on the arterial system, measured in terms of vehicle miles of travel and on an average weekday, increased from 13.1 million to 20.1 million vehicle miles, or approximately 54 percent, between 1963 and 1972. The largest increases in utilization occurred in Milwaukee and Waukesha Counties, with increases of about 3.3 million vehicle miles of travel, or 47 percent of the regional increase, and 1.5 million vehicle miles of travel, or 22 percent of the regional increase, respectively, over the nine-year period. Together these accounted for about 69 percent of the total increase within the Region. The highest rates of increase in arterial system use occurred in Waukesha and Ozaukee Counties, which experienced rates of increase of approximately 85 and 76 percent, respectively.

Analysis of the current use and changes in use of the arterial street and highway system of the Region clearly indicates that the freeway system has become the basic foundation of the regional surface transportation system. In 1963, freeways and expressways, which comprised 4 percent of the existing arterial street and highway system, carried slightly more than 11 percent of the total vehicle miles of arterial travel. By 1972, freeways and expressways comprised 10 percent of the existing arterial street and highway mileage, but carried approximately 31 percent of the total arterial vehicle miles of travel. Clearly, freeways in the Region are not only highly efficient but also immensely popular carriers of arterial travel.

Moreover, of the increase of 7.1 million daily vehicle miles of travel occurring between 1963 and 1972, about 68 percent, or 4.8 million vehicle miles, occurred on the freeway system, while only 32 percent, or 2.3 million vehicle miles, occurred on the standard surface arterials. This shift to utilization of freeway facilities has been greatest in Milwaukee County, where total daily vehicle miles of travel on the freeway system increased more than sevenfold, from about 0.53 million in 1963 to approximately 3.98 million in 1972, while total daily vehicle miles of travel on standard surface arterials in the county decreased slightly from 6.8 million in 1963 to 6.7 million in 1972.

A significant characteristic of the utilization of the arterial street and highway system is the average trip length of the travel occurring on each segment (see Figure 54). A relationship exists between the average trip length on a street or highway and the level of service it provides, since tripmakers making longer trips commonly utilize those arterial facilities which maximize travel speed, safety, convenience, and comfort. Thus, arterial streets and highways providing the highest levels of service are normally utilized by travel exhibiting the longest trip lengths. Map 98 shows the average trip lengths on each segment of the existing arterial street and highway system in 1972. The longest trip lengths, as expected, occur on the freeway system, which provides the highest level of traffic service and which has regional and interregional continuity. The pattern of average trip length in 1963, as shown on Map 97, was modified from 1963 to 1972, primarily through the influence of the completed additions to the regional freeway system.

Relationship of System Use to Capacity

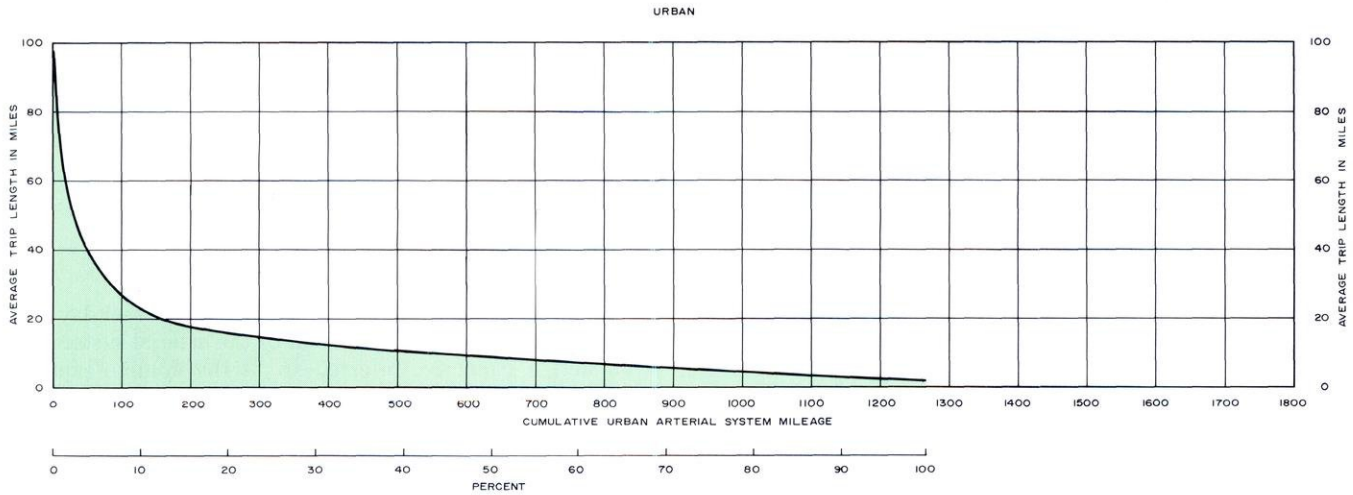
The relationship between the average daily weekday traffic utilizing a particular section of the arterial system and its design capacity, referred to as the volume/capacity (V/C) ratio, is a useful means of identifying and quantifying existing and probable future imbalances between street usage and street supply. This relationship, when determined and evaluated for the entire arterial system, is useful in identifying major travel corridors where additional capacity is needed even under existing travel demands.

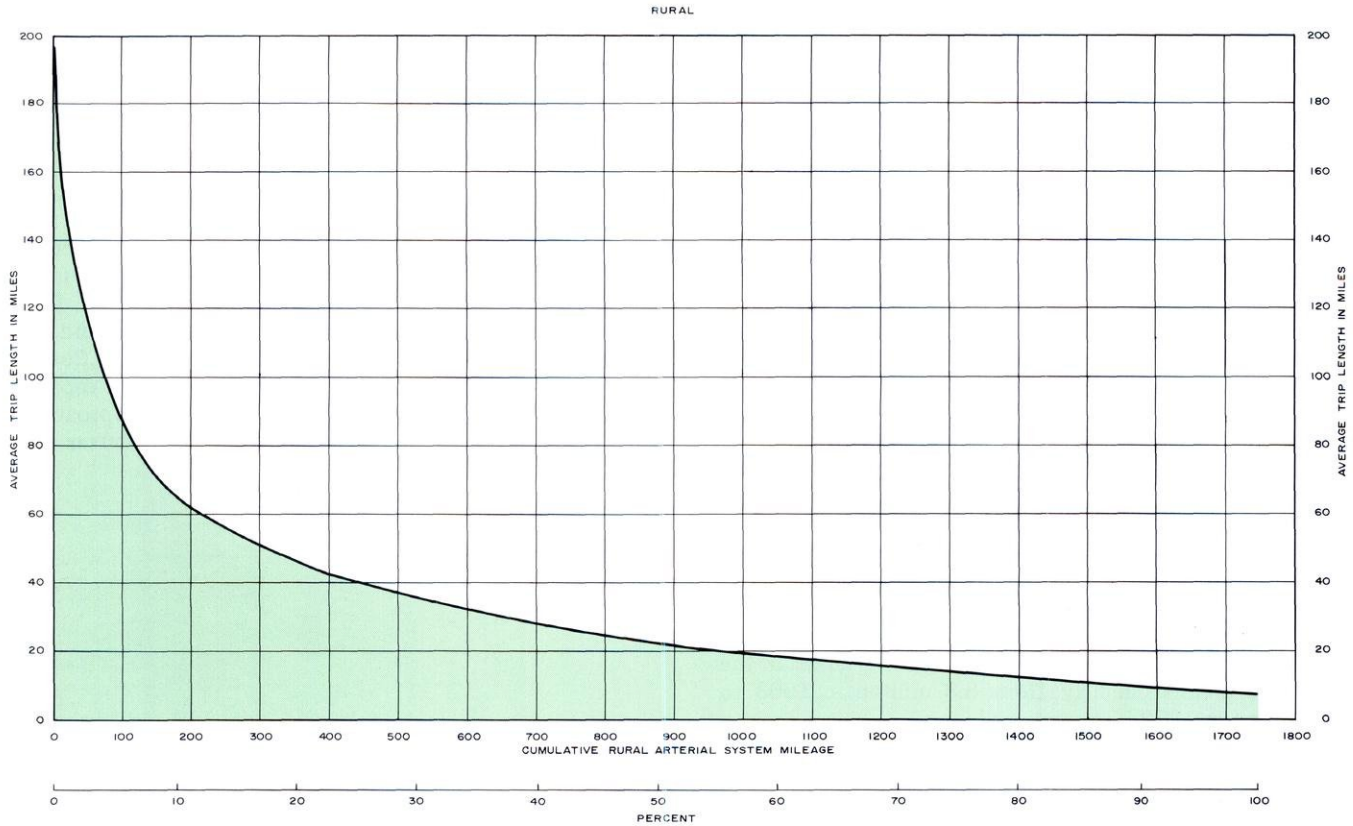
This volume/capacity ratio was computed for each link of the arterial network. The results are indicated on Map 99 for 1963 and Map 100 for 1972. In order to facilitate their presentation and subsequent analysis, the V/C ratios have been grouped into three categories: under capacity, V/C = 0.90 or less; at capacity, V/C = 0.91 to 1.10; and over capacity, V/C = 1.11 or more.[8] The significance of these ranges of volume-to-capacity ratios is that those facilities operating under design capacity provide fully adequate service having stable flow and few restrictions on operating speed; those facilities operating at design capacity provide adequate service having stable flow, higher volume, and more restrictions on speed and lane changing, while experiencing restricted traffic flow at times; and those facilities operating over design capacity experience traffic congestion at times approaching unstable flow, and little freedom to maneuver (see Figure 55).

[8] *Under the initial 1963 determination of capacity, under capacity was defined as V/C = 0.7 or less, at capacity as V/C = 0.8 to 1.1, and over capacity as V/C = 1.2 or more. These ratios were subsequently adjusted to those presented above during plan test in order to approximate the levels of service B, C, and D, respectively, as described in the Highway Research Board Special Report 87, Highway Capacity Manual-1965.*

Figure 54

RELATIONSHIP BETWEEN AVERAGE TRIP LENGTH AND CUMULATIVE URBAN AND RURAL ARTERIAL SYSTEM MILEAGE IN THE REGION: 1972

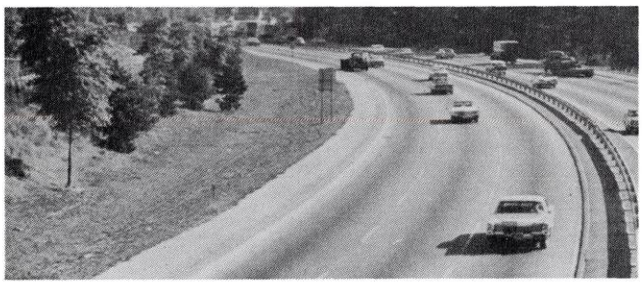




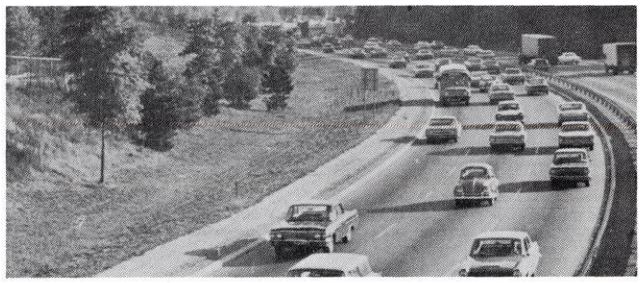
Source: SEWRPC.

Figure 55

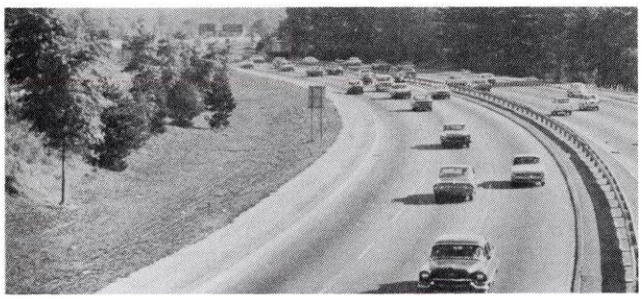
CONCEPTUAL LEVELS OF SERVICE ON THE ARTERIAL STREET AND HIGHWAY SYSTEM



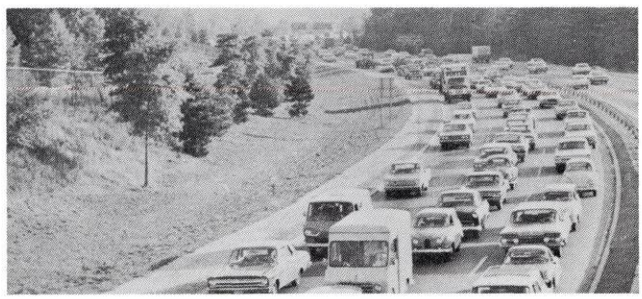
Level of Service - A: Free flow with low volumes and no restrictions on operating speed



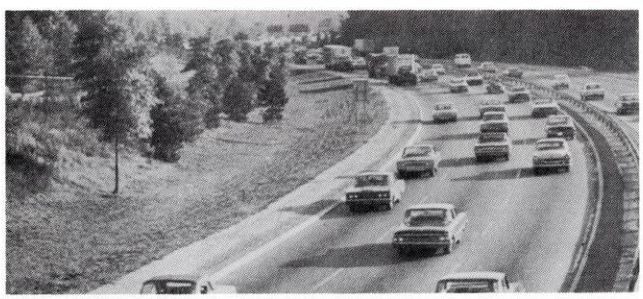
Level of Service - D: Approaches unstable flow with tolerable operating speeds being maintained



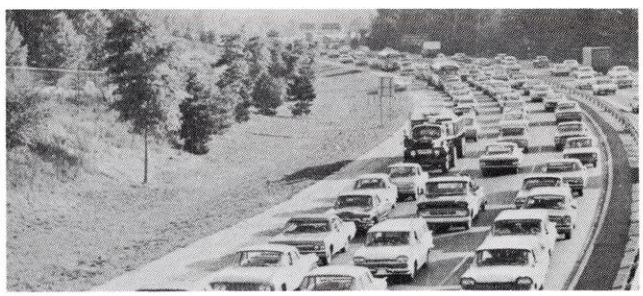
Level of Service - B: Stable flow with operating speeds beginning to be restricted



Level of Service - E: Unstable flow, low operating speeds with ~~monetary~~ momentary stoppages of flow



Level of Service - C: Stable flow with speeds and maneuverability are more closely controlled by higher volumes

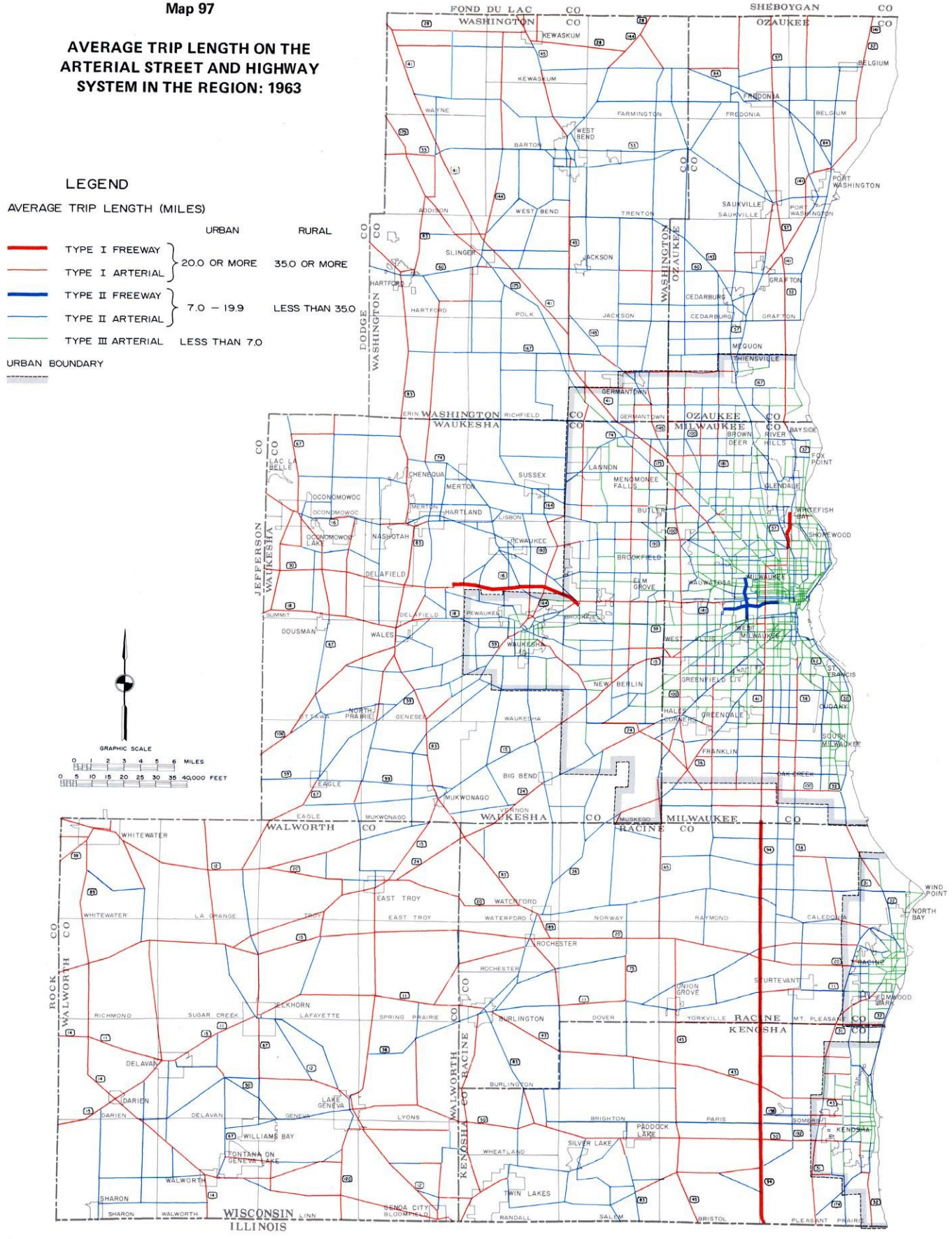


Level of Service - F: Forced flow operation at low speeds with frequent stoppages

Source: Highway Capacity Manual 1965, Highway Research Board, National Academy of Sciences–National Research Council.

Map 97

AVERAGE TRIP LENGTH ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE REGION: 1963

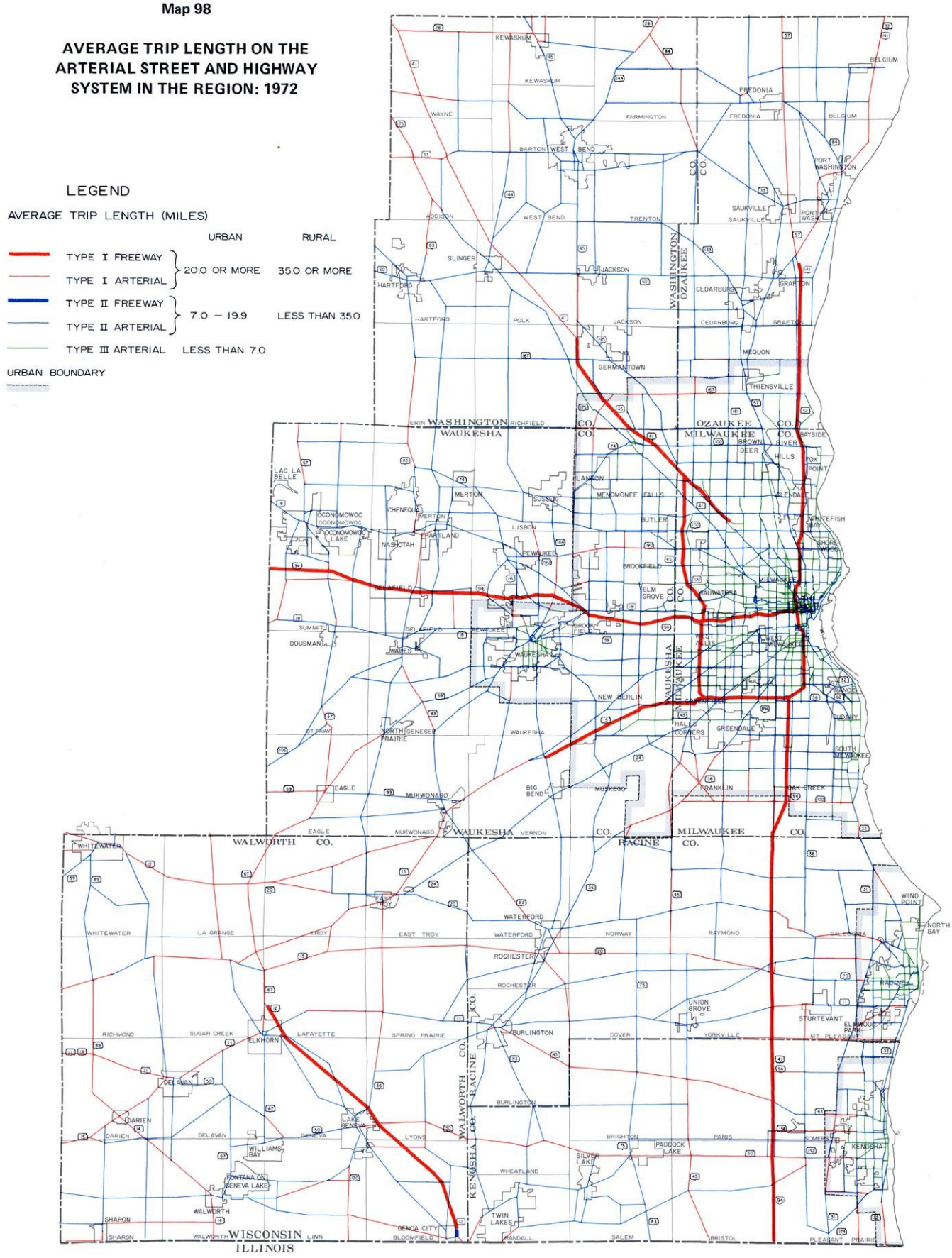


A relationship should exist between the average trip length on a street or highway and the level of service it provides, since tripmakers making longer trips commonly desire to utilize those arterial facilities which maximize travel speed and safety. The pattern of average trip length in 1963 is shown on the above map, and is representative of conditions in the Region prior to the development of a freeway system. As may be expected, in the Milwaukee metropolitan area the longest trips were found to occur on the major state trunk highways, such as S. 27th Street (USH 41), N. Port Washington Road (STH 141), Bluemound Road (USH 18), W. National Avenue (STH 15), STH 100, and USH 41.

Source: SEWRPC.

Map 98

AVERAGE TRIP LENGTH ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE REGION: 1972

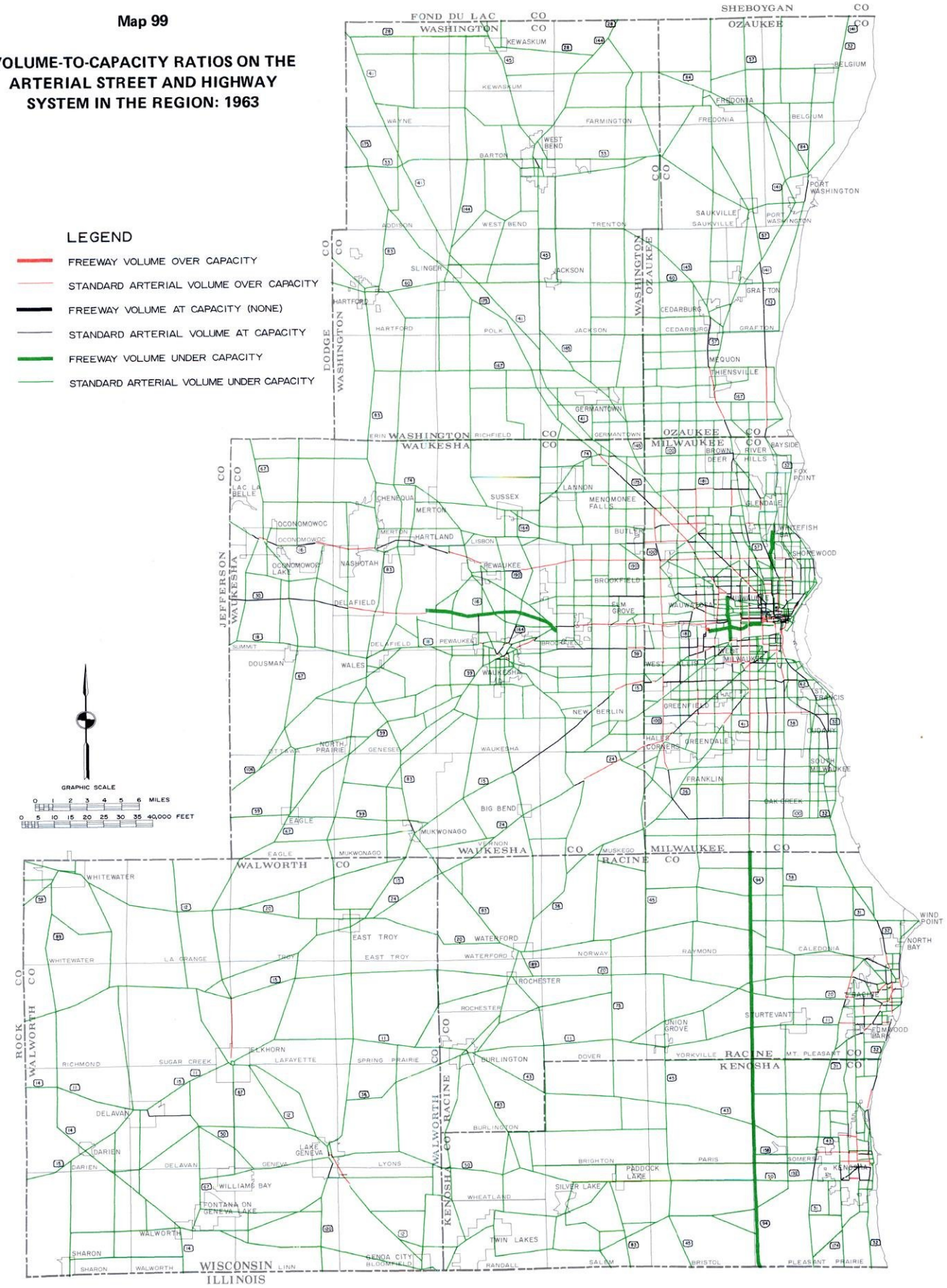


The impact of the developing regional freeway system on the pattern of average trip length on the arterial street and highway system in the Region can be seen by comparing the above map for 1972 with the 1963 average trip length pattern shown on Map 97. In the Milwaukee metropolitan area, the longest trip lengths now occur on the freeway system. Average trip lengths have been reduced on those standard surface arterials in travel corridors now served by freeways, including S. 27th Street, N. Port Washington Road, Bluemound Road, W. National Avenue, and STH 100.

Source: SEWRPC.

Map 99

VOLUME-TO-CAPACITY RATIOS ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE REGION: 1963

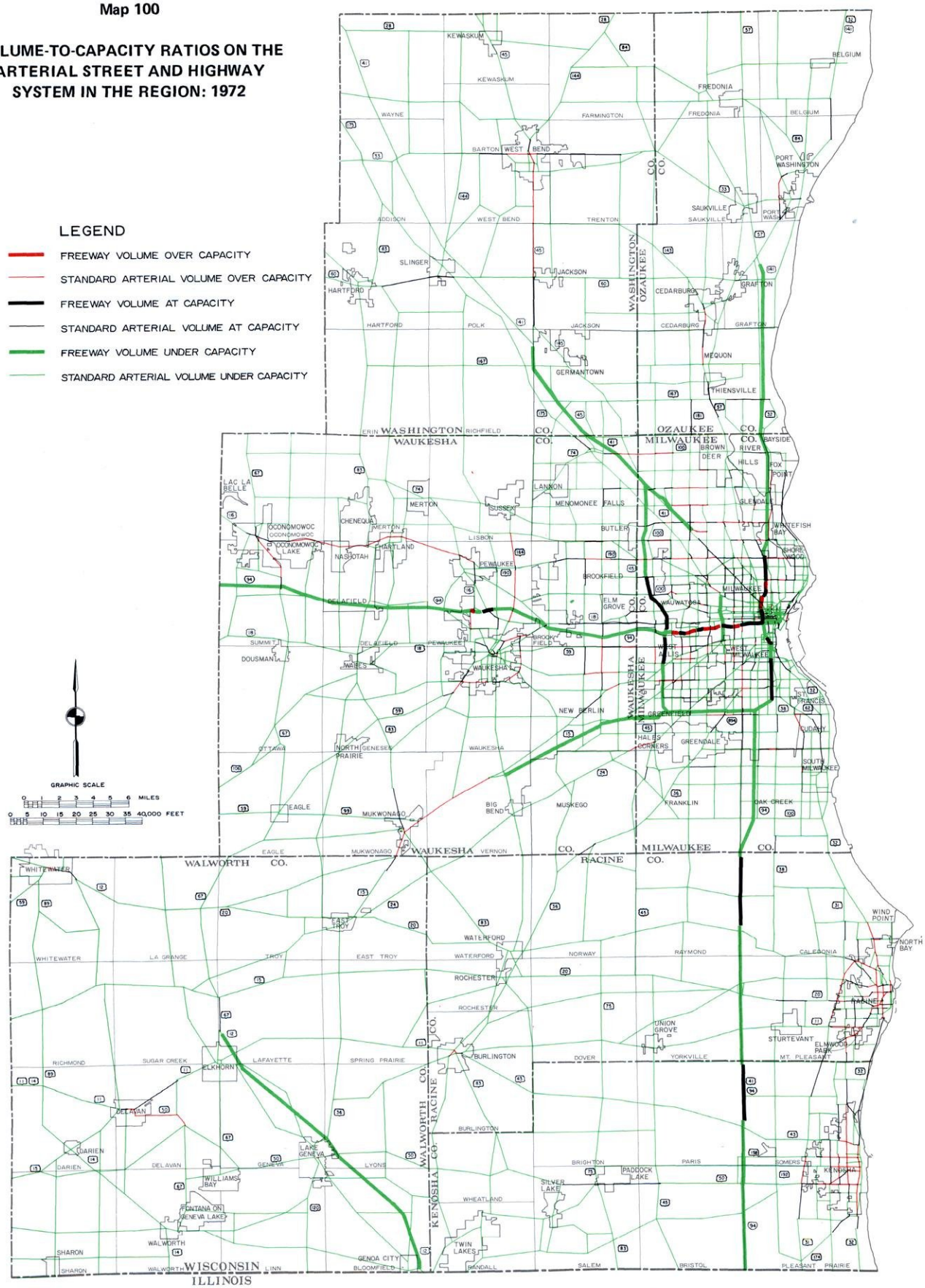


The above map reflects traffic flow patterns and conditions within the Region prior to urban freeway construction. About 6 percent of the arterial street and highway system in the Region, or about 192 miles, were operating over design capacity or under congested conditions in 1963. Another 4 percent, or about 140 miles, were operating at design capacity. The remaining 90 percent, or 2,857 miles, were operating freely below design capacity. Congestion was particularly severe in the three major urban centers of the Region. In Milwaukee County, about 25 percent of all arterial streets and highways, or about 202 miles, were operating at or over design capacity. This included such important surface arterials as W. National Avenue, S. 27th Street, Bluemound Road, STH 100, W. Fond du Lac Avenue, W. Appleton Avenue, and N. Port Washington Road.

Source: SEWRPC.

Map 100

VOLUME-TO-CAPACITY RATIOS ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE REGION: 1972



By 1972 the development of the regional freeway system had significantly altered traffic flow patterns and conditions within the Region. In the Milaukee area, congestion on many important surface arterials, such as W. National Avenue, S. 27th Street, Bluemound Road, STH 100, W. Fond du Lac Avenue, W. Appleton Avenue, and N. Port Washington Road, had been relieved by the construction of freeway facilities. The overwhelming majority of this congested arterial mileage—87 percent—is located in the Milwaukee, Racine, and Kenosha urbanized areas. In Milwaukee County about 17 percent of the arterial system was operating at or over design capacity, as compared to 25 percent of the arterial system in 1963. This significant reduction in traffic congestion in Milwaukee County is largely due to the opening of freeway facilities. The freeway facilities in Milwaukee County absorbed more than the 3.3 million vehicle miles by which travel demand in that county increased over the decade, thereby permitting a corresponding decrease in traffic congestion on the surface arterials. For the Region as a whole, arterial traffic congestion was held at about 1963 levels despite an 8 percent increase in population, a 40 percent increase in motor vehicle registrations, a 25 percent increase in trip generation, and a 54 percent increase in arterial vehicle miles of travel. Without the regional freeway system, such increases in travel demand could not have been absorbed without increasing traffic congestion to intolerable levels.

Source: SEWRPC.

As shown on Map 100 and in Table 110 which identify the distribution of the arterial segments operating at these levels of congestion, most of the arterial system mileage within the Region operating at or over design capacity is located in the intensely developed urban areas. Of the arterial street and highway mileage within the Region which is presently (1972) operating at or over design capacity, 87 percent is located within the Milwaukee, Racine, and Kenosha urbanized areas. Moreover, as summarized in Table 110, over 16 percent of Milwaukee County's arterial mileage is presently operating at or over design capacity, while none of the three still primarily rural counties—Ozaukee, Walworth, and Washington—has over 6 percent of its arterial mileage operating at or over design capacity.

Between 1963 and 1972, the number of miles of arterial streets and highways operating over design capacity was reduced from 191.8 to 165.6, or by 14 percent (see Map 99). The number of miles of arterials operating at design capacity, however, increased from 139.9 in 1963 to 151.9 in 1972, or by 9 percent. Thus, the effect of changes in arterial supply and use from 1963 to 1972 was a net reduction of 14.2 miles, or 4 percent—from 331.7 to 317.5 miles—of facilities operating at or over design capacity. These changes have been brought about largely through the construction of the freeway system, which has served to accommodate over 67 percent of the increase in travel within the Region over the nine-year period as measured by vehicle miles of arterial travel.

It is significant to note that, as shown in Table 110 and on Figure 13 of Chapter III of this report, the miles of facilities operating at or over capacity had been reduced to 290.7 in 1967 and to 275.2 in 1970, the year following the last extensive freeway facility opening within the urbanized areas of the Region. However, the lag in freeway construction brought the mileage operating at or over capacity up to 317.2 in 1972.

SUPPLY AND USE OF MASS TRANSIT

To be comprehensive, regional transportation planning must consider all modes of travel, with particular emphasis on how those modes may affect 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 the existing and potential use of mass transit facilities. The principal emphasis in such attention at the regional level, however, must be focused on those mass transit facilities which are of areawide significance and, as such, must be designed as integral parts of the regional transportation system.

As shown in Figure 56, the vehicular transportation of people can be divided conceptually into two major categories: personalized transportation and mass transportation. Personalized transportation may be defined as the transportation of individuals—or very small groups of people—by relatively small, generally individually owned or leased vehicles which are operated for each trip so as to provide direct, virtually "door-to-door" service between trip origin and trip destination. The most common forms of personalized transportation are the private automobile, including the "pooled" use of such automobiles; taxicabs; motorcycles; bicycles; and with respect to air travel, small

Table 110

VOLUME-TO-CAPACITY RATIOS FOR THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE REGION BY COUNTY: 1963, 1967, 1970, and 1972[a]

County	1963 V/C Range 0.00-0.90 Mileage	1963 V/C Range 0.00-0.90 Percent of Total	1963 V/C Range 0.91-1.10 Mileage	1963 V/C Range 0.91-1.10 Percent of Total	1963 V/C Range Above 1.10 Mileage	1963 V/C Range Above 1.10 Percent of Total	1963 Total Mileage
Kenosha	260.8	92.6	7.2	2.6	13.5	4.8	281.5
Milwaukee	589.8	74.5	85.4	10.8	116.3	14.7	791.5
Ozaukee	250.3	94.5	6.3	2.4	8.3	3.1	264.9
Racine	327.7	93.3	10.0	2.8	13.6	3.9	351.3
Walworth	390.5	97.7	3.9	1.0	5.3	1.3	399.7
Washington	401.8	99.9	0.5	0.1	0.0	0.0	402.3
Waukesha	635.6	91.2	26.6	3.8	34.8	5.0	697.0
Region	2,856.5	89.6	139.9	4.4	191.8	6.0	3,188.2

County	1967 V/C Range 0.00-0.90 Mileage	1967 V/C Range 0.00-0.90 Percent of Total	1967 V/C Range 0.91-1.10 Mileage	1967 V/C Range 0.91-1.10 Percent of Total	1967 V/C Range Above 1.10 Mileage	1967 V/C Range Above 1.10 Percent of Total	1967 Total Mileage
Kenosha	272.1	91.5	12.9	4.3	12.5	4.2	297.5
Milwaukee	706.3	83.1	68.1	8.0	75.4	8.9	849.8
Ozaukee	277.1	96.6	6.7	2.3	3.2	1.1	287.0
Racine	337.7	90.9	13.1	3.5	20.7	5.6	371.5
Walworth	397.8	97.6	5.8	1.4	4.1	1.0	407.7
Washington	409.1	99.6	1.5	0.4	0.0	0.0	410.6
Waukesha	641.6	90.6	38.1	5.4	28.6	4.0	708.3
Region	3,041.7	91.3	146.2	4.4	144.5	4.3	3,332.4

County	1970 V/C Range 0.00-0.90 Mileage	1970 V/C Range 0.00-0.90 Percent of Total	1970 V/C Range 0.91-1.10 Mileage	1970 V/C Range 0.91-1.10 Percent of Total	1970 V/C Range Above 1.10 Mileage	1970 V/C Range Above 1.10 Percent of Total	1970 Total Mileage
Kenosha	264.2	91.1	9.3	3.2	16.5	5.7	290.0
Milwaukee	713.5	86.8	61.6	7.5	47.0	5.7	822.1
Ozaukee	232.0	93.6	13.1	5.3	2.7	1.1	247.8
Racine	303.4	87.1	19.0	5.5	25.9	7.4	348.3
Walworth	390.5	96.9	6.8	1.7	5.5	1.4	402.8
Washington	317.6	95.3	6.2	1.9	9.3	2.8	333.1
Waukesha	605.5	92.1	16.6	2.5	35.7	5.4	657.8
Region	2,826.7	91.1	132.6	4.3	142.6	4.6	3,101.9

County	1972 V/C Range 0.00-0.90 Mileage	1972 V/C Range 0.00-0.90 Percent of Total	1972 V/C Range 0.91-1.10 Mileage	1972 V/C Range 0.91-1.10 Percent of Total	1972 V/C Range Above 1.10 Mileage	1972 V/C Range Above 1.10 Percent of Total	1972 Total Mileage
Kenosha	250.4	87.2	14.7	5.1	22.0	7.7	287.1
Milwaukee	662.9	83.3	71.8	9.0	61.0	7.7	795.7
Ozaukee	237.9	93.8	10.1	4.0	5.5	2.2	253.5
Racine	316.0	88.9	19.1	5.4	20.3	5.7	355.4
Walworth	404.5	98.2	2.7	0.7	4.8	1.1	412.0
Washington	326.0	94.6	9.7	2.8	9.1	2.6	344.8
Waukesha	603.5	90.0	23.8	3.6	42.9	6.4	670.2
Region	2,801.2	89.8	151.9	4.9	165.6	5.3	3,118.7

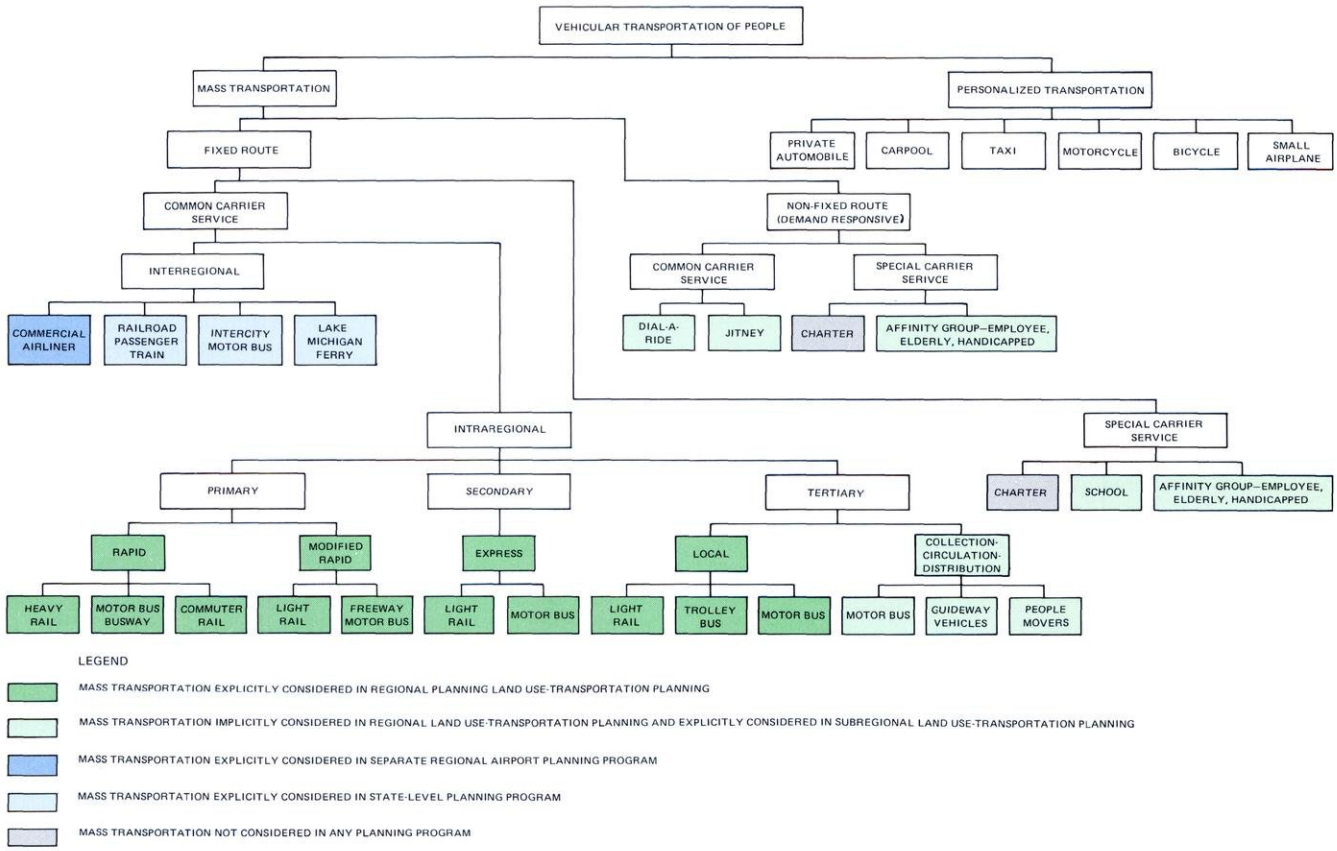
[a] *The significance of the volume-to-capacity ratio of the ranges used is:*

0.00-0.90 - Under design capacity, fully adequate and safest operational level.
0.91-1.10 - At design capacity but still adequate.
Over 1.10 - Over design capacity, congested at times.

Source: SEWRPC.

Figure 56

CLASSIFICATION OF THE VEHICULAR TRANSPORTATION OF PEOPLE



Source: SEWRPC.

airplanes. With respect to surface travel, this major means of vehicular transportation—that by automobile and taxi—is explicitly considered in the regional transportation planning process.

Mass transportation may be defined as the transportation of relatively large groups of people by relatively large, generally publicly or quasi-publicly owned vehicles routed between or along significant concentrations of related trip origins and destinations. The most common forms of mass transportation in the Region are the motor bus, railway passenger train, large airplane, and trans-lake ferry. Some form of mass transportation 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 personalized transportation, but also to provide an alternative, more efficient mode of travel for certain types of trips within and between urban areas.

As shown in Figure 56, mass transportation may be further divided into two subcategories: fixed route and nonfixed route. Fixed route mass transportation may be defined as the provision of service to the general public or special subgroups of the general public by relatively large vehicles operated on regular schedules over prescribed routes. Nonfixed route mass transportation may be defined as the provision of service to the general public or to special subgroups of the public on a demand responsive basis. The operation of fixed route mass transportation, like the operation of personalized transportation, can be readily simulated by the mathematical models developed and maintained for this purpose by the Commission under the regional transportation study. The operations of the nonfixed route category cannot, however, be readily simulated by the models developed by the Commission. Yet, such operations may affect the modal choice decision for certain types of personal trips.

Accordingly, unlike personalized and fixed route mass transportation, which can be and are explicitly considered in the regional transportation planning process, nonfixed route mass transportation is only implicitly considered in this process through assumptions relating to the level of service in given subareas of the Region as those levels of service would affect modal choice. Nonfixed route mass transportation service is, however, given more explicit consideration by the Commission in subregional transportation planning, particularly in the preparation of transit development programs as required for urban areas of the Region by the U. S. Department of Transportation, Urban Mass Transportation Administration.

Fixed route mass transportation service may be further subdivided into common carrier service and special carrier service. In the fixed route category, common

carrier service may be defined as fixed route, scheduled headway, mass transportation service provided to the general public. In the fixed route category, special carrier service may be defined as fixed route mass transportation service provided to special subgroups, the membership of which is subject to qualification. Examples of fixed route special carrier service include the traditional yellow school bus service operated by school districts for elementary and secondary school pupils, the special U-Bus service as initially operated by the University of Wisconsin-Milwaukee for its students and staff, and the special employee service operated by Goodwill Industries, Inc. in the Milwaukee urbanized area.

Nonfixed route mass transportation service similarly may be further subdivided into common carrier service and special carrier service. In the nonfixed route category, common carrier service may be defined as mass transportation service provided to the general public. Such service could include so-called "jitney" service, where vehicles cruise a given subarea of the Region and provide transportation service on visual signal, or a "dial-a-ride" service where small buses or vans are utilized to provide telephonic demand responsive service. There are presently no examples of such service in the Region. In the nonfixed route category, special carrier service may be defined as nonfixed route mass transportation service provided to special subgroups of the general public where ridership eligibility is largely based upon membership in a qualified group. An example of such service to a special population subgroup in the Region today is the "little red bus" dial-a-ride service currently operated by Waukesha County to provide special, demand responsive transit service to the elderly.

As shown in Figure 56, the common carrier fixed route mass transportation service may be further subdivided into two additional categories. The first category—interregional—includes those forms of fixed route mass transportation providing service across regional boundaries to meet external travel demand, such as commercial air travel, railway passenger train service, ferry service across Lake Michigan, and intercity bus service. The second category—intraregional—includes those forms of common carrier fixed route mass transportation providing service within the Region to meet internal travel demand.

The interregional category of fixed route common carrier service is considered under the regional surface transportation planning effort only as the terminal facilities relating to such service may comprise major trip generators for the internal fixed route mass transit and highway systems. Interregional commercial air travel is explicitly considered by the Commission under a separate comprehensive regional airport system planning program, while interregional train, bus, and cross-lake ferry service is to be considered by the Wisconsin Department of Transportation under a separate statewide planning program.

The intraregional common carrier fixed route service may be further subdivided into primary, secondary, and tertiary levels of service. The primary level of service is intended to facilitate transregional, or intercommunity,[9] travel by connecting the various major activity centers and communities of the Region. Primary level service consists of service provided by those mass transportation facilities which join the major regional activity centers—such as regional commercial, industrial, institutional, and recreational centers—to each other and to the various residential communities comprising the Region. The major purpose of the primary level of mass transportation service is to provide a network of relatively high-speed lines which serve and connect these kinds of centers and residential communities. Primary level mass transportation service may be characterized as having relatively high operating speeds and relatively low accessibility.

Primary transit service may be further subdivided into rapid and modified rapid transit subcategories. Rapid transit service can be defined as service provided at relatively high operating speeds over exclusive, fully grade separated rights-of-way with station stops, if any, between terminals generally located no less than one mile or more apart. Rapid transit service may thus be provided by commuter rail facilities; "heavy" rail transit facilities[10]

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[9] *A community is defined as a group of residential neighborhood units that are served by a common high school, shopping center, and park. As such, a community may or may not be coterminous with a civil division.*

[10] *The terms "heavy" rail and "light" rail are often misunderstood and confused. In general, the following are the distinguishing characteristics of heavy and light rail:*

Characteristic	*Heavy Rail*	*Light Rail*
Size of vehicle	*Relatively large vehicles with maximum capacities ranging from 180 to 250 passengers per car (seating capacity ranging from 44 to 62 passengers per car).*	*Relatively small vehicles with maximum capacities ranging from 75 to 80 passengers per car, or 155 to 180 passengers per two-car articulated unit (seating capacity ranging from 50 to 62 passengers per car, or 68 to 80 passengers per two-car articulated unit).*
Loading	*High level platform*	*Grade level*
Electric power supply	*Third rail*	*Overhead wire*
Right-of-way	*Usually fully grade separated*	*Usually not fully grade separated*
Maximum length of trains	*Relatively long—up to 10 cars*	*Relatively short—one to three cars*

In lay terms, heavy rail can be visualized in terms of "El" or "subway" systems, while light rail can be visualized in terms of "streetcar" systems.

or motor buses operating on exclusive busways. Modified rapid transit may be provided by motor buses operating in mixed traffic on freeways, and by "light" rail facilities, if such facilities are provided with an exclusive but not necessarily fully grade separated right-of-way. All forms of primary intraregional transit service are explicitly considered in the regional transportation planning process.

The secondary level of intraregional common carrier fixed route service consists of express service. This is defined as service provided over arterial streets with stops generally located at intersecting transit routes and major traffic generators, generally no less than 1,200 feet apart. The secondary mass transportation system may provide "feeder" service to the primary system, as well as greater depth and breadth of access from subregional areas. Secondary express service could be provided by motor bus or by light rail cars when such vehicles are operated in mixed traffic on shared rights-of-way. The operation of motor buses or light rail vehicles over exclusive lanes within an otherwise shared right-of-way would constitute a high level of secondary service. In general, secondary mass transit service may be distinguished from primary mass transit service in that it provides a greater degree of accessibility at somewhat slower operating speeds. This secondary level of intraregional mass transit service is also explicitly considered in the regional transportation planning process.

The tertiary level of fixed route common carrier mass transportation service is characterized by a high degree of accessibility and a relatively low operating speed. This tertiary level may be subdivided into two categories: local and collection-circulation-distribution. Local service may be defined as service provided primarily over arterial and collector streets with stops for passenger pickup and discharge located no more than 1,200 feet apart. Such service could be provided by motor bus, trolley bus, or light rail vehicles. Local tertiary service is explicitly considered in the regional transportation planning process. Collection-circulation-distribution service may be defined as service provided for the movement of passengers within major activity centers by motor bus or van, trolley bus, light rail vehicles, automated guideway vehicles, and other types of people movers, such as moving ramps. The collection-circulation-distribution portion of tertiary intraregional transit service is not explicitly considered in the regional transportation planning process. Such service is explicitly considered in the subregional transportation planning process, particularly in the preparation of urban area transit development programs.

The tertiary level of transit service in its ideal form would constitute a dense grid of local transit lines that would provide a high degree of access to mass transit service and would "feed" the primary and secondary transit systems. These latter facilities would tend to be more widely spaced and could be both grid and radial in nature. A crude analogy may be drawn between the primary, secondary, and tertiary transit systems and the various components of the street and highway system of the Region. The primary transit system, characterized by high operating speeds and low accessibility, performs essentially the same function as the regional freeway system—carrying large volumes of relatively long trips. The secondary transit system, characterized by somewhat lower operating speeds and somewhat higher accessibility than the primary transit system, in many ways performs the same function as the standard surface arterial streets and highways, both feeding to and collecting from the primary system and providing a degree of access to adjacent land uses. The tertiary transit system, characterized by low operating speeds and high accessibility, performs much the same function as collector and minor streets, providing access to transit from adjacent land uses, and providing collection and distribution service related to the primary and secondary systems.

Fixed Route Mass Transportation—
Common Carrier Service

Interregional Service: Interregional fixed route mass transportation service was provided within the Region in 1972 by seven commercial air carriers, including Air Michigan, Eastern, Midstate Air Commuter, North Central, Northwest Orient, Ozark, and United Airlines; by railroad passenger train service; by bus service; and by trans-lake car ferry service. As indicated previously, these services, because of their statewide and interstate significance, were not considered in the regional transportation planning process except as the terminal facilities involved affect the other elements of the regional surface transportation system. For purposes of comparison with service provided in 1963, however, the interregional mass transportation service provided to the Region in 1972 by buses operating over public streets and highways and by passenger trains operating over exclusive railroad rights-of-way were identified. The routing of these two forms of fixed route service operating within the Region in 1963 and 1972 is shown on Maps 101 and 102, respectively.

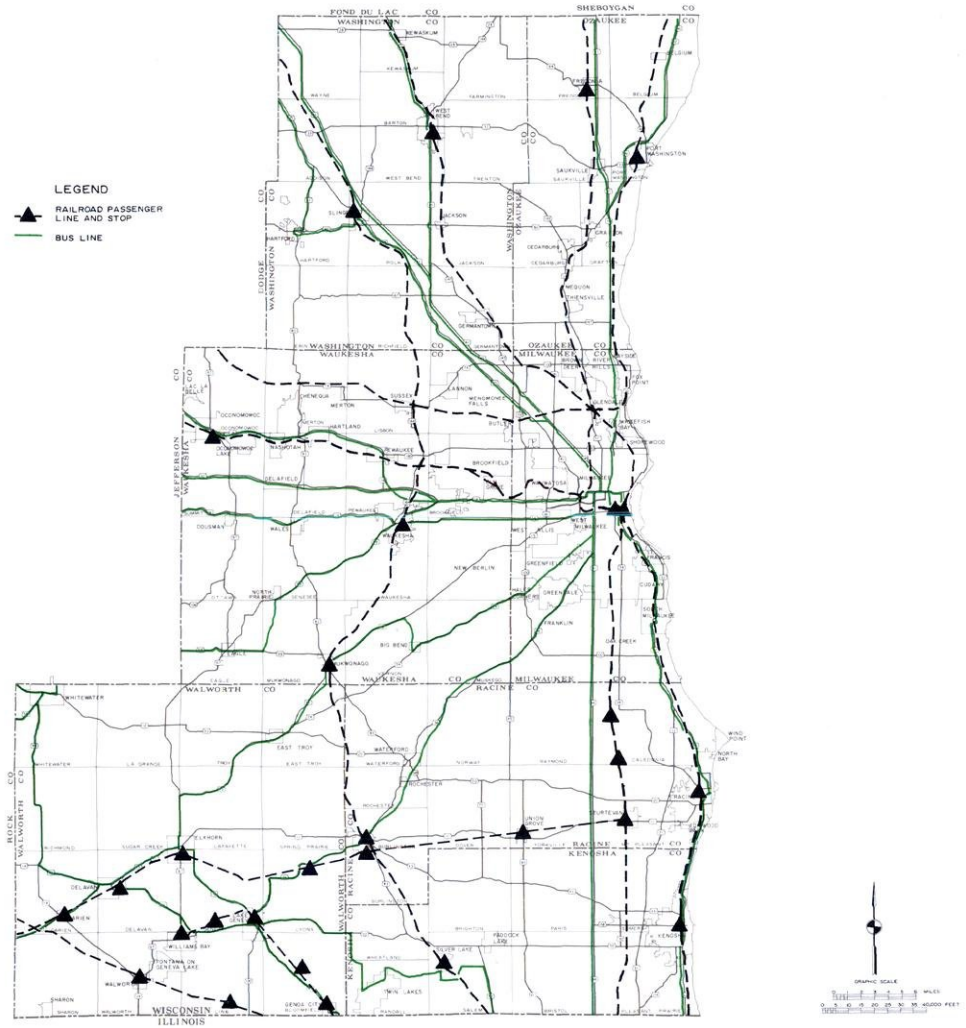
Railway Passenger Train Service: Interregional fixed route mass transportation service within the Region was provided over approximately 97 miles of railroad right-of-way by two privately owned railroads: the Chicago and Northwestern Transportation Company (C & NW) and the Chicago, Milwaukee, St. Paul and Pacific Railroad Company (The Milwaukee Road). In addition, the quasi-public National Railroad Passenger Corporation (AMTRAK) provided interregional railroad service over Milwaukee Road trackage within the Region.

Chicago-oriented suburban passenger service, considered herein as interregional service, was provided by the C & NW and Milwaukee Road. The C & NW operated two trains in each direction on weekdays between the Cities of Lake Geneva and Chicago, Illinois, and nine trains in each direction between the Cities of Kenosha and Chicago. The Milwaukee Road provided one train in each direction on weekdays between the Village of Walworth and Chicago.

Interregional railroad passenger service provided by AMTRAK consisted of seven daily trains in each direction between the Cities of Milwaukee and Chicago. Two of these trains in each direction also operated to and

Map 101

INTERREGIONAL MASS TRANSPORTATION SERVICE IN THE REGION: 1963

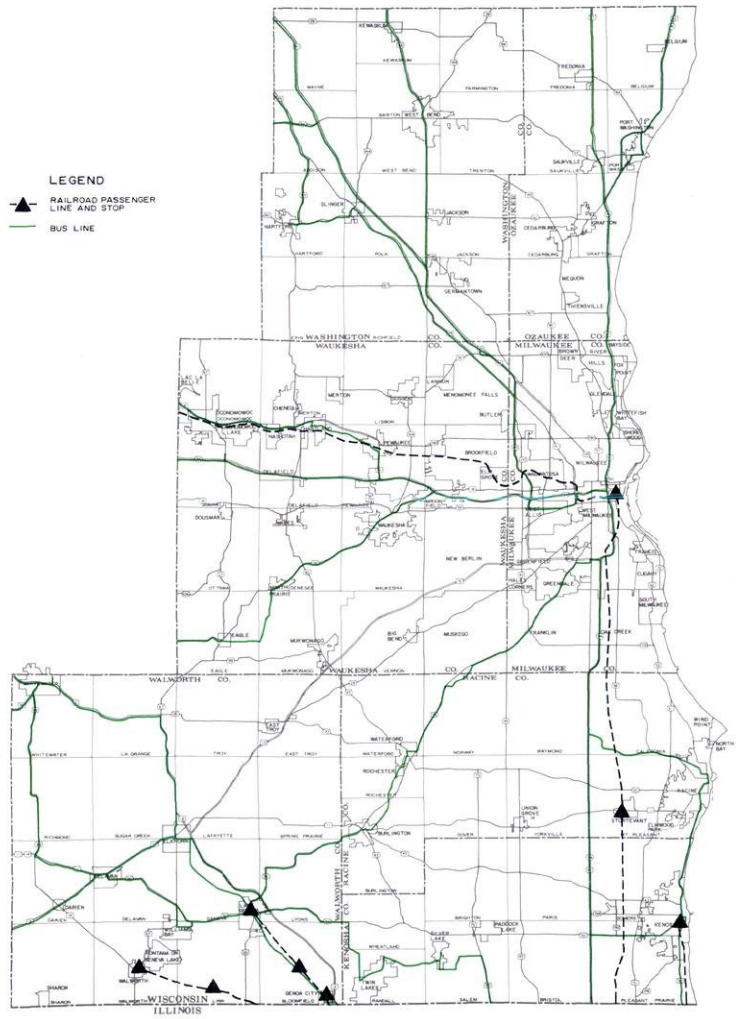


Excluding commercial airline and Lake Michigan ferry service, interregional mass transportation service in the Region in 1963 was provided through railway passenger train and motor bus service. Railway passenger train service was provided over a total of about 400 route miles of track in 1963, providing stops at 22 incorporated cities and villages within the Region, and connecting these cities and villages to other regions of the United States. Interregional bus service was provided over approximately 600 miles of streets and highways in 1963, providing service to 52 incorporated cities and villages in the Region.

Source: SEWRPC.

Map 102

INTERREGIONAL MASS TRANSPORTATION SERVICE IN THE REGION: 1972



By 1972, interregional railroad passenger train service had been greatly reduced within the region, being limited to service over a total of 97 route miles of track. Such service consisted only of the quasi-public AMTRAK service over the Milwaukee Road trackage in the Region with stops at only two urban places—Milwaukee and Sturtevant—as well as the Chicago-oriented commuter railroad service from Kenosha; Lake Geneva, Pell Lake, and Genoa City; and Walworth and Zenda. Interregional bus service in 1972 was operated over approximately 500 miles of streets and highways, providing service to 37 incorporated cities and villages in the Region.

Source: SEWRPC.

from points west of Milwaukee—one to and from Minneapolis, Minnesota and one train in each direction to and from Seattle, Washington. Two of these seven trains in each direction also operated south through Chicago to and from St. Louis, Missouri. Four of the seven trains in each direction also stopped at the Village of Sturtevant, the only other AMTRAK boarding point in the Region besides Milwaukee. Since the 1972 inventory of rail service was completed, AMTRAK has added an additional through train between Chicago, Milwaukee, Minneapolis, and Seattle, but has discontinued through train service between Milwaukee and St. Louis.

The 97 miles of railroad trackage over which passenger service was provided in 1972 compare with 408 miles of such railroad trackage in 1963[11] (see Map 101), a decline of about 76 percent. Service discontinued between 1963 and 1972 included all interregional railroad passenger train service between Milwaukee and northern Wisconsin. Immediately after the 1963 inventory was completed, the C & NW discontinued passenger service between Milwaukee and Minneapolis. Between 1963 and 1970, the C & NW gradually reduced service between Milwaukee and Ashland, Ishpeming, and Land O'Lakes. By 1970, service was cut back to the City of Green Bay, and service along the shore of Lake Michigan via the Cities of Sheboygan and Manitowoc was operated only once a week. In 1971, when AMTRAK assumed operation of all interregional passenger trains except the Chicago-oriented commuter service, all passenger service north of the City of Kenosha was eliminated on the C & NW. Commuter service between the City of Lake Geneva and the Village of Williams Bay with a stop at Lake Como was discontinued by the C & NW in 1965.

The Soo Line Railroad Company discontinued all interregional passenger train service in 1965. The service, which stopped at the Cities of Burlington and Waukesha and the Villages of Mukwonago, Silver Lake, and Slinger, operated to Chicago to the south and to Superior to the north.

The Milwaukee Road discontinued interregional passenger train service between Milwaukee and Savannah, Illinois via Burlington in 1965, and between Milwaukee and Calumet, Michigan in 1968. The five trains in each direction[12] operated daily between Milwaukee and Watertown were cut back to one train each day by the Milwaukee Road in 1971, when AMTRAK began service in the Region. The remaining passenger train which operated between Watertown and Milwaukee, and as such would constitute interregional service under a strict application of the definitions used herein, provided primarily commuter service within the Region with stops at Oconomowoc, Okauchee, Nashotah, Hartland, Pewaukee, Duplainville, Brookfield, Elm Grove, and Wauwatosa, and made its last trip in July 1972.[13]

Bus Service: The inventory revealed that interregional bus service was provided over approximately 500 miles of streets and highways in 1972. Interregional bus service was provided on a regularly scheduled basis by seven private companies: Badger Coaches, Inc.; Central-West Motor Stages, Inc.; Greyhound Lines-West; Peoria-Rockford Bus Company; Tri-State Coach Lines, Inc.; Wisconsin Coach Lines, Inc.; and Wisconsin-Michigan Coaches, Inc.; and by one supplemental carrier on a demand basis: Scholastic Transit Company (North American Coach Company).

The most frequent interregional bus service in the Region in 1972 was provided in the Milwaukee-Chicago corridor, with a total of 27 regularly scheduled trips in each direction. Greyhound Lines-West operated 19 scheduled trips in each direction each weekday between Milwaukee and Chicago without any intermediate stops within the Region. In addition, Greyhound Lines-West operated three trips in each direction per weekday in this same corridor with stops in Racine and Kenosha. Tri-State Coach Lines, Inc. operated five scheduled trips in each direction on weekdays between Milwaukee and O'Hare International Airport in Chicago, with stops in the Region at STH 20 and IH 94 in Racine County and at STH 50 and IH 94 in Kenosha County. These 27 regularly scheduled trips represent more than double the service provided in 1963, when 13 trips were scheduled in each direction. Relatively frequent interregional bus service is also provided by several carriers in the Milwaukee-Madison and Milwaukee-Green Bay corridors. Other interregional bus service, shown on Map 102, is usually limited to one or two trips in each direction per day.

The approximately 500 miles of streets and highways over which interregional bus routes operated in 1972 were about 100 miles less than operated in 1963 (see Map 101). It should be noted, too, that interregional bus routes in several travel corridors were shifted to freeways opened to traffic during the 1963-1972 period. New interregional bus service was inaugurated in 1971 between Milwaukee and the Great Lakes Naval Training Center in Illinois, but over streets and highways already used by other interregional bus lines. The interregional service between Chicago and Lake Geneva and Delavan, by LaGrange-LaGrange Park Transit Company, changed

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[11] *In SEWRPC Planning Report No. 7, Volume I, there was reported a total of 360 miles of passenger service in the Region, erroneously omitting the Chicago and Northwestern Railroad service to Green Bay via Port Washington and service between Williams Bay and Chicago.*

[12] *In SEWRPC Planning Report No. 7, Volume I, reported eight trains daily in each direction, having overstated the service between Milwaukee and Watertown.*

[13] *Ridership on this service was surveyed on September 21, 1971. The survey indicated that of the 60 passengers, 60 percent used the service both morning and evening five days a week and 80 percent of the user trips were for work purposes. One-half of the ridership made the trip as auto drivers prior to their use of the service, while one-third did not previously make the trip. The average rider had been using the service for nearly six years.*

ownership in 1972 and is now operated by Central-West Motor Stages, Inc. Overall, interregional bus service, with the exception of increased service in the Milwaukee-Chicago corridor, has remained largely unchanged since the 1963 inventory.

Intraregional Service: Intraregional fixed route mass transit service was provided within the Region in 1972 in each of the three categories of primary, secondary, and tertiary levels of service. Primary service in 1972 consisted entirely of the modified rapid transit "freeway flyer" motor bus service provided in the Milwaukee urban area by the Milwaukee and Suburban Transport Corporation. By comparison, the only primary service provided in 1963 in the Region was the commuter rail service operated by the Milwaukee Road between Watertown just west of the Region and downtown Milwaukee (see Maps 103 and 104). By 1972 this service had been abandoned and the Region was left without any commuter rail service. The modified rapid transit service provided over freeways in Milwaukee County was initiated by the Milwaukee and Suburban Transport Corporation in 1964. The first such service began between the Mayfair Shopping Center in the City of Wauwatosa and the Milwaukee central business district (CBD). Because the first route was an immediate success, additional routes were added. By 1974, nine routes operating over 43 miles of freeway in the Milwaukee urban area were in operation. Total ridership on the freeway flyers, as shown in Figure 57, increased from about 81,000 revenue passengers annually in the first year of operation to about 721,000 annual revenue passengers in 1973.

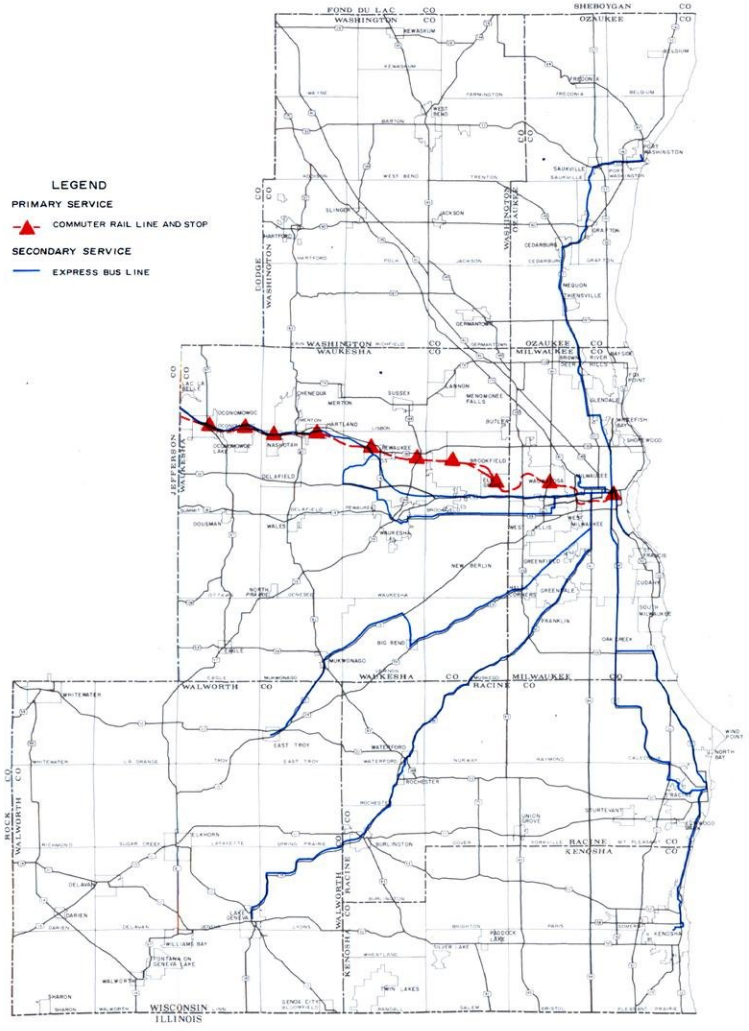
Figure 57

REVENUE PASSENGERS CARRIED ON MODIFIED RAPID TRANSIT IN THE REGION BY ROUTE: 1964-1973

Source: Milwaukee and Suburban Transport Corporation.

Map 103

PRIMARY AND SECONDARY INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE REGION: 1963

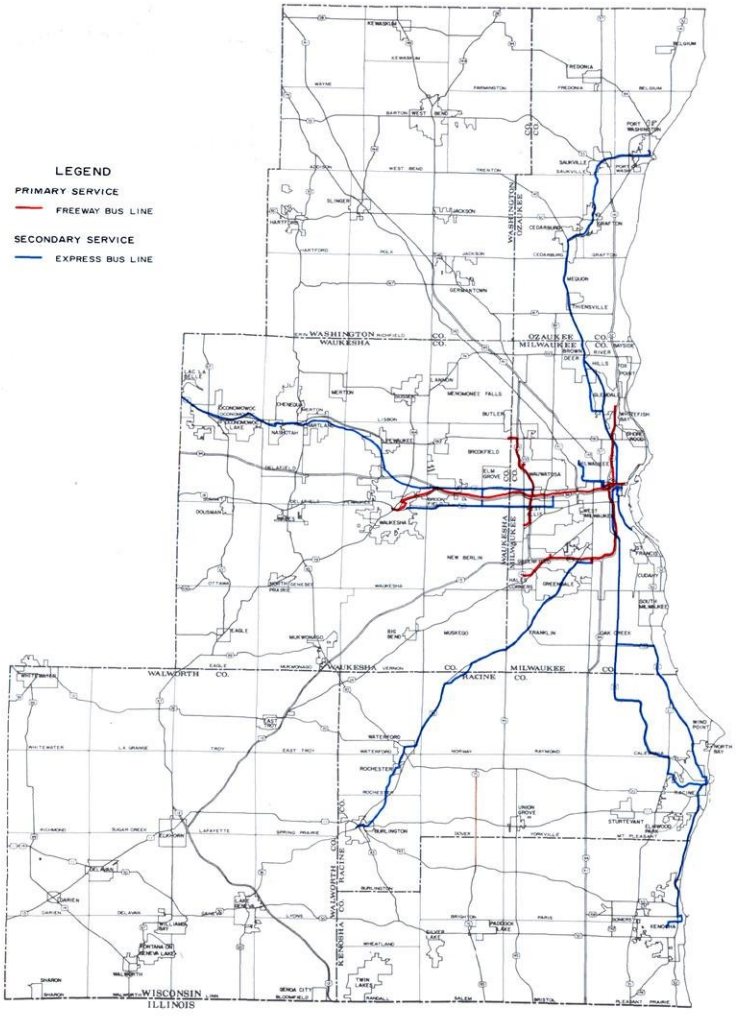


The only primary intraregional mass transportation service provided in the Region in 1963 was the commuter rail service operated over 46 route miles of track by the Milwaukee Road between Watertown, just west of the Region, and the Milwaukee central business district. This rail service made ten stops within the Region. Secondary intraregional mass transit service in 1963 consisted of eight express bus lines operated over 225 miles of streets and highways in several regional travel corridors by Greyhound Lines and Wisconsin Coach Lines, Inc., as well as two express bus lines operated over eight miles of streets and highways in the Milwaukee urban area by the Milwaukee and Suburban Transport Corporation.

Source: SEWRPC.

Map 104

PRIMARY AND SECONDARY INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE REGION: 1972



By 1972, the single intraregional commuter rail service that existed in the Region in 1963 had been abandoned. New primary level service was begun in the form of modified rapid transit freeway flyer bus service. Such service in 1972 consisted of seven lines operated over 45 miles of streets and highways. Secondary level mass transit service in the form of bus lines remained largely unchanged during the 1963-1972 period, with service being dropped, however, between Waukesha and Oconomowoc and between Milwaukee and East Troy. Secondary level service consisted of five lines operated over 175 miles of streets and highways by Wisconsin Coach Lines, Inc., and two lines operated over 8 miles of streets and highways by the Milwaukee and Suburban Transport Corporation.

Source: SEWRPC.

Secondary intraregional mass transit service in the Region for the years 1963 and 1972 is also shown on Maps 103 and 104. Such service in both years largely consisted of express bus lines operated by Wisconsin Coach Lines, Inc. and by the Milwaukee and Suburban Transport Corporation. The secondary service provided by the Transport Corporation was the same in both 1963 and 1972, consisting of two express bus lines, one from the Milwaukee CBD south toward the southerly lakeshore suburbs of Milwaukee, and the other from the Milwaukee CBD west and north to the Washington Park area of Milwaukee. Secondary mass transit service provided by Wisconsin Coach Lines, Inc. in the Region remained nearly unchanged in the period 1963 to 1972. However, service was discontinued in 1971 in the Milwaukee-East Troy and the Waukesha-Oconomowoc travel corridors. The most frequent service provided by Wisconsin Coach Lines, Inc. in 1972 was found in the Milwaukee-Waukesha corridor with 17 eastbound trips and 20 westbound trips per weekday, a reduction from the 32 trips in each direction provided in 1963. Secondary service between Milwaukee and Port Washington, Watertown, Racine, and Kenosha remained at about the same levels over the 1963-1972 period.

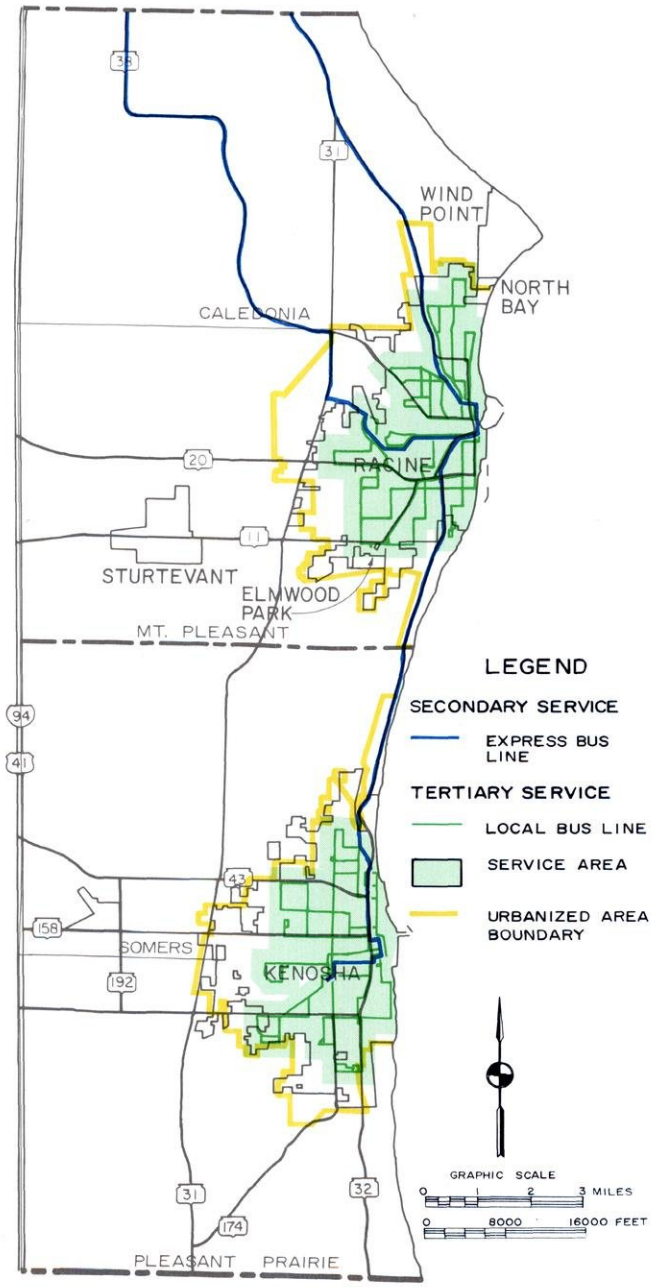
Tertiary mass transportation service was provided in the Kenosha, Milwaukee, and Racine urbanized areas in 1972. The Kenosha Transit-Parking Commission provided tertiary service in the Kenosha urbanized area; the Milwaukee and Suburban Transport Corporation provided such service within Milwaukee County; Wisconsin Coach Lines, Inc. provided such service in the City of Waukesha; and Flash City Transit Company provided such service in the Racine urbanized areas. In addition, a tertiary level collection-circulation-distribution system was operated by the University of Wisconsin-Parkside in Kenosha County. The tertiary mass transportation service provided within the Kenosha and Racine urbanized areas in 1963 and 1972 is shown on Maps 105 and 106, respectively. The tertiary mass transportation service provided within the Milwaukee urbanized area in 1963 and 1972 is shown on Maps 107 and 108, respectively.

As shown in Table 111, about 36 percent of the land area and approximately 82 percent of the resident population of the Milwaukee urbanized area was found to be within the tertiary, or local, mass transportation service area in 1972. In the Kenosha urbanized area, the local mass transit service area exceeded the urbanized area boundaries in places so that approximately 115 percent of the land area and about 97 percent of the resident population were served. This high proportion of area and population served in the Kenosha area is due primarily to extensions of local mass transit service to outlying industries and enclaves of senior citizen housing.

If local mass transportation is to provide a reasonable alternative to the use of the automobile, such service must meet certain minimum standards with respect to hours of operation and frequency of service. Such standards, as identified by the Technical Coordinating and Advisory Committee, are presented in Chapter II of Volume Two of this report. Comparison of the existing local mass transportation service with the standards permits delineation of the extent of local mass transportation service meeting these standards provided within the Region in 1972 (see Table 112 and Map 109).

Map 105

INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE KENOSHA AND RACINE URBANIZED AREAS: MAY 1963

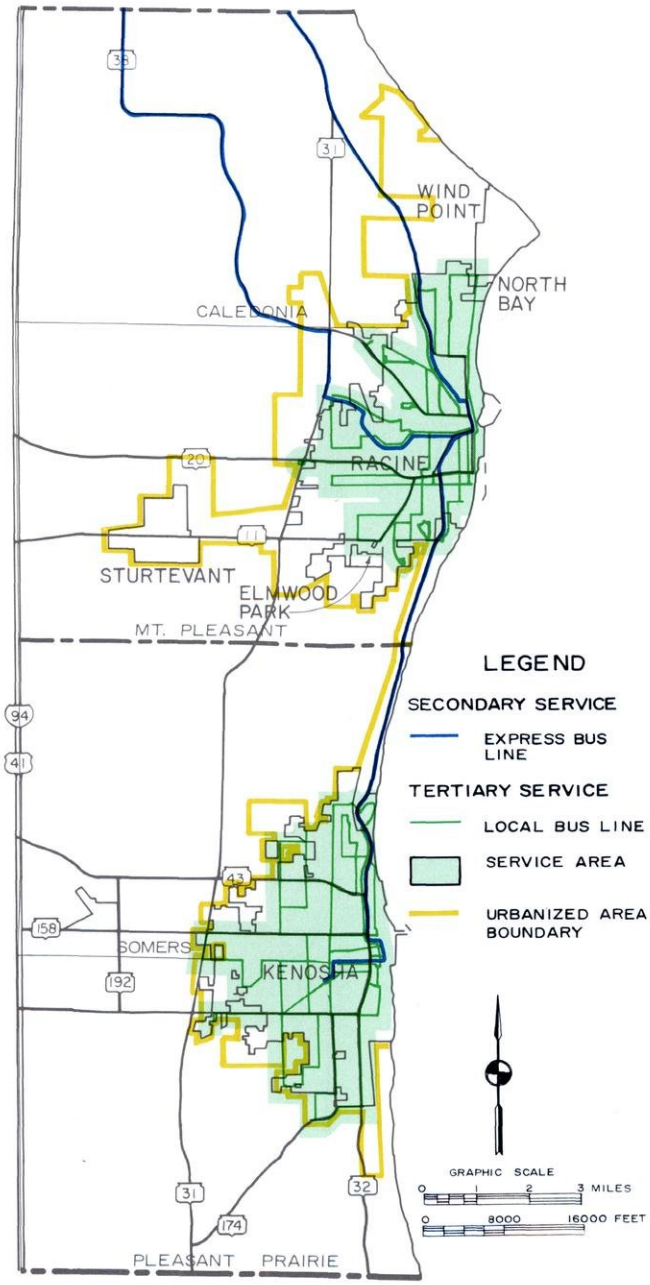


In 1963, tertiary, or local, mass transportation service was provided in the Kenosha and Racine areas by Lakeshore Transit, Inc. In the Racine area, about 96,600 persons lived within one-quarter mile of local transit lines, representing virtually all of the urban area population. In the Kenosha area, about 74,000 persons lived within one-quarter mile of local transit lines, also representing virtually all of the urban area population. In 1963, the number of local transit seat miles provided, a relatively good measure of level of service, was about 129,900 in the Racine area and about 80,800 in the Kenosha area.

Source: SEWRPC.

Map 106

INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE KENOSHA AND RACINE URBANIZED AREAS: MAY 1972



By 1972 the local mass transportation operations in the Kenosha and Racine areas had radically changed from those provided in 1963. In Racine, a new radial system was in operation by Flash City Transit Company using small minibuses. In Kenosha, a publicly owned and operated system was in service following the failure of not only Lakeshore Transit, Inc., which operated the service in 1963, but also a subsequent private corporation—Pathfinder City Transit Lines, Inc. In Racine, about 100,600 persons lived within one-quarter mile of local transit lines, representing about 88 percent of the urban area population. In Kenosha, about 83,900 persons lived within one-quarter mile of local transit lines, representing about 97 percent of the urban area population. The level of service provided in each urban area had declined dramatically, however, with the number of local transit seat miles provided declining to 29,500 in the Racine area, representing a 77 percent decline from the 1963 level, and to 43,200 in the Kenosha area, representing a 47 percent decline from the 1963 level. Since 1972, the private operator in Racine has gone out of business and the city has taken over ownership and operation of the transit system.

Source: SEWRPC.

The only service within the Region which fully meets the standards is that provided in the Milwaukee urbanized area. About 69 percent of the population of that area resides within the defined tertiary or local service area of the Milwaukee system. The service provided to the Kenosha and Racine urbanized areas, while generally meeting the standards for frequency of service during periods of operation, is not operated over the full periods of time required by the standards.

Numerous changes in local mass transportation service occurred between 1963 and 1972. In the Racine area, the "cross-town" urban mass transportation service operated by Lakeshore Transit, Inc., using large, 40-passenger transit type buses, was discontinued in 1968 and replaced by a "radial" system operated by Flash City Transit Company, using small, 19-passenger minibuses. This company realized a profit only in its initial year of operation and has been subsidized by the City of Racine since 1972.[14]

In Kenosha, service by Lakeshore Transit, Inc. was discontinued in April 1969. Local mass transportation service was not restored by a new company until August 1969. The new company, Pathfinder City Transit Lines, Inc., failed to make a profit on its operations—even with a subsidy provided by the City of Kenosha—and discontinued operations in February 1971. The City of Kenosha was again without local mass transit service until September 1971, when the publicly operated Kenosha Transit-Parking Commission began service.

While there were numerous changes in ownership and levels of local mass transportation service in the Region between 1963 and 1972, only one such area of the Region experienced the complete abandonment of local mass transportation service. The City of Port Washington lost its remaining local mass transportation service in 1966 when Port Transit Lines, Inc. discontinued service because of lack of patronage.

The Milwaukee and Waukesha areas are the only urban areas in the Region where local mass transportation service was provided by the same private operator in 1972 as in 1963.[15] In Waukesha, a change in policy regarding the transportation of students within the City of Waukesha resulted in a decrease in ridership of nearly 50 percent on Wisconsin Coach Lines buses in 1971, which resulted in service cutbacks, including a reduction in the number of routes operated and an increase in headways between buses. In Milwaukee County, the Milwaukee and Suburban Transport Corporation has also continued to experience ridership losses. Ridership levels in the Milwaukee area stabilized during 1965 and 1966, but a crippling strike and civil disorders in 1967 renewed the steady decline in revenue passengers.

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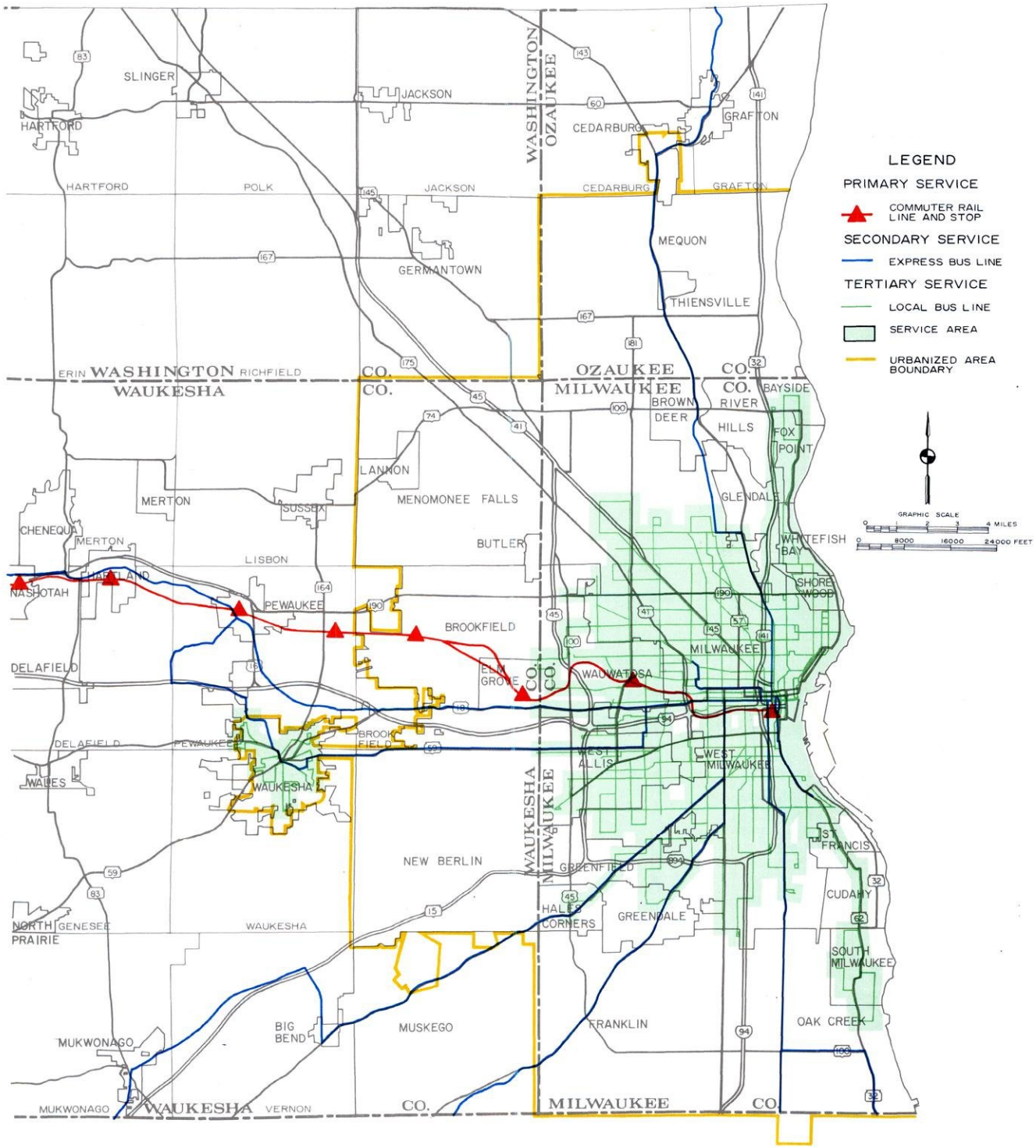
[14] *On July 1, 1975, the City of Racine acquired the assets of the Flash City Transit Company and began operation of the transit system.*

[15] *On July 1, 1975, Milwaukee County acquired the assets of the Milwaukee and Suburban Transport Corporation and began operation of the transit system.*

Map 107

INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE MILWAUKEE URBANIZED AREA: MAY 1963

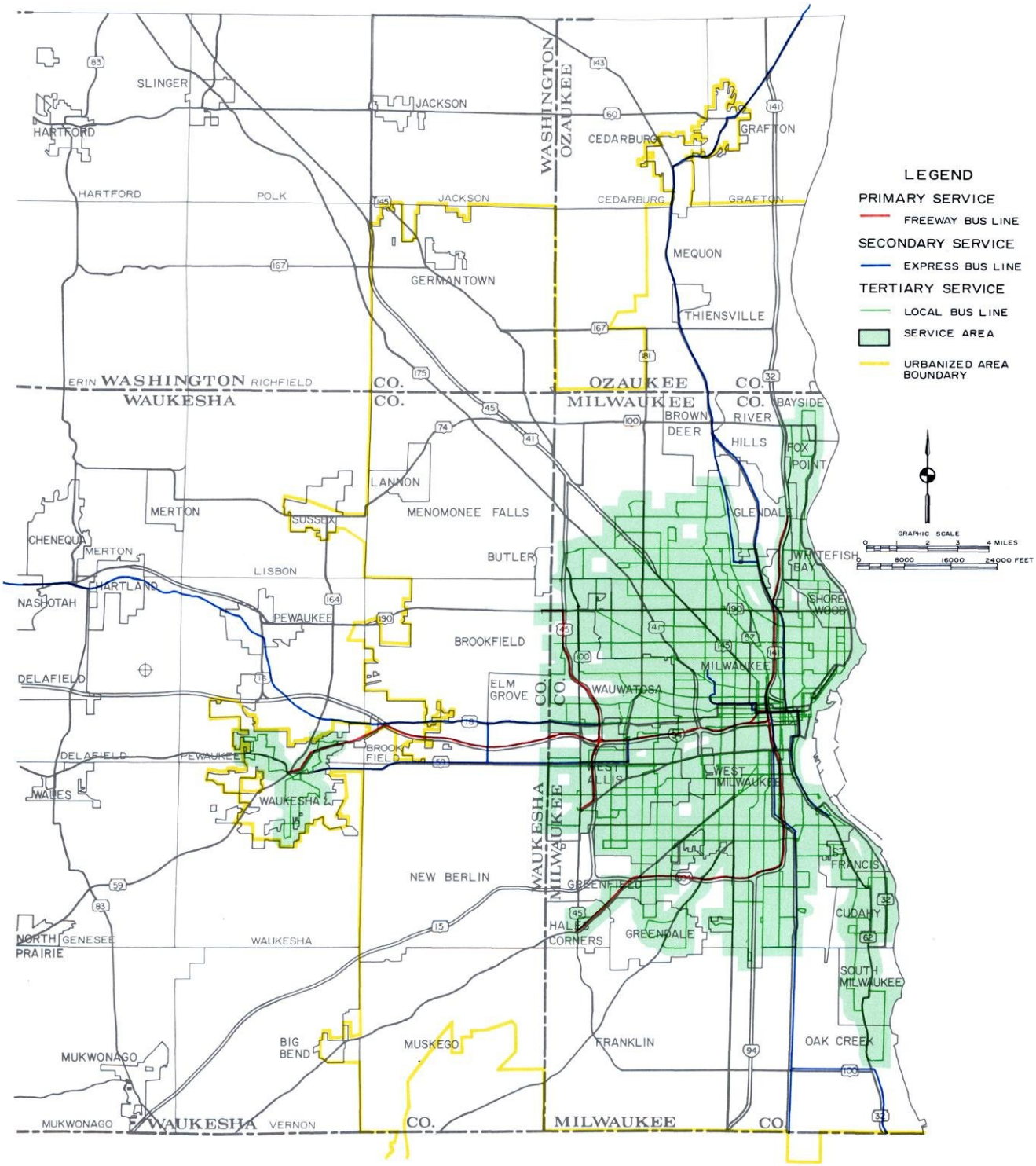


Local mass transit service provided in the Milwaukee urbanized area by the Milwaukee and Suburban Transport Corporation and Wisconsin Coach Lines, Inc. is shown on the above map. In 1963, about 1.05 million persons resided within one-quarter mile of local transit lines, representing about 87 percent of the total urbanized area population. Service by the Milwaukee and Suburban Transportation Corporation was confined to Milwaukee County; Wisconsin Coach Lines, Inc. provided local mass transit service in the City of Waukesha. In 1963, the number of local transit seat miles provided was about 3.4 million, while the number of passenger miles carried was 1.0 million, representing a 30 percent utilization rate.

Source: SEWRPC.

Map 108

INTRAREGIONAL MASS TRANSPORTATION SERVICE IN THE MILWAUKEE URBANIZED AREA: MAY 1972



In 1972, both the Milwaukee and Suburban Transport Corporation and Wisconsin Coach Lines, Inc. continued to provide local mass transit service in the Milwaukee urbanized area. The total population residing within one-quarter mile of local transit lines declined slightly from 1.05 million in 1963 to 1.04 million in 1972, representing 87 and 82 percent of the urbanized area populations, respectively. The number of round trip route miles provided rose dramatically, however, from 716 in 1963 to 986 in 1972, representing a 38 percent increase. Thus, a large expansion in route miles was required simply in order to serve the same number of residents in the urban area. Utilization of the service provided, measured in terms of the number of passenger miles to the number of seat miles provided, also declined dramatically from 30 percent in 1963 to about 17 percent in 1972.

Source: SEWRPC.

Table 111

LAND AREA SERVED, POPULATION SERVED, AND ROUTE MILES OPERATED BY LOCAL MASS TRANSIT IN THE REGION BY URBAN AREA: 1963 and 1972

Urban Area	Urban Area Size (Acres)		Area Served by Local Transit[a] (Acres)		Percent of Total Urban Area Served		Urban Area Population		Population Served by Local Transit[a]		Percent of Total Population Served		Round Trip Route Miles		
	1963	1972	1963	1972	1963	1972	1963[b]	1972[b]	1963[b]	1972[b]	1963	1972	1963	1972	Percent Change
Milwaukee[c]	250,900	292,100	90,500	105,500	36	36	1,216,500	1,267,400	1,053,100	1,043,600	87	82	716	986	38
Racine	9,300	18,000	8,300	11,200	88	62	95,900	115,200	96,600	100,600	101	88	76	81	7
Kenosha[d]	8,500	11,200	8,100	12,900	96	115	73,400	86,500	74,000	83,900	101	97	55	59	7
Subtotal	268,700	321,300	106,900	129,600	40	40	1,385,800	1,469,100	1,223,700	1,228,100	88	84	847	1126	33
Port Washington[e]	3,200	--	2,600	--	80	--	7,500	--	7,400	--	98	--	9	0	- 100
Total	271,900	--	109,500	--	40	--	1,393,300	--	1,231,100	--	88	--	856	1126	32

[a] *Area of U. S. Public Land Survey quarter sections within one-quarter mile of transit route.*

[b] *SEWRPC estimate.*

[c] *Includes Milwaukee and Waukesha transit systems (excludes school "trippers" in the City of Waukesha and includes primary and secondary transit service provided by the Milwaukee and Suburban Transport Corporation).*

[d] *Excludes school trippers.*

[e] *Service discontinued in 1966.*

Source: SEWRPC.

Table 112

LAND AREA AND POPULATION SERVED BY LOCAL MASS TRANSIT IN THE REGION MEETING SEWRPC MINIMUM STANDARDS BY URBANIZED AREA: 1972

Urbanized Area	Population	Area (Acres)	Total Local Mass Transit Service				Local Mass Transit Service Area Which Meets SEWRPC Standards[a]			
			Population Served	Percent of Urbanized Area	Area Served (Acres)	Percent of Urbanized Area	Population Served	Percent of Urbanized Area	Area Served (Acres)	Percent of Urbanized Area
Kenosha	86,500	11,200	83,900	97	12,900	115	--	--	--	--
Milwaukee	1,267,400	292,100	1,043,600	82	105,500	36	868,200	69	65,900	23
Racine	115,200	18,000	100,600	87	11,200	62	--	--	--	--
Total	1,469,100	321,300	1,228,100	84	129,600	40	868,200	59	65,900	21

[a] *See Chapter II, Volume 2 of this report for standards.*

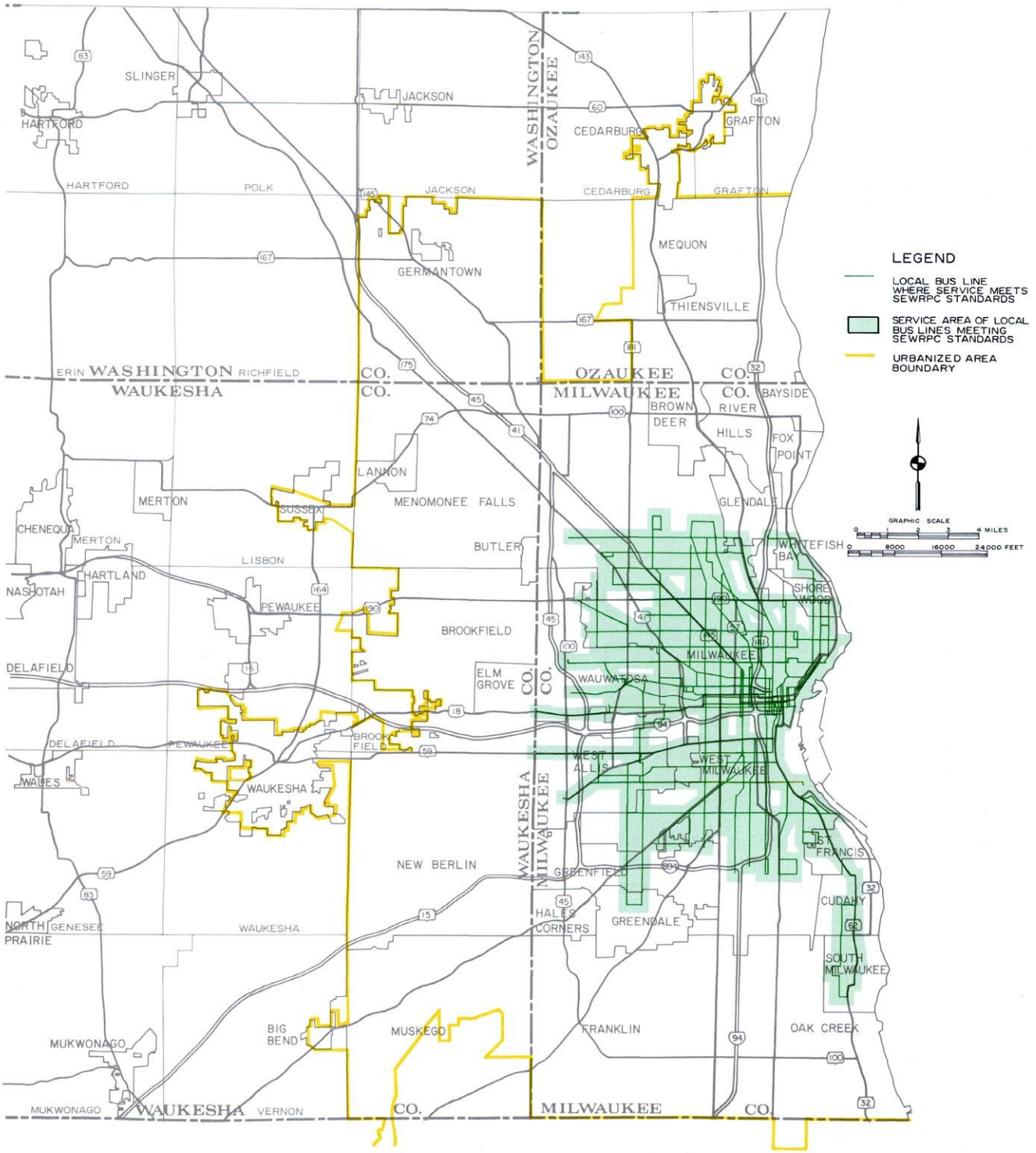
Source: SEWRPC.

A comparison of route miles, population, and area served by local transit in 1963 and 1972 is shown in Table 111. The local transit service area increased between 1963 and 1972 in each of the urban areas. The largest change (37 percent) in service area was in the Kenosha urban area. The service areas in the Racine and Milwaukee areas also increased, but by smaller increments. The Kenosha urban area also had the largest change (13 percent) in resident population served. Round trip route miles of service provided increased in all three urbanized areas, with the Milwaukee urban area increasing by about 27 percent. In spite of this large increase in the Milwaukee urban area, the resident population served declined by about 1 percent since 1963, indicating that, due primarily to declining population densities, a large expansion in route miles was required simply in order to serve about the same number of residents.

A comparison of land area and resident population served by local mass transportation in 1963 and 1972 indicates that the transit systems in the Milwaukee and Kenosha urbanized areas have expanded their respective service areas to extend service to new urbanized areas. The percentage of the total resident population served, however, dropped about 4 percent in the Milwaukee urbanized area, and there was no significant change in the Kenosha

Map 109

LOCAL MASS TRANSIT IN THE REGION MEETING SEWRPC MINIMUM STANDARDS: 1972



The only tertiary or local level mass transit service in the Region which fully meets the service standards with respect to hours of operation and frequency of service established for the regional transportation planning effort is a portion of the total such service provided in the Milwaukee urbanized area. Thus, while about 82 percent of the people living in the Milwaukee urbanized area are provided with some form of local mass transit service, only 69 percent of the total are provided with service that meets the minimum standards. The service provided in the Racine and Kenosha urbanized areas, while meeting the standards for frequency of service during periods of operation, is not operated over the full periods of time required by the standards.

Source: SEWRPC.

urbanized area. Within the Racine urbanized area, however, there were significant decreases in the percent of total land area and resident population served, indicating that expansion of the local transit system has not kept pace with the growth of the urbanized area.

Whereas round trip route miles and area served have generally increased, bus miles and seat miles of local service operated have shown a marked decrease in all three urban areas, indicating a lengthening of headways, a reduction in hours of service, and in the case of Racine, the use of smaller buses (see Table 113). Comparison of the area served by local mass transit meeting the standards presented in Chapter II of Volume Two of this report further indicates a significant reduction in local mass transit service. The service reductions within each urban area have followed the decline in transit patronage, as indicated in Table 114 and Figures 58, 59, and 60, which depict the historic trend in annual revenue passengers within each urban area.

Table 114 indicates a 41 percent decrease in annual revenue passengers within the Milwaukee urban area, from 89 million in 1963 to 52 million in 1972. This compares with a similar 41 percent decrease in the number of local mass transportation rides per capita, from 85 in 1963 to 50 in 1972. Similarly, within the Racine urban area, annual revenue passengers declined 82 percent, from three million in 1963 to one-half million in 1972, while local mass transportation rides per capita declined from 30 in 1963 to five in 1972. Within the Kenosha urban area, ridership declines paralleled those in the Racine

Table 113

UTILIZATION OF LOCAL MASS TRANSIT ON AN AVERAGE WEEKDAY IN THE REGION BY URBAN AREA: 1963 and 1972

Urbanized Area	Transit Vehicle Miles			Local Mass Transit Service Provided—Seat Miles			Local Mass Transit Service Used—Passenger Miles			Percent of Utilization	
	1963	1972	Percent Change	1963[a]	1972	Percent Change	1963[a]	1972	Percent Change	1963[a]	1972
Milwaukee[b]	78,886	61,314	-22	3,201,300	3,186,000	--	966,700	551,500	-43	30	17
Racine	3,548	1,555	-56	129,900	29,500	-77	31,800	5,300	-83	24	18
Kenosha	2,465	1,138	-54	80,800	43,200	-47	15,100	3,900	-74	19	9
Total	84,899	64,007	-25	3,412,000	3,258,700	-4	1,013,600	560,700	-45	30	17

[a] *Service provided by Port Transit Lines, Inc. in the City of Port Washington is not included.*

[b] *Includes primary and secondary transit service provided by the Milwaukee and Suburban Transport Corporation.*

Source: SEWRPC.

Table 114

ANNUAL REVENUE PASSENGERS AND RIDES PER CAPITA ON LOCAL MASS TRANSIT IN THE REGION BY URBAN AREA: 1963 and 1972

Urban Area	Annual Revenue Passengers			Population Served by Local Mass Transportation		Local Mass Transit Rides Per Capita		
	1963	1972	Percent Change	1963	1972	1963	1972	Percent Change
Milwaukee[a]	88,997,579	52,417,783	-41	1,053,100	1,043,600	85	50	-41
Racine	2,901,986	525,681	-82	96,600	100,600	30	5	-83
Kenosha	1,884,416	503,191	-73	74,000	83,900	26	6	-76
Port Washington[b]	129,874	0	-100	7,400	--	18	--	-100
Total	93,913,855	53,446,655	-43	1,231,100	1,228,100	76	43	-43

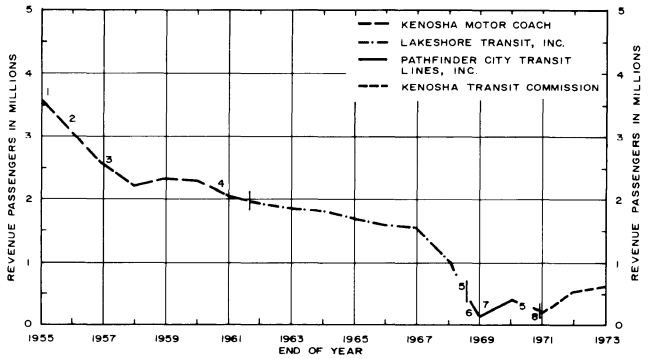
[a] *Includes primary and secondary transit service provided by the Milwaukee and Suburban Transport Corporation.*

[b] *Service discontinued in 1966.*

Source: SEWRPC.

Figure 58

LOCAL MASS TRANSIT REVENUE PASSENGERS IN THE KENOSHA URBAN AREA: 1955-1973



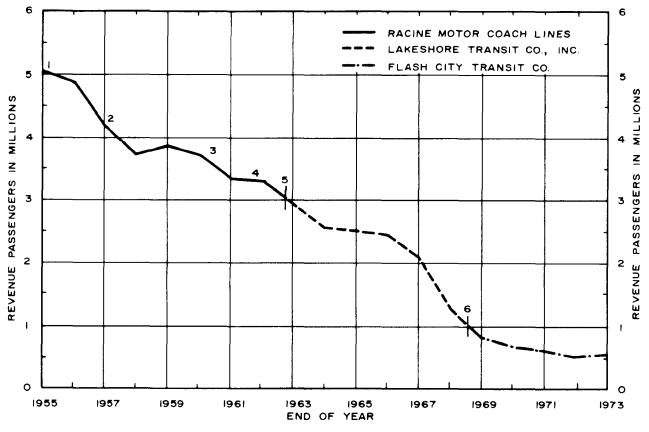
NOTES:

[1] Adult cash fare: 15 cents (June 1955)
[2] Adult cash fare increased to 18 cents (January 1957)
[3] Adult cash fare increased to 20 cents (January 1958)
[4] Adult cash fare increased to 25 cents (November 1961)
[5] Period of no service (February 1969-August 1969 and February 1971-September 1971)
[6] Adult token fare: 40 cents (November 1969)
[7] Adult token fare reduced to 33.3 cents (March 1970)
[8] Adult cash fare: 25 cents (September 1971)

Source: SEWRPC and Wisconsin Public Service Commission.

Figure 60

LOCAL MASS TRANSIT REVENUE PASSENGERS IN THE RACINE URBAN AREA: 1955-1973



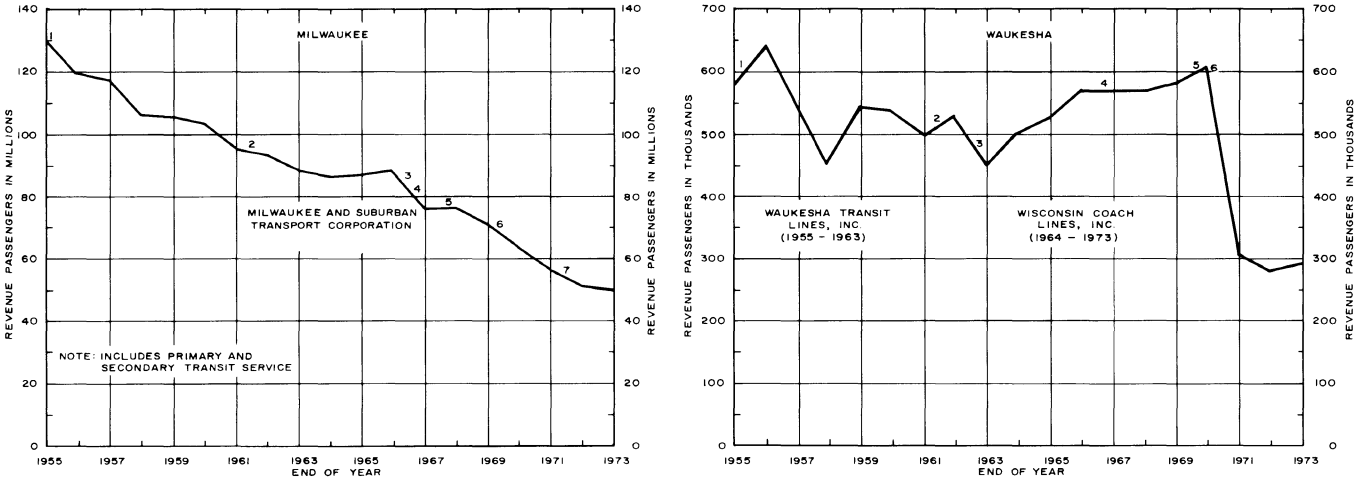
NOTES:

[1] Adult cash fare: 15 cents (February 1955)
[2] Adult cash fare increased to 18 cents (February 1958)
[3] Adult cash fare increased to 20 cents (May 1961)
[4] Adult cash fare increased to 25 cents (September 1962)
[5] Adult cash fare increased to 30 cents (August 1963)
[6] Adult token fare: 40 cents (October 1969)

Source: SEWRPC and Wisconsin Public Service Commission.

Figure 59

LOCAL MASS TRANSIT REVENUE PASSENGERS IN THE MILWAUKEE AND WAUKESHA URBAN AREAS: 1955-1973



NOTES:

[1] Adult cash fare: 20 cents (May 1954)
[2] Adult cash fare increased to 25 cents (May 1962)
[3] Adult cash fare increased to 30 cents (June 1967)
[4] Includes periods of transit strike and civil disorder (May-August 1967)
[5] Implementation of exact fare plan (October 1968)
[6] Adult cash fare increased to 40 cents (May 1970)
[7] Adult cash fare increased to 50 cents (June 1972)

[1] Adult cash fare: 15 cents (May 1954)
[2] Adult cash fare increased to 20 cents (July 1962)
[3] Company name changed to Wisconsin Coach Lines, Inc. (July 1963)
[4] Adult cash fare increased to 25 cents (November 1967)
[5] Change in policy for busing of students within the City of Waukesha (September 1970)
[6] Adult cash fare increased to 40 cents (January 1971)

Source: SEWRPC and Wisconsin Public Service Commission.

urban area, decreasing 73 percent, from two million annual revenue passengers in 1963 to one-half million in 1972, while local mass transportation rides per capita declined from 26 in 1963 to six in 1972. The exceptions to these general downward trends appeared in 1965 in the Milwaukee urban area with a general stabilization of ridership, the increase in patronage in Kenosha following a fare reduction in 1969 and public acquisition in 1971, and the stabilization of ridership in Racine in 1973.[16]

[16] *Trends in ridership within each of the local mass transportation service areas during 1974 indicate an increase of ridership within Kenosha and Racine. Ridership in the Milwaukee urbanized area appears to have stabilized despite a fare increase in July of 1974. These changes may be attributable in part to the growing awareness on the part of the tripmaker of energy, particularly motor fuel, shortages.*

SUPPLY AND USE OF TERMINAL FACILITIES

Terminal facilities are an important element of any transportation system, since they affect system utilization, operation, and efficiency. In the Region, transportation terminal facilities which interact significantly with the highway and transit elements of the regional transportation system, and which must, therefore, be considered in the regional transportation plan reevaluation effort, include primarily selected major automobile parking facilities and truck terminals.

For the purposes of regional transportation planning, an inventory of automobile parking facilities in the Region was conducted to permit an analysis of parking supply and demand in those areas where automobile parking is most critical in terms of its effect on the use of the regional transportation system. Therefore, the inventories of automobile parking facilities are confined to the central business districts of the Milwaukee, Racine, and Kenosha urbanized areas, and to those parking facilities provided for express and modified rapid transit service in the Milwaukee urbanized area. This inventory sought to establish, on an aggregate basis, the characteristics of parking supply and demand in these areas in order to permit determination of facility capabilities and deficiencies. All truck terminals were inventoried to allow analysis of truck terminal location and size within the Region.

Parking Facilities

The parking facilities considered as important integral parts of the existing regional transportation system include automobile parking facilities currently provided in the central business districts (CBD's) of the Region's three urbanized areas, and automobile parking facilities presently provided as change-of-mode facilities for the existing express and modified rapid transit service operating within the Region.

Determination of the existing supply of parking facilities in the Milwaukee, Racine, and Kenosha central business districts was primarily accomplished through the regional land use inventory, in which all areas providing off-street automobile parking of 10 spaces or more were identified, delineated, and measured as a special land use. In addition, detailed parking facility data provided by the three municipalities was used to supplement the inventory data. As shown in Table 115, the Milwaukee CBD area not only has a substantially larger parking supply than the Racine and Kenosha CBD's, but it is also of a significantly different composition, with a substantially larger proportion of private structure facility spaces and a significantly smaller percentage of on-street parking spaces. Also as indicated in Table 115, the supply of parking facilities in the Milwaukee CBD increased about 15 percent, from about 26,700 spaces in 1963 to about 30,700 spaces in 1972.

Similar increases, from about 3,400 spaces to about 4,600 spaces, or 34 percent, and from about 4,400 spaces to about 5,700 spaces, or 29 percent, within the Racine and Kenosha central business districts, respectively, were observed from 1963 to 1972. The changes in Milwaukee CBD parking facilities have primarily been a result of a doubling of the parking supply provided by both publicly and privately owned structures. Changes in the Racine and Kenosha CBD's are principally due to additions of privately owned surface parking lots.

The demand for parking within an area is commonly expressed in terms of the accumulation of parked vehicles in the area by hour of the day, together with data on the characteristics of the parking, including duration, purpose, and type of parking facility utilized. The hourly accumulation of parked vehicles in the CBD's of the Milwaukee, Racine, and Kenosha urbanized areas is summarized in Figures 61, 62, and 63, respectively, as calculated from data obtained in the regional origin-destination survey.

Within the Kenosha CBD, a substantial decrease in the maximum hourly accumulation of parkers on an average weekday was observed between 1963 and 1972, from 3,648 to 3,090, the peak hourly accumulation shifting from a morning to a late afternoon occurrence. In Racine, the decrease was somewhat less in that the maximum hourly accumulation of parkers on an average weekday decreased from 3,648 to 3,362. The Milwaukee CBD

Table 115

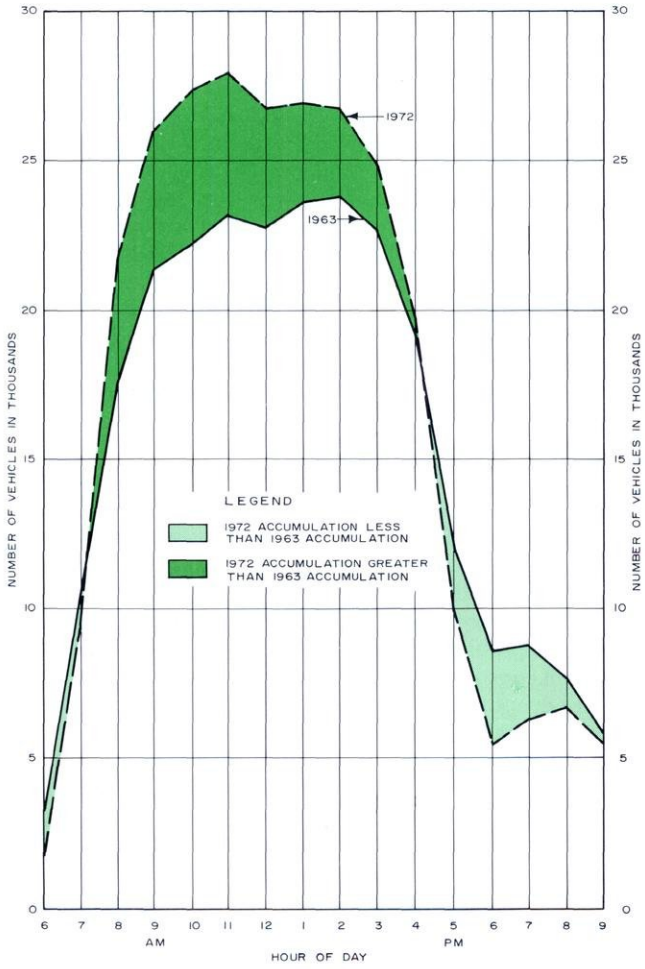
PARKING SUPPLY IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963 and 1972

Type Of Parking Facility	Milwaukee			Racine			Kenosha		
	1963 (Spaces)	1972 (Spaces)	Percent Change	1963 (Spaces)	1972 (Spaces)	Percent Change	1963 (Spaces)	1972 (Spaces)	Percent Change
On-Street	5,056	3,816	-25	1,143	1,092	-4	1,891	1,978	5
Surface Lot, City Owned	2,322	559	-76	985	1,056	7	1,262	1,613	28
Surface Lot, Privately Owned	13,872	15,696	13	914	2,075	127	1,268	1,983	56
Structure, City Owned	1,307	2,197	68	300	301	0	--	0	0
Structure, Privately Owned	4,065	8,439	108	50	33	-34	--	134	--
Total	26,662	30,707	15	3,392	4,557	34	4,421	5,708	29

Source: SEWRPC.

Figure 61

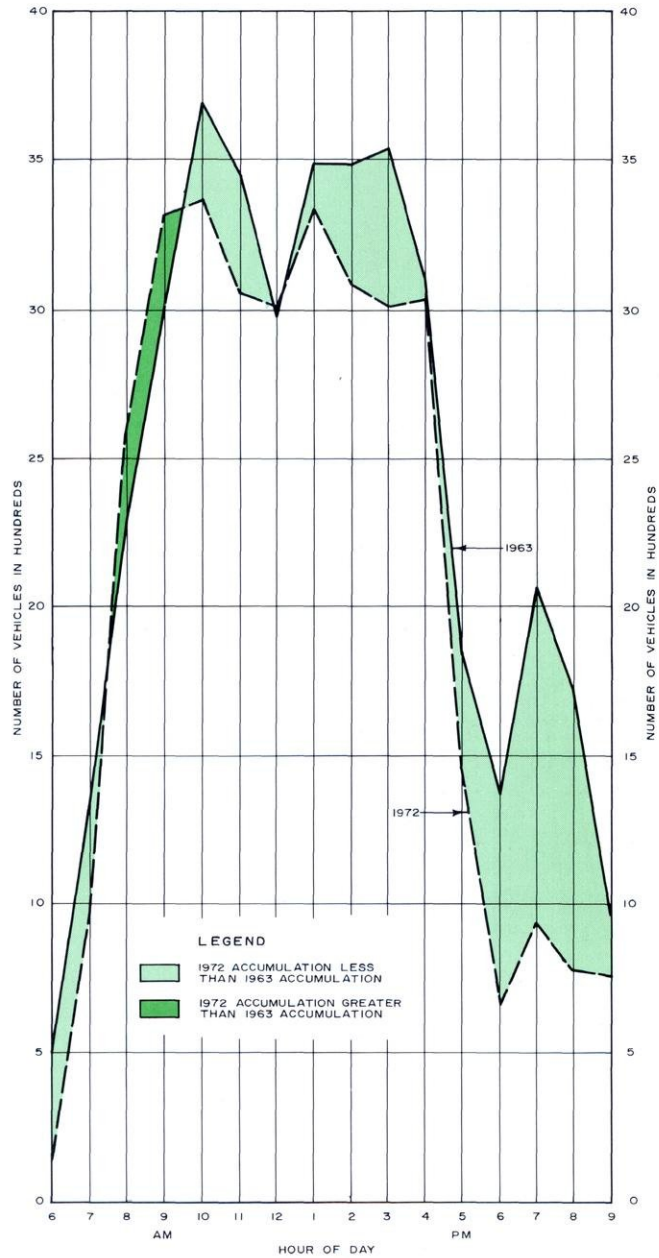
TOTAL HOURLY PARKING ACCUMULATIONS WITHIN THE MILWAUKEE CENTRAL BUSINESS DISTRICT: 1963 and 1972



Source: SEWRPC.

Figure 62

TOTAL HOURLY PARKING ACCUMULATIONS WITHIN THE RACINE CENTRAL BUSINESS DISTRICT: 1963 and 1972



Source: SEWRPC.

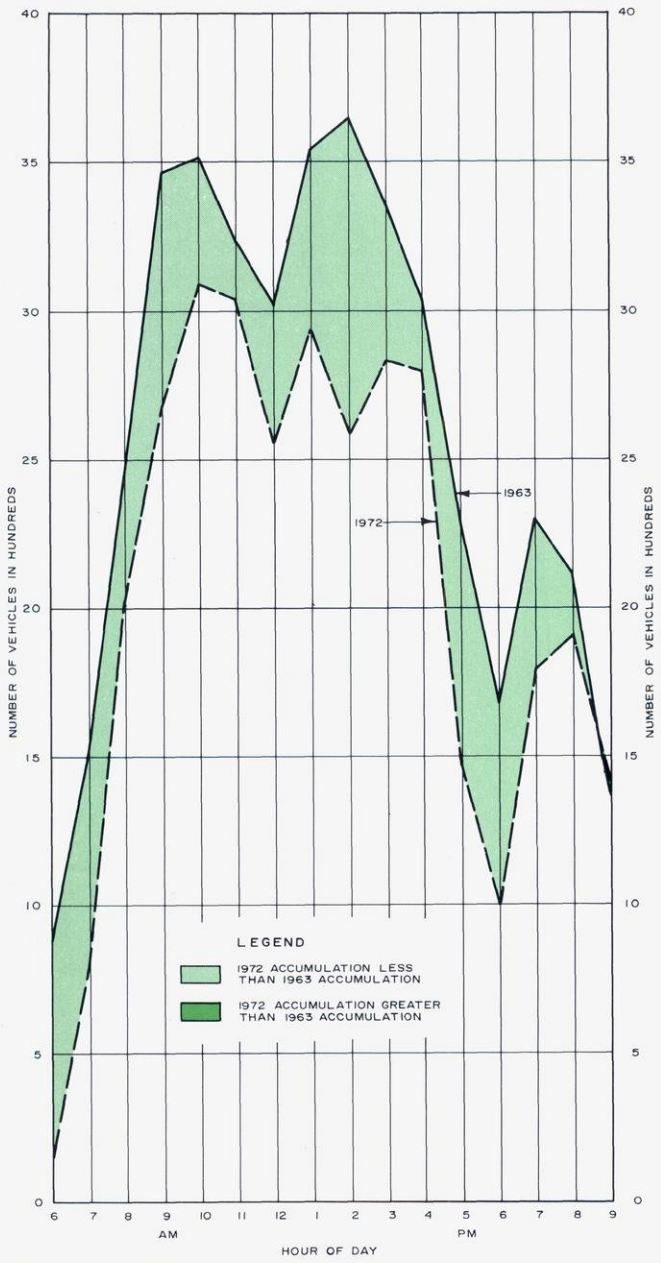
showed significant increases in parking, from 23,901 vehicles in 1963 to 28,142 vehicles in 1972, with the peak hourly accumulation on an average weekday increasing by over 18 percent. The maximum hourly accumulation was also found to have shifted from the early afternoon to late morning.

As shown in Figures 62 and 63, the twin-peaked configuration of the hourly parking accumulations occurring in the Kenosha and Racine CBD's differ from the single long peak observed in the Milwaukee CBD. In the Milwaukee and Racine CBD's, the greatest proportion of parking accumulation is due to trips made for work purposes. Much smaller numbers of accumulated vehicles are the result of trips made for shopping, personal business, or social, recreational, and other purposes. In the Kenosha CBD, the dominant parker trip purpose is personal business.

As shown in Table 116, which summarizes the distribution of parkers by trip purpose, approximately 59 percent of all parkers in the Milwaukee CBD made the trip for the purpose of work, as compared to 37 and 26 percent in the Racine and Kenosha CBD's, respectively. Approximately 19 and 22 percent of all parkers in the Racine and Kenosha CBD's, respectively, made the trip for shopping purposes, while only 5 percent of all parkers in the Milwaukee CBD had this trip purpose. Significantly larger proportions of the parking in the Racine and Kenosha CBD's were, therefore, made for personal business—32 percent in both cases—than the 17 percent in the Milwaukee CBD. Little change in the percent distribution

Figure 63

TOTAL HOURLY PARKING ACCUMULATIONS WITHIN THE KENOSHA CENTRAL BUSINESS DISTRICT: 1963 and 1972



Source: SEWRPC.

of parkers by trip purpose was observed since 1963, with the personal business trip purpose increasing slightly in all three CBD's, the work trip purpose increasing in the Racine CBD, and the other trip purpose category increasing in the Kenosha CBD.

A significant characteristic of parking demand related to purpose is the duration of stay of the parkers. As shown in Table 117, which summarizes the percentage distribution of the duration of stay of parkers within the Milwaukee, Racine, and Kenosha CBD's, the Kenosha and Racine CBD's attract a high percentage of parkers with durations of under one hour—53 and 49 percent, respectively. By comparison, only 25 percent of the parkers in the Milwaukee CBD have a parking duration of less than one hour.

The attraction of parkers with a duration of eight hours or more follows an opposite pattern, with 30 percent of the parkers in the Milwaukee CBD having a duration of eight hours or more, followed by Racine (12 percent) and Kenosha (8 percent). Within the Milwaukee and Racine central business districts, the percent of the parkers with durations of one hour or less showed a decrease from 28 percent in 1963 to 25 percent in 1972, and from 56 percent in 1963 to 49 percent in 1972, respectively. Within the Kenosha central business district, however, the percent of parkers with durations of one hour or less increased slightly, from 52 percent in 1963 to 53 percent in 1972, with slight increases in the longer durations of two hours or more.

Another significant characteristic of parking demand is the type of parking facility used. As summarized in Table 118, the type of parking facility used by parkers in the Racine and Kenosha CBD's is very similar, with substantial numbers of parkers utilizing metered on-street and free off-street parking. The type of parking facilities used in the Milwaukee CBD varies significantly from that in the Kenosha and Racine CBD's, with a substantially greater proportion of parkers utilizing off-street pay parking facilities. Table 118 also indicates the change in the use of parking by type observed between 1963 and 1972 within each of the three central business districts. The observed changes are not significant except for the reduction in on-street free parking in Milwaukee and Kenosha and the reduction in on-street metered parking in Racine. These reductions were offset by increases in off-street parking of both free and paid types.

An evaluation of the adequacy of the supply of CBD parking facilities in light of this existing demand was made by comparing the peak accumulation on an average weekday in each CBD with its existing parking supply, and examining the distribution of walking distance of parkers within each CBD. As shown in Table 119, approximately 92 percent of the available spaces were occupied during the peak accumulation of an average weekday in the Milwaukee CBD, while approximately 74 and only about 54 percent were so occupied in the Racine and Kenosha CBD's, respectively, in 1972.

It should be noted in the interpretation of the information presented in Table 119 that an apparent adequacy of CBD parking facilities on a gross CBD-wide basis does not necessarily indicate that the supply of parking facilities is adequate on a more localized basis. Certain local areas within each CBD may be deficient in long-term parking space, even though the overall supply of parking facilities for the entire CBD may be quite adequate. Moreover, certain local areas within a CBD may not possess the necessary supply to satisfy the parking demand within those areas, while other areas within the CBD may have an excess of parking supply.

Table 116

PERCENTAGE DISTRIBUTION OF PARKERS BY TRIP PURPOSE IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963 and 1972

Trip Purpose	Milwaukee			Racine			Kenosha		
	1963	1972	Change	1963	1972	Change	1963	1972	Change
Work	59	59	--	34	37	3	35	26	-9
Shop	7	5	-2	21	19	-2	22	22	--
Personal Business	14	17	3	26	32	6	28	32	4
Other	20	19	-1	19	12	-7	15	20	5
Total	100	100	--	100	100	--	100	100	--

Source: SEWRPC.

Table 117

PERCENTAGE DISTRIBUTION OF PARKERS BY DURATION OF STAY IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963 and 1972

Parking Duration (In Hours)	Milwaukee			Racine			Kenosha		
	1963	1972	Change	1963	1972	Change	1963	1972	Change
Under 1.0	28	25	-3	56	49	-7	52	53	1
1.0 - 1.9	16	15	-1	12	15	3	15	17	2
2.0 - 7.9	28	30	2	23	24	1	22	23	-1
8.0 and Over	28	30	2	9	12	3	11	8	-3
Total	100	100	--	100	100	--	100	100	--

Source: SEWRPC.

Table 118

PERCENTAGE DISTRIBUTION OF PARKERS IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS BY TYPE OF PARKING FACILITY USED: 1963 and 1972

Type of Parking	Milwaukee		Racine		Kenosha	
	1963	1972	1963	1972	1963	1972
On-Street, Free	26	16	17	16	24	17
On-Street, Meter	14	12	47	33	39	42
Off-Street, Free	30	32[a]	33	46	32	39
Off-Street, Paid	30	40	3	5	5	2
Total	100	100	100	100	100	100

[a] *Off-street free parking includes validated parking.*

Source: SEWRPC.

Table 119

COMPARISON OF PEAK HOUR PARKING ACCUMULATION AND SUPPLY FOR THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963 and 1972

Peak-hour Parking Data	Milwaukee		Racine		Kenosha	
	1963	1972	1963[a]	1972	1963	1972
Peak Hour	2 to 3 p.m.	11 to 12 noon	10 to 11 a.m.	10 to 11 a.m.	2 to 3 p.m.	10 to 11 a.m.
Peak Hour Accumulation	23,901	28,142	3,691	3,362	3,648	3,090
Spaces Available	26,620	30,707	3,390	4,557	4,420	5,708
Percent of Spaces Used	90	92	109	74	83	54

[a] *The utilization of 300 more parking spaces than were available in the Racine CBD indicates that parkers with trip destinations within the CBD were actually parking in areas immediately adjacent to the CBD and walking into the CBD to their trip destinations.*

Source: SEWRPC.

An indication of such localized deficiencies may be obtained by examining the distribution of walking distance made by parkers within a CBD, that is, the number of blocks walked from a parking site to the ultimate trip destination. The walking distances of parkers within the Racine, Kenosha, and Milwaukee CBD's, as summarized in Table 120, constitute another measure of the adequacy of parking supply in each respective CBD. As shown in Table 120, the distribution of the walking distance of parkers within the Racine and Kenosha CBD's is nearly identical. Approximately 92 percent of all parkers walked one block or less, or about 500 feet or less, to their ultimate destination, and only 1 percent and 2 percent, respectively, of all parkers walked three blocks or more. Even in the Milwaukee CBD, 68 percent of all parkers walked a distance of one block or less to their ultimate destination, and only 11 percent walked three blocks or more.

As a result of the changes in the supply of, and demand for, parking facilities within these three CBD's, the peak period of occupancy of parking spaces has changed. Within the Milwaukee CBD the percentage of utilized parking spaces has increased by 2 percent as a result of the demand for parking spaces increasing more rapidly than the supply. In the Racine and Kenosha CBD's, the percentage of available spaces occupied during the peak period has decreased, due to both a decrease in demand and an increase in the supply, as shown in Table 119, thus indicating an increase in the overall adequacy of parking within the two CBD's. Table 120, which summarizes the distribution of parkers by distance walked to destination in 1963 and 1972 in the three CBD's, provides a further indication of increased parking adequacy in the Racine and Kenosha CBD's, since it displays an increase in the proportion of parkers with shorter walking distances from parking sites to trip destinations. However, the table also indicates that the adequacy of parking in the Milwaukee CBD, expressed in terms of walking distance, has decreased somewhat from 1963 to 1972, indicating a dispersal of parking facilities to the fringe of the central business district.

The other type of automobile parking facility explicitly considered in the regional transportation plan reevaluation is the change-of-mode facility. Such parking facilities were provided in connection with the modified rapid transit service, commonly referred to as the Freeway Flyer service, operating in the Milwaukee urbanized area in 1972. To establish the current capabilities and deficiencies of these parking facilities, inventories of parking supply and demand at the terminal areas of the service were performed. Distributed among eight shopping center parking lots located throughout the Milwaukee urbanized area, the supply of these parking facilities as of 1972 and measured in terms of the number of available parking spaces is identified in Table 121.

Table 121 also summarizes the demand for these parking facilities on an average weekday in 1972. It should be noted that the major proportion of this demand consists of trips made for the purpose of work, as shown in Table 122. The comparison of the supply of these facilities to the demand for them, also summarized in Table 121, revealed that on an average weekday in 1972 approximately 69 percent of the parking spaces provided as change-of-mode facilities were utilized. Moreover, one of these facilities, Country Fair in Hales Corners, was overutilized by 56 percent, with parkers using spaces intended for patrons of the shopping center. Also, two of the facilities, Bay Shore and Treasure Island—West Allis, were operating at intended capacity.[17]

Truck Terminal Facilities

Truck terminals, or garaging locations, constitute another important type of terminal facility within the Region requiring consideration as an integral part of the regional transportation system. All truck terminals within the Region in 1972 were inventoried in order to permit analysis of the spatial distribution of existing truck garaging locations and correlation with the land uses at which trucks were garaged. As shown on Map 111 and summarized in Table 123, truck garaging locations, although concentrated in urban areas, were generally distributed throughout these urban areas. Moreover, of the trucks garaged within the Region in 1972, most were garaged at commercial land uses, as shown in Table 124.

[17] *Since the 1972 inventory, the parking facility in Hales Corners has been relocated to a different site with a parking space for 50 automobiles. The Bay Shore facility was replaced with a new, publicly built parking facility which provides parking space for 190 automobiles.*

Table 120

PERCENTAGE DISTRIBUTION OF PARKERS BY DISTANCE WALKED TO DESTINATION IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963 and 1972

Blocks Walked	Milwaukee			Racine			Kenosha		
	1963	1972	Change	1963	1972	Change	1963	1972	Change
Under 1	87	68	-19	86	92	6	85	92	7
1	5	13	8	8	4	-4	7	4	-3
2	4	8	4	3	3	--	5	2	-3
3 or More	4	11	7	3	1	-2	3	2	-1
Total	100	100	--	100	100	--	100	100	--

Source: SEWRPC.

Table 121

PARKING SUPPLY AND DEMAND FOR THE MILWAUKEE URBAN AREA FREEWAY FLYER SERVICE: 1972

Location	Route Number	Parking Spaces[c] Available	Autos Parked May 24, 1972	Percent Space Utilized	Inbound Passengers Carried May 24, 1972
Mayfair	41	300	136	45	334
Bay Shore[a]	42	125	124	99	294
Country Fair-Hales Corners	43	50	78	156	176
Treasure Island-West Allis	44	100	95	95	226
Capitol Drive	45	100	57	57	110
Spring Mall	46	100	66	66	176
Target	47	100	45	45	130
Northland[b]	48	--	--	--	--
Total	--	875	601	69	1,446

[a] *Route not in service from August 12, 1972 through January 3, 1973 due to lack of adequate parking facilities.*

[b] *Route began service on August 14, 1972 with a 100-space parking capacity.*

[c] *Since 1972, new freeway flyer service has been inaugurated from the following areas: Northshore Public Transit Station (190 parking spaces), Northridge Shopping Center (200 parking spaces estimated), Treasure Island-Brown Deer (125 parking spaces estimated), and the Brown Deer-East Public Transit Station (250 parking spaces). In addition, two facilities have moved to new areas: Mayfair (200 parking spaces estimated), and Country Fair-Hales Corners, which has moved to an abandoned business parking lot (50 parking spaces).*

Source: Milwaukee and Suburban Transport Corporation and SEWRPC.

Table 122

PERCENTAGE DISTRIBUTION OF INBOUND MILWAUKEE URBAN AREA FREEWAY FLYER PASSENGERS BY TRIP PURPOSE: 1972

Trip Purpose	Percent
Work	91.0
Home	4.8
School	3.7
Personal Business	0.2
Recreational Activity	0.2
Shopping	0.1

Source: SEWRPC.

Table 123

TRUCKS GARAGED WITHIN THE REGION BY COUNTY: 1963 and 1972[a]

County	1963	1972	Percent Increase
Kenosha	4,730	6,772	43
Milwaukee	25,427	31,597	24
Ozaukee	2,418	3,289	36
Racine	6,286	9,088	45
Walworth	4,592	6,268	36
Washington	3,530	5,594	58
Waukesha	8,392	14,642	74
Region	55,375	77,250	40

[a] *The number of trucks garaged within a county may not necessarily be identical to the number of trucks registered within a county, because commercially registered vehicles may be utilized by employers and employees and garaged at their residences.*

Source: SEWRPC.

Table 124

PERCENTAGE DISTRIBUTION OF TRUCKS BY GARAGING LAND USE: 1963 and 1972

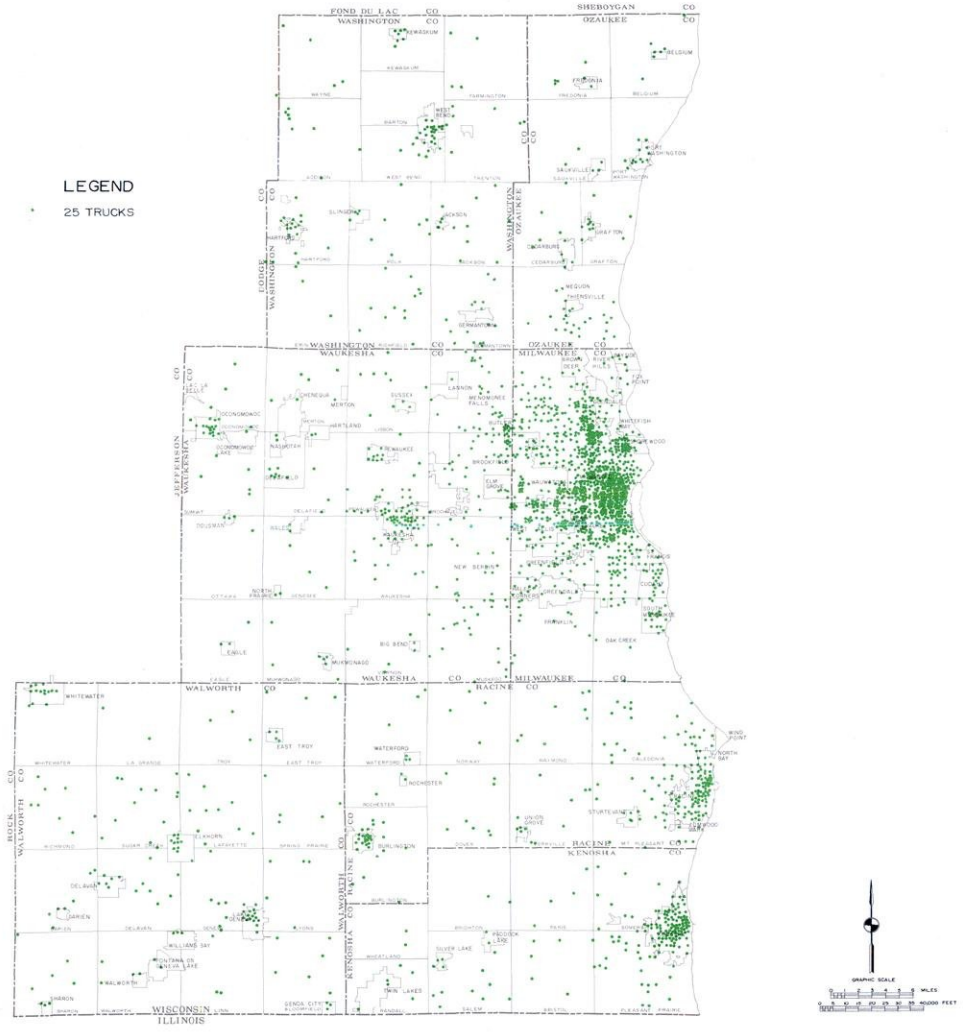
Type of Land Use	1963	1972
Commercial	42	35
Industrial	13	10
Transportation, Communication, and Utilities	13	12
Governmental and Institutional	8	8
Residential	9	25
Agricultural	15	10
Other	1	--

Source: SEWRPC.

Significant changes in truck garaging have occurred since 1963 in terms of both the spatial location and type of land use at which trucks were garaged. The changes in the spatial location, shown on Maps 110 and 111 and summarized by county in Table 123, were comprised primarily of increases in the number of trucks garaged in outlying areas of the urban centers of the Region. Of the seven counties in the Region, Waukesha County experi-

Map 110

TRUCK GARAGING LOCATIONS WITHIN THE REGION: 1963

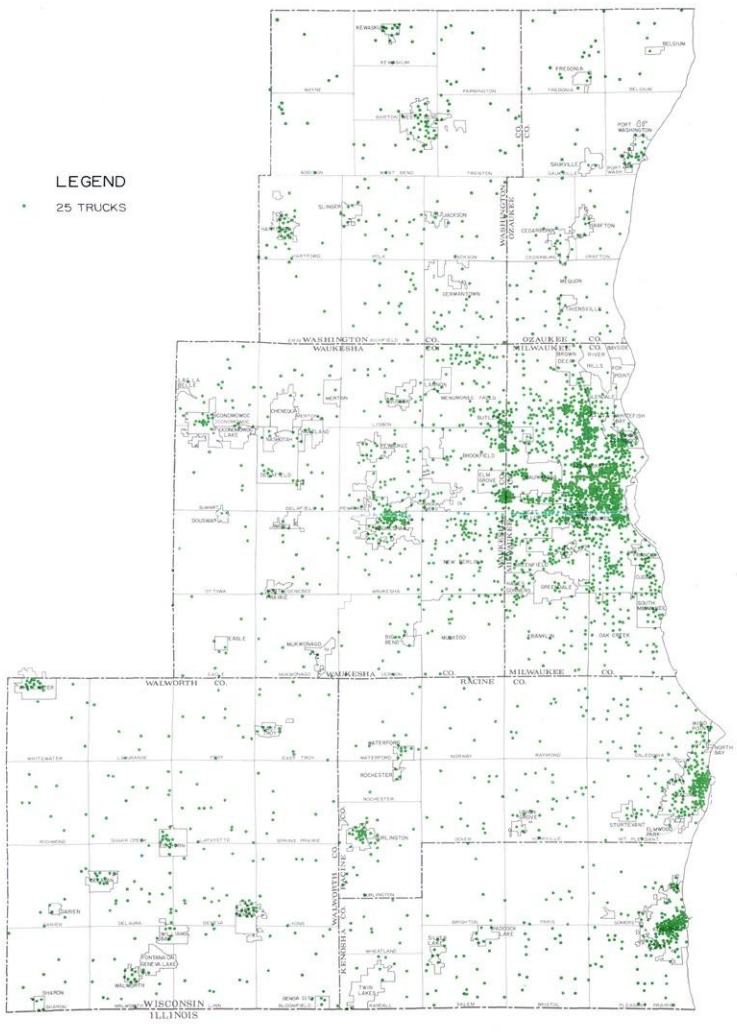


The above map identifies the spatial distribution of truck garaging locations within the Region for the year 1963. There were about 55,000 trucks garaged within the Region during that year. It is evident that operating bases for trucks, although highly concentrated in urban areas, are nevertheless well dispersed throughout such areas.

Source: SEWRPC.

Map 111

TRUCK GARAGING LOCATIONS WITHIN THE REGION: 1972



By 1972 the total number of trucks garaged within the Region had grown significantly, from about 55,000 in 1963 to about 77,000 in 1972, representing an increase of 40 percent. Much of the increase in truck garaging locations has occurred in Milwaukee and Waukesha Counties, with Milwaukee County evidencing an increase despite decreases in the number of operating bases for trucks within the central business district and environs of the City of Milwaukee.

Source: SEWRPC.

enced the greatest increase in the number of garaged trucks, from 8,392 in 1963 to 14,642 in 1972. Milwaukee County also experienced a substantial increase of 6,170 trucks. Waukesha County exhibited the highest rate of increase, 74 percent, followed by Washington and Racine Counties with increases of 58 and 45 percent, respectively.

Changes have also occurred in the type of land use at which trucks were garaged from 1963 to 1972. As shown in Table 124, the percentage of trucks garaged at residential, recreational, and agricultural land uses has increased, while the proportion of trucks garaged within the Region at almost all other land uses, particularly commercial land uses, has decreased.

SUMMARY

This chapter summarized the status and use of the existing surface transportation system of the Region, including arterial streets and highways, mass transit, and automobile parking and truck terminal facilities. The chapter has also documented the changes which have occurred in the status and use of the existing transportation system from 1963, the base year of the initial regional transportation planning effort, to 1972, the base year for the transportation plan reevaluation. A number of the inventory findings having particular significance for regional land use and transportation system planning are evident. These include:

1. As of 1972, there were approximately 9,819 route miles of streets and highways of all types—arterials, collectors, and land access facilities—open to traffic within the Region, of which about 3,119 route miles, or 32 percent, were functioning as arterial streets and highways. Of the arterial mileage, about 305 miles, or less than 10 percent, consisted of freeways, expressways, and ramps. Milwaukee and Waukesha Counties were found to have approximately 25 and 20 percent, respectively, of the total regional arterial street and highway mileage, while none of the other counties were found to have more than 14 percent of the total regional arterial mileage. Moreover, Milwaukee and Waukesha Counties were found to have significant proportions of the total regional freeway, expressway, and related ramp mileage, approximately 41 and 22 percent, respectively, while no other county had more than 12 percent of the total freeway, expressway, and related ramp mileage.

   Significant changes have occurred since 1963 in the arterial street and highway system of the Region. While total street and highway mileage within the Region increased by about 10 percent, from 8,943 miles in 1963 to 9,819 miles in 1972, total arterial street and highway mileage decreased slightly, from approximately 3,188 miles in 1963 to 3,119 miles in 1972. This decrease was primarily the result of the construction of about 108 miles of freeways and expressways within the Region between 1963 and 1972, with a resultant shift of parallel surface streets and highways from an arterial function to a collector or land access street function.

2. Approximately 20 million vehicle miles of travel were found to occur on the arterial street and highway system of the Region on an average weekday in 1972. Most of this arterial utilization occurred within the intensely urbanized areas of the Region, with Milwaukee County accounting for over 53 percent of the total vehicle miles of travel and exhibiting by far the most intensive use of the arterial system, with over 13,400 vehicle miles of travel occurring per mile of arterial street and highway on an average weekday, a marked increase over the comparable figure of about 9,300 vehicle miles per mile in 1963. Although comprising less than 10 percent of the total arterial system mileage, the freeway and expressway system was found to carry more than 30 percent of the total vehicle miles of travel which occurred within the Region on an average weekday.

   Substantial changes have also occurred since 1963 in the use of the arterial street and highway system of the Region. Vehicle miles of travel on the arterial street and highway system within the Region increased by 54 percent from 1963 to 1972, or by approximately 7 million vehicle miles per average weekday. The majority of this increase, 69 percent, occurred in Milwaukee and Waukesha Counties. Increases in the utilization of the arterial street and highway system occurred in every county of the Region, with Waukesha and Ozaukee Counties experiencing the greatest rates of increase, 85 and 76 percent, respectively. Much of the increase in arterial and highway utilization has been absorbed by the developing freeways and expressway system, with over 67 percent of the total increase in arterial utilization from 1963 to 1972 occurring on these limited access facilities. In Milwaukee County, freeway and expressway facilities actually absorbed an amount greater than the 3.3 million vehicle miles of increase in travel demand within the county, with a corresponding decrease in traffic on the surface arterials.

3. Approximately 318 miles, or about 10 percent of the total arterial street and highway system within the Region, were found to be operating either at or over design capacity in 1972. Most of the congested arterial streets and highways were located within the intensely urbanized areas of the Region. Milwaukee County was found to have about 17 percent of its total arterial street and highway mileage operating at or over design capacity in 1972. Racine, Kenosha, and Waukesha Counties, the remaining three counties which contain high concentrations of urban development, all had approximately 10 percent or more of the arterial street and highway mileage operating at or over capacity.

The arterial street and highway mileage operating at or over capacity actually decreased within the Region by about 4 percent, from about 332 miles in 1963 to about 275 miles in 1970, then increased to about 318 miles in 1972. Milwaukee and Walworth Counties exhibited reductions of about 69 miles and about one mile, respectively, while the other five counties exhibited a combined increase of about 56 miles in arterial streets and highways operating at or over capacity. The total net reduction in traffic congestion was effected in spite of an 8 percent increase in population, a 40 percent increase in motor vehicle registration, a 25 percent increase in trip generation, and a 54 percent increase in vehicle miles of travel.

4. Interregional surface mass transportation service was provided in 1972 by railroad passenger trains over three railroad lines, and by motor bus over 500 miles of routes. No significant changes occurred from 1963 to 1972 in the arterial street and highway mileage over which interregional bus service was routed, other than a shift of routes in several travel corridors to newly completed freeways. However, a 76 percent decline in the miles of railroad right-of-way over which passenger service was provided occurred within the Region over that time. In addition, intraregional travel by train was virtually nonexistent by 1972.

5. Intraregional tertiary, or local, mass transportation service within the Region was provided only in the Kenosha, Milwaukee, and Racine urbanized areas in 1972. The Milwaukee mass transit operation was by far the dominant operation, accounting for over 95 percent of the seat miles and passenger miles of service provided and for over 98 percent of the revenue passengers carried within the Region.

   Significant changes in the provision and use of local mass transportation service occurred in the Region between 1963 and 1972. In the City of Kenosha, there were two periods between 1963 and 1972 when no local mass transportation service was provided. In the City of Racine, the conventional "cross town" service utilizing large buses provided in 1963 was abandoned and replaced by a novel "radial system" using small buses. Finally, the complete abandonment of local mass transportation service occurred in the City of Port Washington in 1966. Nevertheless, the local mass transportation systems operating in the Region had to increase the total round trip route mileage operated by about 33 percent, from 847 route miles in 1963 to 1,126 route miles in 1972, to serve approximately the same number of people.

   Scheduled total bus and seat mileage of service were, however, decreased from 85,000 miles and 3.4 million seat miles in 1963 to 64,000 miles and 3.3 million seat miles in 1972. The percent utilization of scheduled seat miles of service by passenger miles of use declined on an average weekday from 19 percent to 9 percent in Kenosha, from 30 percent to 17 percent in Milwaukee and Waukesha, and from 24 percent to 18 percent in Racine.

   The proportion of the resident population of urbanized areas served by local mass transit also declined from 88 percent in 1963 to 84 percent in 1972. This decrease was particularly evident in the Racine urbanized area, where the transit system showed significant decreases in the percent of total land area and resident population served, from about 100 percent to 88 percent.

   Significant reductions in the use of local mass transportation also occurred within the Region between 1963 and 1972, with all local mass transportation systems experiencing substantial ridership declines which have tended to stabilize in recent years. Within the Milwaukee urbanized area, annual revenue passengers have decreased by 41 percent, from 89 million in 1963 to 52 million in 1972, while annual revenue passengers per capita have declined from 85 to 50. The Kenosha and Racine urbanized areas have shown similar declines in annual revenue passengers from 1.9 million to 0.5 million and 2.9 million to 0.5 million, respectively. Per capita revenue passengers also declined from 26 to 6 and from 30 to 5 in Kenosha and Racine, respectively.

6. A prototype of the modified rapid transit service recommended in the adopted regional transportation plan, and called "Freeway Flyer" service by the company, began operating in 1964 over one route with 81,000 annual revenue passengers. By 1974, the service had been expanded to nine routes providing service to about 721,000 annual revenue passengers.

7. In 1972, as in 1963, the supply of parking facilities in the Milwaukee, Racine, and Kenosha central business districts appeared adequate in light of existing demand on the basis of an overall area evaluation. The current occupancy during periods of peak accumulations in the three major central business districts of the Region on an average weekday was 92 percent of existing supply in Milwaukee, 74 percent of existing supply in Racine, and 54 percent of existing supply in Kenosha. These figures do not reflect parking needs during peak shopping seasons in each respective central business district, nor do they indicate the adequacy of the existing supply of parking facilities in localized subareas of each respective central business district.

   Significant changes in the parking supply and demand in the Milwaukee, Racine, and Kenosha central business districts have occurred between 1963 and 1972. The parking supply in all three

central business districts has been increased since 1963. Parking spaces were increased by 29 percent, from 4,400 to 5,700, in Kenosha; by 15 percent, from 26,700 to 30,700, in Milwaukee; and by 34 percent, from 3,400 to 4,600, in Racine. The parking demand in the three central business districts has changed, particularly in the peak periods, increasing in Milwaukee from 23,900 to 28,100, or almost 18 percent, while decreasing from 3,700 to 3,400, or about 8 percent, in Racine; and decreasing in the Kenosha central business district from 3,600 to 3,100, or 14 percent. Moreover, the trip purpose, duration of stay, and parking facility type utilization of the parkers within the three CBD's has substantially changed. As a result of these changes in parking demand and the increases in parking supply in the three CBD's from 1963 to 1972, the percentage of parking capacity utilized during peak parking hours has decreased 35 percent in Racine and 29 percent in Kenosha, thus indicating, on a gross basis, an increase in the overall adequacy of the parking supply in the Racine and Kenosha central business districts, while increasing by 2 percent in Milwaukee, indicating a reduction in the overall adequacy of the parking supply.

8. Trucks garaged within the Region in 1972 totaled 77,250, an increase of 40 percent over the 1963 total of 55,375. Percent increases ranged from 24 percent in Milwaukee County to 74 percent in Waukesha County. Significant changes in the location of garaged trucks have also occurred since 1963, with reductions in the number of trucks garaged in central Milwaukee County and increases in the number garaged in suburban and rural areas of the Region. The distribution of trucks by garaging land use also indicated a change in truck use, with decreases in the percentage of trucks garaged at all land uses except residential.

Chapter IX

TRAVEL HABITS AND PATTERNS

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 central concept 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 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, discusses the significant forces shaping the regional travel habits and patterns, and compares the findings of the 1972 travel inventory with the 1963 travel inventory.

THE 1972 REGIONAL INVENTORY OF TRAVEL

The complete findings of the 1963 regional inventory of travel were discussed in SEWRPC Planning Report No. 7. The new regional inventory of travel was more extensive than the 1963 inventory both in the number and kinds of surveys conducted and in the scope and detail of information collected. It consisted not only of all the basic origin-destination surveys conducted in the 1963 survey, namely, the home interview, truck and taxi, and external cordon surveys; but also of five other important special origin-destination surveys, namely, the mass transit user; mass transit nonuser; major traffic generator; interregional motor bus, rail, and car ferry; and weekend travel surveys.

In the 1972 home interview survey, 17,511 households were randomly selected for personal interview. The samples were drawn principally from electric utility customer account address lists and augmented where necessary by street address directories. The sample rates were varied to ensure that an adequate number of samples were drawn to properly represent each of 619 traffic analysis zones. The sample rates ranged from 1 to 3 percent in the more highly urbanized areas and from 4 to 9 percent in the less urbanized areas of the Region, averaging approximately 3 percent overall.

Information obtained from each sample household included socioeconomic characteristics of the household and household members; detailed data on each trip made by household members five years of age and older; a history which traced changes in the location and characteristics of households over a 15-year period; and personal opinions of heads of households or spouses concerning various aspects of transportation facilities and services, housing facilities and services, and outdoor recreation facilities and services.

Of the 17,511 households sampled, 15,388, or about 88 percent, provided completed information. These sample households represented the approximately 557,300 total households in the Region. In addition, a uniform 3 percent sampling was randomly selected of 10,400 dwelling units contained in group quarters such as dormitories, convents, nursing schools, and homes for the aged. Completed information was obtained from the occupants of these units for 308 of 324 samples, or 95 percent.

In the truck and taxi survey, a total of 4,184 trucks were randomly selected from the Wisconsin Department of Transportation, Division of Motor Vehicles registration records and from lists compiled by U. S. government agencies of trucks operating within the Region, such as military and postal vehicles, at sample rates of 4 percent for light trucks and 6 percent for medium and heavy trucks,[1] together representing a total of approximately 85,000 registered trucks. Of the 4,184 trucks sampled, completed information was obtained for 3,441, or about 82 percent. Information obtained for each truck sample included detailed data concerning each trip made on an average weekday; basic information concerning the

[1] *A light truck is defined as one having a gross weight of 10,000 pounds or less for farm trucks and 8,000 pounds or less for all other trucks. A medium truck is defined as one having a gross weight greater than 10,000 pounds but no more than 50,000 pounds for farm trucks and greater than 8,000 pounds but no more than 50,000 pounds for all other trucks. A heavy truck is defined as one having a gross weight of more than 50,000 pounds.*

vehicle such as garaging address, vehicle type, carrying capacity, carrier type, load type, and the business and industry of the operator; and information relating to the kinds and weight of commodities carried and to the number of total miles traveled.

In the taxi portion of the truck and taxi survey, of a total of approximately 450 taxis licensed to operate within the Region, 368 were scheduled for interview. The rest were found not to be in use on an average weekday. Of the 368 taxis in use, completed information was obtained for 303, or about 67 percent of the total licensed and about 82 percent of the total in use. Information obtained for each taxi sample included data relating to the ownership and garaging address of the vehicle, and to detailed data for each taxi trip made.

In the external cordon survey, roadside interview stations were established on all 37 major highways at the periphery of the Region. Of approximately 136,260 motor vehicles crossing these stations on an average weekday during the survey period, 80,260, or about 59 percent, were stopped and the drivers interviewed. Information obtained included detailed data relating to each trip crossing the cordon, to the type and garaging address of each sampled vehicle, the number of passengers carried, and for trucks only, the carrier type, load type, and kind and weight of commodities carried. Information was also obtained concerning additional trips made entirely within the Region by nonresident persons and vehicles on the day of interview, such information being obtained for the first time by the Commission.

As a part of the external cordon survey, and to complete the regional data files on interregional travel, special origin-destination surveys were conducted on interregional motor bus, rail, and carferry. Information obtained in these surveys included certain socioeconomic characteristics of the travelers and detailed data concerning each trip made. In these surveys, a mailback questionnaire technique was employed in which a questionnaire was distributed to each passenger for completion and return. Of 1,297 questionnaires distributed to motor bus passengers, 299 completed forms, or 23 percent, were returned; of 827 questionnaires distributed to AMTRAK and commuter rail passengers, 457 completed forms, or 55 percent, were returned; and of 749 questionnaires distributed to carferry passengers, 162 completed forms, or 22 percent, were returned.

In the conduct of certain special origin-destination surveys, namely, the mass transit user, mass transit nonuser, and major traffic generator surveys, special emphasis was placed upon the collection of data which would provide in-depth information as a sound basis for the development of short- and long-range action programs designed to promote greater mass transit use within the Region, and thus improve the balance between private and public transportation systems. Particular emphasis was directed at gaining an increased understanding of the factors leading to modal choice.

Under the mass transit user survey, the principal emphases were directed at comparisons of the desired with the actual lines of mass transit travel, to obtain a measure of the effectiveness of each of the four transit systems in the Region; and the discovery of user personal characteristics and attitudes which would lead to transit ridership by choice. Mailback questionnaires were distributed to transit passengers on the Milwaukee, Racine, Kenosha, and Waukesha transit systems for completion and return. Such questionnaires requested information concerning the socioeconomic characteristics of the users and the detailed characteristics of their trips. Of primary importance to the measurement of the effectiveness of the transit systems were data relating to the geographic location at points of origin and ultimate destination, and at points of boarding and transfer of each trip. Of primary importance to determining the factors leading to modal choice were data relating to the socioeconomic characteristics of the user and to the availability of an automobile as an alternative mode at the time a trip was made.

For the Milwaukee transit system, 122,655 forms were distributed, and 38,434, or 31 percent, were returned. For the Racine transit system, 2,239 forms were distributed, and 1,088, or 49 percent, were returned. For the Kenosha transit system, 1,385 forms were distributed, and 670, or 48 percent, were returned. For the Waukesha transit system, 467 forms were distributed, and 240, or 51 percent, were returned. The transit travel patterns as derived from this portion of the mass transit user survey will be used to formulate recommendations to the transit carriers on the means for improving the levels and quality of service provided.

In this survey, approximately 2,000 mass transit users identified as "choice" transit riders[2] were also reinterviewed to obtain additional data concerning why they chose mass transit when an automobile was available for the trip, how they believed their mass transit travel could best be improved, the frequency of their present mass transit use, and certain additional personal and household characteristic data. Identification of factors leading to mass transit riding by choice will be used to refine the existing modal choice model.

In the mass transit nonuser survey, the principal emphases were directed at identifying why residents have reduced the amount of travel, or do not travel, by mass transit; identifying the kinds of changes required in the transit system for them to begin, increase, or resume transit travel; and determining the differences in survey findings resulting from the use of varying sample rates, ranging from 3 percent to 33 percent. Six relatively small residential areas were selected. These represented older sections of the Region in which transit service has been maintained at a relatively high level but where transit utilization has

[2] *A "choice" transit rider is defined here as one on a given trip who had the option of driving an auto at the time the trip was made.*

been found to decline substantially, and newer sections where transit utilization has not met expectations despite extensions of service to those developing areas. In this survey, a total of 2,205 households were randomly selected for interview at a sample rate of approximately 33 percent. Of the 2,205 households selected for interviews, 1,827, or about 83 percent, provided completed information. The findings of this survey will be used to recommend changes, where possible, in the transit systems which could overcome objections to transit ridership as determined in the survey, and to gain an increased understanding of the effects of varying sample rates upon trip distributions.

In the major traffic generator survey, the principal emphasis was directed at identifying, for selected major commercial, industrial, and institutional employment centers of the Region, those areas in which employee or student resident addresses were sufficiently concentrated to warrant consideration of direct or improved mass transit service or the establishment of car pool service between home and work, taking into consideration arrival and departure time patterns. In this survey, 45 major firms and institutional agencies were asked to provide complete lists of employee or student resident addresses. Of these 45 firms and agencies, 29 firms and one university, representing two-thirds of the total firms and agencies contacted, provided such lists, containing together approximately 73,500 employee or student resident addresses. The findings of this survey were to be used to develop improved transit service and thereby to encourage increased mass transit use for trips to and from commercial, industrial, and institutional centers, and to encourage car pooling as well.

In addition to these three special mass transit oriented travel surveys, one other special survey was undertaken as part of the 1972 regional inventory of travel, consisting of a survey of average daily weekend travel. In this survey, primary emphasis was placed on the determination of the characteristics of average daily weekend travel and of the differences in such characteristics with average daily weekday travel. To this end, identical households and vehicles sampled in the home interview and truck and taxi surveys of average daily weekday travel were used as samples in the survey of average daily weekend travel. Information obtained in the weekend travel survey of households included detailed data related to the characteristics of each trip made by each household member five years of age and older. In addition, through the use of a special questionnaire, data concerning summer weekend recreational travel were also obtained. Of approximately 10,130 households to which questionnaires were mailed requesting Saturday or Sunday travel data, 5,484, or nearly 54 percent, returned completed questionnaires. Of these 5,484 questionnaires, 854, or 16 percent, provided data relating to summer weekend recreational travel.

Information obtained in the truck and taxi weekend travel survey included detailed data relating to the characteristics of each trip made by both trucks and taxis, including the kind and weight of commodities carried by trucks and the number of passengers carried by taxis. Of the 3,734 questionnaires mailed to truck operators, 1,018 completed forms, or 27 percent, were returned, and of 303 questionnaires mailed to taxi operators, 192 completed questionnaires, or 63 percent, were returned. The findings in the weekend travel survey will provide important information to studies of weekend travel patterns and weekend recreational demand, and to the need for public and private transportation service to meet this demand within the Region.

The expanded data obtained in these eight surveys provided a complete representation of the total travel occurring within the Region on an average weekday and an average weekend day in 1972. In each survey, careful attention was given to data collection scheduling to avoid a daily bias in the information.

Accuracy Checks

Two distinct sets of accuracy checks were employed to determine the degree of accuracy and completeness of the data obtained in the major travel surveys. In one set, socioeconomic characteristics from the major surveys were compared with 1970 census and other independent source data. In the other set, vehicle trip volumes as derived from the travel surveys were compared to actual vehicle volumes obtained by classification counts made at screenlines, cutlines, and analysis cordon lines, and vehicle miles of travel as derived from the travel surveys were compared to estimated actual vehicle miles of travel.

Review of the socioeconomic accuracy checks on the home interview survey indicated households with one person were somewhat underrepresented, while households with two or more persons were slightly overrepresented, thereby producing an overrepresentation of both the regional household population and the number of automobiles available in the Region by about 3 percent. Adjustment factors were developed, therefore, based on 1970 census data, which weighted zonal household factors by size of household. Following adjustment, the socioeconomic accuracy checks were conducted again. The results indicated that the home interview survey socioeconomic characteristic data exhibited a high degree of accuracy and completeness.

Review of accuracy checks on truck data from the truck and taxi survey indicated no appreciable bias in the sampling and expansion process. Comparisons of truck availability and trucks by type between survey findings and estimates derived from Wisconsin Division of Motor Vehicle registration records indicated that the truck data display a high degree of accuracy for the Region and within each county.

Due to the absence of independent data other than that utilized in constructing the sample concerning the number and spatial distribution of taxis and taxi travel, accuracy checks on such information could not be conducted. However, it is believed that the 100 percent sample rate applied to the relatively small universe of taxis in the Region, combined with the exceptionally high rate of

response—82 percent—obtained in the taxi portion of the truck and taxi survey, resulted in data which are reasonably accurate and can be confidently used in the planning process.

Upon completion of the accuracy checks on the expanded and adjusted housing and socioeconomic characteristic data as derived from the internal home interview and truck and taxi surveys, a number of checks were performed to ascertain the degree of accuracy of, or to provide the means of adjustment to, the trip information obtained in these surveys and in the external cordon travel survey. For this analysis, expanded trip data from these three separate travel surveys were combined. To verify that travel into and out of the Region was adequately replicated by the 1972 travel inventory, accuracy checks were conducted at the external cordon which provided a measure of vehicle travel by residents and nonresidents of the Region. The findings indicated that the external cordon survey data did indeed accurately replicate such travel and could be used, without adjustment, in lieu of external travel data as reported in the home interview and truck and taxi surveys.

The two basic travel accuracy checks performed were comparisons of the combined travel survey data with traffic counts by vehicle type of vehicle crossings at selected east-west screenlines, cut lines,[3] and cordon lines; and estimates of actual vehicle miles of travel. The principal check compared traffic count and classification data from all vehicle crossings of screenlines between 6 a.m. and 8 p.m. with vehicle trip volumes determined from the travel survey data to be crossing such screenlines. The three screenlines, which paralleled natural or man-made barriers to minimize undetected crossings, bisected the urbanized areas of Milwaukee, Racine, and Kenosha (see Map 112). In addition, the Milwaukee screenline, which paralleled IH 94, extended across the Region from the Waukesha-Jefferson County line on the west to Lake Michigan on the east.

To supplement the screenline check and to ensure that no bias resulted from the location of the screenline, cut lines were established in both north-south and east-west directions and analysis cordons were established around each of the urbanized areas. The other major travel check compared vehicle miles of travel from adjusted survey trip data assigned to the arterial street and highway network with actual travel estimates derived from traffic volume counts for each of the Kenosha, Milwaukee, and Racine urbanized areas; for the remainder of the Region, which consists of rural and small urban areas; and for the Region as a whole.

Results of the travel accuracy checks indicated that not only travel crossing the external cordon, but also regional travel occurring outside of the urbanized areas, was adequately replicated by the 1972 travel inventory. However, tripmaking by auto and truck in the urbanized areas of Kenosha, Milwaukee, and Racine was found to be underrepresented in the off-peak travel periods. Therefore, adjustment factors were applied in each of the urbanized areas to all truck and automobile trips other than trips to attend work or school, which constitute the principal components of peak period travel and which previous analyses indicated were accurately replicated by the unadjusted personal interview survey data. Development of the adjustment factors for nonwork and nonschool trip purposes incorporated the influences of time of day, geographic subarea of the trip ends, and mode of travel. Application of the adjustment factor to the travel data increased internal vehicle trips by approximately 11 percent.

Following adjustment, the travel data were compared to screenlines, cutlines, and vehicle miles of travel derived from traffic counts. The results of the screenline accuracy checks on the adjusted travel data, as shown in Table 125, indicated that the simulated traffic volumes from the adjusted survey data represented 93 percent of the traffic volumes crossing the screenlines in Kenosha, 97 percent in Milwaukee, and 97 percent in Racine. The results of the trip adjustments on cutlines indicated that simulated traffic volumes in Kenosha represented 96 percent of counted volumes; in Milwaukee, 100 percent; and in Racine, 98 percent. A check on vehicle miles of travel derived from the adjusted travel data indicated that vehicular travel simulated from survey data in the Kenosha urbanized area represented 109 percent of total estimated vehicular travel; in the Milwaukee urbanized area, 98 percent; in the Racine urbanized area, 96 percent; and in the more rural areas, where no trip adjustment was needed, 96 percent of total. For the entire Region, simulated vehicle miles of travel represented 97 percent of total estimated vehicle miles of travel (see Table 126).

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 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.

As previously mentioned, one important reason for conducting the reinventory of travel was to obtain similar data for two points in time. The 1963 and 1972 origin-destination surveys were conducted through the use of sampling techniques, and it was necessary, therefore, that the sample data obtained be expanded to represent total travel occurring within the Region on an average weekday in each of those years. To accomplish this purpose two factoring procedures were required. In the first procedure, the sample data were expanded to represent the statistical universe, or population, from which the samples were drawn; and in the second procedure, the sample data were further adjusted, where necessary, to account for known errors in the statistical universe and to account for the underreporting of tripmaking, common to all major origin-destination surveys.

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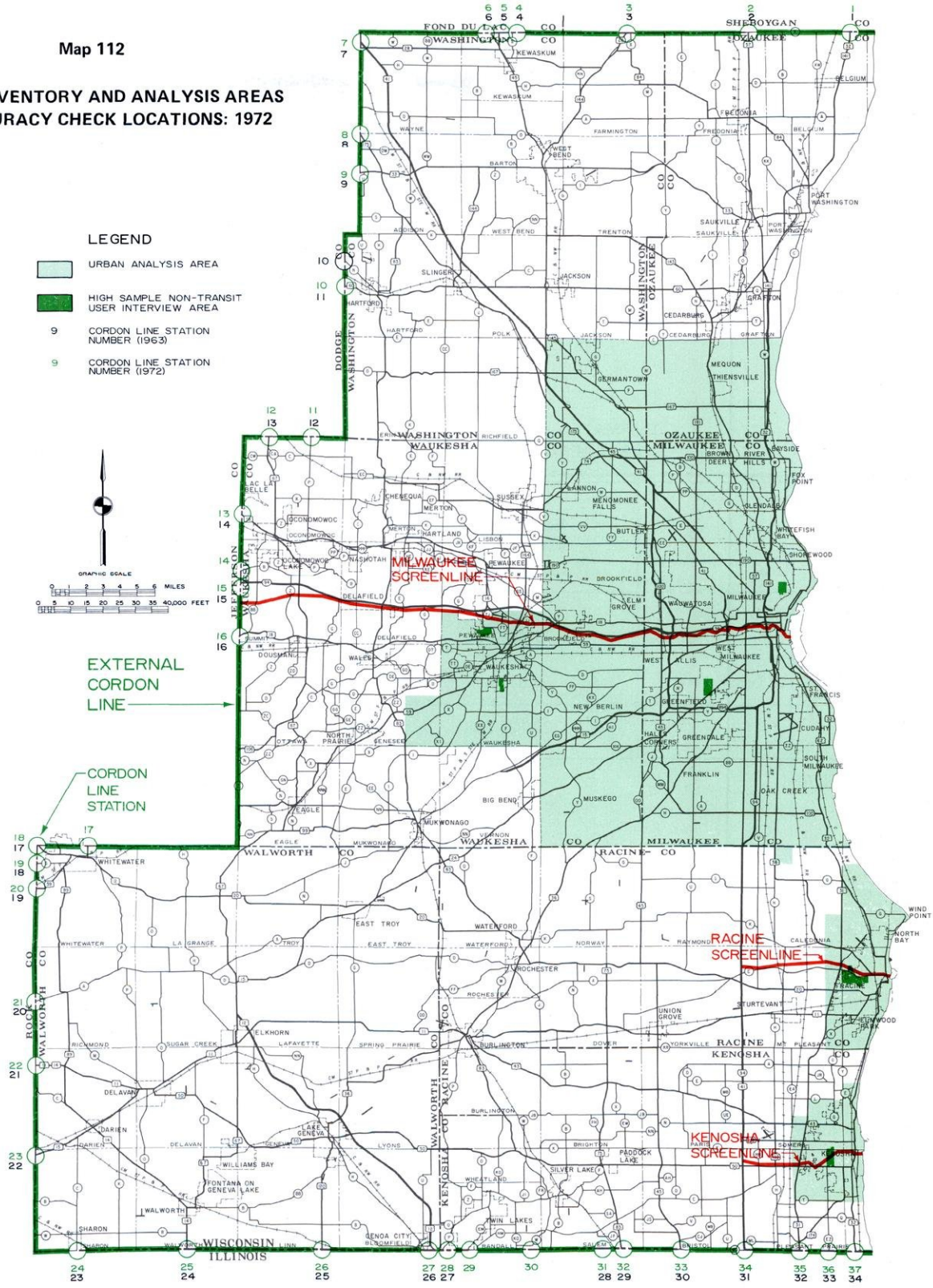
[3] *A cut line is defined as an imaginary line extending through a selected portion of a geographic area for the purpose of comparing and analyzing data as estimated from traffic counts with data derived from personal interview travel surveys.*

Map 112

TRAVEL INVENTORY AND ANALYSIS AREAS AND ACCURACY CHECK LOCATIONS: 1972



Household characteristic data, vehicle information, and travel data were obtained by personal interviews with residents of 15,400 households and 3,400 truck and taxi operators throughout the Region, and with 80,300 drivers of vehicles crossing regional boundaries. The above map identifies the boundaries of the three urban areas selected for intensive survey data analysis, the location of the 37 roadside interview stations in the external cordon survey, the screenlines selected for accuracy check purposes, and the six urban areas selected for intensive sampling under the nonuser mass transit survey.

Source: SEWRPC.

Table 125

AVERAGE WEEKDAY VEHICULAR ACTIVITY ON THE KENOSHA, MILWAUKEE, AND RACINE SCREENLINES: 1972

Screenline	Classified Traffic Volumes from Screenlines			Simulated Traffic Volumes from Adjusted Travel Inventory					
	Trucks	Automobiles	Total	Trucks	Percent of Classified Trucks	Automobiles	Percent of Classified Automobiles	Total	Percent of Classified Vehicles
Kenosha	9,070	135,770	144,840	8,649	95.4	125,367	92.3	134,016	92.5
Milwaukee	33,675	470,840	504,515	33,825	100.4	453,555	96.3	487,380	96.6
Racine	10,230	125,295	135,525	9,797	95.8	121,678	97.1	131,475	97.0

Source: SEWRPC.

Table 126

ESTIMATED AND SIMULATED VEHICLE MILES OF TRAVEL ON AN AVERAGE WEEKDAY IN SELECTED AREAS OF THE REGION: 1972

Area	Estimated Daily Vehicle Miles of Travel: Traffic Counts	Simulated Daily Vehicle Miles of Travel: Adjusted Survey Data	Percent of Estimated Travel
Kenosha Urbanized Area	596,900	647,800	108.5
Milwaukee Urbanized Area	12,956,600	12,651,000	97.6
Racine Urbanized Area	737,000	707,800	96.0
Rural and Small Urban Area	5,833,400	5,584,600	95.7
Region	20,123,900	19,591,200	97.4

Source: SEWRPC.

The procedures for applying adjustment factors differed for each component survey, and in the case of the home interview survey differed between the 1963 and 1972 surveys. In the comparison of home interview survey findings it was found that a relatively small increase in work trips was indicated from 1963 to 1972, which is inconsistent with the substantial increase in employment known to have occurred within the Region during the period. An examination of the factors originally used to adjust the 1963 home interview trip data was therefore conducted. The results indicated that the use of differential adjustment factors in 1972 but not in 1963 made direct comparisons impossible.[4]

For direct comparisons, therefore, the 1963 person trip data were refactored using differential adjustment factors. Use of these factors produced slightly different distributions of all personal travel characteristics, and upon comparison with the 1972 trip data, produced an increase in work trips from 1963 to 1972 which was consistent with the increase in employment experienced in this period. This adjustment in work trips amounted to 76,400 trips, or 2 percent of the total 1963 persons trips. Although important to the accuracy of the survey, it had very little effect on the distribution of person travel in other 1963 trip data summaries.

It is believed that the use of differentially adjusted travel data has produced a refinement in the 1963 data and provides a sound basis for direct comparisons with the 1972 travel data. Thus, the refactored 1963 survey data are utilized in the comparisons of 1963 and 1972 person travel throughout this text. Further, for comparisons with the 1972 data, the 1963 trip data discussed in this text represent expanded, adjusted, and linked data, and therefore cannot be readily compared with the information discussed in SEWRPC Planning Report No. 7, Volume One, Chapter VIII, which for the most part represents expanded, unadjusted, and unlinked data.

[4] *In 1963, all travel data obtained in the three major urbanized areas of the Region were increased through the application of a uniform adjustment factor, regardless of travel mode or trip purpose. In 1972, adjustment factors unique to each urbanized area were applied only to automobile travel for purposes other than home-based work or school and to truck travel for all purposes. In the remainder of the Region, no adjustment was made to the travel data in 1963 or 1972.*

INVENTORY FINDINGS

The major origin-destination surveys conducted in 1963 and in 1972, namely, the home interview, truck and taxi, and external cordon surveys, furnished the principal data required by the transportation planning process in southeastern Wisconsin, and thus provide a comprehensive representation of regional travel habits and patterns. The findings of this inventory encompass detailed information relating to the characteristics of total internal person and internal vehicle travel; the characteristics of travel entering, leaving, and passing directly through the Region; the location of travel within the Region; and the characteristics of travel in certain subareas of the Region, such as the major central business districts.

Quantity of Total Travel

There were approximately 1.81 million persons residing in the Region in the spring of 1972, based on travel survey findings. This figure represents an increase of about 156,000 persons, or about 9 percent, in the resident population of the Region between 1963 and 1972.[5] These regional residents occupied nearly 557,300 year-round housing units and 10,400 units in group quarters, for a total of nearly 568,000 occupied housing units in 1972. This figure represents an increase of about 77,000 occupied housing units, or about 16 percent, since 1963. Occupied housing units within the Region increased at a rate greater than that of the regional population during this period because the average household size decreased from 3.37 persons per household in 1963 to 3.19 persons in 1972. This decline in persons per household is believed to result primarily from the tendency of younger families to have fewer children and of unmarried persons to maintain separate quarters apart from the family.

There were about 4.68 million person trips[6] made within the Region on an average weekday in 1972. This figure represents an increase of about 887,000 person trips per day, or about 23 percent, since 1963. Of these 4.68 million person trips, about 4.50 million, or about 96 percent of the total, were internal person trips, that is, trips having both the origin and destination within the Region. These 4.50 million internal person trips represent an increase of 902,000 trips, or 25 percent, since 1963. The average number of internal person trips per capita increased from 2.2 in 1963 to 2.5 in 1972, while the average number of internal person trips per household increased from 7.3 to 7.9.

In 1972 there were approximately 3.41 million vehicle trips, consisting mainly of auto, truck, and taxi trips made within the Region on an average weekday, representing an increase of 848,000 vehicle trips, or 33 percent, since 1963. Of the 3.41 million vehicle trips, about 3.29 million, or 96 percent, were internal vehicle trips, representing an increase of 824,000 such trips, or 33 percent, since 1963.

In addition to these internal person and vehicle trips, there were about 177,000 external person trips and about 126,000 external vehicle trips made into, out of, or through the Region. These figures represented a decrease of 15,000 person trips, or about 8 percent, and an increase of 24,000 vehicle trips, or about 24 percent, since 1963 (see Table 127).

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[5] *These figures do not include, both in 1972 and 1963, approximately 20,000 persons confined in mental hospitals, prisons, invalid homes, and other such group quarters where travel by inmates is restricted.*

[6] *A person trip is defined herein as a one-way journey between a point of origin and a point of destination by a person five years of age or over traveling as an auto driver or as a passenger in an auto, taxi, truck, motorcycle, 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.*

Table 127

AVERAGE WEEKDAY PERSON AND VEHICLE TRIPS BY SURVEY TYPE: 1963 and 1972

	1963				1972				Change: 1963-1972			
	Person Trips		Vehicle Trips		Person Trips		Vehicle Trips		Person Trips		Vehicle Trips	
Survey Type	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent	Number	Percent
Personal Interview												
Home Interview	3,603,000	94.9	2,166,000	84.3	4,504,900	96.2	2,905,000	85.0	901,900	25.0	739,000	34.1
Truck and Taxi	--	--	300,400	11.7	--	--	385,300	11.3	--	--	84,900	28.3
Subtotal	3,603,000	94.9	2,466,400	96.0	4,504,900	96.2	3,290,300	96.3	901,900	25.0	823,900	33.4
External Cordon	191,700	5.1	101,600	4.0	176,900	3.8	125,700	3.7	- 14,800	- 7.7	24,100	23.7
Total	3,794,700	100.0	2,568,000	100.0	4,681,800	100.0	3,416,000	100.0	887,100	23.4	848,000	33.0

Source: SEWRPC.

Internal Person Travel

Internal Person Trip Production: A comparison of the information shown on Maps 113 and 114 indicates that person trip production varied widely by subarea of the Region in 1963 and 1972. The lowest rates of person trip production in both years were found in the central areas of the larger cities and in certain portions of the rural areas, where the average number of trips per household was usually less than four. The highest rates in both years were found in the suburban and rural urban fringe areas, where the number of trips per household averaged 12 or more. Increased trip production increased from 1963 to 1972, particularly in many of the rural areas where the average number of trips per household increased from a range of four to eight trips per day to eight to twelve trips per day, and in many suburban areas where trip production averages increased from a range of eight to twelve to a range of twelve to sixteen or more trips per day.

Relationship of Automobile Availability: A strong correlation exists between person trip production and the number of automobiles available to households. The 1972 survey findings indicated that about 704,600 automobiles were available to the approximately 567,700 households existing within the Region, an average of 1.24 autos per household, or about 389 autos per 1,000 resident population, compared to the 1963 findings of 527,300 automobiles available, an average of 1.07 autos per household and 319 autos per 1,000 resident population (see Maps 115 and 116).

The correlation of automobile availability to person trip production in the Region is indicated in Table 128. As shown, trip production per household increased sharply in 1963 and 1972 in relation to increased automobile availability. Thus, while zero-auto households averaged two person trips per average weekday, one-auto households averaged seven person trips per weekday. The household trip average continued to increase in two-auto and three-or-more-auto households in 1963 and 1972. This table also indicates that the proportion of zero-auto and one-auto households decreased, while the proportion of two-auto and three-or-more-auto households increased. Should these trends continue, greater volumes of person travel and even greater proportions of automobile travel to total person travel may be anticipated within the Region in future years.

Table 129 compares the percentage distribution of zero-, one-, and two-or-more-auto households within the Region as recorded by the 1972 SEWRPC travel inventory and by the 1970 census. Also shown is a similar distribution of zero-, one-, and two-or-more-auto house-

Table 128

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY AUTOMOBILE AVAILABILITY: 1963 and 1972

Autos Available	1963 Households		1963 Person Trips		1972 Households		1972 Person Trips		Person Trips Per Household	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	1963	1972
0	90,700	18.4	193,900	5.4	95,600	16.8	182,500	4.1	2.1	1.9
1	284,600	57.9	2,107,800	58.5	279,200	49.2	1,964,900	43.6	7.4	7.0
2	103,000	21.0	1,123,900	31.2	161,300	28.4	1,851,000	41.1	10.9	11.5
3 or More	13,100	2.7	177,400	4.9	31,600	5.6	506,500	11.2	13.5	16.0
Region	491,400	100.0	3,603,000	100.0	567,700	100.0	4,504,900	100.0	7.3	7.9

Source: SEWRPC.

Table 129

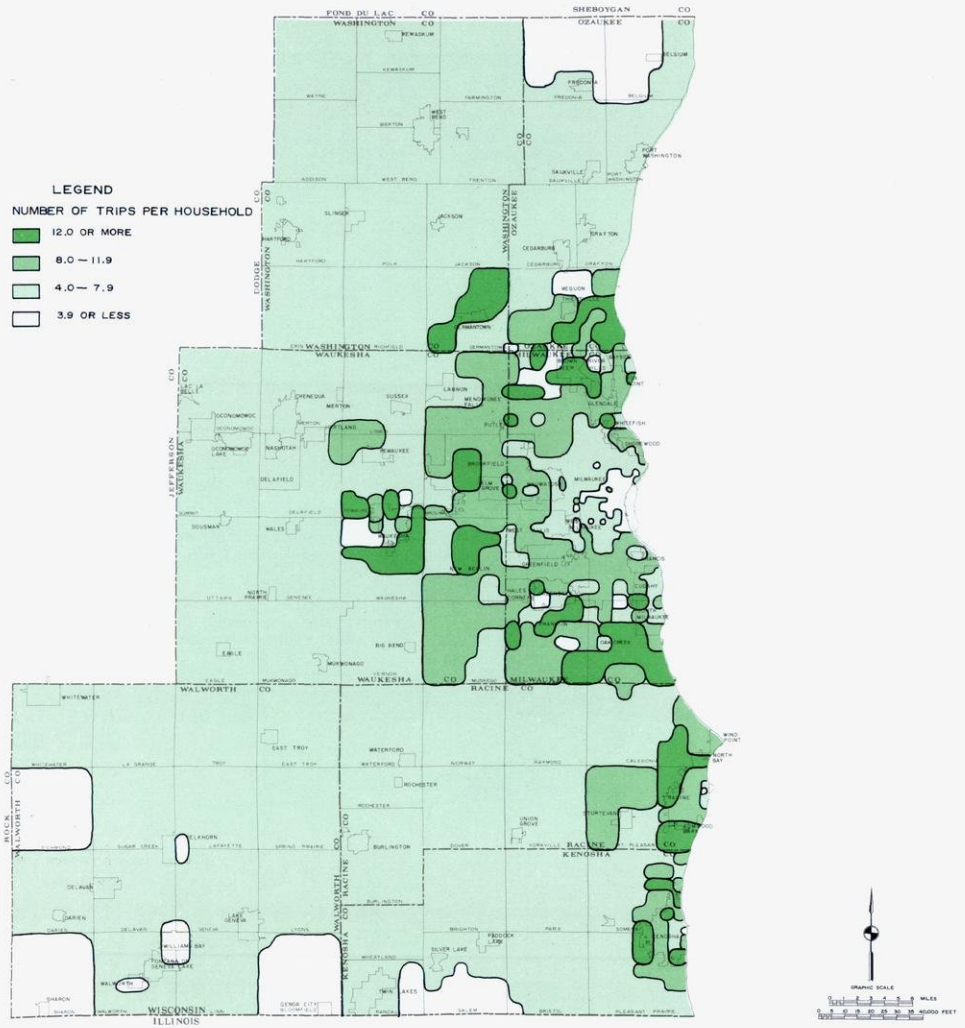
PERCENTAGE DISTRIBUTION OF 0, 1, AND 2 OR MORE AUTOMOBILE HOUSEHOLDS IN THE REGION—1970 AND 1972, AND IN THE TWIN CITIES METROPOLITAN AREA—1970

Area and Data Source	Year	Percent of Households: 0-Auto Households	1-Auto Households	2-or-More-Auto Households
Region—SEWRPC Travel Inventory	1972	16.8	49.2	34.0
Region—U. S. Census	1970	16.5	50.1	33.4
Twin Cities, Minn. Metropolitan Area	1970	15.0	52.1	32.9

Source: U. S. Bureau of the Census; A Summary Report of Travel in the Twin Cities Metropolitan Area, The Metropolitan Council, April 1974, p. 41; and SEWRPC.

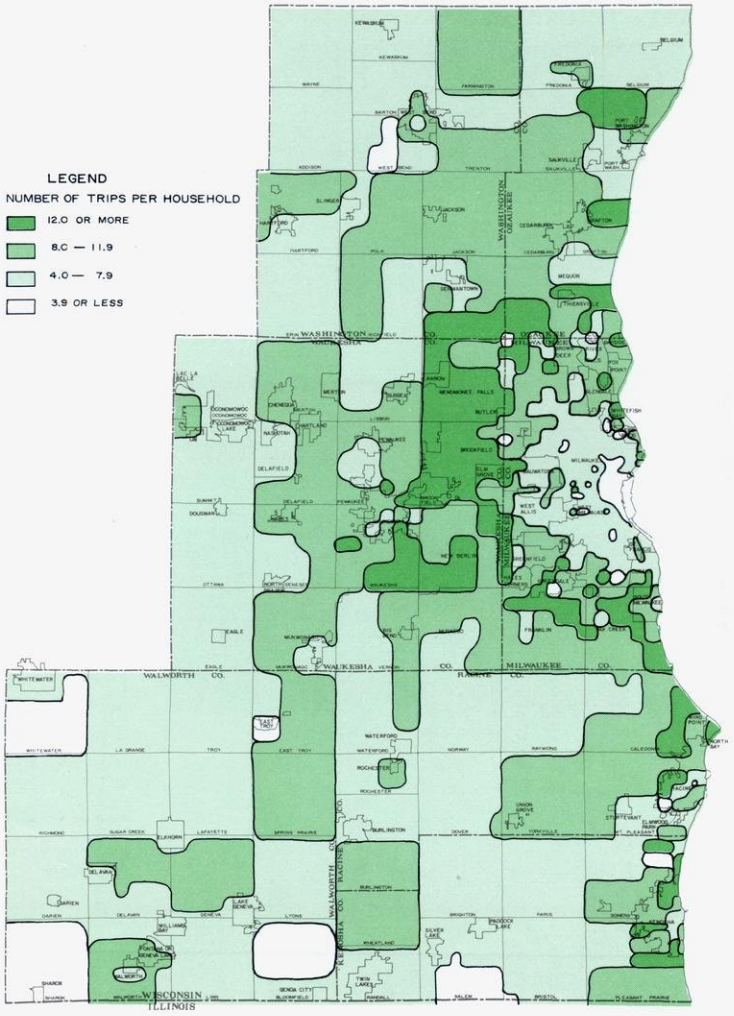
Map 113

AVERAGE WEEKDAY INTERNAL PERSON TRIPS
PER HOUSEHOLD IN THE REGION: 1963



Map 114

AVERAGE WEEKDAY INTERNAL PERSON TRIPS
PER HOUSEHOLD IN THE REGION: 1972

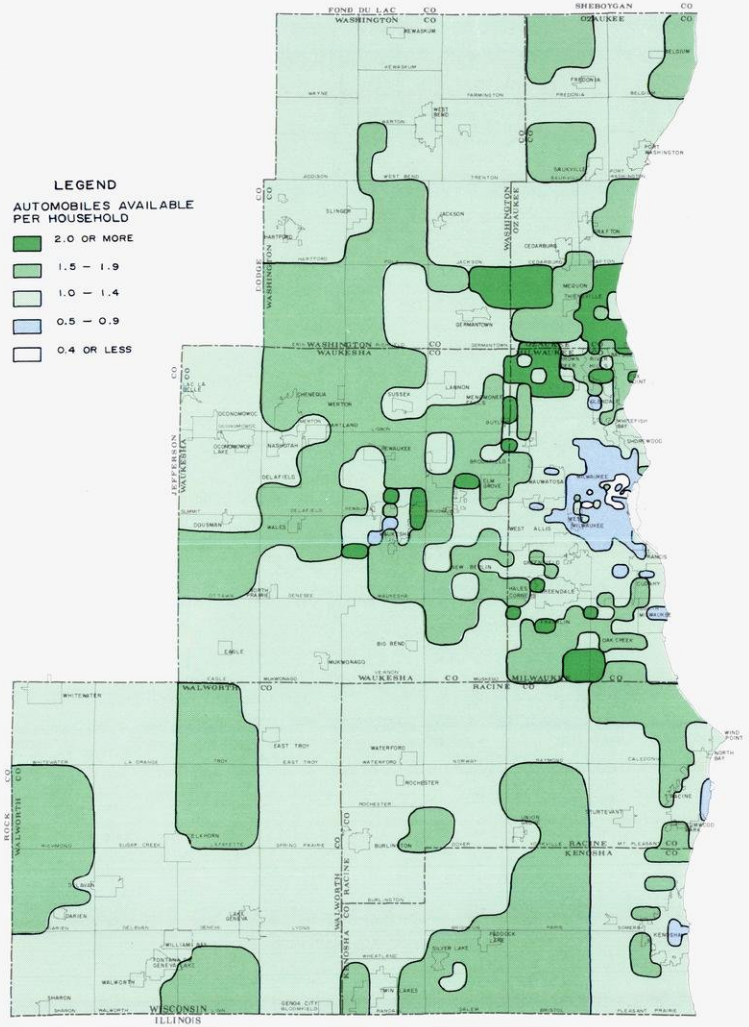


Residents of the Region made about 4.5 million person trips within the Region on an average weekday in 1972, representing an increase of about 900,000 trips, or 25 percent, over the 1963 level. The average number of internal person trips per household increased from 7.3 in 1963 to 7.9 in 1972. As shown on the above maps, areas with lower than average tripmaking rates are located primarily in the central areas of the major cities of the Region and in a few scattered rural areas, while areas with higher than average tripmaking rates are located in the suburban and rural-urban fringe areas of the Region. Higher than average tripmaking is evident in those subareas of the Region which underwent extensive urbanization since 1963.

Source: SEWRPC.

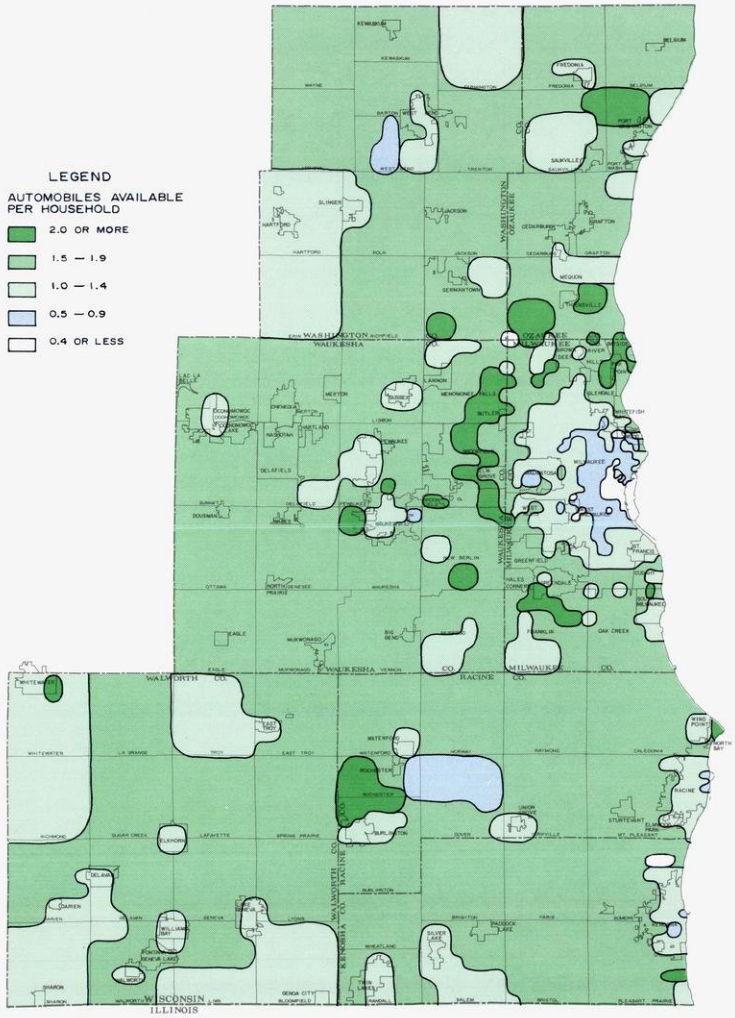
Map 115

AUTOMOBILES AVAILABLE PER HOUSEHOLD IN THE REGION: 1963



Map 116

AUTOMOBILES AVAILABLE PER HOUSEHOLD IN THE REGION: 1972



In 1963 there were about 527,000 automobiles available to the approximately 491,000 households in the Region, an average of 1.07 autos per household, or 319 autos per thousand resident population. By 1972 there were about 705,000 automobiles available, an increase of about 34 percent, representing an average of 1.24 autos per household, or 389 autos per thousand resident population. Survey data indicate that the proportion of zero- and one-auto households decreased between 1963 and 1972, while the proportion of two-auto and three-or-more-auto households has increased. As shown on the above maps, households with two-or-more-autos available tended to be concentrated in both years in the suburban and rural-urban fringe areas of the Region.

Source: SEWRPC.

holds within the Minneapolis-St. Paul metropolitan area as recorded in a 1970 travel inventory. It should be noted, in reference to the continuing trend toward multi-auto households, that the 1972 percentage distribution of autos per household very closely matched that reported in the 1970 census, indicating that the largest percentage increase in multi-auto households occurring from 1963 to 1972 occurred prior to 1970.

Relationship of Family Size: Person trip production within the Region is also related to the number of persons comprising the household. Table 130 indicates that while one-person households averaged about two trips per household, two-person households averaged about five trips per household. The average number of trips per household increased in each successively higher household size category both in 1963 and 1972.

Relationship of Household Annual Income: A third factor correlated with person trip production is household annual income. Because household annual income data were obtained only in the urbanizing areas in 1963 and regionwide in 1972, the tables referenced below show first the 1972 regionwide findings, and then the 1963 and 1972 urbanized area findings. Table 131 indicates that the average number of person trips per household in 1972 increased in relation to higher household annual income. Households having a yearly income of less than $4,000 averaged about three trips per household, while those in the next higher income group averaged six trips per household. In each successively higher income level, trip production averages showed complementary increases.

Table 131 further indicates that households reporting a yearly income of less than $8,000 equaled 30 percent of total households but accounted for only 15 percent of total trips, while households reporting a yearly income over $12,000 equaled 40 percent of total households but accounted for 54 percent of total trips. Households reporting a yearly income between $8,000 and $11,999 equaled 30 percent of total households and accounted for 31 percent of total trips.

Table 130

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY FAMILY SIZE: 1963 and 1972

Family Size	1963 Households		1963 Person Trips		1972 Households		1972 Person Trips		Person Trips Per Household	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	1963	1972
1	60,000	12.2	114,600	3.2	98,700	17.4	234,800	5.2	1.9	2.4
2	136,300	27.7	685,000	19.0	164,200	28.9	903,200	20.1	5.0	5.5
3	87,800	17.9	668,400	18.6	92,400	16.3	762,100	16.9	7.6	8.2
4	84,000	17.1	807,100	22.4	86,600	15.3	904,700	20.1	9.6	10.4
5 or More	123,300	25.1	1,327,900	36.8	125,800	22.1	1,700,100	37.7	10.8	13.5
Region	491,400	100.0	3,603,000	100.0	567,700	100.0	4,504,900	100.0	7.3	7.9

Source: SEWRPC.

Table 131

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY INCOME GROUP: 1972

Income Range	Households[a] Number	Households[a] Percent of Total	Person Trips Number	Person Trips Percent of Total	Person Trips Per Household
$ 0 to 3,999	51,600	13.2	145,300	4.2	2.8
4,000 to 7,999	67,100	17.2	384,400	11.2	5.7
8,000 to 11,999	117,300	30.1	1,043,200	30.5	8.9
12,000 to 15,999	75,600	19.4	854,700	25.0	11.3
16,000 to 24,999	60,200	15.4	741,800	21.7	12.3
25,000 or More	18,200	4.7	252,300	7.4	13.9
Total Reporting Households	390,000	100.0	3,421,700	100.0	8.8

[a] *Approximately 31 percent of total households did not provide household annual income data.*

Source: SEWRPC.

To compare 1963 and 1972 urbanizing area data, 1963 dollar amounts were converted to 1972 constant dollars. Because the income groupings were not entirely compatible between 1963 and 1972, interpolations were made where necessary. The data shown in Table 132 indicate that in the urbanizing areas of the Region, the average number of person trips per household by income group was markedly similar in 1963 and 1972 within each income category. Similar to the regional pattern shown in Table 131, households having a yearly income of less than $4,000 averaged about three trips per household in both years. The next highest income group averaged six trips per household in both years and trip production averages in both years continued to increase in relation to each successively higher income level. The average trip production for all urbanizing area households reporting income was 7.8 trips per household in 1963 and nine trips per household in 1972. This increase in average trips occurred in conjunction with the increased numbers of households in 1972 in the higher income brackets, where higher than average trip production occurs.

Table 132 also indicates that in 1963, households reporting a yearly income of less than $8,000 equaled 47 percent of total urbanizing area households and accounted for 30 percent of the trips, whereas in 1972 such households equaled 31 percent of urbanizing area households and accounted for 16 percent of the trips. Conversely, households reporting a yearly income in excess of $12,000 in 1963 equaled only 21 percent of total urbanizing area households and accounted for 32 percent of the trips, while in 1972 such households equaled 39 percent of total urbanizing area households and accounted for 54 percent of the trips. Households reporting a yearly income between $8,000 and $11,999 equaled 32 percent of the urbanizing area households and generated 38 percent of the trips in 1963, while in 1972 such households equaled 30 percent of the urbanizing area households and generated 31 percent of the trips.

These data indicate that although trip generation per household by income category is relatively stable over time, increasing affluence is related to increased travel, emphasizing the regularity and orderliness of travel and providing another means for sound transportation planning and forecasting of future travel.

Relationship of Structure Type: Person trip production is also related to the type of structure in which the household resides. As with household annual income data, information relating to trip production by structure type was obtained in 1963 only in the urbanizing areas of the

Table 132

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY INCOME GROUP: 1963 and 1972

Income Range (1972 Constant Dollars)	Year	Households		Person Trips		Person Trips Per Household
		Number[a]	Percent of Total	Number	Percent of Total	
0 to 3,999	1963	66,400	17.5	184,600	6.2	2.8
	1972	42,000	13.4	121,700	4.3	2.9
4,000 to 7,999	1963	110,700	29.2	706,300	23.8	6.4
	1972	55,600	17.7	322,700	11.4	5.8
8,000 to 11,999	1963	122,000	32.1	1,135,800	38.2	9.3
	1972	94,600	30.1	867,100	30.6	9.2
12,000 to 15,999	1963	53,000	14.0	596,000	20.0	11.2
	1972	59,300	18.9	699,000	24.6	11.8
16,000 to 21,999	1963	18,400	4.8	225,600	7.6	12.3
	1972	31,900	10.1	404,400	14.3	12.7
22,000 and Over	1963	9,200	2.4	123,800	4.2	13.4
	1972	30,800	9.8	421,000	14.8	13.7
Total Reporting Households	1963	379,700	100.0	2,972,100	100.0	7.8
	1972	314,200	100.0	2,835,900	100.0	9.0

[a] *In the urbanizing areas, approximately 10 percent of the households in 1963 and 33 percent in 1972 did not provide household annual income data.*

Source: SEWRPC.

Region, while in 1972 such data were obtained regionwide. The tables referenced below show first the 1972 regionwide findings, and second the 1963 and 1972 urbanized area findings.

Table 133 indicates that the average daily number of trips per household in 1972 bears an inverse relationship to the number of households within the structure. One-household structures, for example, averaged nine trips per household, while two-household structures averaged about six trips per household. As the number of households in structures increased to three or four and to five or more, the average number of trips per household continued to decline slightly. The average daily number of trips for households in mobile homes was found to be 5.2 trips, and for households in group quarters, about 2.5 trips.

Table 134 indicates that the average number of person trips per household by structure type in the urbanizing areas of the Region on an average weekday was quite similar within each structure category in both 1963 and 1972, and similar to the 1972 regionwide findings shown in Table 133. As in the regional findings, average trip production per household decreased regularly in relation to increased numbers of households within a structure.

Table 134 also shows that structures containing a single household, although equaling 54 and 58 percent of total households in the urbanizing areas in 1963 and 1972, respectively, accounted for 67 and 72 percent, respectively, of total person trips generated by urbanizing area households. Structures containing two or more households, on the other hand, although equaling 43 and 40 percent of total urbanizing area households in 1963 and 1972, accounted for only 32 and 28 percent, respectively, of total person trips generated by households in these areas. Mobile homes, equaling 0.3 and 0.2 percent of total urbanizing area households, accounted for 0.2 percent of total person trips generated by these areas in both 1963 and 1972. Households in group quarters, hotels, motels, and rooming houses, while equaling about 2 percent of total urbanizing area households in 1963 and 1972, accounted for only 0.3 and 0.6 percent of total person trips generated by these areas.

These data, shown in Tables 133 and 134, provide additional evidence of the regularity, and hence the predictability, of person travel over time.

Mode of Internal Person Trips: Freedom to select a particular mode of travel is not always present. Many households, for example, are located in areas not served by mass transit, and thus are highly dependent upon the automobile. Many other households do not have automobiles available, and thus are dependent almost entirely on mass transit. The survey findings indicate that auto-oriented travel on an average weekday accounted for the large majority of total internal person travel within the Region in 1963 and 1972. Auto driver trips alone accounted for 60 percent of total person trips in 1963 and 64 percent in 1972, while auto passenger trips accounted for an additional 27 percent of the total in both 1963 and 1972. Of the remaining modes, mass transit passenger trips accounted for 9 percent of the total in 1963 and 4 percent in 1972,[7] and school bus trips accounted for 3 percent of the total in 1963 and 4 percent in 1972. All other modes together, such as taxi passengers, truck passengers, and in 1972, motorcycle drivers and passengers, accounted for 0.5 percent or less in both 1963 and 1972 (see Table 135).

Table 135 also indicates that from 1963 to 1972, auto driver trips increased by 731,000, or 34 percent, while auto passenger trips increased by only 242,000, or 25 percent. This reflects the effects of the substantial

[7] *In comparison, mass transit trips in the Chicago and Minneapolis-St. Paul metropolitan areas accounted for 10 percent and 3 percent, respectively, of total person trips in those areas in 1970.*

Table 133

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY STRUCTURE TYPE: 1972

Structure Type	Households		Person Trips		Person Trips Per Household
	Number	Percent of Total	Number	Percent of Total	
One-Household	353,200	62.2	3,349,500	74.4	9.5
Two-Household	113,400	20.0	650,300	14.4	5.7
Three-or-Four-Household	28,800	5.1	157,000	3.5	5.5
Five-or-More-Household	58,100	10.2	306,700	6.8	5.3
Mobile Home	2,000	0.4	10,400	0.2	5.2
Other (Group Quarters, Hotels, Motels, Rooming Houses)	12,200	2.1	31,000	0.7	2.5
Region	567,700	100.0	4,504,900	100.0	7.9

Source: SEWRPC.

Table 134

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY STRUCTURE TYPE: 1963 and 1972

Structure Type	Year	Households		Person Trips		Person Trips Per Household
		Number	Percent of Total	Number	Percent of Total	
One-Household	1963	229,700	54.4	2,169,600	67.2	9.4
	1972	270,100	57.6	2,705,800	71.5	10.0
Two-Household	1963	115,500	27.3	725,900	22.5	6.3
	1972	106,500	22.7	611,100	16.1	5.7
Three-or-Four-Household	1963	30,700	7.3	170,900	5.3	5.6
	1972	27,300	5.8	150,600	4.0	5.5
Five-or-More-Household	1963	36,200	8.6	145,500	4.5	4.0
	1972	55,100	11.8	287,800	7.6	5.2
Mobile Homes	1963	1,300	0.3	7,600	0.2	5.8
	1972	900	0.2	5,700	0.2	6.3
Other (Group Quarters, Hotels, Motels, Rooming Houses)	1963	9,000	2.1	10,100	0.3	1.1
	1972	9,100	1.9	23,100	0.6	2.5
Total Urbanizing Areas	1963	422,400	100.0	3,229,600	100.0	7.6
	1972	469,000	100.0	3,784,100	100.0	8.1

Source: SEWRPC.

Table 135

DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL: 1963 and 1972

Mode of Travel	Person Trips				Change: 1963-1972	
	1963		1972			
	Number	Percent of Total	Number	Percent of Total	Number	Percent
Auto Driver	2,165,700	60.1	2,897,000	64.3	731,300	33.8
Auto Passenger	985,100	27.4	1,227,400	27.2	242,300	24.6
Mass Transit	324,300	9.0	186,200	4.1	-138,100	-42.6
School Bus	119,900	3.3	173,800	3.9	53,900	45.0
Other	8,000	0.2	20,500	0.5	12,500	156.3
Total	3,603,000	100.0	4,504,900	100.0	901,900	25.0

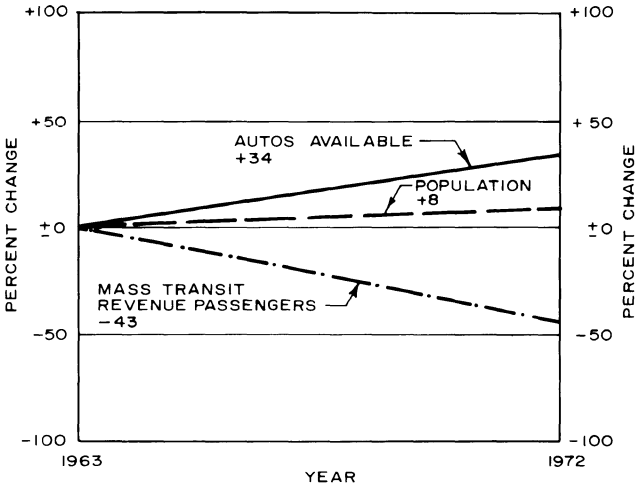
Source: SEWRPC.

growth not only in the number of automobiles available to drivers, but also in the number and proportions of multi-auto households within the Region. The lesser growth in auto passenger travel resulted in a decrease in the average auto occupancy rate for the Region from 1.46 persons per auto in 1963 to 1.43 persons in 1972.

Mass transit passenger trips, in contrast to the increases in auto travel, in the regional population, and in automobiles available, decreased from about 324,000 revenue passenger trips per average weekday in 1963 to about 186,000 in 1972, a decrease of about 138,000, or 43 percent (see Figure 64). In the Milwaukee transit service

Figure 64

PERCENT CHANGE IN POPULATION, AUTOMOBILES AVAILABLE, AND MASS TRANSIT REVENUE PASSENGERS IN THE REGION: 1963-1972



Source: SEWRPC.

area,[8] the number of mass transit passenger rides per year per capita decreased from 85 in 1963 to 51 in 1972; in the Racine transit service area, from 30 in 1963 to five in 1972; and in the Kenosha transit service area, from 26 in 1963 to six in 1972. Accompanying this decline was a significant decrease in the number and proportion of choice transit passengers, from 27,000, or about 8 percent of the total, in 1963 to less than 8,000, or about 4 percent of the total, in 1972.

Person trips by school bus within the Region increased substantially, from about 120,000 in 1963 to about 174,000 in 1972, an increase of about 54,000, or 45 percent. Trips by all other modes of travel combined increased from about 8,000 in 1963 to more than 20,000 in 1972, an increase of more than 12,000 trips, or 156 percent. Most of this increase, however, resulted from the inclusion of motorcycle trips in the 1972 survey and not in the 1963 survey.

To obtain a full representation of the amount of average daily employment attendance as well as to provide a complete understanding of home-to-work travel, information was obtained in both 1963 and 1972 concerning persons who either walked to work or worked at home. Of total home-to-work trips, walked-to-work trips accounted for slightly less than 5 percent in 1963 and slightly more than 5 percent in 1972, and work-at-home "trips" accounted for approximately 0.5 percent in 1963 and more than 1 percent in 1972.

[8] *For the purposes of this report, a transit service area is defined as the area within one-quarter mile of a transit line.*

Of approximately 24,000 walk-to-work trips in 1963 and 1972, trips to industrial establishments accounted for 48 percent in 1963 and 28 percent in 1972; trips to retail and service establishments accounted for 33 percent in 1963 and 35 percent in 1972; trips to governmental and institutional establishments accounted for 15 percent in 1963 and 28 percent in 1972; and trips to other land uses, including residential; recreational; agricultural; transportation, communication, and utilities; and open lands and water areas accounted together for about 4 percent of the total in 1963 and 9 percent in 1972.

Selected Characteristics of Users of Various Modes of Internal Person Travel: Table 136 indicates that the majority of auto driver trips within the Region on an average 1963 and 1972 weekday were made by males, and conversely, the majority of auto passenger and mass transit passenger trips were made by females. The proportion of female auto driver trips, however, increased from 30 percent in 1963 to 39 percent in 1972. Table 136 also indicates that of all age groups in both survey years, persons in the 35-44 age group comprised the highest percentage of auto driver trips, children in the 5-14 age group comprised the highest percentage of auto and school bus passenger trips, and people in the 15-19 age group comprised the highest percentage of mass transit passenger trips. In general, the proportions of trips by all modes of travel were found to increase from 1963 to 1972 by persons within the four youngest age categories and within the two oldest age categories, with corresponding decreases in the proportions of trips in the other age categories. The increase in the travel of the young shown in Table 136 reflects the decline in the median age of the population in the last decade as reported by the 1970 census.

Table 136 also indicates that while the proportion of auto passenger trips made by licensed drivers increased from 38 percent in 1963 to 45 percent in 1972, the proportion of such drivers making mass transit and school bus trips remained relatively stable over the period. Table 136 shows that the proportion of work-based trips to total person trips decreased slightly from 1963 to 1972 within the auto driver, auto passenger, and mass transit trip categories, with the largest percentage decrease occurring in the mass transit category. This table also shows that while the proportion of school-based trips remained relatively constant in the auto driver, auto passenger, and school bus categories from 1963 to 1972, a rather substantial increase occurred in the proportion of school-based trips made by mass transit.

Of total person trips made in the six peak hours of the day, differences in the proportions of such trips from 1963 to 1972 were small within each mode of travel except that of trips by school bus, which decreased from 86 percent in 1963 to 79 percent in 1972. Of the other modes, trips made in peak periods of the day accounted for slightly more than 40 percent of total auto driver trips, 30 percent of total auto passenger trips, and 60 percent of total mass transit trips in both 1963 and 1972.

Table 136

PERCENTAGE DISTRIBUTION OF SELECTED CHARACTERISTICS OF USERS OF VARIOUS MODES OF INTERNAL PERSON TRAVEL IN THE REGION: 1963 and 1972

Selected Characteristic	Year	Percent of Trips by Mode			
		Auto Driver	Auto Passenger[a]	Transit Passenger	School Bus Passenger
Sex					
Male	1963	69.9	31.9	36.8	49.0
	1972	60.7	31.7	34.2	50.3
Female	1963	30.1	68.1	63.2	51.0
	1972	39.3	68.3	65.8	49.7
Total	1963	100.0	100.0	100.0	100.0
	1972	100.0	100.0	100.0	100.0
Age Group					
5-14	1963	--	31.2	9.6	75.4
	1972	--	30.3	12.2	77.4
15-19	1963	3.9	11.2	19.2	23.7
	1972	6.3	15.7	22.1	21.5
20-24	1963	8.6	7.6	9.8	--
	1972	11.8	10.3	11.7	--
25-29	1963	11.5	6.6	4.6	--
	1972	12.5	7.0	5.0	--
30-34	1963	12.6	5.8	4.6	--
	1972	11.1	5.0	3.9	--
35-44	1963	28.1	13.7	13.6	--
	1972	21.9	8.0	9.2	--
45-54	1963	19.9	11.2	14.7	--
	1972	19.4	9.7	12.0	--
55-64	1963	10.7	7.4	14.3	--
	1972	10.8	7.5	13.1	--
65 and Older	1963	4.7	5.3	9.6	--
	1972	6.2	6.5	10.8	--
Total	1963	100.0	100.0	100.0	99.1[b]
	1972	100.0	100.0	100.0	98.9
Other					
Licensed Drivers	1963	100.0	38.4	29.6	8.2
	1972	100.0	44.9	29.2	8.6
Going to and from Work	1963	46.3	16.4	50.8	--
	1972	42.0	15.4	42.5	--
Going to and from School	1963	1.2	10.2	21.1	99.6
	1972	2.4	10.2	28.9	99.2
Trips in Six Peak Hours	1963	41.3	32.9	64.6	86.0
	1972	42.1	35.9	62.4	79.0
Going to and from Milwaukee CBD	1963	6.0	4.4	31.2	--
	1972	5.1	4.5	30.7	--

[a] *Includes truck and taxi passengers.*

[b] *The remaining 0.9 percent in 1963 and 1.1 percent in 1972 are distributed throughout the other age groups.*

Source: SEWRPC.

It is significant to note that despite a decrease of nearly 43 percent in total mass transit travel within the Region, only a small difference was found within each travel mode from 1963 to 1972 in the proportion of internal trips having either origins or destinations in the Milwaukee central business district (CBD) on an average weekday. It is also significant that approximately 31 percent of total transit trips, but only about 5 to 6 percent of total auto driver trips and only about 4 to 5 percent of total auto passenger trips, had origins or destinations in that CBD in 1963 and 1972.

In comparison, the findings of major travel inventories in the Minneapolis-St. Paul and Chicago metropolitan areas in 1970 indicate that the proportion of CBD auto driver trips and CBD mass transit trips to total trips made by those modes within the metropolitan areas on an average weekday were: 5 percent of total auto driver trips and 38 percent of total mass transit trips in Minneapolis, 4 percent of total auto driver trips and 20 percent of total mass transit trips in St. Paul, and less than 1 percent of total auto driver trips and 17 percent of total mass transit trips in Chicago.

Mass Transit Trip Production: The total number of households making mass transit trips on an average weekday in the urbanizing areas of the Region decreased from approximately 110,500 households in 1963 to 73,200 in 1972, a decrease of 37,300 households, or 34 percent. The interaction of such factors as automobile availability, family size, household annual income, and household structure type with transit tripmaking is examined in Tables 137 through 140.

Table 137 indicates that in both 1963 and 1972 the average number of transit trips per transit tripmaking household in the urbanizing areas decreased successively as the number of automobiles available per household increased. The largest decrease in transit tripmaking per household in 1963 occurred between zero-auto and one-auto households, where the average number of transit trips per household decreased from 3.2 to 2.7, with the latter average remaining relatively steady for two-auto and three-or-more-auto households. In 1972 the largest decrease occurred between two-auto and three-or-more-auto households, where the average number of trips per household decreased from 2.3 to 1.9.

Table 138 indicates that although the average number of transit trips per transit tripmaking household in the urbanizing areas generally increased as family size increased, the average number of transit trips per person in these households generally decreased in relation to increased family size. The largest increase in the average number of transit trips per household occurred between four-person and five-person households both in 1963 and

Table 137

AVERAGE WEEKDAY INTERNAL TRANSIT TRIPS PER TRANSIT TRIP-MAKING HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY AUTOMOBILE AVAILABILITY: 1963 and 1972

Automobiles Available	1963					1972					Percent Change	
	Households		Transit Trips		Average Trips Per Household	Households		Transit Trips		Average Trips Per Household	Households	Transit Trips
	Number	Percent of Total	Number	Percent of Total		Number	Percent of Total	Number	Percent of Total			
None	39,300	35.6	127,100	39.7	3.2	27,400	37.4	74,900	40.5	2.7	-30.3	-41.1
One	56,200	50.8	153,000	47.9	2.7	30,800	42.1	76,600	41.5	2.5	-45.2	-49.9
Two	13,500	12.2	35,800	11.2	2.7	12,300	16.8	28,300	15.3	2.3	- 8.9	-20.9
Three or More	1,500	1.4	3,900	1.2	2.6	2,700	3.7	5,000	2.7	1.9	80.0	28.2
Total	110,500	100.0	319,800	100.0	2.9	73,200	100.0	184,800	100.0	2.5	-33.8	-42.2

Source: SEWRPC.

Table 138

AVERAGE WEEKDAY INTERNAL TRANSIT TRIPS PER TRANSIT TRIP-MAKING HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY FAMILY SIZE: 1963 and 1972

Family Size	1963						1972						Percent Change	
	Households		Transit Trips		Average Trips Per Household	Average Trips Per Person	Households		Transit Trips		Average Trips Per Household	Average Trips Per Person	Households	Transit Trips
	Number	Percent of Total	Number	Percent of Total			Number	Percent of Total	Number	Percent of Total				
One	13,800	12.5	34,700	10.9	2.5	2.5	12,800	17.6	27,800	15.0	2.2	2.2	- 7.2	-19.9
Two	29,900	27.1	78,000	24.4	2.6	1.3	17,800	24.3	38,300	20.7	2.2	1.1	-40.5	-50.9
Three	21,900	19.8	64,100	20.0	2.9	1.0	11,600	15.8	27,100	14.7	2.3	0.8	-47.0	-57.7
Four	17,500	15.8	50,600	15.8	2.9	0.7	11,600	15.8	30,700	16.6	2.6	0.7	-33.7	-39.3
Five or More	27,400	24.8	92,400	28.9	3.4	0.7	19,400	26.5	60,900	33.0	3.1	0.6	-29.2	-34.1
Total	110,500	100.0	319,800	100.0	2.9	0.9	73,200	100.0	184,800	100.0	2.5	0.8	-33.8	-42.2

Source: SEWRPC.

1972, and the largest decrease in the average number of transit trips per person occurred between one-person and two-person households in 1963 and 1972.

Table 139 indicates that household annual income has a very minimal relationship to mass transit tripmaking by transit tripmaking households. Unlike total person trip production, which exhibited a steady increase in tripmaking as household income increased, as shown in Table 131, mass transit trip production exhibited an almost even distribution by income category in 1963 and a somewhat uneven distribution by income category in 1972. Table 139 also indicates that the proportion of transit trips to total transit trips within a given income category is pointedly similar to the proportion of households to total households in that category.

Table 140 indicates that the average number of transit trips per transit tripmaking household in the urbanizing areas was slightly greater for two-household and three- or four-household structures than for either one-household or five-or-more-household structures in both 1963 and 1972. The largest variation in the trip average occurred in the five-or-more-household structure category in 1972. This table also indicates that the average number of transit trips per transit tripmaking households in mobile homes amounted to about two trips in both 1963 and 1972, and in group quarters such as hotels, motels, dormitories, and rooming houses, to about two trips in 1963 and about three trips in 1972.

The data presented in Tables 137 through 140 indicate that mass transit use has declined not only within the Region as a whole, but also within virtually every segment of the regional transit tripmaking population. Thus, in nearly every category within each of the classifications of automobile availability, family size, household annual income, and household structure type, average transit tripmaking per household has decreased from 1963 to 1972. In no category did the average number of transit

Table 139

AVERAGE WEEKDAY INTERNAL TRANSIT TRIPS PER TRANSIT TRIP-MAKING HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY INCOME GROUP: 1963 and 1972

Income Range (1972 Constant Dollars)	1963 Households		1963 Transit Trips		1963 Average Trips Per Household	1972 Households		1972 Transit Trips		1972 Average Trips Per Household
	Number[a]	Percent of Total	Number	Percent of Total		Number	Percent of Total	Number	Percent of Total	
000 – 3,999	16,600	16.8	47,700	16.7	2.9	6,800	14.7	17,000	14.6	2.5
4,000 – 7,999	31,400	31.8	91,600	32.2	2.9	9,800	21.2	26,500	22.7	2.7
8,000 – 11,999	31,600	32.0	91,200	32.0	2.9	13,900	30.0	32,300	27.7	2.3
12,000 – 15,999	13,800	14.0	38,900	13.7	2.8	8,900	19.2	23,700	20.3	2.7
16,000 – 21,999	3,900	4.0	11,000	3.9	2.8	4,600	9.9	10,700	9.2	2.3
22,000 – and Over	1,400	1.4	4,300	1.5	3.1	2,300	5.0	6,400	5.5	2.8
Total Households Reporting	98,700	100.0	284,700	100.0	2.9	46,300	100.0	116,600	100.0	2.5

[a] *In the urbanizing areas approximately 11 percent of transit tripmaking households in 1963 and 37 percent in 1972 did not provide household annual income data.*

Source: SEWRPC.

Table 140

AVERAGE WEEKDAY INTERNAL TRANSIT TRIPS PER TRANSIT TRIP-MAKING HOUSEHOLD IN THE URBANIZING AREAS OF THE REGION BY STRUCTURE TYPE: 1963 and 1972

Structure Type	1963 Households		1963 Transit Trips		1963 Average Trips Per Household	1972 Households		1972 Transit Trips		1972 Average Trips Per Household	Percent Change	
	Number	Percent of Total	Number	Percent of Total		Number	Percent of Total	Number	Percent of Total		Households	Transit Trips
One-Household	51,800	46.9	146,800	45.9	2.8	36,300	49.6	91,600	49.6	2.5	-29.9	-37.6
Two-Household	36,100	32.7	108,100	33.8	3.0	20,700	28.3	54,900	29.7	2.7	-42.7	-49.2
Three-or-Four-Household	8,100	7.3	24,500	7.7	3.0	5,100	6.9	13,400	7.3	2.6	-37.0	45.3
Five-or-More-Household	12,700	11.5	36,600	11.4	2.9	10,000	13.7	21,900	11.8	2.2	-21.3	-40.2
Mobile Home	100	0.1	200	0.1	2.0	100	0.1	200	0.1	2.0	0.0	0.0
Other (Group Quarters, Hotels, Motels, Rooming Houses)	1,700	1.5	3,600	1.1	2.1	1,000	1.4	2,800	1.5	2.8	-41.2	-22.2
Total	110,500	100.0	319,800	100.0	2.9	73,200	100.0	184,800	100.0	2.5	-33.8	-42.2

Source: SEWRPC.

trips exceed approximately three trips per household, barely more than a single round trip, not even in zero-auto households or in the lowest income households. These averages would suggest that mass transit travel consists principally of those who had no alternative mode of travel at the time the trip was made.

Purposes of Internal Person Trips: The activities of a household are usually centered on the home. It logically follows, therefore, that home-oriented travel accounted for a large proportion of total internal person travel on an average weekday. The importance of home as a generator of person trips was emphasized by the finding that trips to home equaled 41 percent of total trip destinations in both 1963 and 1972, and was further emphasized by the finding that an equal proportion began at home. Trips which have either an origin or destination at home were found to comprise more than four-fifths of total internal person travel. It is apparent, then, that future travel facility requirements within the Region will be determined in large measure by the amount and location of future residential development.

Second in importance of all trip purpose categories were trips to work, which accounted for 18 percent of the total in 1963 and 16 percent in 1972. The total number of internal person trips made for work purposes within the Region on an average weekday, as reported in the 1963 and 1972 surveys, was found to closely match, in each instance, independent estimates of average daily employment within the Region for those years, taking into consideration the variations in daily work attendance and the influence of nonresident employment within the Region. Of the remaining trip purpose categories, personal business trips accounted for 13 percent of the total in 1963 and 15 percent in 1972. Shopping trips accounted for 12 percent in both 1963 and 1972, social-recreation trips accounted for 12 percent in 1963 and 11 percent in 1972, and trips to attend school accounted for 5 percent in both 1963 and 1972.

Substantial increases in tripmaking during this period were found in all trip purpose categories. The largest increases were noted in trips to home (377,300, or 26 percent), to conduct personal business (189,600, or 41 percent), and for shopping (119,400, or 28 percent). Somewhat smaller but still important increases were noted in trips for social-recreation purposes (84,700, or 20 percent), for work purposes (76,400, or 12 percent), and to attend school (54,500, or 33 percent), as shown in Table 141.

Average Auto Occupancy by Selected Trip Purpose: The overall average number of persons per auto, including the driver, remained relatively constant from 1963 to 1972, at 1.43 and 1.41 persons, respectively. Although only minor differences were found from 1963 to 1972 in auto occupancy rates within a given trip purpose category, rather significant differences were found in such occupancy among trip purpose categories.

The highest rate of occupancy occurred in trips for social-recreation purposes, equaling 1.84 and 1.91 persons in 1963 and 1972, respectively. Of other trip purpose categories, the average occupancy in 1963 and 1972, respectively, was: for shopping, 1.55 and 1.46; for home, 1.48 and 1.43; for personal business, 1.36 and 1.35; and for work, 1.16 and 1.15 (see Table 142).

Land Uses of Internal Person Trips: The impact of the home upon person travel on an average weekday is also shown by the finding that trips to residential land uses accounted for nearly half of total internal person trip destinations in 1963 and 1972. The majority of these consisted of trips made by family members returning to their homes, but also included trips by friends or relatives who came to visit, or salesmen or repairmen making business calls. Commercial land uses, including retail stores, professional offices, and service establishments, as well as hotels, motels, and places of amusement, attracted 26 percent of total person trips in 1963 and

Table 141

DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION: 1963 and 1972

Trip Purpose at Destination	Person Trips				Change: 1963-1972	
	1963		1972			
	Number	Percent of Total	Number	Percent of Total	Number	Percent
Home	1,458,900	40.5	1,836,200	40.8	377,300	25.9
Work	664,400	18.4	740,800	16.4	76,400	11.5
Personal Business	465,300	12.9	654,900	14.5	189,600	40.7
School	165,500	4.6	220,000	4.9	54,500	32.9
Social-Recreation	423,400	11.8	508,100	11.3	84,700	20.0
Shopping	425,500	11.8	544,900	12.1	119,400	28.1
Total	3,603,000	100.0	4,504,900	100.0	901,900	25.0

Source: SEWRPC.

28 percent in 1972. Governmental and institutional land uses, such as schools, post offices, hospitals, libraries, and other public buildings, attracted 12 percent of the total in 1963 and 13 percent in 1972.

Industrial land uses, comprising durable and nondurable manufacturing establishments as well as wholesale and storage areas, accounted for 8 percent of the total trip destinations in 1963 and 6 percent in 1972. Of other land uses, trips to recreational, agricultural, and open land and water areas together accounted for 2 percent of the total in both 1963 and 1972. Trips to transportation, communication, and utility land uses accounted for 2 percent in 1963 and over 1 percent in 1972.

Significant increases in tripmaking from 1963 to 1972 were found in residential land uses (391,800 trips, or 22 percent), commercial land uses (346,900 trips, or 37 percent), and governmental and institutional land uses (158,300 trips, or 35 percent). A smaller increase was found in recreational, agricultural, and open land and water area land uses—14,200 trips, or 19 percent. Decreases in tripmaking from 1963 to 1972 were found in both industrial land uses and in transportation, communication, and utility land uses. The former decreased by 6,400 trips, or 2 percent, while the latter decreased by 2,900 trips, or 5 percent, reflecting the decrease in employment in each of these categories which occurred within the Region during the period (see Table 143).

Relationships of Travel Mode, Trip Purpose, and Land Use: The distributions of internal person trips by trip purpose by mode of travel, trip purpose by land use, and land use by mode of travel, as shown in Figures 65, 66, and 67, reveal very similar proportions between 1963 and 1972 by category, differing by item only 4 percent or less in nearly all instances. Differences in excess of 4 percent from 1963 to 1972 include an increase of 12 percent in the proportion of total trips to transportation, communication, and utility land uses for work purposes, and

Table 142

AVERAGE AUTOMOBILE OCCUPANCY OF AVERAGE WEEKDAY INTERNAL TRIPS IN THE REGION BY SELECTED TRIP PURPOSE: 1963 and 1972

Year	Average Auto Occupancy by Selected Trip Purpose					
	Work	Personal Business	Social-Recreation	Shopping	Home	Total Travel
1963	1.16	1.36	1.84	1.55	1.48	1.43
1972	1.15	1.35	1.91	1.46	1.43	1.41

Source: SEWRPC.

Table 143

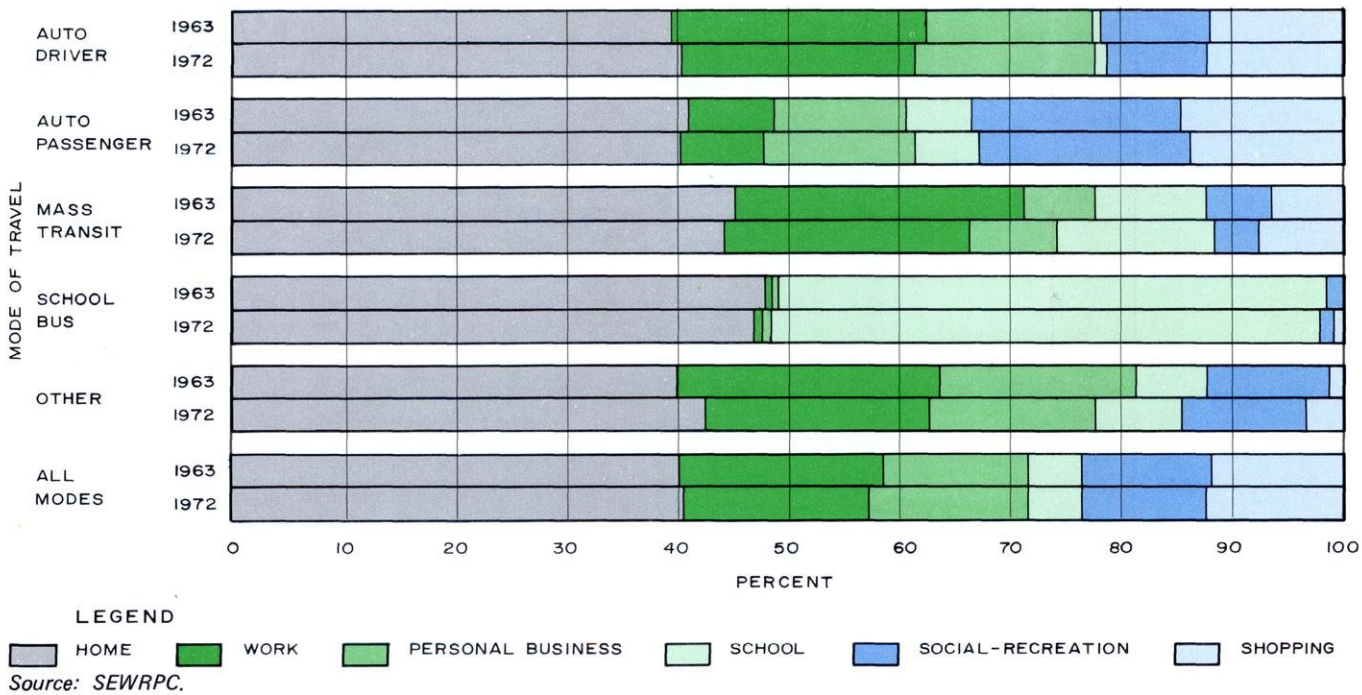
DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY LAND USE AT DESTINATION: 1963 and 1972

Land Use at Destination	Person Trips				Change: 1963-1972	
	1963		1972			
	Number	Percent of Total	Number	Percent of Total	Number	Percent
Residential	1,783,100	49.5	2,174,900	48.3	391,800	22.0
Commercial	934,500	25.9	1,281,400	28.4	346,900	37.1
Industrial	300,100	8.3	293,700	6.5	- 6,400	- 2.1
Governmental and Institutional	448,500	12.5	606,800	13.5	158,300	35.3
Transportation, Communication, and Utilities	61,900	1.7	59,000	1.3	- 2,900	4.7
Recreational and Others	74,900	2.1	89,100	2.0	14,200	19.0
Total	3,603,000	100.0	4,504,900	100.0	901,900	25.0

Source: SEWRPC.

Figure 65

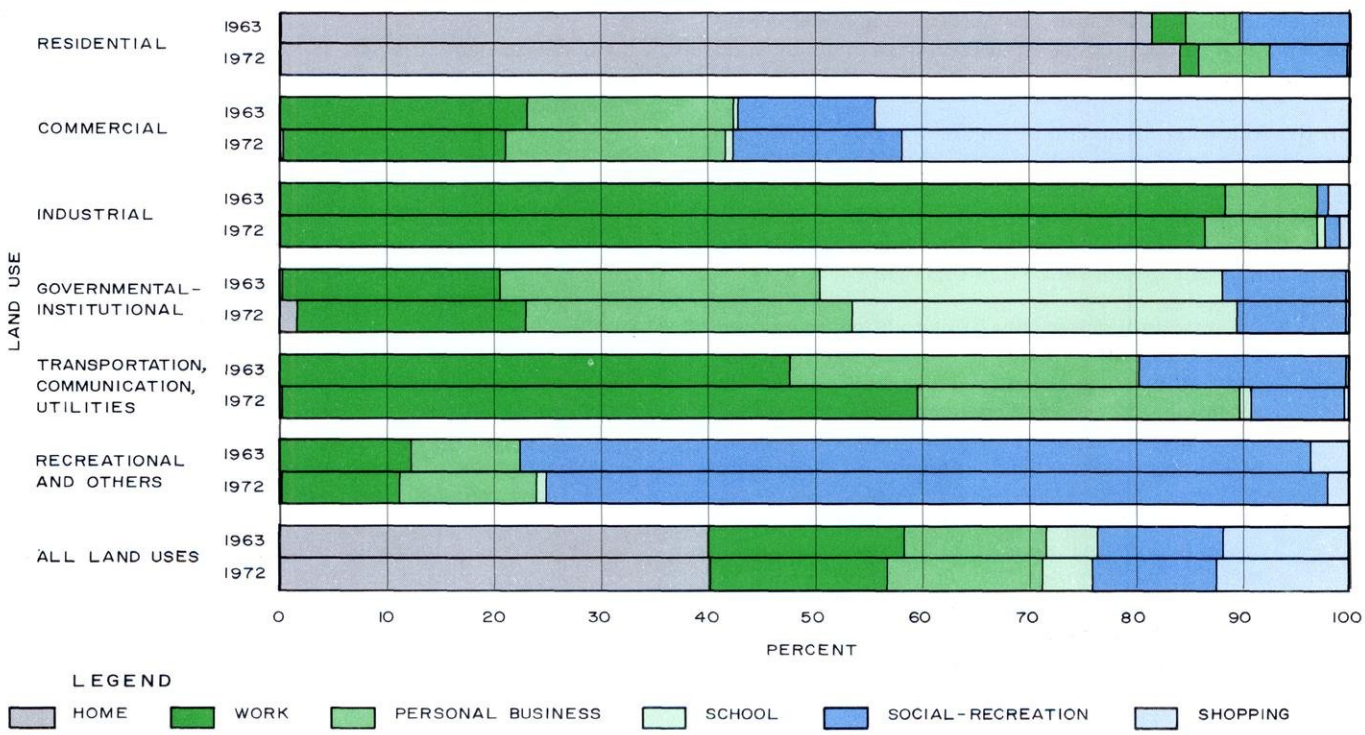
PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AND MODE OF TRAVEL: 1963 and 1972



Source: SEWRPC.

Figure 66

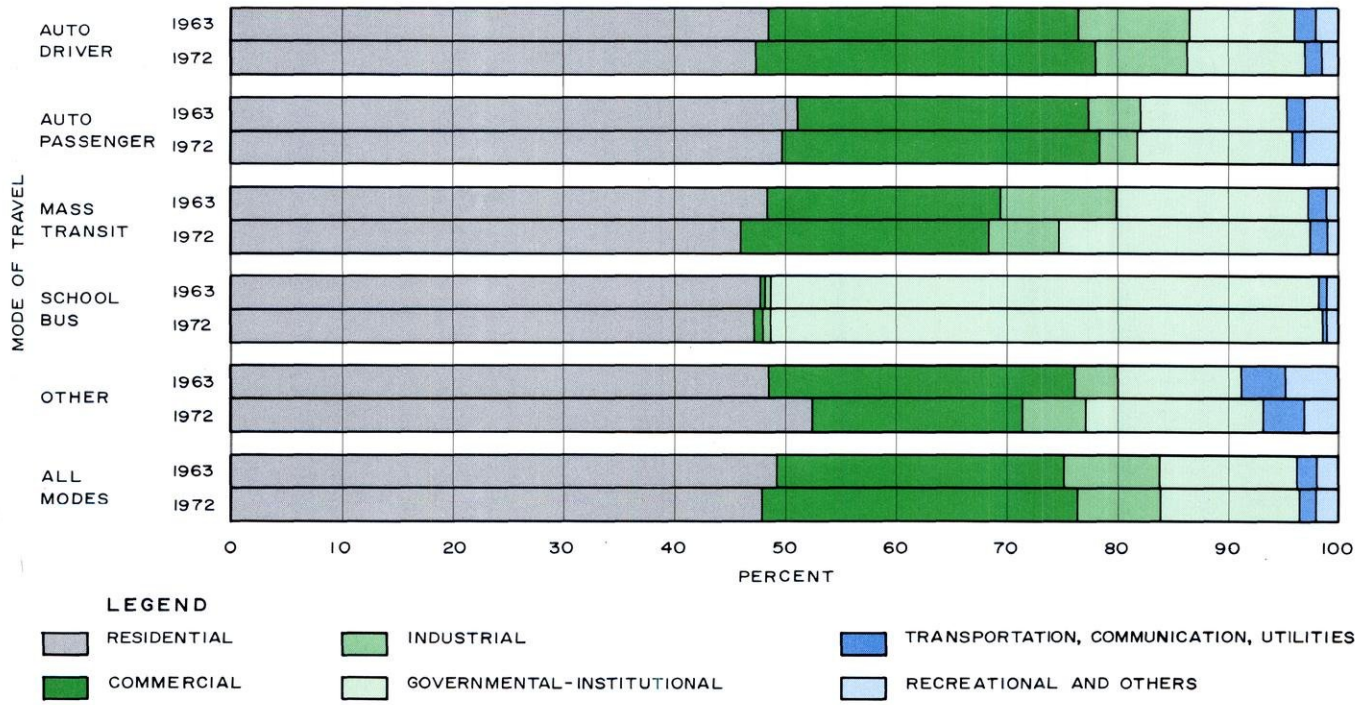
PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AND LAND USE: 1963 and 1972



Source: SEWRPC.

Figure 67

PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY LAND USE AND MODE OF TRAVEL: 1963 and 1972



Source: SEWRPC.

a decrease of 10 percent in the proportion of total trips to such land uses for social-recreational purposes, as shown in Figure 66; and an increase of 5 percent in the proportion of total trips made by "other" travel modes to governmental and institutional land uses, and a decrease of 9 percent in the proportion of total trips made by such modes to commercial land uses, as shown in Figure 67.

In the following discussion of Figures 65, 66, and 67, the percentages for a given category are shown for 1963 and 1972, in that order. Figure 65 presents the percentage distributions of internal person trips by trip purpose at destination by mode of travel. The following are the more important findings shown in this figure:

- Of total auto driver trips, trips to home accounted for 39 and 40 percent; to work, 23 and 21 percent; to personal business, 15 and 16 percent; to shopping, 12 and 13 percent; and for social-recreational purposes, 10 and 9 percent; with all others accounting for 1 percent or less each.

- Of total auto passenger trips, trips to home accounted for 41 percent both years; for social-recreational purposes, 19 percent both years; to shopping, 14 percent both years; to personal business, 12 and 13 percent; to work, 8 and 7 percent; and to school, 6 percent both years.

- Of total mass transit trips, trips to home accounted for 45 and 44 percent; to work, 26 and 22 percent; to school, 10 and 14 percent; to personal business, 6 and 8 percent; to shopping, 7 and 8 percent; and for social-recreational purposes, 6 and 4 percent.

Figure 66 presents the percentage distributions of internal person trips by trip purpose at destination by land use at destination. The following are the more important findings shown in this figure:

- Of total trips to residential land uses, trips to home accounted for 82 and 84 percent; trips for social-recreational purposes, 10 and 8 percent; trips for personal business, 5 and 7 percent; with all others accounting for 3 percent or less each.

- Of total trips to commercial land uses, trips to shopping accounted for 44 and 42 percent; to work, 23 and 21 percent; to personal business, 19 and 21 percent; and for social-recreational purposes, 13 and 16 percent; with all others accounting for less than 1 percent each.

- Of total trips to industrial land uses, trips to work accounted for 88 and 87 percent; and to personal business, 9 and 10 percent; with all others accounting for 3 percent or less each.

- Of total trips to governmental and institutional land uses, trips to school accounted for 37 and 36 percent; to personal business, 31 percent both

years; to work, 20 and 21 percent; and for social-recreational purposes, 12 and 10 percent; with all others accounting for 2 percent or less each.

- Of total trips to transportation, communication, and utility land uses, trips to work accounted for 48 and 60 percent; to personal business, 33 and 30 percent; and for social-recreational purposes, 20 and 9 percent; with all others accounting for less than 1 percent each.

- Of total trips to recreational, agricultural, open land, and water area land uses, trips for social-recreational purposes accounted for 74 and 73 percent; to work, 12 percent both years; and to personal business, 11 and 13 percent; with all others accounting for 3 percent or less each.

Figure 67 shows the percentage distributions of internal person trips by land use at destination by mode of travel. The following are the more important findings shown in this figure:

- Of total auto driver trips, trips to residential land accounted for 49 and 48 percent; to commercial land, 28 and 31 percent; to industrial land, 10 and 8 percent; and to governmental and institutional land, 9 and 11 percent; with all others accounting for 2 percent or less each.

- Of total auto passenger trips, trips to residential land accounted for 51 and 50 percent; to commercial land, 26 and 29 percent; to governmental and institutional land, 13 and 14 percent; and to industrial land, 5 and 4 percent; with all others accounting for 3 percent or less each.

- Of total mass transit trips, trips to residential land accounted for 49 and 46 percent; to commercial land, 21 and 22 percent; to governmental and institutional land, 18 and 23 percent; and to industrial land, 11 and 6 percent; with all others accounting for 2 percent or less each.

These percentage distributions, which show the interrelationships of travel mode, trip purpose, and land use, indicate that person travel within the Region is an orderly, regular occurrence which exhibits a high degree of repetitiveness over time. Such knowledge contributes to a fuller understanding of future travel behavior, and provides a sound basis for forecasts of future travel requirements.

Daily Patterns in Person Travel: The patterns shaped by the variations of daily volumes of total person travel in 1963 and 1972 are quite similar, as shown in Figure 68. The patterns, strongly influenced by Friday travel volumes in both years, indicate that total person travel varied no more than 6 percent from the daily average for any weekday other than Friday, which had total person trip volumes 14 percent above average in 1963 and 9 percent above average in 1972. Because auto driver trip volumes heavily dominated total person trip volumes in both 1963 and 1972, the patterns of auto driver trips closely matched those of total person trips in both years. The patterns of mass transit passenger trips were almost exactly similar in 1963 and 1972, varying by no more than 8 percent from the weekday average in both years, and reflecting the high degree of regularity of such travel by day.

The patterns of auto, truck, and taxi passenger trips had the largest variance from the weekday average in both years, with the travel on Friday rising to 25 percent above the average in 1963 and to 19 percent above the average in 1972. The patterns of school bus trips, although exhibiting differences by day of week in 1963 and 1972, varied by no more than 11 percent from the weekday average. The patterns of school bus trips were less similar in 1963 and 1972 than the patterns of other modes. These differences are likely random in nature, and may occur because of the use of other modes in inclement weather; because of the randomness of scheduling field trips, teacher conferences, and other special school activities; and because of absenteeism.

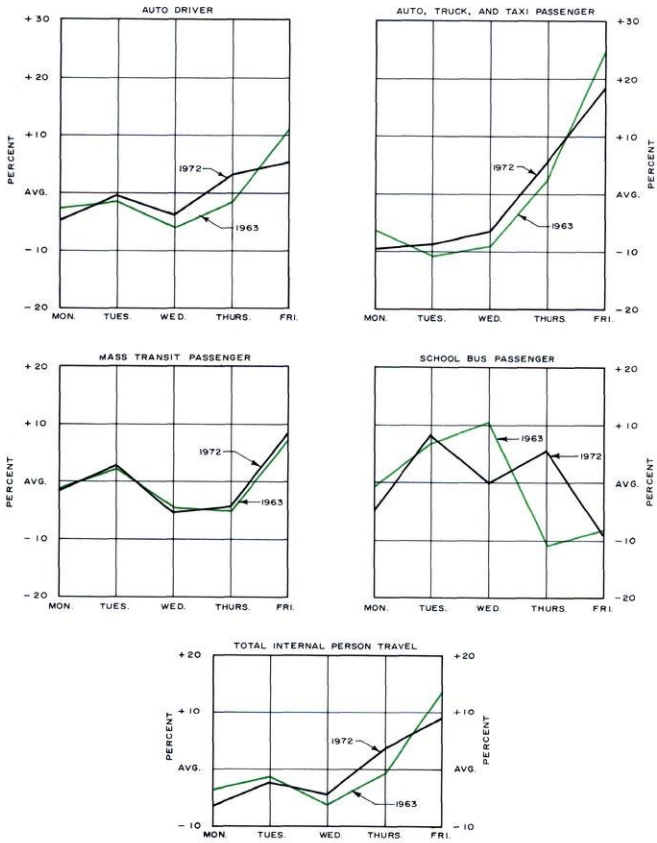
It is important to point out, however, that although person trip volumes varied day by day, the percentage of the day's trips carried by each mode remained approximately the same as the percentage of the total for each mode. The maximum deviation from the average weekday by day of week for each mode was: for auto drivers, 1.5 percent in 1963 and 1.8 percent in 1972; for auto, truck, and taxi passengers, 3 percent in 1963 and nearly 3 percent in 1972; for transit passengers, 0.6 percent in 1963 and 0.3 percent in 1972; and for school bus passengers, 0.7 percent in both years.

The reasons for the daily variations in person travel are indicated in Figure 69, which shows the daily variations by trip purpose. The very large increases in tripmaking on Fridays in 1963 and 1972 were caused by the significant increases in trips for personal business, social-recreation, and shopping purposes. Friday shopping trips were 44 and 22 percent above the weekday average in 1963 and 1972, respectively; while Friday trips for personal business and social-recreation were about 12 and 26 percent, respectively, above the weekday average in both 1963 and 1972. Work trips on Friday were about 2 percent below the weekday average in both 1963 and 1972, and trips to attend school were 10 percent and 14 percent below the weekday average in 1963 and 1972, respectively.

Hourly Patterns of Internal Person Travel: The hourly distributional patterns of internal person trips by trip purpose indicate that, although total person trip volumes increased substantially within the Region on an average weekday from 1963 to 1972, the regular ebb and flow of travel remained remarkably similar, both in the proportion of trips by trip purpose within the hourly distributions and in the proportion and times of peak periods. The single exception was a more pronounced decline in 1963 than in 1972 in person activity in the hour beginning at 6 p.m.

Figure 68

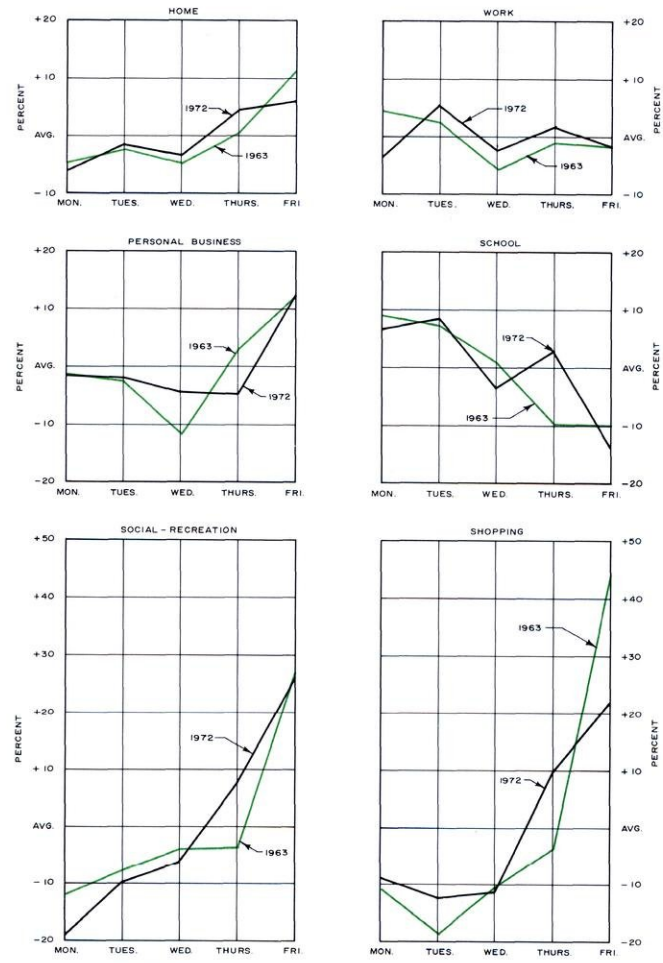
DAILY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL: 1963 and 1972



Source: SEWRPC.

Figure 69

DAILY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE: 1963 and 1972



Source: SEWRPC.

The patterns formed by the hourly distribution of person trips by trip purpose at destination, as reflected in Figures 70 and 71, present a graphic representation of person travel within the Region on an average 1963 and 1972 weekday. The patterns show the relative inactivity of the early morning hours followed by a sharp peak centered around 7 a.m. as trips to work and school began. Trips for shopping, personal business, and social-recreation began during the later morning hours and continued fairly evenly until mid-afternoon. The afternoon peak period beginning at 3 p.m. was larger and more sustained than the morning peak, and was characterized predominantly by trips to return home. The sharp decline in person trip activity from the afternoon peak was slowed in the early evening hours, as trips for shopping and social-recreational purposes reached their maximum hourly volumes for the day.

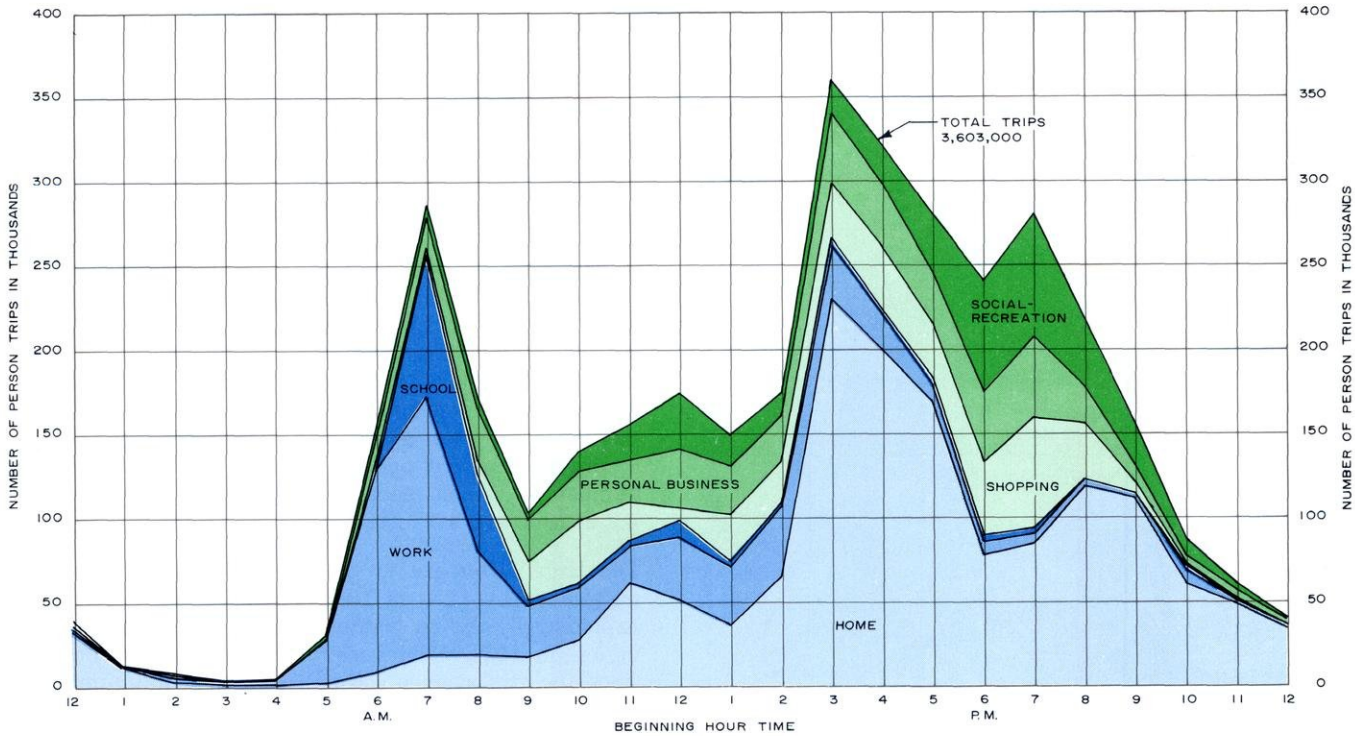
The 1963 and 1972 hourly distributional patterns of internal person trips by mode of travel were also found to be quite similar both in the proportion of trips by mode of travel and in the proportions and times of peak periods, as shown in Figures 72 and 73. One major exception can be noted in the decline from 1963 to 1972 in the number and proportion of mass transit trips in virtually every hour of the day. Another exception is the more pronounced decline in 1963 than 1972 of auto driver trips, as in the case of 1963 person trips, in the hour beginning at 6 p.m. The largest hourly volumes of 1963 and 1972 auto driver, school bus, and mass transit passenger trips occurred during the morning and afternoon peak periods, while the largest hourly volumes for auto, truck, and taxi passengers combined occurred in the hour beginning at 7:00 p.m. Within each hour of the day, auto driver trips outnumbered trips by all other modes combined.

Internal Vehicle Travel

Internal Vehicle Trip Production: In addition to the approximately 704,600 automobiles and 21,000 motorcycles available to residents of the Region in 1972, there were approximately 77,250 trucks and 450 taxis licensed for use on an average weekday. These figures represented increases from 1963 to 1972 of 177,300 automobiles, or 34 percent, and of 18,750 trucks, or 32 percent, and a decrease of 50 taxis, or 10 percent.

Figure 70

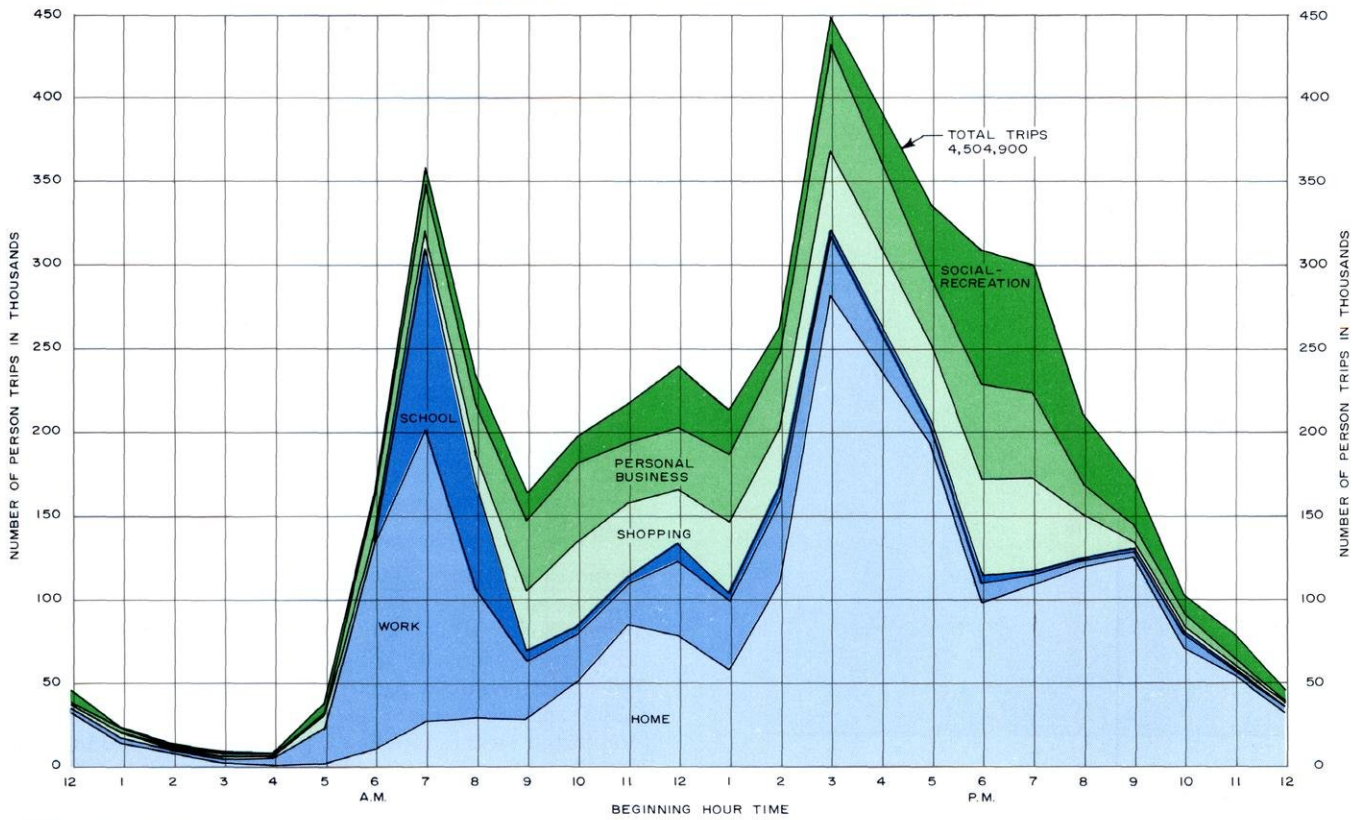
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION: 1963



Source: SEWRPC.

Figure 71

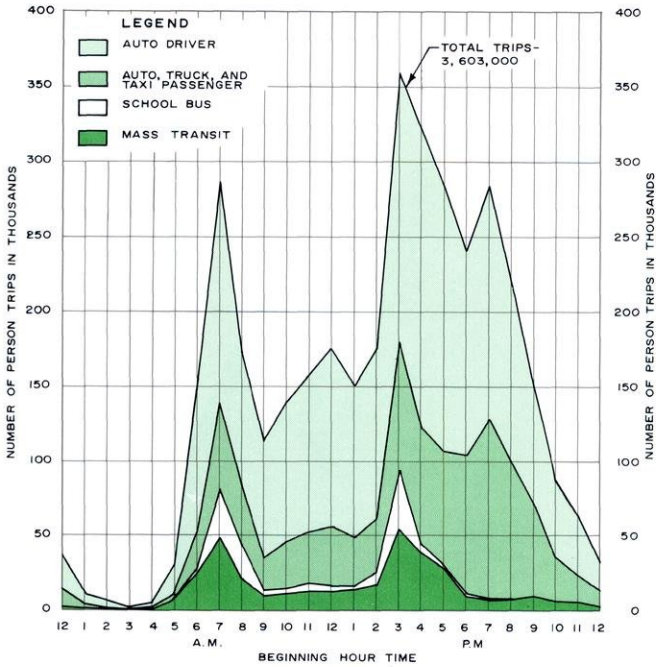
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION: 1972



Source: SEWRPC.

Figure 72

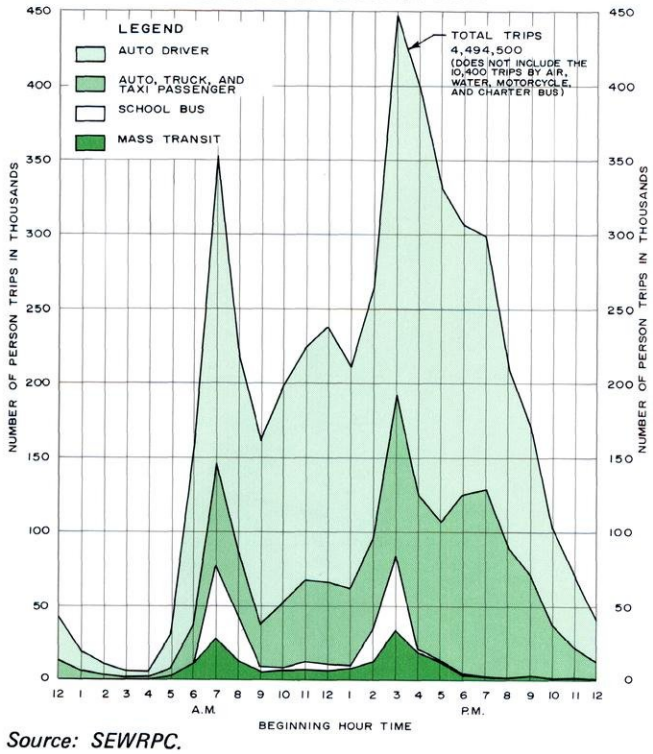
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL: 1963



Source: SEWRPC.

Figure 73

HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL: 1972



Source: SEWRPC.

In 1972 these 803,300 autos, trucks, taxis, and motorcycles made a total of 3,290,300 vehicle trips on an average weekday, an increase of 823,900 vehicle trips, or 33 percent, from 1963 to 1972. This increase is substantially higher than the 25 percent increase in total internal person trips during the same period, and reflects the more rapid growth in automobile availability (34 percent) and truck availability (32 percent) than in the regional population, which increased only 9 percent.

Automobiles, averaging 4.1 vehicle trips per day in both 1963 and 1972, accounted for 88 percent of total vehicle trips in both 1963 and 1972. Trucks, averaging five trips per day in 1963 and 4.8 trips per day in 1972, accounted for 12 percent of total vehicle trips in 1963 and 11 percent in 1972. Taxis, averaging 14 trips per day in 1963 and 31.8 trips per day in 1972, accounted for less than one-half of 1 percent of total trips in both 1963 and 1972. Motorcycles, averaging 0.4 trips per day in 1972, accounted for 0.3 percent of total trips. The average number of vehicle trips per day for total vehicles was 4.2 in 1963 and 4.1 in 1972 (see Table 144).

The large difference in the average number of vehicle trips made by taxis in 1963 and 1972 is believed to be explained by the far greater proportion of taxis actually in use in 1972—82 percent—than in 1963—55 percent, since the trip average was based on the total number of taxis licensed for, rather than actually in, use.

Internal Truck Trip Production by Truck Type: There were a total of 77,250 trucks available for use on an average 1972 weekday according to survey findings, representing an increase from 1963 to 1972 of 18,750 trucks, or about 32 percent. Most of this increase occurred in the category of light trucks, which increased by about 17,200, or 51 percent. A small increase—2,350 trucks, or 12 percent— was experienced in the category of medium trucks, while a decrease of 800 heavy trucks, or 19 percent, was experienced.

Together these light, medium, and heavy trucks made a total of 371,000 trips, representing an increase of 77,600 trips, or 26 percent, during the period. Light trucks, averaging five trips per day in 1963 and 3.6 trips per day in 1972, accounted for 58 percent of the total trips in 1963 and 50 percent in 1972. Medium trucks, averaging 5.4 trips per day in 1963 and 7.6 trips per day in 1972, accounted for 38 percent of the total trips in 1963 and 47 percent in 1972. Heavy trucks, averaging 3.1 trips per day in 1963 and 3.4 trips per day in 1972, accounted for 4 percent of total trips in 1963 and 3 percent in 1972. The average number of trips per day for total trucks was five in 1963 and 4.8 in 1972 (see Table 145).

Purposes of Internal Truck Trips: Of total internal truck trips on an average weekday, trips made to pick up and/or deliver goods totaled a little more than 60 percent of the total trips in both 1963 and 1972. Trips returning to the bases of operations totaled 17 percent of the total in 1963 and 15 percent in 1972; trips for other work-connected business totaled 5 percent of the total in 1963 and 8 percent in 1972; trips for personal use totaled 5 percent in 1963 and 10 percent in 1972; and trips to

provide customer service, such as repair work, accounted for 11 percent in 1963 and 5 percent in 1972.

It was also found that trips by medium and heavy trucks were made largely to pick up and/or deliver goods, amounting to 72 percent in 1963 and 82 percent in 1972 for medium trucks, 76 percent in 1963 and 75 percent in 1972 for heavy trucks, and 53 percent in 1963 and 42 percent in 1972 for light trucks. Trips for personal use and for work-connected business were far more prevalent in light trucks than in either medium or heavy trucks in 1963 and 1972 (see Figure 74).

Purposes of Internal Taxi Trips: The principal purpose of internal taxi vehicle trips consists almost entirely of picking up and/or delivering passengers, amounting to 94 percent of the total in 1963 and 96 percent in 1972. The only other purpose with a significant number of trips was that of returning to the base of operation, amounting to nearly 6 percent of the total in 1963 and 4 percent in 1972.

Internal Truck Trip Production by Land Use: Trucks moving goods rather than persons were attracted principally to residential, commercial, and industrial land uses, and to a lesser degree to transportation, communication, and utility; governmental and institutional; and recreation, agricultural, and open land and water land uses. Residential land uses accounted for 29 percent of the total in 1963 and 32 percent in 1972; commercial land uses, 31 percent in 1963 and 28 percent in 1972; industrial land uses, 19 percent in 1963 and 20 percent in 1972; transportation, communication, and utility, land uses, 10 percent in 1963 and 9 percent in 1972; governmental and institutional land uses, 6 percent in 1963 and 7 percent in 1972; and recreation, agricultural, and open land and water areas, 6 percent in 1963 and 4 percent in 1972. Thus, of total truck travel in 1963 and 1972, truck trips to nonresidential land uses equaled about 70 percent of all truck travel (see Figure 75).

Internal Taxi Vehicle Trip Production by Land Use: Of the total internal taxi vehicle trips made on an average weekday, trips to residential land uses accounted for 42 percent of the total in 1963 and 52 percent in 1972. Trips to commercial land uses were 27 percent of the total in 1963 and 26 percent in 1972; trips to transportation, communication, and utility land uses were 20 percent of the total in 1963 and 12 percent in 1972; trips to governmental and institutional land uses were 7 percent of the total in 1963 and 1972; trips to industrial land uses were 2 percent of the total in 1963 and 1972; and trips to recreational land uses were 1 percent of the total in 1963 and less than 1 percent in 1972 (see Figure 76).

Table 144

VEHICLE AVAILABILITY AND AVERAGE WEEKDAY INTERNAL VEHICLE TRIPS IN THE REGION BY TYPE: 1963 and 1972

Type of Vehicle	1963					1972				
	Vehicles		Vehicle Trips		Average Number of Trips	Vehicles		Vehicle Trips		Average Number of Trips
	Number	Percent of Total	Number	Percent of Total		Number	Percent of Total	Number	Percent of Total	
Automobile	527,300	89.9	2,166,000	87.8	4.1	704,600	87.7	2,897,000	88.0	4.1
Truck	58,500	10.0	293,400	11.9	5.0	77,250	9.6	371,000	11.3	4.8
Taxi	500	0.1	7,000	0.3	14.0	450	0.1	14,300	0.4	31.8
Motorcycle	--	--	--	--	--	21,000	2.6	8,000	0.3	0.4
Total	586,300	100.0	2,466,400	100.0	4.2	803,300	100.0	3,290,300	100.0	4.1

Source: SEWRPC.

Table 145

DISTRIBUTION OF TRUCK AVAILABILITY AND AVERAGE WEEKDAY INTERNAL TRUCK TRIPS IN THE REGION BY TRUCK TYPE: 1963 and 1972

Type of Truck	Year	Trucks			Truck Trips			Average Trips Per Truck
		Number	Percent of Total	Percent Change 1963 - 1972	Number	Percent of Total	Percent Change 1963 - 1972	
Light	1963	33,800	57.8	--	169,500	57.8	--	5.0
	1972	51,000	66.0	50.9	185,800	50.1	9.6	3.6
Medium	1963	20,500	35.0	--	110,900	37.8	--	5.4
	1972	22,850	29.6	11.5	173,500	46.8	56.4	7.6
Heavy	1963	4,200	7.2	--	13,000	4.4	--	3.1
	1972	3,400	4.4	-19.0	11,700	3.1	-10.0	3.4
Total	1963	58,500	100.0	--	293,400	100.0	--	5.0
	1972	77,250	100.0	32.1	371,000	100.0	26.4	4.8

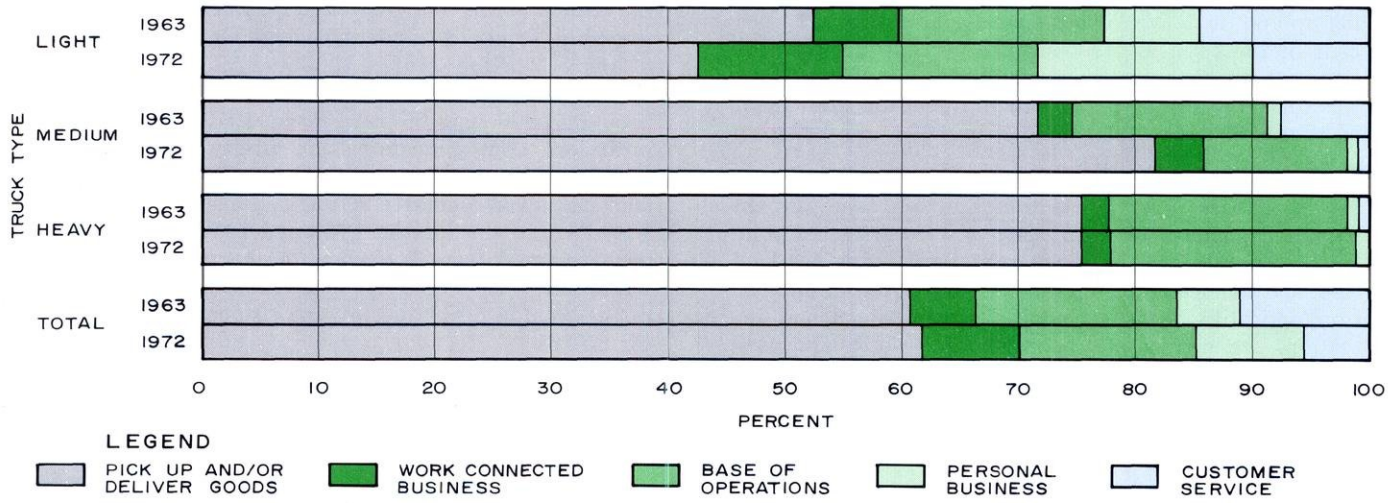
Source: SEWRPC.

Characteristics of Internal Truck Use Within the Region on an Average Weekday: The 1963 and 1972 inventories found that average truck trip lengths within the Region varied significantly by business or industry of truck owners. Table 146 indicates, for example, that while trucks operated by governmental and institutional establishments averaged about three miles per trip in both 1963 and 1972, trucks operated by nondurable manufacturers averaged nine miles per trip in 1963 and 11 miles per trip in 1972. The average truck trip length for all internal trips on an average weekday was about five miles per trip in 1963 and seven miles in 1972.

This table also indicates that about one truck in three did not make a trip on the average weekday and that truck utilization varied significantly by industry. On an average weekday, for example, while about four of five trucks operated by manufacturers of durable goods were utilized,

Figure 74

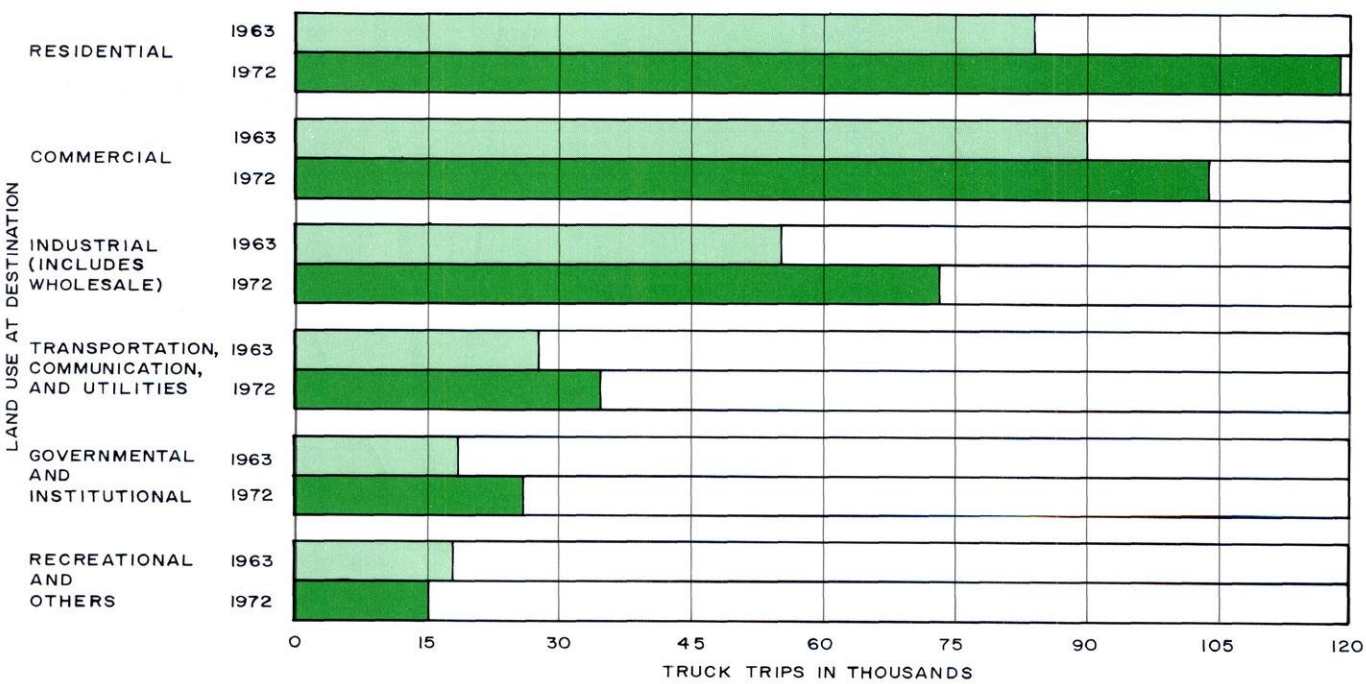
PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL TRUCK TRIPS IN THE REGION BY LIGHT, MEDIUM, HEAVY, AND TOTAL TRUCKS BY DESTINATION PURPOSE: 1963 and 1972



Source: SEWRPC.

Figure 75

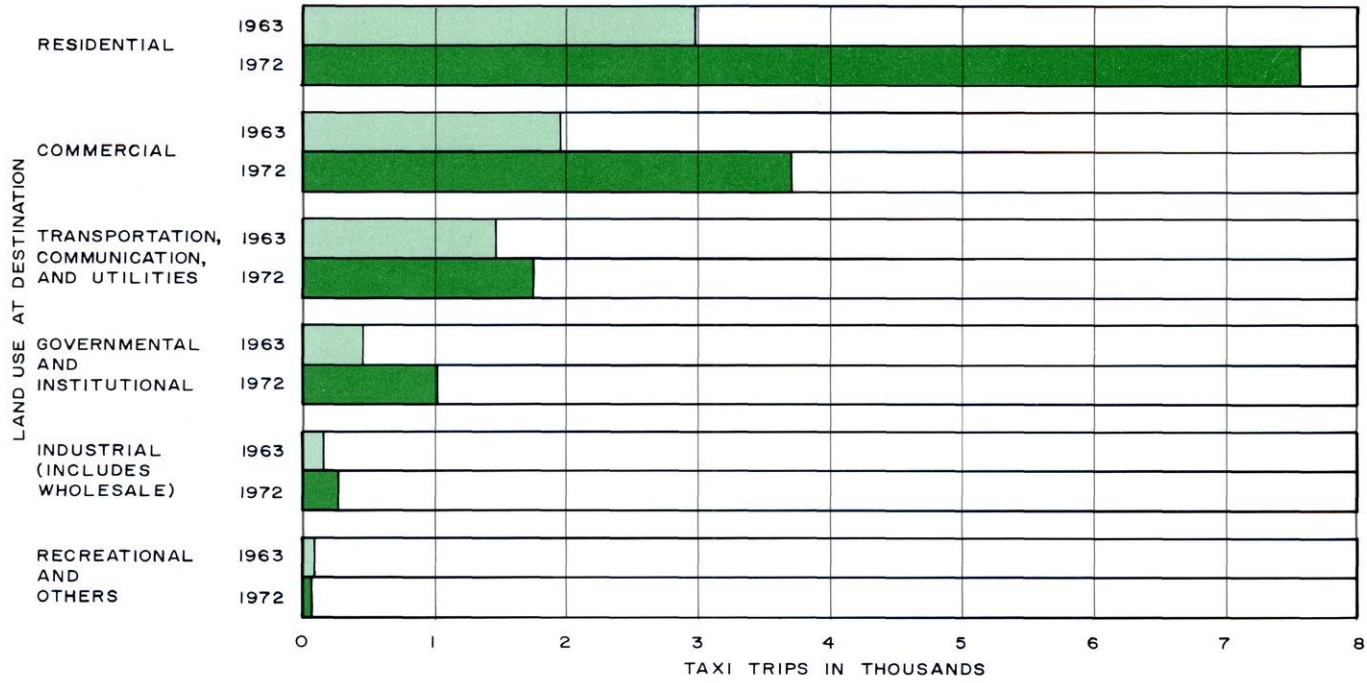
DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL TRUCK TRIPS IN THE REGION BY LAND USE AT DESTINATION: 1963 and 1972



Source: SEWRPC.

Figure 76

DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL TAXI VEHICULAR TRIPS IN THE REGION BY LAND USE AT DESTINATION: 1963 and 1972



Source: SEWRPC.

only two of five farm trucks were utilized. The average number of trips made by trucks on a typical weekday also varied by business or industry category. The highest average numbers of trips per truck were made by trucks operated by manufacturers of durable goods, by governmental and institutional establishments, by service establishments, and by transportation, communication, and utility firms and agencies, while the smallest trip averages per truck were made by farm trucks and trucks operated principally for personal use. The average for all trip-making trucks was found to be approximately eight trips per truck in 1963 and seven trips per truck in 1972.

Hourly Distribution of Internal Vehicle Travel: The distribution of internal vehicle travel in 1972 by beginning hour indicates a pattern markedly similar to 1963 internal vehicle travel. Auto driver trips in 1963 and 1972 outnumbered the combined truck and taxi trips in every hour of the day. Where truck and taxi travel peaked in the hours beginning at 10 a.m. and 1 p.m., auto driver travel peaked in the hours beginning at 7 a.m. and 4 p.m. The afternoon peak in auto driver travel was greater and more sustained than the morning peak period. During the evening hours, auto driver travel slowly declined and was substantially decreased by the end of the hour beginning at 12 a.m. (see Figures 77 and 78).

The hourly distribution of truck and taxi travel indicates that the bulk of internal truck trips occurred during the business hours of the day, whereas the relatively small number of taxi trips was distributed more evenly over most of the day, declining only in the early morning hours. The morning peak period of truck travel occurred at 10 a.m. followed by a decline in activity during the noon hour and an afternoon peak at 1 p.m. Although total truck travel was concentrated mainly between the hours of 6 a.m. and 6 p.m., medium and heavy truck travel was concentrated mainly between the hours of 7 a.m. and 4 p.m. (see Figures 79 and 80).

Average Trip Lengths and Trip Times of Auto Driver Travel: Travel exhibits certain regularities with respect to spatial distribution. The total number of trips entering an area within a given 24-hour period, for example, will be approximately matched by the total number of trips leaving that area. A corollary travel characteristic is that of directional symmetry, where travel between any two areas will consist of an approximately equal flow in each direction, not necessarily at the same time of day.

In general a reluctance exists to travel farther than necessary to satisfy a given trip purpose. The length of the trip, therefore, depends primarily upon the trip purpose and the available opportunities to satisfy this purpose. Figure 81 indicates that a large majority of auto driver trips made by residents of the Region were relatively short in distance in both 1963 and 1972. Home-based work trips were the longest of all major trip purposes, averaging approximately five miles in 1963 and 5.4 miles in 1972. Home-based shopping trips were the shortest, averaging two miles in 1963 and 2.5 miles in 1972. Non-home-based trips and home-based trips made for

Table 146

SELECTED TRIPMAKING CHARACTERISTICS OF TRUCKS GARAGED IN THE REGION BY THE BUSINESS OR INDUSTRY OF THE OWNER: 1963 and 1972

Business or Industry	Year	Average Weekday Trips Per Truck	Average Miles Traveled Per Truck Trip	Percent of Trucks in Use for Each Business or Industry	Percent of Total Trucks in Region
Retail	1963	7.7	5.2	61.3	13.5
	1972	6.7	6.6	58.2	9.6
Service	1963	12.1	3.3	74.5	5.3
	1972	10.0	4.1	59.2	5.3
Wholesale	1963	6.6	5.7	73.0	23.1
	1972	5.6	9.2	71.9	19.9
Durable Manufacturing	1963	17.0	2.5	78.2	6.8
	1972	12.7	6.8	85.7	4.2
Nondurable Manufacturing	1963	7.2	9.0	74.6	5.9
	1972	6.5	10.9	73.3	6.2
Transportation, Communication, and Utilities	1963	8.5	6.2	76.0	12.9
	1972	11.9	6.3	76.2	11.7
Governmental and Institutional	1963	12.8	2.7	66.2	8.2
	1972	11.2	3.0	61.3	8.4
Agricultural	1963	3.1	6.6	40.3	14.9
	1972	3.5	8.8	40.1	9.9
Personal Use	1963	2.7	7.1	61.9	8.7
	1972	2.9	11.5	62.7	24.7
Other	1963	3.8	6.9	48.4	0.7
	1972	1.0	--	49.2	0.1
Total	1963	8.0	4.9	65.7	100.0
	1972	6.9	7.3	64.8	100.0

Source: SEWRPC.

all other purposes ranged between these two extremes in both 1963 and 1972, indicating that people are willing to travel farther to work than for any other purpose. Figure 81 also indicates that within each trip purpose category, both the average and the median trip lengths in miles were greater in 1972 than in 1963, and that the median trip length in each case was less than the average trip length in miles.

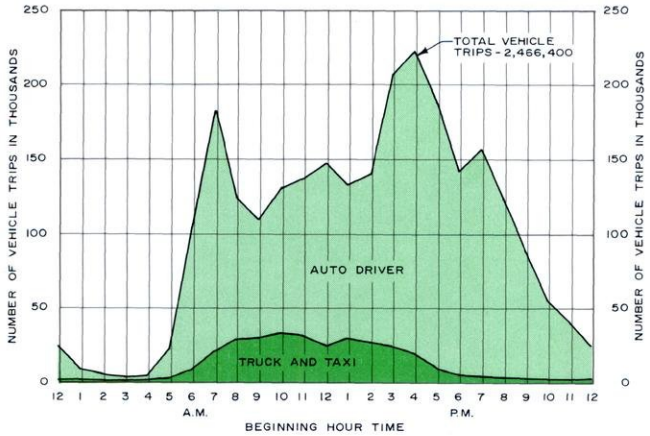
The travel time distributional pattern shown in Figure 82 indicates that although the average travel time of auto driver home-based work trips remained constant from 1963 to 1972, the average travel time of all other purposes increased. The average travel time of home-based shopping trips increased from 9.2 minutes in 1963 to 11.6 minutes in 1972, home-based "other" trips increased from 12.4 minutes in 1963 to 13.5 minutes in 1972, and non-home-based trips increased from 12.6 minutes in 1963 to 14 minutes in 1972. Figure 82 indicates that within each trip purpose category both the average and median trip lengths in time were greater in 1972 than in 1963, and that the median trip length in each case was less than the average trip length in time.

Freeway Utilization Within the Region on an Average Weekday: Of the approximately 3,416,000 total vehicle trips made within, into, out of, or passing through the Region on an average 1972 weekday, about 612,200 vehicle trips, or 18 percent, were found to have been made over a freeway facility for some portion of the trip. The number and percent of internal vehicle trips using freeway facilities equaled 553,800, or 17 percent, compared to 62,400, or nearly 50 percent, of external vehicle trips using such facilities. The difference occurred because of the far greater length of external vehicle trips and the greater need and opportunity to use freeways.

The number and percent of vehicle trips using a freeway within each travel mode were: internal auto trips, 493,100, or 17 percent; internal truck trips, 58,500, or 16 percent; internal motorcycle trips, 1,100, or 14 percent; internal taxi trips, 1,100, or 8 percent; external

Figure 77

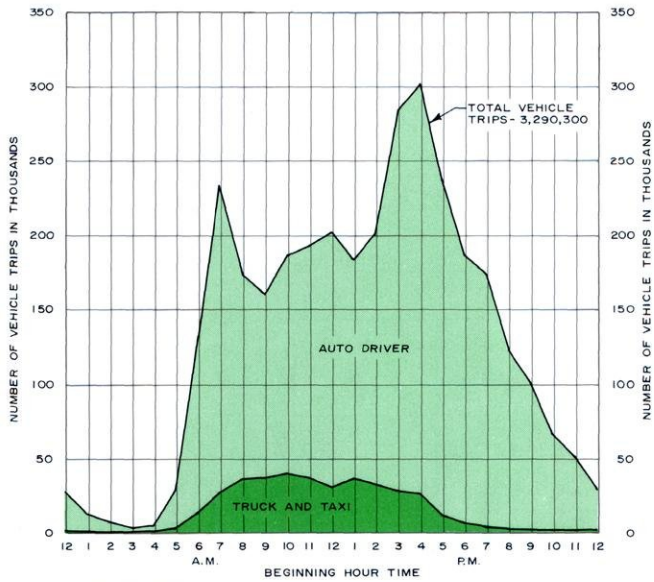
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL VEHICLE TRIPS IN THE REGION BY AUTOMOBILE AND TRUCK AND TAXI: 1963



Source: SEWRPC.

Figure 78

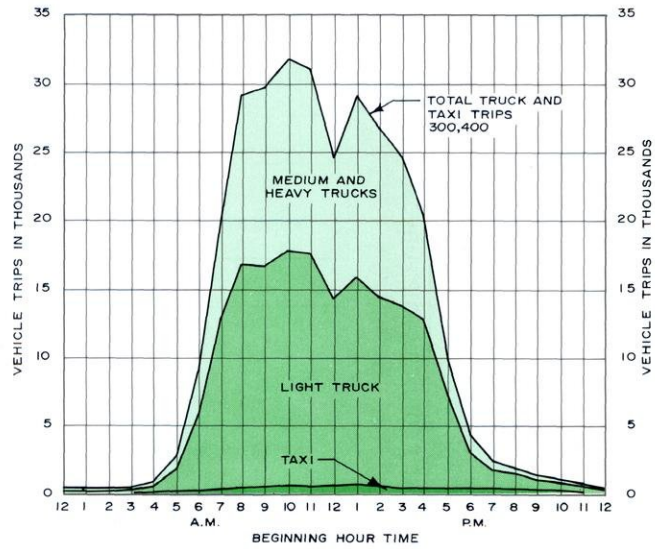
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL VEHICLE TRIPS IN THE REGION BY AUTOMOBILE AND TRUCK AND TAXI: 1972



Source: SEWRPC.

Figure 79

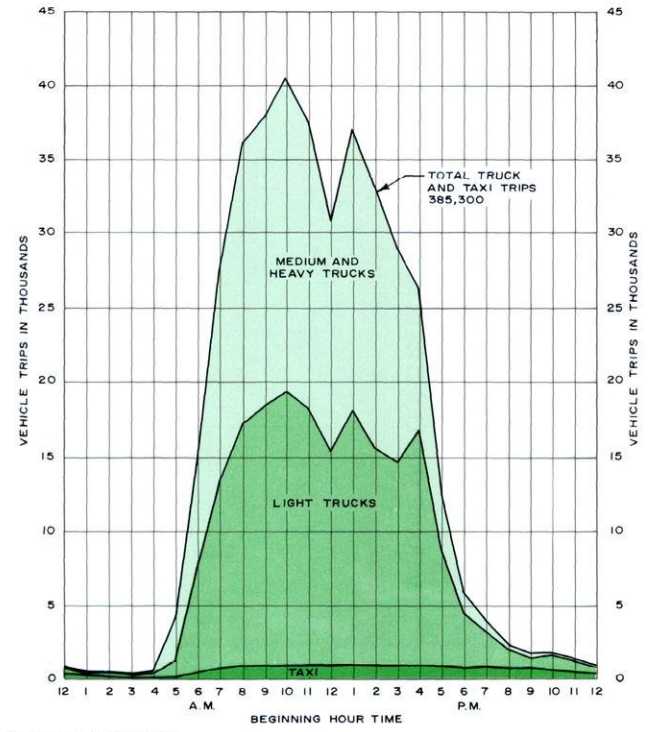
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL TRUCK AND TAXI TRIPS IN THE REGION BY VEHICLE TYPE: 1963



Source: SEWRPC.

Figure 80

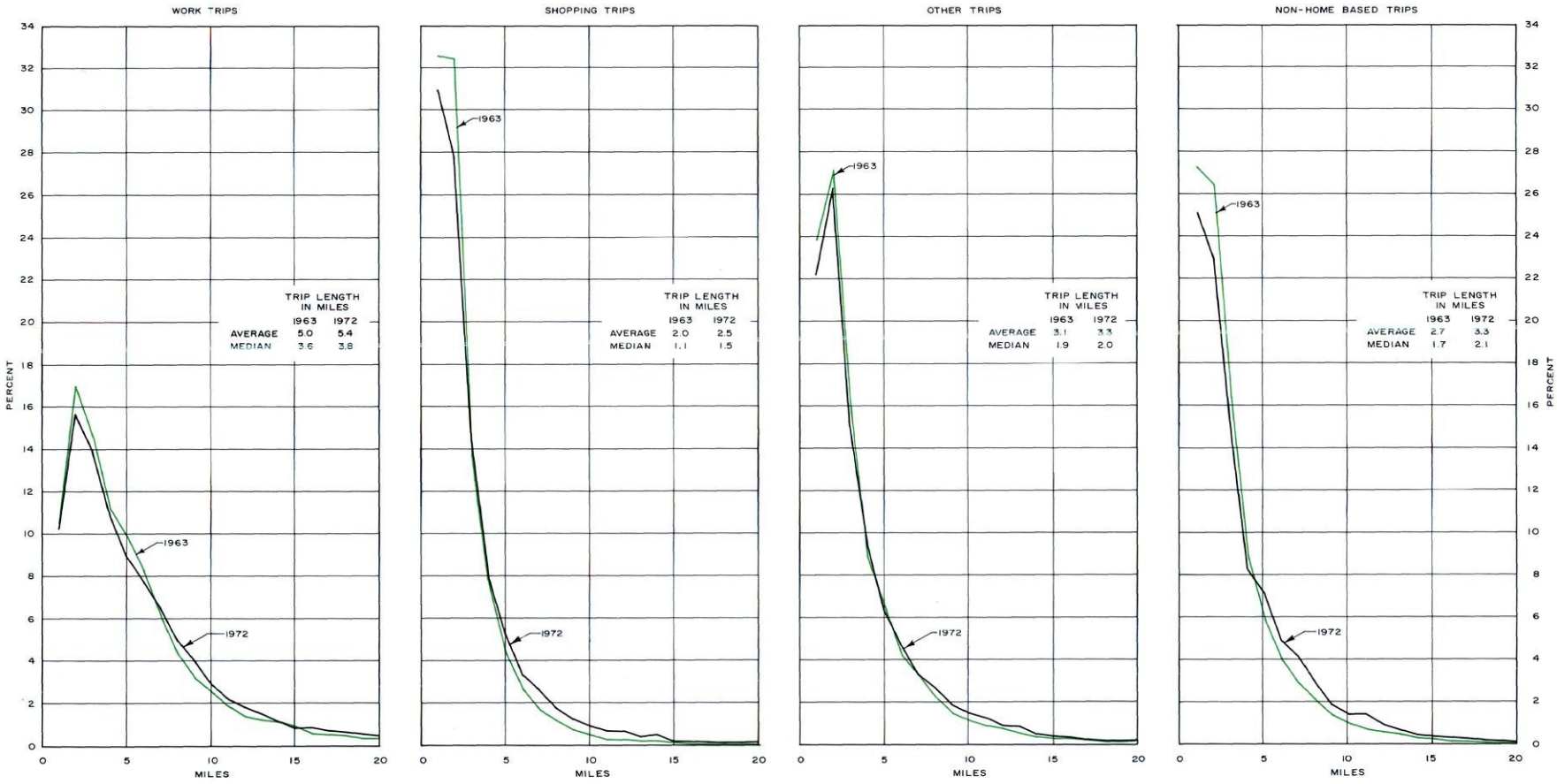
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL TRUCK AND TAXI TRIPS IN THE REGION BY VEHICLE TYPE: 1972



Source: SEWRPC.

Figure 81

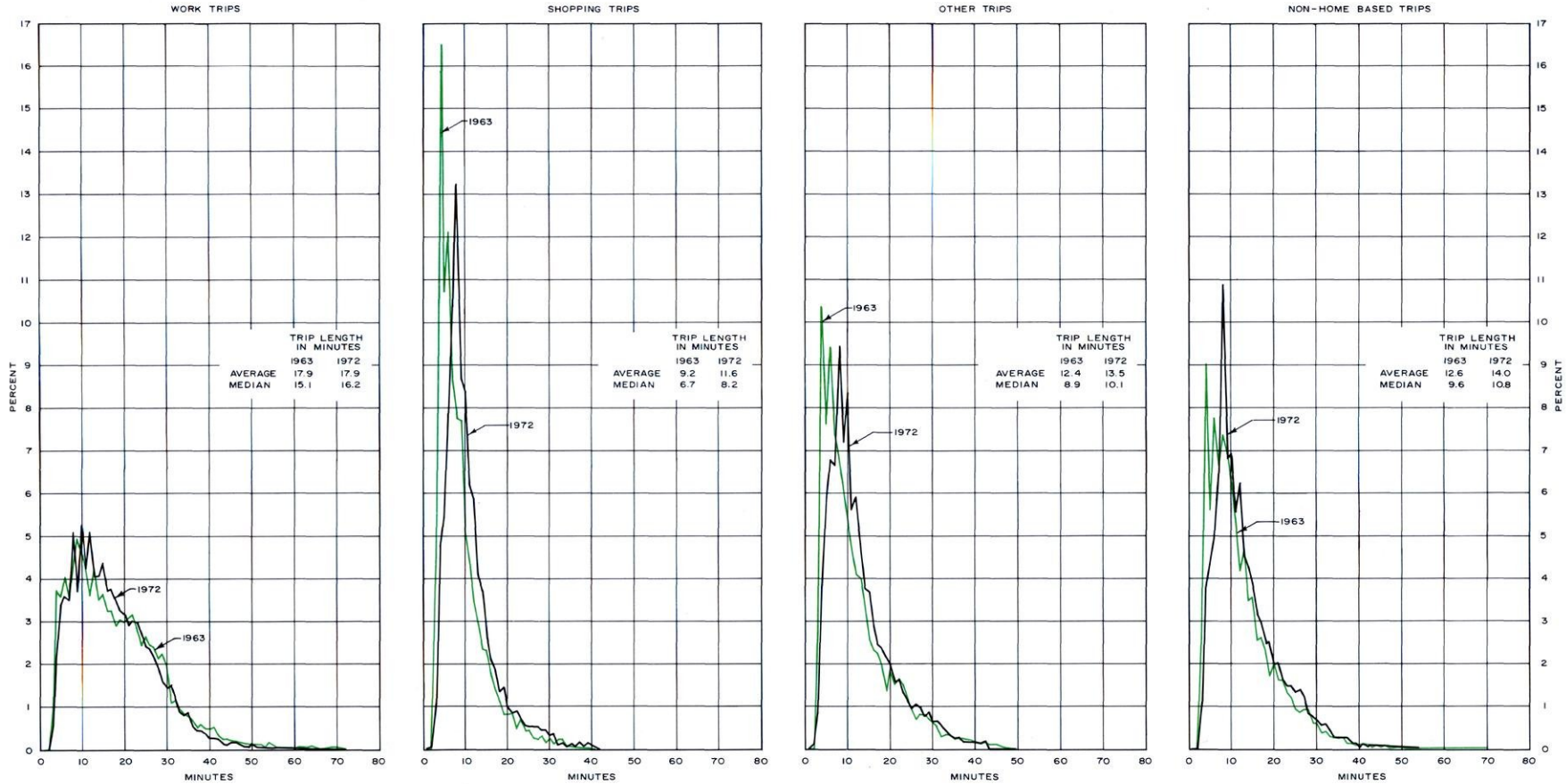
AVERAGE TRIP LENGTHS IN MILES OF AVERAGE WEEKDAY AUTO DRIVER TRAVEL IN THE REGION BY TRIP PURPOSE: 1963 and 1972



Source: SEWRPC.

Figure 82

AVERAGE TRIP LENGTHS IN MINUTES OF AVERAGE WEEKDAY AUTO DRIVER TRAVEL IN THE REGION BY TRIP PURPOSE: 1963 and 1972



Source: SEWRPC.

auto trips, 48,300, or 48 percent; external truck trips, 14,000, or 56 percent; and external motorcycle trips, 100, or 33 percent (see Table 147).

Location of Travel

The amount of travel attracted to a given area is largely determined by the amount, type, and intensity of development in that area. Maps 117 and 118 show the spatial distribution of internal person trip destinations within the Region on an average weekday in 1963, when such destinations totaled 3,603,000, and in 1972, when such destinations totaled 4,504,900. The highest concentrations of internal person trip destinations on both maps occur in the highly developed central business districts and major industrial and commercial areas of the larger cities in the Region. Significant concentrations of person trip destinations, however, are also found in many smaller communities. A table showing the amount of person and vehicle travel between planning analysis areas within the Region on an average weekday in 1972 is included in Appendix E.

Changes in the concentrations of person trip destinations from 1963 to 1972 were noted in the Cities and environs of Racine, Kenosha, Brookfield, and Waukesha, as well as in the smaller Cities of West Bend, Hartford, Oconomowoc, Whitewater, and Burlington and in the Village of Menomonee Falls. In Milwaukee County, changes in the concentrations of person trip destinations from 1963 to 1972 were found in the south-central area, including the Southridge Shopping Center area and areas centered on 27th Street west of General Mitchell Field. Within the Milwaukee central business district, changes occurred in the major shopping areas on Wisconsin Avenue, and in the governmental and institutional area which includes the county courthouse, public library, public museum, a technical college, and other public or quasi-public establishments.

Maps 119 and 120 show the spatial distribution of internal mass transit trip destinations within the Region on an average weekday in 1963, when such destinations totaled 324,300, and in 1972, when such destinations totaled 186,200. A comparison of these maps indicates that significant concentrations of mass transit destinations are confined almost entirely to the most densely populated areas of the larger cities of the Region, and that major concentrations of mass transit trip destinations are found only in the central business district of the City of Milwaukee. These maps also indicate that mass transit utilization has declined substantially from 1963 to 1972, particularly with respect to trip destinations in Milwaukee County, in the Milwaukee central business district, and in the Cities of Kenosha and Racine.

Maps 121 and 122 show the "desire lines" connecting the points of origin to the points of destination of mass transit trips to the CBD of the Cities of Milwaukee, Racine, and Kenosha. It was found that the number of traffic analysis zones producing at least 100 internal mass transit trips with destinations in the Milwaukee central business district on an average weekday decreased from 150 in 1963 to 99 in 1972; in the Racine central business district, from eight in 1963 to none in 1972; and in the Kenosha central business district, from eight in 1963 to none in 1972. These maps indicate that in both 1963 and 1972 the distance of the large majority of mass transit trips to the Milwaukee central business district was short.

Maps 123 and 124 show the spatial distribution of internal truck trip destinations within the Region on an average weekday in 1963, when such destinations totaled 293,400, and in 1972, when such destinations totaled 371,000. The patterns shown on these maps indicate that

Table 147

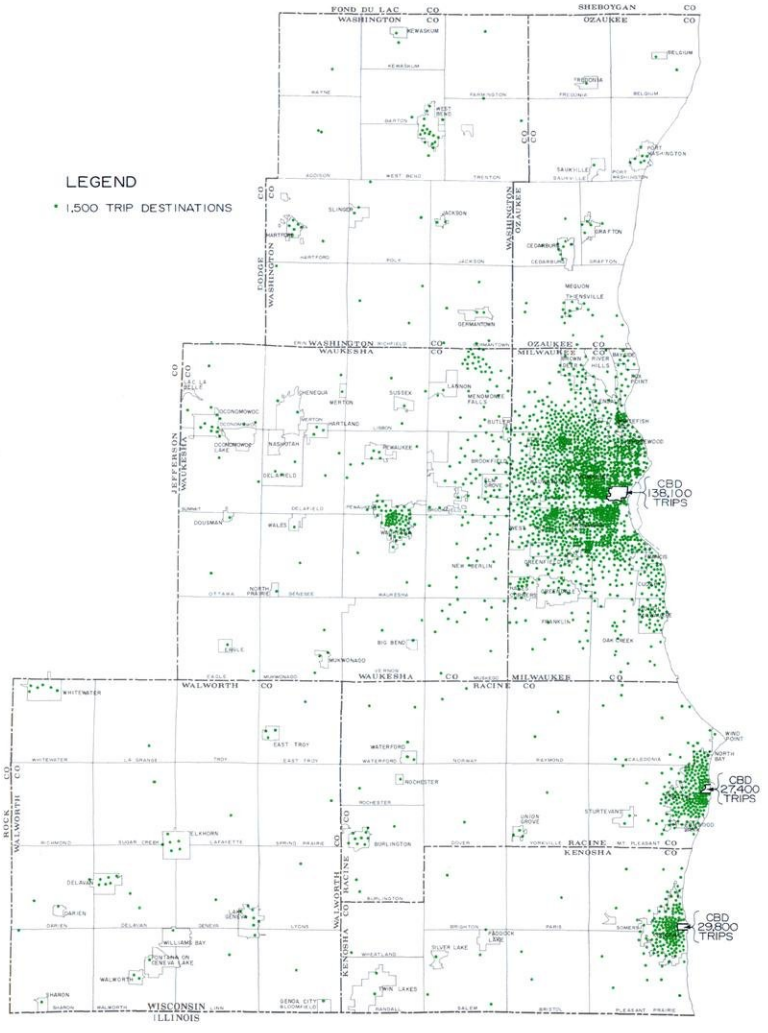
PERCENT OF INTERNAL AND EXTERNAL VEHICLE TRIPS IN THE REGION USING FREEWAY FACILITIES ON AN AVERAGE WEEKDAY: 1972

Type of Trip	Vehicle Trips		
	Total	Trips Using Freeway	Percent Using Freeway
Internal			
Automobile	2,897,000	493,100	17.0
Truck	371,000	58,500	15.8
Taxi	14,300	1,100	7.7
Motorcycle	8,000	1,100	13.8
Subtotal	3,290,300	553,800	16.8
External			
Automobile	100,500	48,300	48.1
Truck	24,900	14,000	56.2
Motorcycle	300	100	33.3
Subtotal	125,700	62,400	49.6
Total	3,416,000	616,200	18.0

Source: SEWRPC.

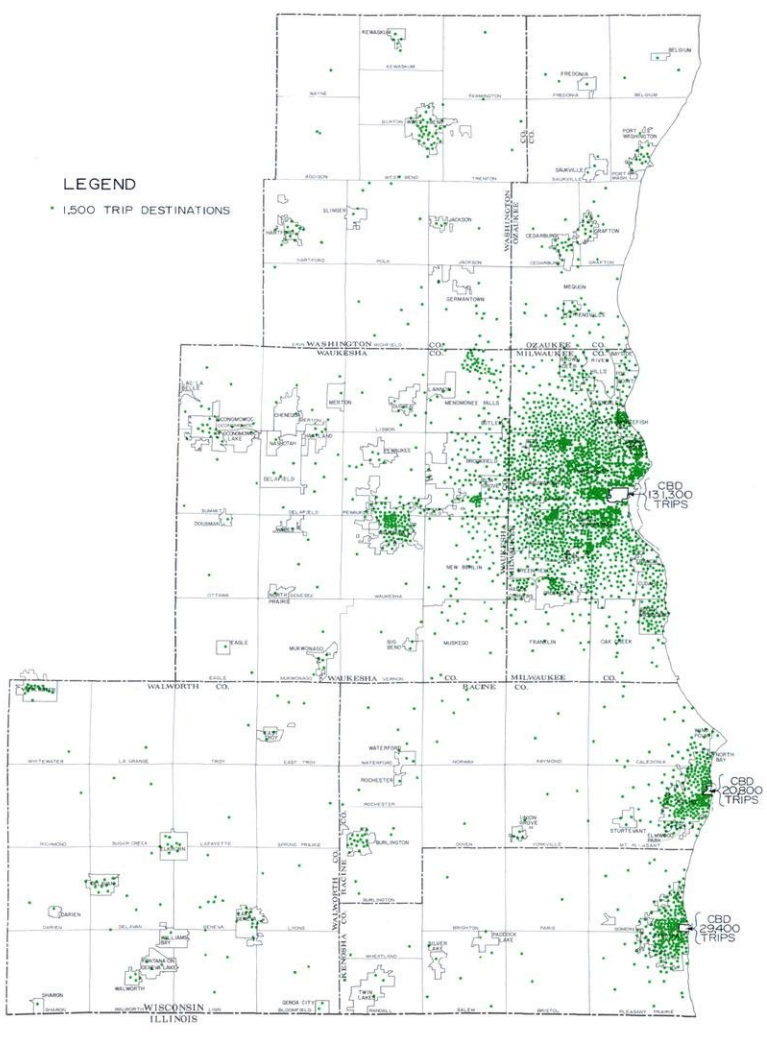
Map 117

AVERAGE WEEKDAY INTERNAL PERSON TRIP DESTINATIONS IN THE REGION: 1963



Map 118

AVERAGE WEEKDAY INTERNAL PERSON TRIP DESTINATIONS IN THE REGION: 1972

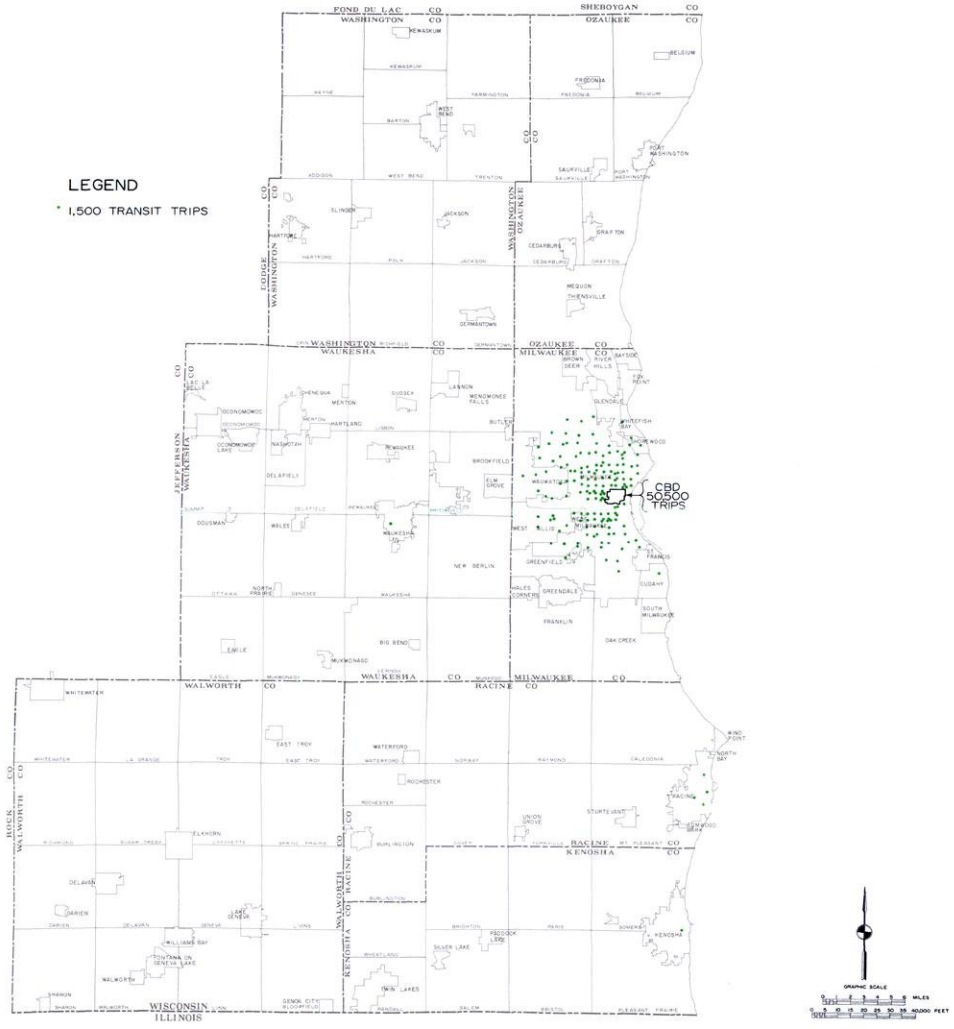


The amount of travel attracted to a given subarea of the Region is determined by the amount, kind, and intensity of land use development present in that area. In both 1963 and 1972, as shown on the above maps, the highest concentrations of internal person trip destinations were found in the highly developed central business districts and the major wholesale, industrial, and commercial areas of the larger cities in the Region. The overall pattern produced by plotting the location of internal person trip destinations closely resembles the existing urban development pattern.

Source: SEWRPC.

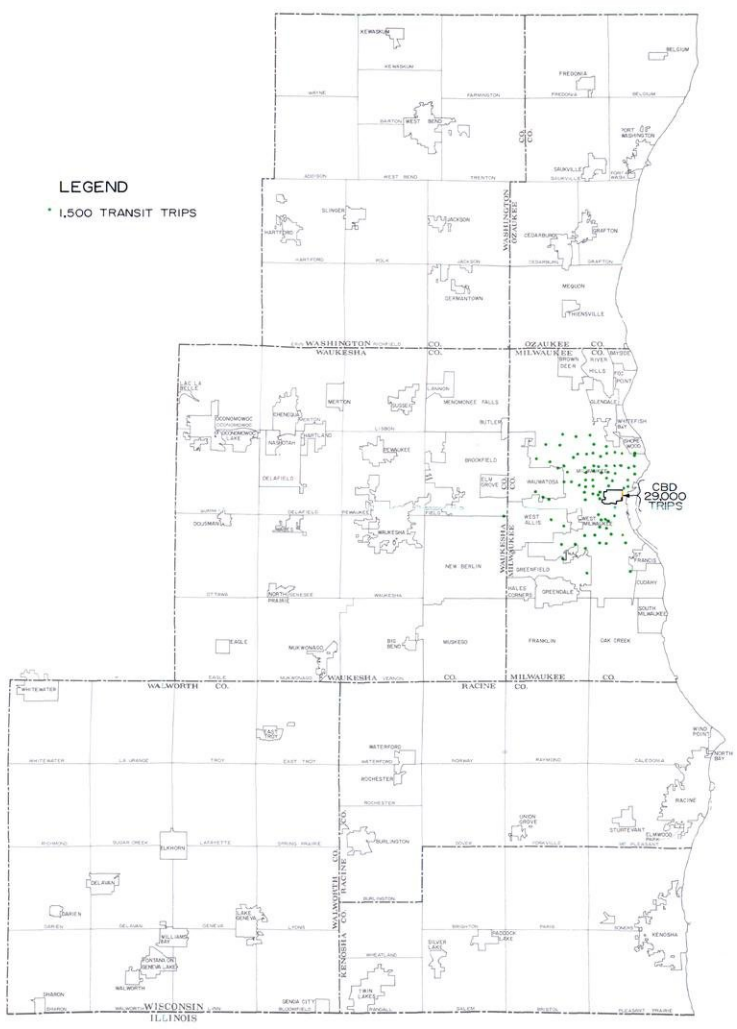
Map 119

AVERAGE WEEKDAY MASS TRANSIT TRIP DESTINATIONS IN THE REGION: 1963



Map 120

AVERAGE WEEKDAY MASS TRANSIT TRIP DESTINATIONS IN THE REGION: 1972

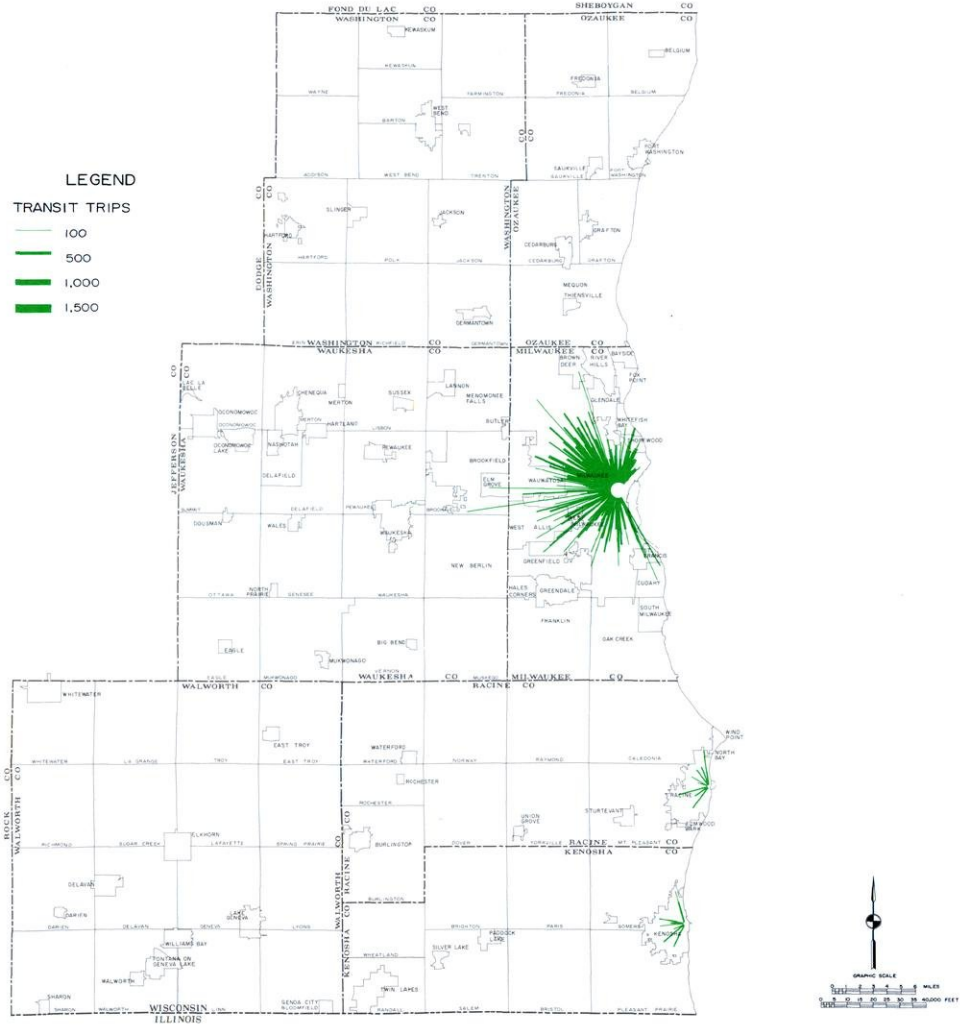


Mass transit trip destinations within the Region on an average weekday decreased sharply from about 324,000 in 1963 to about 186,000 in 1972. As shown on the above maps, the most significant decreases during this period occurred in the densely populated areas of Milwaukee County and in the central business districts of Milwaukee, Racine, and Kenosha. By 1972 there was not a single traffic analysis zone in the Racine or Kenosha urbanized areas that attracted a minimum of 1,500 mass transit trip destinations on an average weekday.

Source: SEWRPC.

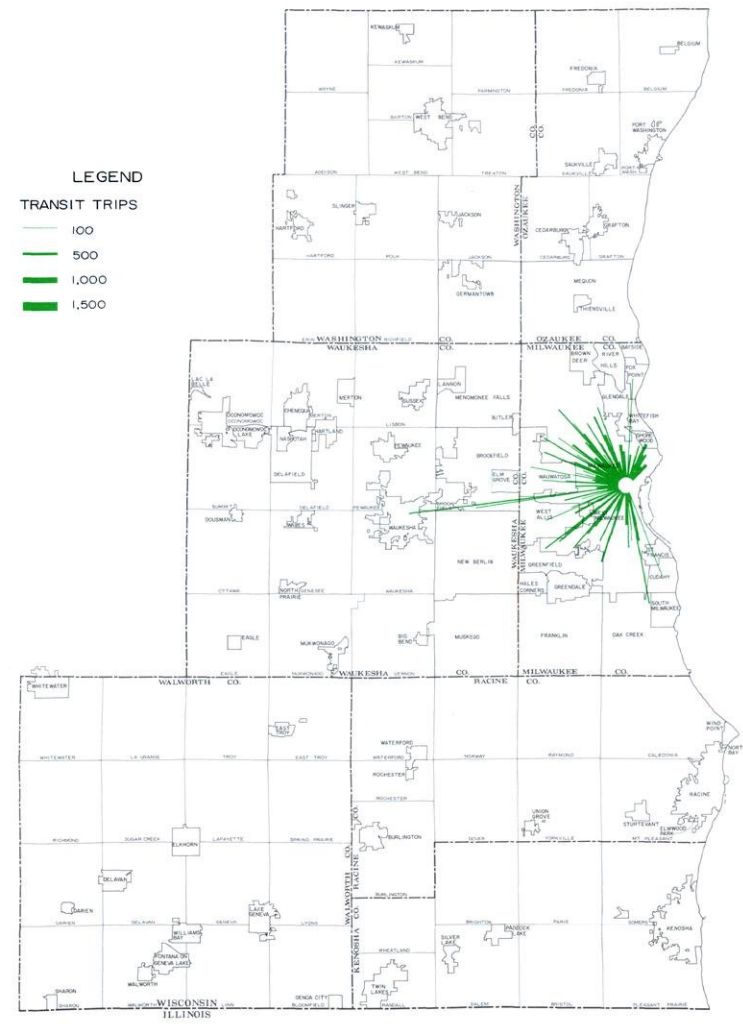
Map 121

AVERAGE WEEKDAY MASS TRANSIT TRIP ORIGINS WITH DESTINATIONS IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963



Map 122

AVERAGE WEEKDAY MASS TRANSIT TRIP ORIGINS WITH DESTINATIONS IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1972

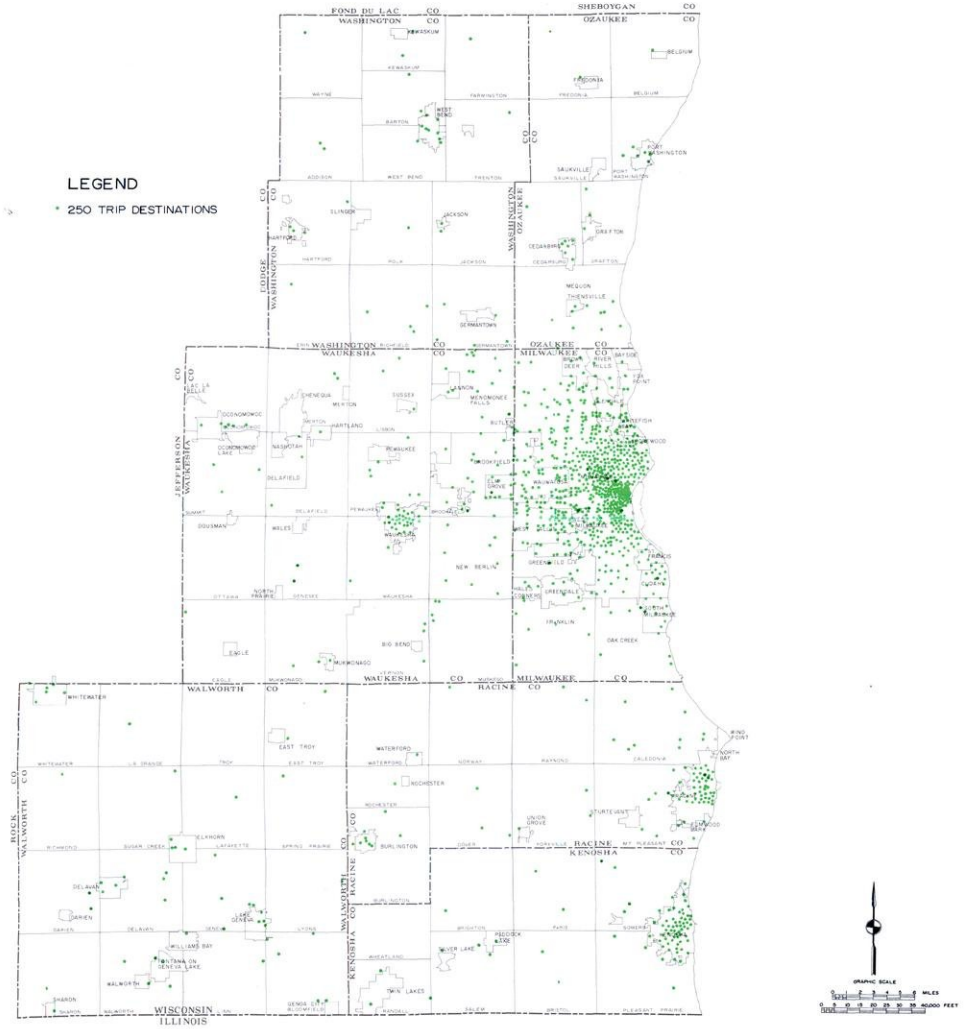


Reflecting the decline in mass transit use within the Region from 1963 to 1972, the number of traffic analysis zones producing at least 100 mass transit trips with destinations in the Region's major central business districts on an average weekday decreased from 150 zones in 1963 to 99 zones in 1972 with respect to the Milwaukee central business district, and from eight zones in 1963 to none in 1972 with respect to both the Kenosha and Racine central business districts. The number of zones producing 500 or more mass transit trips with destinations in the Milwaukee central business district decreased from 19 zones in 1963 to three zones in 1972. The majority of transit trip destinations in the Milwaukee central business district represent relatively short trips.

Source: SEWRPC.

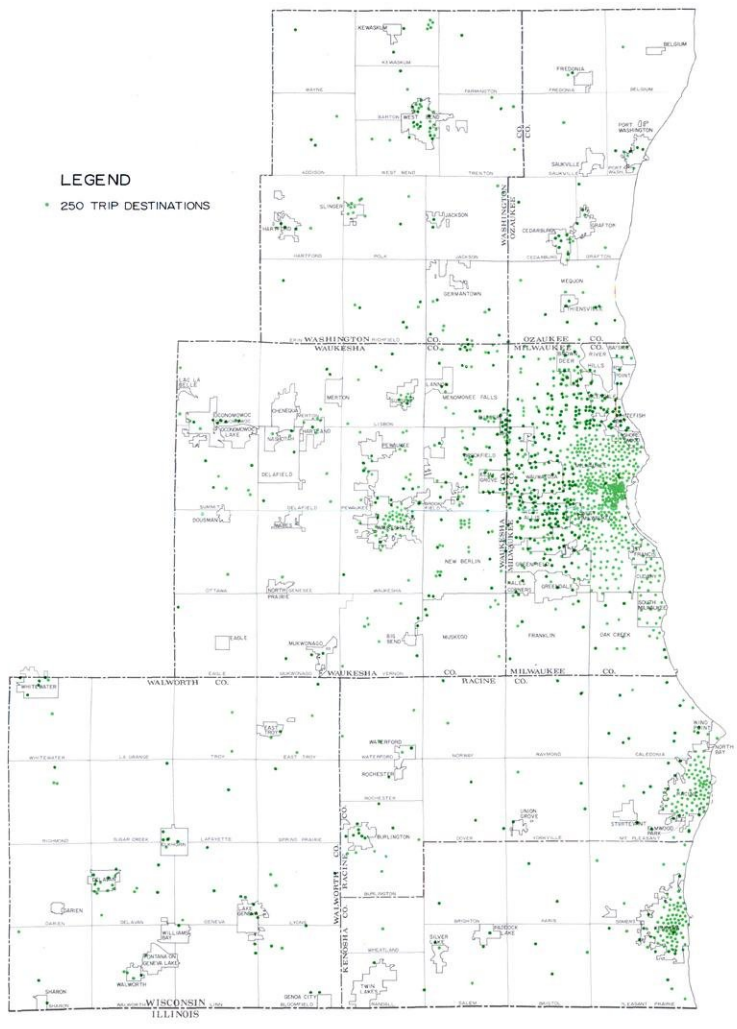
Map 123

AVERAGE WEEKDAY TRUCK TRIP DESTINATIONS IN THE REGION: 1963



Map 124

AVERAGE WEEKDAY TRUCK TRIP DESTINATIONS IN THE REGION: 1972



The number of internal truck trip destinations within the Region on an average weekday increased from about 293,000 in 1963 to about 371,000 in 1972. As shown on the above maps, in both 1963 and 1972 truck trip destinations were most highly concentrated in the central business districts of the major cities of the Region and in the intensively developed wholesale, commercial, and industrial areas within and adjacent to those cities.

Source: SEWRPC.

internal truck trip destinations are most highly concentrated in the central areas of the larger cities of the Region and in the major commercial and industrial areas within and adjacent to these central cities. These maps also indicate that while substantial increases in truck trip destinations occurred from 1963 to 1972 in many rural areas as well as in the highly developed industrial and commercial areas outside the central areas of the Cities of Milwaukee, Racine, and Kenosha, truck trip destinations within the central areas of these cities remained relatively unchanged.

Maps 125 and 126 show the points of origin of internal vehicle trip destinations in the CBD's of Milwaukee, Kenosha, and Racine. Two significant facts are evident on these maps. First, the areas of attraction of each CBD are limited for the most part to the highly developed portions of its own urbanized area; and second, no appreciable amount of travel occurs between any zone in one urbanized area and the CBD of another urbanized area within the Region. These maps also indicate that the areas of attraction to each CBD expanded somewhat from 1963 to 1972, even though total internal person trip destinations to these areas declined.

Map 127 shows the person trip "desire lines" connecting the origins and destinations of external trips with the points of entry to or exit from the Region for both 1963 and 1972. This map also shows the through movement of person travel as well as the internal-external travel interchange. As might be expected, relatively large travel interchanges existed in both 1963 and 1972 between the Milwaukee urbanized area and most points of entry to or exit from the Region. Significantly, however, no large concentrations of trip destinations existed in either 1963 or 1972 in any single portion of the Milwaukee urbanized area, not even in the Milwaukee central business district. The majority of through trips followed north-south routes, the largest volumes utilizing a combination of IH 94 and either USH 41 or USH 141 in both years. Through travel also occurred between points of origin and destination west and south of the Region. Most of this travel utilized a combination of IH 94 and either STH 30 or USH 16 in 1963, and following its completion, IH 94 west in 1972.

Although external travel patterns were quite similar in 1963 and 1972, certain differences were observed. Between the Lake Geneva area and external points to southeast, for example, person trip interchanges decreased from 12,800 persons in 1963 to 6,700 in 1972. Smaller differences were found between western Walworth County and external points to the west (7,100 person trips in 1963 and 8,300 in 1972), the Kenosha urbanized area and external points to the southwest (6,700 person trips in 1963 and 8,600 in 1972), and the Oconomowoc area and external points to the west (3,500 person trips in 1963 and 6,900 in 1972). A rather large difference was also found in the IH 94-USH 41 corridor, where interchanges connecting external points south and north of the Region decreased from 6,300 person trips in 1963 to 5,300 in 1972.

Characteristics of Travel in Selected Major Central Business Districts

Historically, the highly developed central business districts of the larger cities of the Region have been regarded as the financial, commercial, and cultural centers of the urbanized areas in which they are located. As such, they create considerable interest with respect to growth and change. Because the degree of activity within a central business district in terms of employment and tripmaking is often equated with the well-being of the entire urbanized area it serves, special emphasis is placed here upon the examination of the trends from 1963 to 1972 in the central business districts of Milwaukee, Kenosha, and Racine. The boundaries of these districts and the number of square miles contained in each are shown in Figure 83.

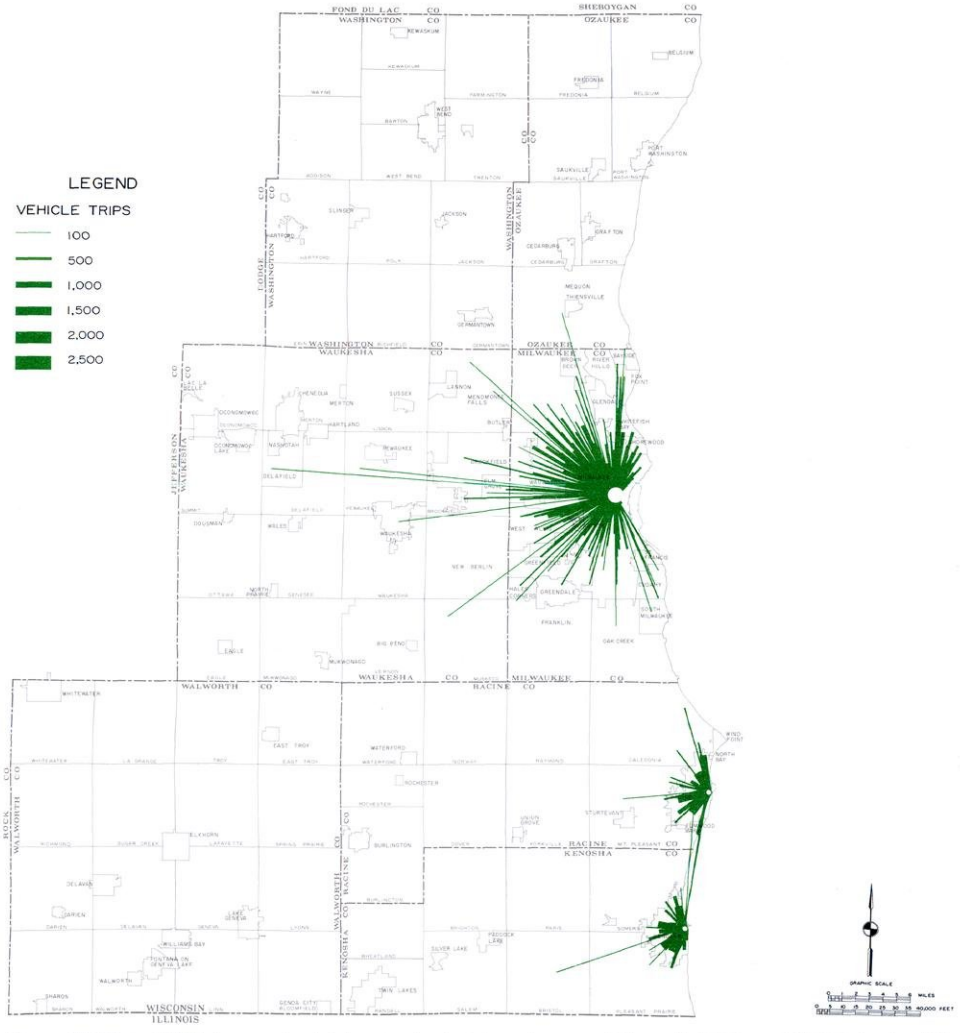
Comparisons of the 1963 and 1972 inventory findings indicate that the total number of person trip destinations on an average weekday decreased in all three central business districts. The Racine and Milwaukee CBD's sustained the greatest losses, the former declining from 27,500 trip destinations to 20,900, or 24 percent; and the latter declining from 140,000 to 133,800, or 4 percent. The Kenosha CBD also suffered some loss, declining from 30,700 trip destinations to 29,800, or 3 percent. Despite the decline in person trip destinations in the Milwaukee CBD, it continues to attract the largest concentrations of person trip destinations within the Region. No other area within the Region of comparable or greater size attracted more than 60,000 person trip destinations or 8,500 transit trip destinations on an average weekday in either 1963 or 1972. It should also be noted that the number of person trip destinations in the Kenosha CBD was greater in both years than similar destinations in the Racine CBD, which serves a larger population, although the area of the Kenosha CBD is 45 percent larger than the area of the Racine CBD.

The most significant change in person travel was the sharp decrease in mass transit trip destinations in each central business district. These decreases amounted to 21,500 trip destinations, or 43 percent, in the Milwaukee CBD, and 13,200, or 46 percent, in its central zones; 1,400, or 78 percent, in the Kenosha CBD; and 1,700, or 85 percent, in the Racine CBD. Counter to this trend were modest increases in auto driver and auto passenger trip destinations in the Milwaukee and Kenosha CBD's. In the Racine CBD, however, relatively substantial decreases also occurred in auto driver and auto passenger trip destinations. It should be noted that the decline in person travel in the central zones of the Milwaukee CBD was greater than the decline in the entire Milwaukee CBD, indicating that person travel in this CBD outside of its central zones increased (see Table 148).

Despite decreases in person trip destinations, the average daily total number of vehicle trip destinations increased in the Milwaukee and Kenosha CBD's, although declining slightly in the Milwaukee CBD central zones and rather substantially in the Racine CBD. The largest increase in vehicle trip destinations—9,600, or 12 percent—occurred in the Milwaukee CBD. Internal auto trip destinations alone more than compensated for the decrease in truck

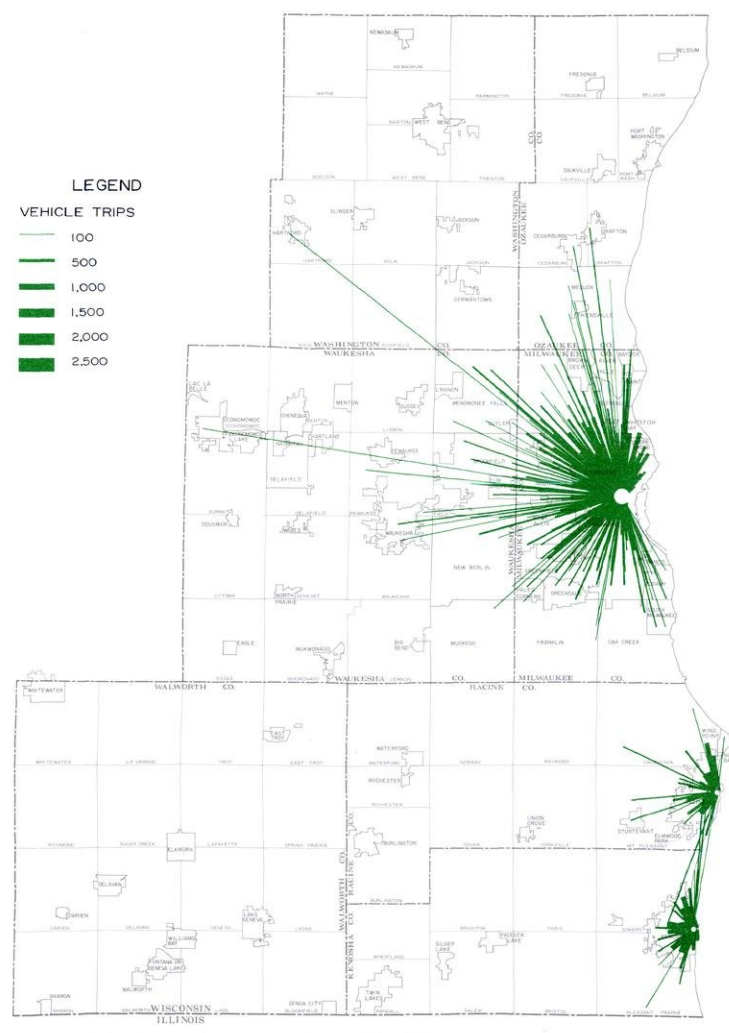
Map 125

AVERAGE WEEKDAY VEHICLE TRIP ORIGINS WITH DESTINATIONS IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1963



Map 126

AVERAGE WEEKDAY VEHICLE TRIP ORIGINS WITH DESTINATIONS IN THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS: 1972

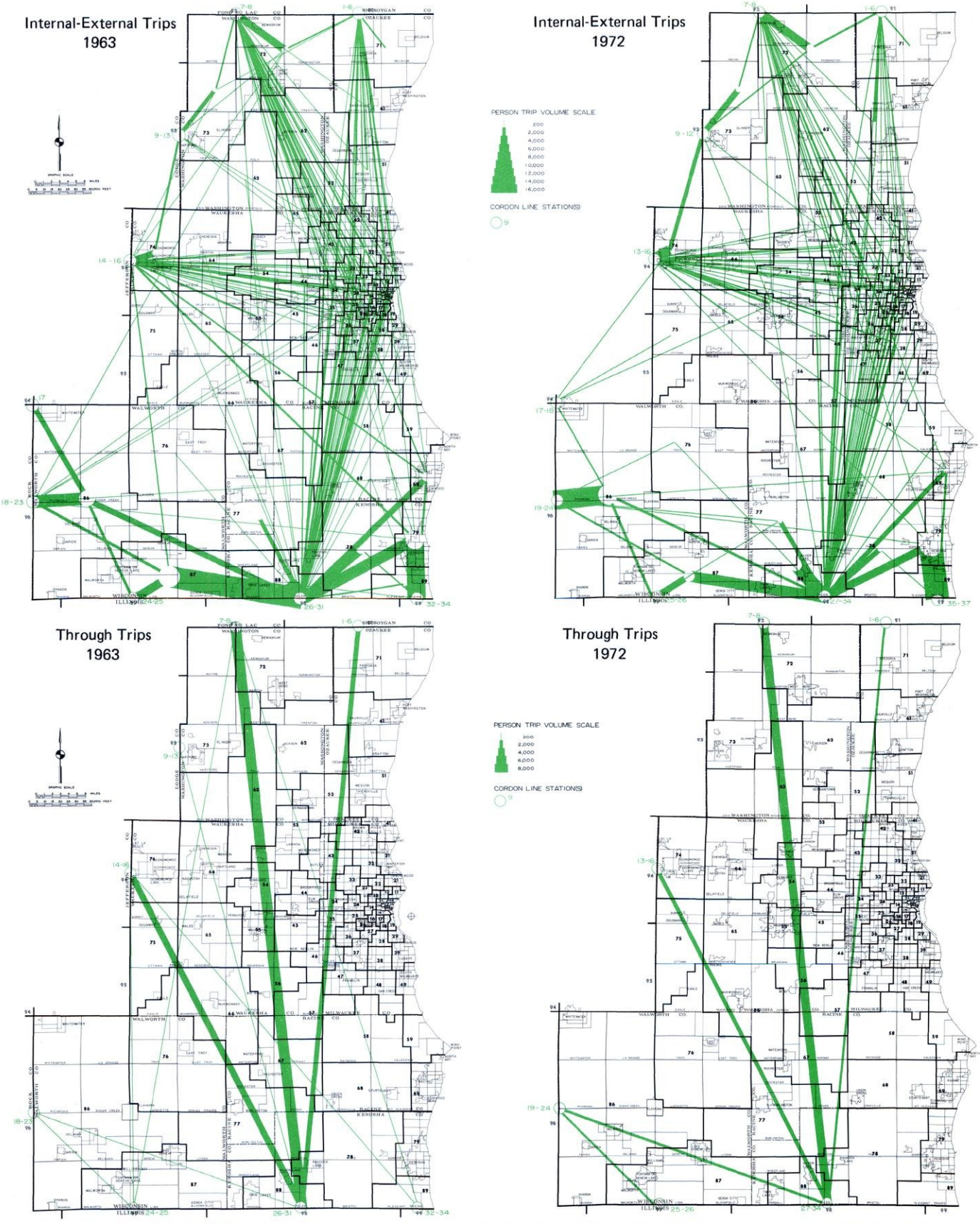


From 1963 to 1972, internal vehicle trip destinations increased from 77,800 to 87,000 in the Milwaukee central business district and from 20,500 to 21,000 in the Kenosha central business district, while decreasing from 19,500 to 15,800 in the Racine central business district. The above maps indicate that the majority of vehicle trips made to each of these CBDs in both years were attracted primarily from the most highly developed portions of the respective urbanized areas, that relatively little vehicle travel occurred between any point in one urbanized area and the CBD of another urbanized area within the Region, and that the length of trips to the CBDs has been increasing.

Source: SEWRPC.

Map 127

AVERAGE WEEKDAY EXTERNAL TRIP DESIRE LINES IN THE REGION: 1963 and 1972



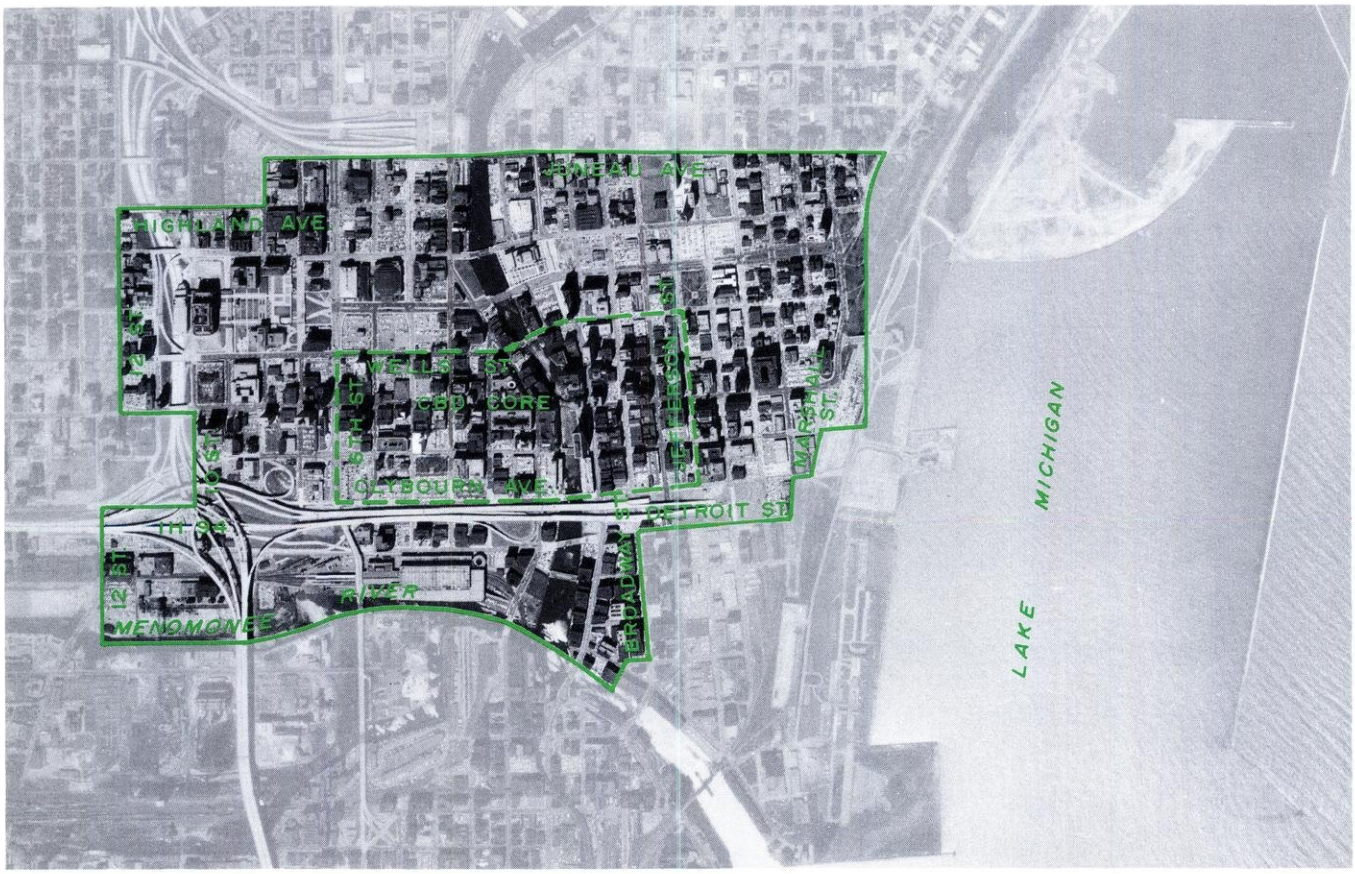
The above maps show for 1963 and 1972 the person trip "desire lines" connecting the origins and destinations of external person trips with the points of entrance to or exit from the Region, as well as the movement of person trips passing directly through the Region. It is significant to note that although relatively large volumes of person trip interchanges occurred between the Milwaukee urbanized area and points of entry to or exit from the Region in both 1963 and 1972, no large concentrations of person trip origins or destinations occurred in either year in any single portion of that area, not even in the Milwaukee central business district. Through travel patterns were quite similar in 1963 and 1972.

Source: SEWRPC.

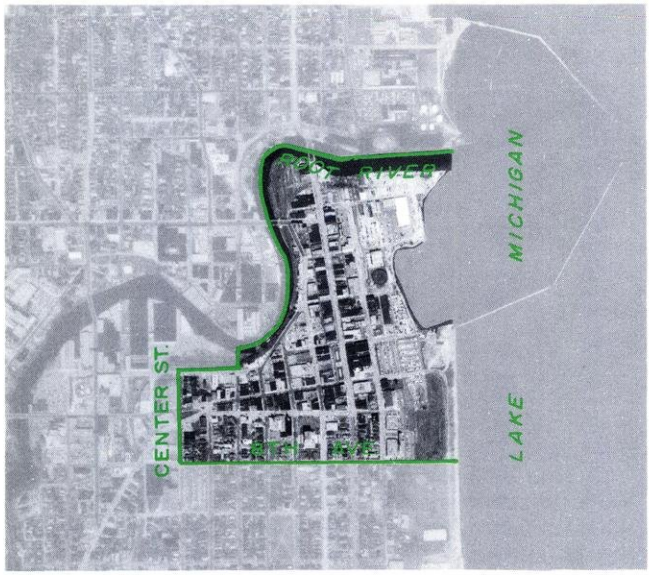
Figure 83

BOUNDARIES OF THE MILWAUKEE, RACINE, AND KENOSHA CENTRAL BUSINESS DISTRICTS

Milwaukee Central Business District and Core Area



Racine Central Business District



Kenosha Central Business District

Source: SEWRPC.

Table 148

AVERAGE WEEKDAY PERSON TRIP DESTINATIONS IN SELECTED CENTRAL BUSINESS DISTRICTS OF THE REGION BY MODE OF TRAVEL: 1963 and 1972

Type of Trip	Travel Mode	Year	Milwaukee CBD			Milwaukee CBD Core		
			Trips	Percent	Percent Change 1963-1972	Trips	Percent	Percent Change 1963-1972
Internal	Auto Driver	1963	65,100	46.5	--	27,600	40.3	--
		1972	74,300	55.5	14.1	27,500	48.9	- 0.4
	Auto Passenger	1963	21,600	15.4	--	10,700	15.6	--
		1972	27,300	20.4	26.4	12,100	21.5	13.1
	Transit Passenger	1963	50,500	36.1	--	28,700	41.8	--
		1972	29,000	21.7	- 42.6	15,500	27.6	- 46.0
	Other	1963	900	0.6	--	300	0.4	--
		1972	700	0.5	- 22.2	100	0.2	- 66.7
Subtotal	--	1963	138,100	98.6	--	67,300	98.1	--
		1972	131,300	98.1	- 4.9	55,200	98.2	- 18.0
External	Auto Driver	1963	1,100	0.8	--	700	1.0	--
		1972	1,500	1.1	36.4	600	1.1	- 14.3
	Auto Passenger	1963	800	0.6	--	600	0.9	--
		1972	1,000	0.8	25.0	400	0.7	- 33.3
Subtotal	--	1963	1,900	1.4	--	1,300	1.9	--
		1972	2,500	1.9	31.6	1,000	1.8	- 23.1
Total CBD Person Trip Destinations	--	1963	140,000	100.0	--	68,600	100.0	--
		1972	133,800	100.0	- 4.4	56,200	100.0	- 18.1

Type of Trip	Travel Mode	Year	Kenosha CBD			Racine CBD		
			Trips	Percent	Percent Change 1963-1972	Trips	Percent	Percent Change 1963-1972
Internal	Auto Driver	1963	19,200	62.5	--	17,900	65.1	--
		1972	19,600	65.8	2.1	14,500	69.4	- 19.0
	Auto Passenger	1963	8,600	28.0	--	7,400	26.9	--
		1972	9,000	30.3	4.7	5,800	27.7	- 21.6
	Transit Passenger	1963	1,800	5.9	--	2,000	7.2	--
		1972	400	1.3	- 77.8	300	1.4	- 85.0
	Other	1963	200	0.7	--	100	0.4	--
		1972	400	1.3	100.0	200	1.0	100.0
Subtotal	--	1963	29,800	97.1	--	27,400	99.6	--
		1972	29,400	98.7	- 1.3	20,800	99.5	- 24.1
External	Auto Driver	1963	500	1.6	--	100	0.4	--
		1972	300	1.0	- 40.0	100	0.5	0.0
	Auto Passenger	1963	400	1.3	--	--[a]	--	--
		1972	100	0.3	- 75.0	--[a]	--	--
Subtotal	-- --	1963	900	2.9	--	100	0.4	--
		1972	400	1.3	- 55.6	100	0.5	0.0
Total CBD Person Trip Destinations	-- --	1963	30,700	100.0	--	27,500	100.0	--
		1972	29,800	100.0	- 2.9	20,900	100.0	- 24.0

[a] *Trips by these modes are less than 50. All trips are rounded to the nearest hundred.*

Source: SEWRPC.

trip destinations, reflecting in part the conversion to the auto of those who formerly traveled to this CBD as mass transit passengers (see Table 149).

The trip purposes and modes of travel of person trip destinations in the Milwaukee, Kenosha, and Racine central business districts on an average weekday in 1963 and 1972 are shown in Table 150. This table indicates that despite decreases in the total number of person trip destinations in each of these CBD's, the percentage distributions of total trip destinations by trip purpose were quite similar in 1963 and 1972. In each central business district the maximum variation in the percentage distributions was 4 percent or less by category, except in the Kenosha CBD where the proportion of work trips to total CBD trips decreased 6 percent and the proportion of personal business trips to total CBD trips increased 9 percent, and in the Racine CBD where the proportion of social-recreation trips to total CBD trips decreased 5 percent.

The percentage distribution of trip destinations by trip purpose within each mode of travel exhibited rather wide differences between 1963 and 1972. These differences resulted principally from the dramatic decline in mass transit use in each CBD and from the apparent shift from mass transit travel to auto driver and auto passenger travel. Thus, while mass transit passenger travel in the Milwaukee CBD decreased from 50,500 trip destinations, or 36 percent of total destinations in 1963, to 29,000 trip destinations, or 22 percent, in 1972, auto driver trip destinations increased from 65,100, or 47 percent of total destinations, in 1963 to 74,300, or 56 percent of total destinations, in 1972. Except for transit travel for school trip purposes in the Milwaukee CBD, which increased since 1963, the percentage distribution of trips by trip purpose to this CBD for each major mode remained quite similar in both periods.

The land uses and modes of travel of person trip destinations in these three central business districts on an average weekday in 1963 and 1972 are shown in Table 151. This table indicates that trip destinations to commercial land uses and governmental and institutional land uses, in that order of importance, comprised more than three-fourths of the total destinations in each CBD in both 1963 and 1972.

Table 151 also indicates that the number of person trip destinations in 1972 to industrial land uses declined substantially from 1963 in each CBD. In the Milwaukee CBD, person trips to governmental and institutional land uses increased, while every other category showed declines in the number of destinations. The major declines occurred in the industrial and residential land use categories. In the Kenosha CBD, the number of person trip destinations to residential and commercial land uses increased, while the number of destinations to industrial and governmental and institutional land uses declined. The largest decline occurred in the industrial land use category. In the Racine CBD, the number of person trip destinations to residential land uses remained the same and the number of destinations to "other" land uses increased. The number of destinations to commercial, industrial, and governmental and institutional land uses all showed substantial declines.

The percentage variation in total person trip destinations from 1963 to 1972 was 5 percent or less by major land use category in each central business district except Kenosha, in which the proportion of total CBD travel which comprised destinations to commercial land uses increased 6 percent and the proportion of destinations to industrial land uses decreased 7 percent. The percentage variations in auto driver and auto passenger trip destinations were 5 percent or less by major category in each CBD except in the proportion to total CBD travel of auto driver destinations to commercial and industrial land uses, which increased 6 percent and decreased 8 percent, respectively, in the Kenosha CBD; in the proportion of auto passenger destinations to commercial land uses, which decreased 7 percent in the Racine CBD; and in the proportion of auto passenger destinations to governmental and institutional land uses, which increased 8 percent in the Milwaukee CBD. The percentage variations in mass transit trip destinations were significantly greater by category, however, especially in the Racine and Kenosha central business districts because of the extreme decline in mass transit utilization in those areas.

While these highly developed central business districts are regarded generally as the financial, commercial, and cultural centers of their respective urbanized areas and as major attractors of person trip destinations, the number of person trip destinations in each central business district as a percent of total person trip destinations within each urbanizing area on an average weekday amounted to only 5 percent in 1963 and 4 percent in 1972 in the Milwaukee CBD; 12 percent in 1963 and 9 percent in 1972 in the Kenosha CBD; and 8 percent in 1963 and 6 percent in 1972 in the Racine CBD. This fact must be kept in mind in the design of transportation systems and services to meet the needs of all tripmakers within the Region.

External Trip Production

In addition to the 4.50 million internal person trips and 3.29 million internal vehicle trips made on an average 1972 weekday, there were 176,900 person trips and 125,700 vehicle trips entering, leaving, or passing directly through the Region, which for the purposes of this discussion will be referred to as "external" trips. In both 1972 and 1963, as indicated in Table 152, the proportion of external person and vehicle trips entering the Region was very similar to the proportion of such trips leaving the Region, ranging by direction from 45 to 47 percent of total person travel and 46 percent each of total vehicle travel. External trips which passed directly through the Region accounted for about 8 percent each of total external person and external vehicle trips in 1972 and 1963.

Although the proportions of external travel by direction were similar for 1972 and 1963, comparisons of the proportion of vehicle travel to person travel and the corresponding mode selections indicated significant

Table 149

AVERAGE WEEKDAY VEHICLE TRIP DESTINATIONS IN SELECTED CENTRAL BUSINESS DISTRICTS OF THE REGION BY MODE OF TRAVEL: 1963 and 1972

Type of Trip	Travel Mode	Year	Milwaukee CBD			Milwaukee CBD Core		
			Trips	Percent	Percent Change 1963-1972	Trips	Percent	Percent Change 1963-1972
Internal	Auto.	1963	65,100	82.3	--	27,600	84.5	--
		1972	74,300	83.8	14.1	27,500	85.7	- 0.4
	Truck	1963	11,600	14.7	--	3,700	11.3	--
		1972	10,900	12.3	- 6.0	3,200	9.9	- 13.5
	Taxi	1963	1,100	1.4	--	700	2.1	--
		1972	1,800	2.0	63.6	800	2.5	14.3
Subtotal	--	1963	77,800	98.4	--	32,000	97.9	--
		1972	87,000	98.1	11.8	31,500	98.1	- 1.6
External	Auto.	1963	1,100	1.4	--	700	2.1	--
		1972	1,500	1.7	36.4	600	1.9	- 14.3
	Truck	1963	200	0.2	--	--[a]	--	--
		1972	200	0.2	0.0	--[a]	--	--
Subtotal	--	1963	1,300	1.6	--	700	2.1	--
		1972	1,700	1.9	30.8	600	1.9	- 14.3
Total CBD Vehicle Trip Destinations	--	1963	79,100	100.0	--	32,700	100.0	--
		1972	88,700	100.0	12.1	32,100	100.0	- 1.8

Type of Trip	Travel Mode	Year	Kenosha CBD			Racine CBD		
			Trips	Percent	Percent Change 1963-1972	Trips	Percent	Percent Change 1963-1972
Internal	Auto.	1963	19,200	91.4	--	17,900	91.3	--
		1972	19,600	91.1	2.1	14,500	91.2	- 19.0
	Truck	1963	1,200	5.7	--	1,600	8.2	--
		1972	1,500	7.0	25.0	1,300	8.2	- 18.8
	Taxi	1963	100	0.5	--	--[a]	--	--
		1972	100	0.5	0.0	--[a]	--	--
Subtotal	--	1963	20,500	97.6	--	19,500	99.5	--
		1972	21,200	98.6	3.4	15,800	99.4	- 19.0
External	Auto.	1963	500	2.4	--	100	0.5	--
		1972	300	1.4	- 40.0	100	0.6	0.0
	Truck	1963	--[a]	--	--	--[a]	--	--
		1972	--[a]	--	--	--[a]	--	--
Subtotal	--	1963	500	2.4	--	100	0.5	--
		1972	300	1.4	- 40.0	100	0.6	0.0
Total CBD Vehicle Trip Destinations	--	1963	21,000	100.0	--	19,600	100.0	--
		1972	21,500	100.0	2.4	15,900	100.0	- 18.9

[a] *Trips by these modes are less than 50. All numbers are rounded to the nearest hundred.*

Source: SEWRPC.

Table 150

AVERAGE WEEKDAY INTERNAL PERSON TRIP DESTINATIONS IN SELECTED CENTRAL BUSINESS DISTRICTS OF THE REGION BY TRIP PURPOSE AND MODE OF TRAVEL: 1963 and 1972

Milwaukee CBD

Destination Trip Purpose	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Home	1963	1,700	2.6	1,400	6.5	3,300	6.5	100	11.1	6,500	4.7
	1972	2,400	3.2	1,000	3.7	900	3.1	--[a]	--	4,300	3.3
Work	1963	36,000	55.3	7,600	35.2	26,500	52.5	100	11.1	70,200	50.8
	1972	40,000	53.9	10,800	39.6	14,500	50.0	200	28.6	65,500	49.9
Personal Business	1963	13,800	21.2	4,800	22.2	6,400	12.7	300	33.4	25,300	18.3
	1972	18,100	24.4	7,600	27.8	3,200	11.0	100	14.3	29,000	22.1
School	1963	1,700	2.6	500	2.3	2,600	5.2	200	22.2	5,000	3.6
	1972	3,600	4.8	800	2.9	3,300	11.4	100	14.3	7,800	5.9
Social-Recreation	1963	7,000	10.8	4,400	20.4	3,000	5.9	200	22.2	14,600	10.6
	1972	6,500	8.7	4,600	16.8	900	3.1	300	42.8	12,300	9.4
Shopping	1963	4,900	7.5	2,900	13.4	8,700	17.2	--[a]	--	16,500	12.0
	1972	3,700	5.0	2,500	9.2	6,200	21.4	--[a]	--	12,400	9.4
Total	1963	65,100	100.0	21,600	100.0	50,500	100.0	900	100.0	138,100	100.0
	1972	74,300	100.0	27,300	100.0	29,000	100.0	700	100.0	131,300	100.0

Kenosha CBD

Destination Trip Purpose	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Home	1963	600	3.1	200	2.3	100	5.6	--[a]	--	900	3.0
	1972	1,100	5.6	700	7.8	--[a]	--	100	25.0	1,900	6.5
Work	1963	6,200	32.3	1,100	12.8	300	16.6	--[a]	--	7,600	25.5
	1972	4,700	24.0	1,000	11.1	--[a]	--	--[a]	--	5,700	19.4
Personal Business	1963	6,800	35.4	2,000	23.2	400	22.2	--[a]	--	9,200	30.9
	1972	7,700	39.3	3,800	42.2	100	25.0	--[a]	--	11,600	39.4
School	1963	300	1.6	800	9.3	700	38.9	200	100.0	2,000	6.7
	1972	500	2.6	1,000	11.1	200	50.0	300	75.0	2,000	6.8
Social-Recreation	1963	1,500	7.8	1,700	19.8	100	5.6	--[a]	--	3,300	11.1
	1972	1,800	9.2	900	10.0	--[a]	--	--[a]	--	2,700	9.2
Shopping	1963	3,800	19.8	2,800	32.6	200	11.1	--[a]	--	6,800	22.8
	1972	3,800	19.3	1,600	17.8	100	25.0	--[a]	--	5,500	18.7
Total	1963	19,200	100.0	8,600	100.0	1,800	100.0	200	100.0	29,800	100.0
	1972	19,600	100.0	9,000	100.0	400	100.0	400	100.0	29,400	100.0

Racine CBD

Destination Trip Purpose	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Home	1963	500	2.8	300	4.1	100	5.0	--[a]	--	900	3.3
	1972	600	4.1	300	5.2	50	16.7	--[a]	--	950	4.6
Work	1963	5,800	32.4	1,100	14.9	800	40.0	--[a]	--	7,700	28.1
	1972	4,900	33.8	1,200	20.7	50	16.7	50	25.0	6,200	29.8
Personal Business	1963	5,900	33.0	2,300	31.1	500	25.0	50	50.0	8,750	31.9
	1972	5,000	34.5	2,200	37.9	100	33.3	100	50.0	7,400	35.6
School	1963	200	1.1	100	1.3	--[a]	--	--[a]	--	300	1.1
	1972	400	2.8	100	1.7	--[a]	--	50	25.0	550	2.6
Social-Recreation	1963	2,000	11.1	1,600	21.6	200	10.0	50	50.0	3,850	14.1
	1972	1,000	6.9	900	15.5	--[a]	--	--[a]	--	1,900	9.1
Shopping	1963	3,500	19.6	2,000	27.0	400	20.0	--[a]	--	5,900	21.5
	1972	2,600	17.9	1,100	19.0	100	33.3	--[a]	--	3,800	18.3
Total	1963	17,900	100.0	7,400	100.0	2,000	100.0	100	100.0	27,400	100.0
	1972	14,500	100.0	5,800	100.0	300	100.0	200	100.0	20,800	100.0

[a] *Trips by these vehicle types are less than 50.*

Source: SEWRPC.

Table 151

AVERAGE WEEKDAY INTERNAL PERSON TRIP DESTINATIONS IN SELECTED CENTRAL BUSINESS DISTRICTS OF THE REGION BY LAND USE AND MODE OF TRAVEL: 1963 and 1972

Milwaukee CBD

Destination Land Use	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Residential	1963	2,200	3.4	1,500	6.9	3,700	7.3	100	11.1	7,500	5.4
	1972	2,800	3.8	1,000	3.7	700	2.4	--[a]	--	4,500	3.4
Commercial	1963	34,100	52.4	11,700	54.2	30,300	60.0	500	55.6	76,600	55.5
	1972	40,200	54.1	15,800	57.9	19,900	68.6	200	28.6	76,100	58.0
Industrial	1963	8,900	13.7	1,600	7.4	4,800	9.5	--[a]	--	15,300	11.1
	1972	6,200	8.4	1,400	5.1	1,200	4.2	--[a]	--	8,800	6.7
Governmental and Institutional	1963	16,700	25.6	4,700	21.8	10,300	20.4	200	22.2	31,900	23.1
	1972	21,500	28.9	8,000	29.3	6,500	22.4	400	57.1	36,400	27.7
Other	1963	3,200	4.9	2,100	9.7	1,400	2.8	100	11.1	6,800	4.9
	1972	3,600	4.8	1,100	4.0	700	2.4	100	14.3	5,500	4.2
Total	1963	65,100	100.0	21,600	100.0	50,500	100.0	900	100.0	138,100	100.0
	1972	74,300	100.0	27,300	100.0	29,000	100.0	700	100.0	131,300	100.0

Kenosha CBD

Destination Land Use	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Residential	1963	900	4.7	400	4.7	100	5.6	--[a]	--	1,400	4.7
	1972	1,200	6.1	700	7.8	--[a]	--	100	25.0	2,000	6.8
Commercial	1963	11,200	58.3	5,200	60.5	600	33.2	--[a]	--	17,000	57.0
	1972	12,700	64.8	5,500	61.1	200	50.0	--[a]	--	18,400	62.6
Industrial	1963	2,000	10.4	500	5.8	100	5.6	--[a]	--	2,600	8.7
	1972	500	2.6	100	1.1	--[a]	--	--[a]	--	600	2.0
Governmental and Institutional	1963	4,300	22.4	2,100	24.4	900	50.0	200	100.0	7,500	25.2
	1972	4,400	22.4	2,200	24.4	200	50.0	300	75.0	7,100	24.2
Other	1963	800	4.2	400	4.6	100	5.6	--[a]	--	1,300	4.4
	1972	800	4.1	500	5.6	--[a]	--	--[a]	--	1,300	4.4
Total	1963	19,200	100.0	8,600	100.0	1,800	100.0	200	100.0	29,800	100.0
	1972	19,600	100.0	9,000	100.0	400	100.0	400	100.0	29,400	100.0

Racine CBD

Destination Land Use	Year	Mode of Travel to Selected CBD									
		Auto Driver		Auto Passenger		Transit Passenger		Other		Total	
		Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total	Trips	Percent of Total
Residential	1963	700	3.9	400	5.4	100	5.0	--[a]	--	1,200	4.4
	1972	900	6.2	300	5.1	--[a]	--	--[a]	--	1,200	5.8
Commercial	1963	11,200	62.5	4,600	62.1	1,300	65.0	100	100.0	17,200	62.8
	1972	9,200	63.4	3,200	55.2	300	100.0	100	50.0	12,800	61.5
Industrial	1963	1,000	5.6	300	4.1	100	5.0	--[a]	--	1,400	5.1
	1972	500	3.5	100	1.7	--[a]	--	--[a]	--	600	2.9
Governmental and Institutional	1963	4,200	23.5	1,800	24.3	400	20.0	--[a]	--	6,400	23.3
	1972	3,000	20.7	1,100	19.0	--[a]	--	--[a]	--	4,100	19.7
Other	1963	800	4.5	300	4.1	100	5.0	--[a]	--	1,200	4.4
	1972	900	6.2	1,100	19.0	--[a]	--	100	50.0	2,100	10.1
Total	1963	17,900	100.0	7,400	100.0	2,000	100.0	100	100.0	27,400	100.0
	1972	14,500	100.0	5,800	100.0	300	100.0	200	100.0	20,800	100.0

[a] *Trips by these vehicle types are less than 50.*

Source: SEWRPC.

Table 152

AVERAGE WEEKDAY EXTERNAL PERSON AND VEHICLE TRIPS IN THE REGION BY DIRECTION: 1963 and 1972

Direction	Year	Auto Driver		Auto Passenger		Truck Driver	
		Number	Percent Change 1963-1972	Number	Percent Change 1963-1972	Number	Percent Change 1963-1972
Inbound	1963	39,700	--	47,900	--	7,100	--
	1972	46,700	17.6	33,500	- 30.1	10,900	53.5
Outbound	1963	40,000	--	48,100	--	7,200	--
	1972	47,500	18.8	35,900	- 25.4	10,700	48.6
Through	1963	5,900	--	10,100	--	1,700	--
	1972	6,600	11.9	6,700	- 33.7	3,300	94.1
All Directions	1963	85,600	--	106,100	--	16,000	--
	1972	100,800	17.8	76,100	- 28.3	24,900	55.6

Direction	Year	Person Trips			Vehicle Trips		
		Total	Percent Change 1963-1972	Percent of All Directions	Total	Percent Change 1963-1972	Percent of All Directions
Inbound	1963	87,600	--	45.7	46,800	--	46.1
	1972	80,200	- 8.4	45.3	57,600	23.1	45.8
Outbound	1963	88,100	--	46.0	47,200	--	46.4
	1972	83,400	- 5.3	47.2	58,200	23.3	46.3
Through	1963	16,000	--	8.3	7,600	--	7.5
	1972	13,300	- 16.9	7.5	9,900	30.3	7.9
All Directions	1963	191,700	--	100.0	101,600	--	100.0
	1972	176,900	- 7.7	100.0	125,700	23.7	100.0

Source: SEWRPC.

changes in external travel. The 176,900 external person and 125,700 external vehicle trips recorded in 1972 represented a decrease of 14,800 external person trips, or 8 percent, and an increase of 24,100 external vehicle trips, or 24 percent, from 1963.

Of the total external person trips, which consist principally of auto driver and auto passenger trips,[9] auto driver trips accounted for 57 percent of the total in 1972 and 45 percent in 1963. Of the total external vehicle trips, auto driver trips accounted for 80 percent of the total in 1972 and 84 percent in 1963. Truck trips accounted for the remainder in each year. These findings indicate that the decrease in total external person trips results from a number of influences on travel since 1963. A primary cause is a decline in external auto passengers, which is attributed largely to the large increases in automobile availability and the substantial increase in multi-auto households nationally and regionally.

In addition, as indicated in Table 153, the largest decline in vehicle occupancy—0.62 persons per vehicle—occurred in trips made for social-recreational purposes. Since these trips tend to incorporate more family members than trips for other purposes, such as work, it is believed that this decline, and to a lesser degree the other declines in vehicle occupancy, are a consequence of the decrease in family size since 1963. The increased use of light trucks for personal use in lieu of an automobile is also believed to have produced a portion of the decrease in total external person trips.

A comparison of the percentage distributions of external person trips by trip purpose for 1963 and 1972 indicates that the proportion of external person trips increased 7 percent for work trips, 4 percent for personal business trips, and 1 percent each for shopping and school trips, and decreased 13 percent for social-recreational trips. Trips to home, the largest category, equaled 40 percent in both 1963 and 1972.

As shown in Table 152, the 24,900 external truck trips entering, leaving, or passing directly through the Region on an average weekday in 1972 represented a 56 percent increase from the 16,000 trips per day in 1963. By direction, truck travel increased 54 percent entering the Region and 49 percent leaving the Region since 1963. Truck travel passing directly through the Region increased 94 percent.

In addition to substantial increases in the volumes of external truck travel, significant changes occurred in the purposes of such travel. As shown in Table 154, of total

[9] *These included approximately 300 motorcycle drivers and 50 motorcycle passengers in 1972.*

Table 153

AVERAGE WEEKDAY EXTERNAL AUTOMOBILE DRIVER TRIPS, PERSON TRIPS, AND VEHICLE OCCUPANCY IN THE REGION BY TRIP PURPOSE: 1963 and 1972

Trip Purpose	1963					1972				
	Auto Driver Trips		Total Person Trips		Vehicle Occupancy	Auto Driver Trips		Total Person Trips		Vehicle Occupancy
	Number	Percent of Total	Number	Percent of Total		Number	Percent of Total	Number	Percent of Total	
Home	34,000	39.7	76,900	40.1	2.262	39,900	39.6	70,900	40.1	1.777
Work	18,300	21.4	26,800	14.0	1.464	28,100	27.9	37,700	21.3	1.342
Personal Business	7,200	8.4	15,700	8.2	2.181	10,800	10.7	20,700	11.7	1.917
School	700	0.8	1,300	0.7	1.857	1,700	1.7	2,600	1.5	1.529
Social-Recreation	22,000	25.7	63,000	32.8	2.864	16,000	15.9	35,900	20.3	2.244
Shopping	3,400	4.0	8,000	4.2	2.353	4,300	4.2	9,100	5.1	2.116
Total	85,600	100.0	191,700	100.0	2.239	100,800	100.0	176,900	100.0	1.755

Source: SEWRPC.

Table 154

DISTRIBUTION OF AVERAGE WEEKDAY EXTERNAL TRUCK TRIPS IN THE REGION BY DESTINATION PURPOSE: 1963 and 1972

Trip Purpose	1963		1972	
	Number	Percent	Number	Percent
Base of Operations	4,200	26.2	9,400	37.8
Work Connected Business	700	4.4	3,200	12.8
Personal Business	700	4.4	2,400	9.6
Pick-Up/Deliver Goods	10,100	63.1	9,800	39.4
Customer Service	300	1.9	100	0.4
Total	16,000	100.0	24,900	100.0

Source: SEWRPC.

external truck trips, external truck trips to the bases of operation, including trips to return home, increased 12 percent from 1963 to 1972; trips made for work-connected business increased 8 percent; and trips for personal business, including trips to school, for social-recreation purposes, to serve passengers, and for shopping, were up 5 percent. Trips to pick up and deliver goods decreased 24 percent, and customer service trips, such as trips for repair service, were down 2 percent. While the number of truck trips involved in the movement of goods remained approximately the same, the proportion of such trips to total external truck trips decreased sharply. This decrease is explained by the substantially increased utilization of trucks for other purposes.

SPECIAL SURVEYS

In order to supplement the findings of the major inventories, five special origin-destination surveys were undertaken as part of the 1972 regional land use-transportation plan reevaluation. These include: 1) the interregional motor bus, rail, and car ferry survey, 2) the mass transit user survey, 3) the mass transit nonuser survey, 4) the major traffic generator survey, and 5) the weekend travel survey. In addition, a special personal opinion survey was conducted as part of the 1972 home interview survey to obtain the opinions, preferences, and attitudes of heads of households or spouses relating to transportation, housing, and recreation. Data from these surveys are an important adjunct to the major inventory findings.

Interregional Passenger Travel by AMTRAK Rail, Commuter Rail, Motor Bus, and Car Ferry

As part of the 1972 regional inventory of travel, special one-day origin-destination surveys were conducted on all regularly scheduled interregional weekday service affecting the Region. In these surveys, conducted for the first time by the Commission, each boarding and through passenger outbound from the Region on AMTRAK rail, commuter rail, and motor bus, and each boarding and debarking car ferry passenger, was asked to complete and return a prepaid, preaddressed mailback questionnaire. The questionnaire related to the socioeconomic characteristics of the passenger, such as age, sex, race, home address, household annual income, and auto availability; and to detailed characteristics of the trip being made, such as the geographic location at points of origin, boarding, transfer, and ultimate destination, the trip purposes, the mode of travel used to reach or upon departing from the common carrier, and the frequency with which that particular trip was made. Information was also obtained concerning whether the trip was part of a round trip, and where applicable, why a common carrier was used when the passenger could have made the trip as an auto driver.

Nine AMTRAK rail runs, 12 commuter rail runs, 72 motor bus runs, and four car ferry runs were included in the surveys. Based on the reciprocal trip theory, the AMTRAK rail, commuter rail, and motor bus surveys were conducted on outbound runs only. Because of the limited number of runs involved, the car ferry survey was conducted on both inbound and outbound runs.

Of the nine AMTRAK rail runs, three originated in Milwaukee and were destined for Chicago, two originated in Milwaukee and were destined for St. Louis via Chicago, two originated in Seattle and were destined for Chicago via Milwaukee, and two originated in Chicago and were destined for Seattle via Milwaukee.

The 12 commuter rail runs were all destined for Chicago. The Chicago and North Western Railroad Company provided service on 11 runs, of which nine originated in Kenosha and two originated in Lake Geneva, with intermediate stops in the Village of Genoa City and the unincorporated community of Pell Lake, Wisconsin. The Milwaukee Road provided service on a single run originating in the Village of Walworth, with an intermediate stop at the unincorporated community of Zenda, Wisconsin.

Of the 72 motor bus runs, Greyhound Bus Lines provided service on 48 runs, most of which were destined for Chicago and environs and for various points within Wisconsin, although some were destined for points as far away as Seattle. Wisconsin Coach Lines provided service on six runs variously to Fond du Lac and Watertown, Wisconsin and to Rockford, Illinois. Badger Bus Lines provided service on six runs to Madison, Wisconsin; Tri-State Coach Lines, Inc., provided service on six runs to O'Hare Airport, Chicago; Wisconsin-Michigan Coach Lines, Inc., provided service on four runs variously to Green Bay, Sister Bay, and Marshfield, Wisconsin; and Peoria-Rockford Bus Company provided service on two runs to Dixon and Rockford, Illinois.

Of the four car ferry runs, the Chessie System provided service on two runs in each direction between Milwaukee and Ludington, Michigan.

Quantity of Interregional Passenger Travel: The survey findings indicate that 2,873 passengers were carried on these surveyed runs. Of these, 560, or an average of about 62 passengers per run, were carried on the nine AMTRAK rail runs; 267, or an average of about 22 passengers per run, were carried on the 12 commuter rail runs; 1,297, or an average of about 18 passengers per run, were carried on the 72 motor bus runs; and 749, or an average of about 187 passengers per run, were carried on the four car ferry runs. The number and percent of passengers returning completed questionnaires in the survey were: for AMTRAK rail, 325, or 58 percent; commuter rail, 132, or 49 percent; motor bus, 299, or 23 percent; and car ferry, 162, or 22 percent.

A high degree of reciprocity exists in virtually all person travel. Thus, while many trips are directly reciprocal between two given points and many other trips are triangular or circuitous, relatively few trips are nonreciprocal.

By assuming reciprocity of all internal-external passenger trips originating within the Region, and by adding the sum of the reciprocated internal-external passenger trips to the sum of through passenger trips for each mode, it is estimated that a total of 4,408 interregional passenger trips were made on an average weekday by these four modes. Of these, 856, or 19 percent, were carried by AMTRAK rail; 532, or 12 percent, by commuter rail; 2,271, or 52 percent, by motor bus; and 749, or 17 percent, by car ferry.

Round Trips: Of respondents returning completed questionnaires, the proportion of interregional passenger trips made as part of a round trip ranged from 84 percent for motor bus to 97 percent for commuter rail. Only 7 percent of the car ferry passengers made a round trip by that mode. The last instance is explained by the fact that the ferry trips across Lake Michigan were largely social-recreational in nature, consisting particularly of families on vacation. For most, the trip represented an uncommon and diverting experience. Nearly all families had an auto aboard the ferry, and after debarking continued to their destination by auto and returned via a land route (see Table 155).

Frequency of Trip: In response to a question about the frequency with which the trip was made, a high degree of repetitiveness was found only in commuter rail travel, in which 67 percent of the passengers indicated the trip was usually made five or more times per week, compared to 8 percent for AMTRAK passengers, 1 percent for motor bus passengers, and 0 percent for car ferry passengers. It was also found that 79 percent of AMTRAK passengers, 87 percent of motor bus passengers, 100 percent of car ferry passengers, and only 14 percent of commuter rail passengers usually made less than one trip per week (see Table 156).

Trip Purpose by Carrier Type: Assuming reciprocity in travel, the purposes for which common carriers are utilized are best represented by reciprocated travel data as shown in Table 157. This distribution by trip purpose reflects some of the differences in the characteristics of travel by the four carrier types. For example, there was a greater diversity of trip purposes for motor bus and AMTRAK rail passengers than for commuter rail and car ferry passengers. Trips to home accounted for 49 percent of commuter rail travel, 42 percent of AMTRAK rail and motor bus travel, and 32 percent of travel by car ferry. Of trips for purposes other than to travel home, motor bus passengers made the trip primarily to attend social-recreational activities, attend school, go to work or for work-related business, or

Table 155

NUMBER OF INTERREGIONAL PASSENGERS AND PERCENT OF ROUND TRIPS ON AN AVERAGE WEEKDAY BY CARRIER TYPE: 1972

Carrier Type	Number of Passengers	Percent Making Round Trip		
		Yes	No	Total
AMTRAK Rail . . .	560	91.6	8.4	100.0
Motor Bus	1,297	84.2	15.8	100.0
Commuter Rail . . .	267	96.9	3.1	100.0
Car Ferry.	749	7.2	92.8	100.0

Source: SEWRPC.

for personal business. AMTRAK rail passengers made the trip primarily to go to work or for work related business, to attend social-recreational activities, or for personal business; commuter rail passenger trips were made primarily to go to work or for work related business; and car ferry travel was primarily for social-recreational purposes.

Mode of Travel Prior to Boarding and Upon Leaving the Carrier: The mode of travel used to reach or depart from the passenger train, motor bus, or car ferry also emphasizes the differences in travel characteristics among the four carrier types. Travel to and from the car ferry consisted principally of automobile drivers and passengers, as would be expected. Commuter rail attracted the largest percentage of passengers—56 percent—to the boarding locations as auto drivers while having the smallest percentage of passengers—3 percent—continuing to their destinations as auto drivers, and the highest percentage (49 percent) walking or using the bus (30 percent).

Automobile passenger was the mode most frequently used to reach the boarding location for AMTRAK (35 percent), followed by automobile driver (27 percent) and taxi passenger (17 percent). The most frequently used modes upon leaving the train were taxi passenger (29 percent), auto passenger (20 percent), and passenger on another train (14 percent). The modes commonly used to reach the boarding locations for motor bus trips were automobile passenger (29 percent) and bus passenger (22 percent). The modes most frequently used after leaving the motor bus were also automobile passenger (27 percent) and bus passenger (25 percent) (see Table 158).

Locations of Ultimate Destinations: The locations of the ultimate destinations of passengers responding to the survey were: for AMTRAK, 10 counties in Wisconsin and 22 other states, the District of Columbia, and Canada; for

Table 156

PERCENTAGE DISTRIBUTION OF FREQUENCY OF INTERREGIONAL TRIPMAKING BY CARRIER TYPE: 1972

Frequency of Travel	Carrier Type			
	AMTRAK Rail	Motor Bus	Commuter Rail	Car Ferry
Less than Once a Month	65.5	59.9	9.5	98.9
Once a Month	5.2	11.6	2.0	1.1
Twice a Month	6.7	12.5	2.6	--
Three Times a Month	1.6	3.1	--	--
Once a Week	4.5	7.0	1.5	--
Twice a Week	5.5	2.3	5.1	--
Three Times a Week	0.9	1.8	3.6	--
Four Times a Week	1.8	0.6	8.9	--
Five Times a Week or More	8.3	1.2	66.8	--
Total	100.0	100.0	100.0	100.0

Source: SEWRPC.

Table 157

PERCENTAGE DISTRIBUTION OF RECIPROCATED INTERREGIONAL PASSENGER TRAVEL BY CARRIER TYPE: 1972

Trip Purpose	Carrier Type			
	AMTRAK Rail	Motor Bus	Commuter Rail	Car Ferry
Home	42.0	42.3	48.8	32.5
Work or Work Related	28.3	11.5	43.2	--
Personal Business	8.0	11.0	2.4	1.9
School	3.3	12.1	2.4	0.6
Social-Recreation	13.8	19.1	1.0	65.0
Shopping	1.8	1.3	2.2	--
Overnight Accommodations	2.8	2.7	--	--
Total	100.0	100.0	100.0	100.0

Source: SEWRPC.

Table 158

PERCENTAGE DISTRIBUTION OF MODE OF TRAVEL OF INTERREGIONAL PASSENGERS PRIOR TO BOARDING AND UPON LEAVING THE CARRIER BY CARRIER TYPE: 1972

Carrier Type	Boarding or Leaving	Mode of Travel							
		Auto Driver	Auto Passenger	Train	Bus	Taxi	Walking	Other	Total
AMTRAK Rail	Boarding	27.1	35.2	6.7	8.1	16.6	4.9	1.4	100.0
	Leaving	12.5	20.5	13.7	9.9	28.9	11.6	2.9	100.0
Motor Bus	Boarding	16.5	29.0	2.2	22.5	8.7	18.5	2.6	100.0
	Leaving	10.6	27.1	1.1	24.8	9.8	18.3	8.3	100.0
Commuter Rail	Boarding	55.7	19.0	--	1.9	2.5	20.3	0.6	100.0
	Leaving	3.0	4.1	2.3	29.7	9.4	48.9	2.6	100.0
Car Ferry	Boarding	39.0	57.7	--	--	2.8	0.5	--	100.0
	Leaving	40.4	57.8	--	--	1.2	0.6	--	100.0

Source: SEWRPC.

motor bus, 31 counties in Wisconsin, 22 other states and the District of Columbia, Canada, Mexico, and even Europe and Africa; and for car ferry, five counties in Wisconsin, eight other states and the District of Columbia, and Canada. The ultimate destinations of commuter rail passengers were all in the State of Illinois, 86 percent of which were in Cook County. Of total interregional trips by motor bus, rail, and car ferry, 2 percent had ultimate destinations in other countries, 71 percent in other states and the District of Columbia, and 27 percent in Wisconsin.

Automobile Availability and Licensed Driver Status: As would be expected, automobile availability shown as a percent of households owning one or more autos was much higher for car ferry passenger households (99 percent) than the regional average of 83 percent. AMTRAK rail and commuter rail passenger households were also higher, with 87 percent of the passengers in both cases being members of households with one or more automobiles available. In contrast, automobile availability to motor bus passengers was lower than the regional average, with 76 percent of motor bus passengers being members of households with one or more autos (see Table 159). In all cases, the percentage of passengers with a license to drive was higher than the regional average of 52 percent, due in part to the smaller percentages of children traveling by these modes. About 91 percent of the commuter rail passengers, 85 percent of the AMTRAK passengers, and 75 percent each of the motor bus and car ferry passengers were licensed drivers (see Table 160).

Choice Ridership by Bus and Rail Passengers: As also shown in Table 160, a majority of the passengers on the commuter rail and AMTRAK runs—73 percent and 66 percent, respectively—and 44 percent of the passengers on the motor bus runs were choice riders. The 1,135 AMTRAK commuter rail and motor bus passengers identified as choice riders recorded a total of 1,958 responses relating to reasons for using the bus or train instead of making the trip by automobile. Traveling by bus or train was described as more convenient than traveling as an auto driver in 51 percent of the responses. About 17 percent of the respondents indicated that the bus or train was used because the passengers enjoyed the opportunity to relax and either read, sleep, or sightsee, and 16 percent indicated that the bus or train was used because it was less expensive than the automobile. Bus or train travel was considered safer in 5 percent of the responses, and 6 percent of the responses indicated that the distance was considered too far to drive. Another 6 percent were miscellaneous comments (see Figure 84).

Mass Transit User Survey

The Commission conducted special one-day surveys of mass transit passengers on the four major mass transit systems operating in the urbanized areas of the Region—the Milwaukee, Racine, Kenosha, and Waukesha urban transit systems, and on one suburban mass transit system—the Waukesha-Milwaukee system. There were two principal purposes of these surveys: to measure the relative effectiveness and convenience of each system by comparing the desired lines of bus travel with the actual lines of travel taken by the buses, and to discover

Table 159

PERCENTAGE DISTRIBUTION OF INTERREGIONAL BUS AND RAIL PASSENGERS BY NUMBER OF AUTOMOBILES AT HOUSEHOLD: 1972

Carrier Type	Number of Automobiles			
	0	1	2 or More	Total
AMTRAK Rail . . .	12.6	46.2	41.2	100.0
Motor Bus	24.2	36.2	39.6	100.0
Commuter Rail . . .	13.4	45.7	40.9	100.0
Car Ferry.	1.1	29.0	69.9	100.0

Source: SEWRPC.

Table 160

PERCENTAGE DISTRIBUTION OF INTERREGIONAL BUS AND RAIL PASSENGERS BY LICENSED DRIVER AND CHOICE RIDERSHIP STATUS: 1972

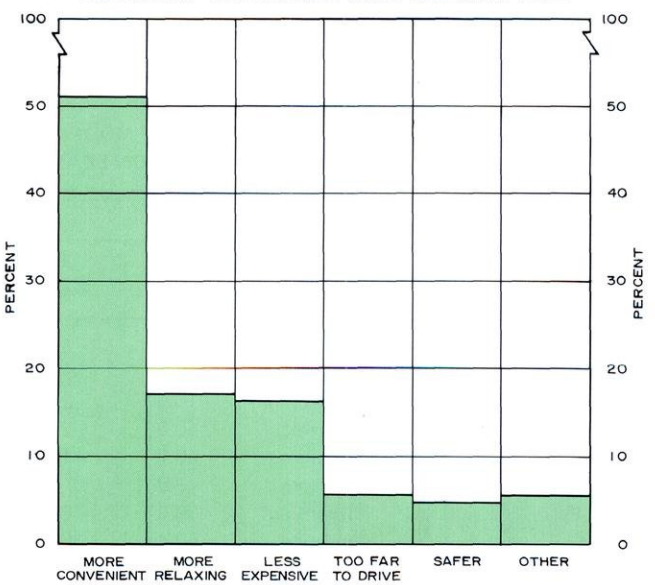
Carrier Type	Bus and Rail Passengers	
	Licensed To Drive	Could Have Made Trip as Driver
AMTRAK Rail	85.0	65.6
Motor Bus	74.8	44.2
Commuter Rail	90.7	72.9
Car Ferry.	74.6	N/A[a]

[a] *Data are not available.*

Source: SEWRPC.

Figure 84

PERCENTAGE DISTRIBUTION OF REASONS BY INTERREGIONAL PASSENGERS FOR CHOICE RIDERSHIP ON BUS AND RAIL SERVICE: 1972



Source: SEWRPC.

the personal characteristics and attitudes of certain bus passengers which led to bus use by choice.

In the conduct of the survey, a prepaid, preaddressed mailback questionnaire was distributed to each bus rider on the Racine, Kenosha, and Waukesha transit systems. Because of the large number of bus passengers involved, and the high degree of reciprocity which exists in internal bus travel, questionnaires were distributed on the Milwaukee and Waukesha-Milwaukee systems in one direction only. The number of questionnaires distributed and the number and percent returned were: on the Milwaukee system, 122,655 distributed, 38,438 returned, or 31 percent; on the Racine system, 2,240 distributed, 1,088 returned, or 49 percent; on the Kenosha system, 1,385 distributed, 670 returned, or 48 percent; on the Waukesha system, 135 distributed, 49 returned, or 36 percent; and on the Milwaukee-Waukesha system, 332 distributed, 185 returned, or 58 percent.

To permit the sample data to be expanded to represent total weekday ridership on each of the five systems, the number of passengers boarding each bus was recorded within a maximum of four segments of each trip on each run of each route. An expansion factor was then determined by dividing the number of boarding passengers by the number of passengers returning completed questionnaires. An adjustment was made for passengers who transferred. In the expansion of these data, all revenue passengers were accounted for by this procedure on the Racine, Kenosha, and Waukesha systems, since these surveys were conducted in both directions. To account for all revenue passengers on the Milwaukee and Waukesha-Milwaukee systems, however, it was necessary to further expand the data by assuming reciprocation of the original trips, since the survey was conducted on those systems in one direction only. The survey findings indicate that on the respective data of each survey, approximately 198,900 passengers were carried on the Milwaukee system; 2,200 on the Racine system; 1,400 on the Kenosha system; 140 on the Waukesha system; and 660 on the Waukesha-Milwaukee system.

Table 161 indicates that, outside of trips to home, trips to work constituted the major portion of bus passenger travel on each of the five systems, ranging from 19 percent on the Kenosha system to 38 percent on the Waukesha-Milwaukee system. Trips to school, for shopping, and for conducting personal business were next in importance. Trips for all other purposes, including social-recreation, represented less than 10 percent of the bus passenger travel on each system.

Table 162 presents the distribution of bus passenger travel on the five transit systems as reported in the survey by age, sex, race, and household annual income. This table indicates that:

- Approximately one-half of total bus passenger trips on the Milwaukee, Racine, Kenosha, and Waukesha systems were made by persons under 35 years of age, compared to approximately one-third on the Waukesha-Milwaukee system.

Table 161

PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY BUS PASSENGER TRIPS IN THE REGION BY TRIP PURPOSE AND TRANSIT SYSTEM: 1972

Trip Purpose	Transit System				
	Milwaukee	Racine	Kenosha[a]	Waukesha-Milwaukee	Waukesha[a]
Home	46.7	39.3	39.2	48.5	46.8
Work	30.8	29.0	18.7	37.5	25.7
School	9.8	9.9	14.7	3.6	11.4
Shopping	4.2	9.0	11.2	5.8	4.8
Social-Recreation	2.0	2.5	2.3	0.9	--
Personal Business	3.3	3.4	7.4	2.9	6.9
Other	3.2	6.9	6.5	0.8	4.4
Total	100.0	100.0	100.0	100.0	100.0

[a] *Excludes school "trippers," or bus runs designed to accommodate school aged children.*

Source: SEWRPC.

Table 162

PERCENTAGE DISTRIBUTION OF AVERAGE WEEKDAY BUS PASSENGER TRAVEL IN THE REGION BY TRANSIT SYSTEM AND SELECTED CHARACTERISTICS OF TRANSIT USERS: 1972

Selected Characteristic	Percent of Trips by Transit System				
	Milwaukee	Racine	Kenosha	Waukesha-Milwaukee	Waukesha
Sex					
Male	27.7	20.1	29.1	38.2	7.7
Female	72.3	79.9	70.9	61.8	92.3
Total	100.0	100.0	100.0	100.0	100.0
Age					
1-15	7.2	10.5	11.2	--	4.0
16-24	31.8	29.8	35.7	20.6	43.0
25-34	12.4	8.9	4.9	11.2	2.9
35-44	10.4	6.9	3.4	17.4	10.0
45-54	15.9	15.7	13.4	19.2	18.1
55-64	15.0	14.6	11.3	24.1	11.7
65 or older	7.3	13.6	20.1	7.5	10.3
Total	100.0	100.0	100.0	100.0	100.0
Income					
Under $4,000	20.3	26.8	25.4	6.6	7.6
$4,000-7,999	29.7	27.9	28.6	18.3	21.0
8,000-11,999	26.9	23.3	19.9	26.8	42.3
12,000-14,999	12.3	11.0	14.6	19.9	12.9
15,000-19,999	7.0	7.3	6.3	21.6	15.2
20,000-24,999	2.4	2.2	2.5	3.9	--
25,000 or Over	1.4	1.5	2.7	2.9	1.0
Total	100.0	100.0	100.0	100.0	100.0
Race					
Black	12.3	8.8	2.4	--	--
White	85.3	87.6	96.0	97.5	93.5
Other	2.4	3.6	1.6	2.5	6.5
Total	100.0	100.0	100.0	100.0	100.0

Source: SEWRPC.

- The largest portion of bus passenger trips were made by passengers 16 through 24 years of age except on the Waukesha-Milwaukee system, where passengers 55 years through 64 years of age made the greatest portion of the trips.

- Female passengers made the majority of trips on all systems, ranging from 62 percent on the Waukesha-Milwaukee system to 92 percent on the Waukesha system.

- White passengers produced the large majority of trips on all systems, ranging from 85 percent on the Milwaukee system to 98 percent on the Waukesha-Milwaukee system. Black passengers made about 12 percent of the trips on the Milwaukee system, 9 percent on the Racine system, 3 percent on the Kenosha system, and 0 percent on the Waukesha and Waukesha-Milwaukee systems. Other races equaled about 7 percent or less on each system.

- Passengers with a household annual income of less than $8,000 accounted for about half of total passenger trips on the Milwaukee, Racine, and Kenosha systems, but accounted for only 29 percent on the Waukesha system and 25 percent on the Waukesha-Milwaukee system.

The total data obtained in this survey are judged to be representative of daily urban and suburban transit tripmaking and of transit tripmakers. The data can be used in comparing present routing with user desire lines for consideration in the provision of improved transit service as an element of the short-range transit development programs being prepared in each urbanized area of the Region; in development of the regional travel modal split model for the simulation of future travel conditions, and in calibrating transit system networks preparatory to alternative system development.

Choice Rider Subsurvey: As part of the mass transit user survey, a choice rider subsurvey was conducted to determine the characteristics and preferences of mass transit passengers who had the choice of making the same trip as an auto driver. The sample was selected from respondents to the mass transit survey who replied affirmatively to the question, "Could you have made this trip as an auto driver?" Of the 2,000 samples selected, 1,958, or 98 percent, were completed. The remaining questionnaires were not completed due to a lack of confirmation that the respondent was a choice rider, inability to contact the respondent, and a small number of refusals to respond. The data obtained from the choice rider subsurvey concerned certain personal and household socioeconomic characteristic data, the frequency and purposes of choice mass transit travel, why mass transit service was utilized when an automobile was available for the trip, and how choice mass transit travel could best be improved.

About 96 percent of the choice riders sampled in the mass transit user survey were riders on the Milwaukee transit system. The Waukesha system accounted for 2 percent and the Racine and Kenosha systems for about 1 percent each. The choice riders on the latter three systems comprised virtually all such riders found in the survey on these systems. The limited number of bus passengers who were choice riders on the three smaller systems does not permit meaningful data comparisons among the transit systems because of the high degree of sampling variability inherent in the smaller systems.

Socioeconomic Characteristics: Responses to the socioeconomic portion of the survey indicated certain personal characteristics of choice riders and choice rider households in addition to those inherent in the definition of a choice rider, namely: 1) the choice rider must be a licensed automobile driver, and 2) the choice rider must have had an automobile available for use at the time the mass transit trip was made. By household size, choice rider households contained an average of 3.4 persons five years of age or older. However, as shown in Table 163, more than 60 percent of total choice rider households consisted of three persons or less five years of age and older.

Table 163

PERCENTAGE DISTRIBUTION OF CHOICE MASS TRANSIT RIDER HOUSEHOLDS IN THE REGION BY SELECTED CHARACTERISTICS 1972

Selected Characteristic	Percent of Total Households
Persons Per Household (5 Years and Over)	
1	5.4
2	34.8
3	20.6
4	17.7
5 or More	21.5
Total	100.0
Licensed Drivers Per Household	
1	17.2
2	50.5
3	20.0
4	9.0
5 or More	3.3
Total	100.0
Automobiles Per Household	
1	60.1
2	31.6
3	6.7
4	1.3
5 or More	0.3
Total	100.0

Source: SEWRPC.

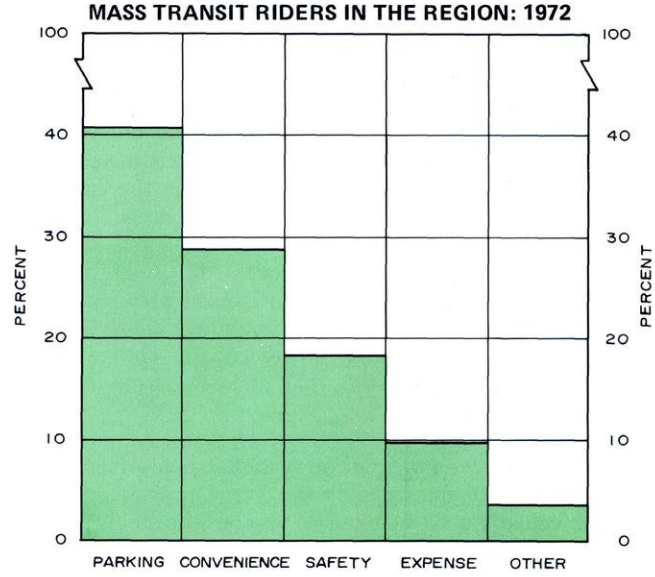
As also shown in Table 163, nearly 83 percent of choice rider households had two or more licensed automobile drivers, and nearly 40 percent had two or more automobiles available. By occupation, 39 percent of the choice riders were clerical and kindred workers, followed by professional, technical, and kindred workers (22 percent), managers and administrators, except farm (13 percent), craftsmen, foremen, and kindred workers (9 percent), service workers other than in private households (6 percent), operatives, including transportation equipment operators (5 percent), salesworkers (4 percent), laborers other than farm workers, (2 percent), and private household workers (less than one-half of 1 percent).

Purposes and Frequency of Choice Mass Transit Ridership: Traveling to work was the most frequent purpose (77 percent) for which mass transit was used by choice riders, followed by trips for shopping and personal business (8 percent each), and trips to school (5 percent). All other purposes equaled 2 percent or less of the total each. Of total choice riders, 68 percent usually utilized the bus five days a week, a figure heavily weighted by those choice riders who were traveling to work or school. On the other hand, choice riders making transit trips for work-related business generally utilized mass transit only one or two days a week. The majority of trips for all other purposes were usually made only once a week (see Table 164).

Choice Rider Attitudes Toward Mass Transit Travel: All but 1 percent of total choice riders gave one or more reasons for using the bus instead of an automobile on the survey day. As indicated in Figure 85, a perceived parking problem, such as the cost of parking, difficulty in finding parking space, or excessive walking distance from the parked automobile to the ultimate destination, was the major reason—40 percent of total replies—for using the bus instead of the auto. The convenience of bus travel was cited in 28 percent of the replies, which gave reasons such as the close proximity of bus stops to place of work and residence, and the opportunity of making the auto available for use by other family members. The safety of bus travel was cited in 18 percent of the replies, indicating a desire to be free from the tensions of auto driving, especially in

Figure 85

PERCENTAGE DISTRIBUTION OF REASONS FOR OPTIONAL USE OF BUS SERVICE BY CHOICE MASS TRANSIT RIDERS IN THE REGION: 1972



Source: SEWRPC.

Table 164

PERCENTAGE DISTRIBUTION OF TRIP PURPOSE OF CHOICE MASS TRANSIT RIDERS IN THE REGION BY FREQUENCY OF TRANSIT TRAVEL: 1972

Trip Purpose	Number of Days Per Week Bus Service is Used[a]								Percent of Total Responses
	1	2	3	4	5	6	7	Total	
Work	1.2	1.7	5.7	4.6	84.2	2.2	0.4	100.0	76.9
Work Related Business	27.2	36.4	18.2	0.0	18.2	0.0	0.0	100.0	0.5
Personal Business	60.9	22.5	8.3	1.2	3.5	1.8	1.8	100.0	7.6
School	5.9	5.0	11.8	5.0	67.3	5.0	0.0	100.0	4.6
Social	57.9	18.4	15.8	2.6	5.3	0.0	0.0	100.0	1.7
Shopping	63.1	24.6	9.4	1.2	1.7	0.0	0.0	100.0	7.8
Recreation	63.1	21.1	10.5	0.0	5.3	0.0	0.0	100.0	0.9
Total	12.5	5.9	6.8	4.0	68.4	2.0	0.4	100.0	100.0

[a] *Percent of all days for corresponding trip purpose.*

Source: SEWRPC.

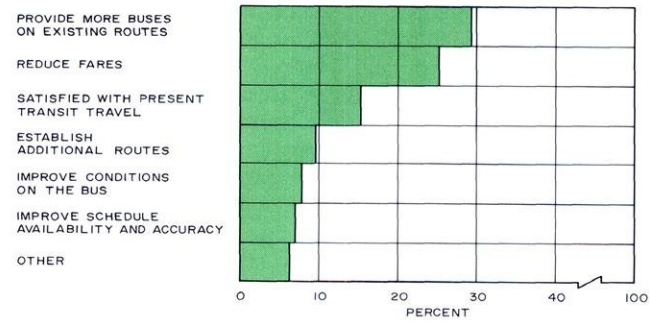
heavy traffic, and a belief that personal safety was greater in a bus than in an auto in case of accident. Approximately 10 percent of the replies indicated that bus travel was less expensive than auto travel, taking into consideration the cost of auto insurance, the general wear on the automobile, and that travel by bus obviated the need, in some instances, for a second or third auto.

Of total choice riders, 83 percent offered one or more comments or recommendations relating to means of improving bus travel. The most common recommendation (29 percent) was the provision of more buses on existing routes, including buses in both peak and nonpeak periods of weekday travel, in adverse weather, and in weekend travel. The second most common recommendation, made by 25 percent, was that bus fares be reduced, including suggestions for lower fares for all bus riders or for senior citizens. Approximately 15 percent of the comments indicated satisfaction with the existing service, and indicated in some cases a desire that the existing service levels be maintained. About 10 percent of the comments recommended provision of new bus service, including express buses on city streets, additional freeway flyer routes in the Milwaukee urbanized area, and the extension of bus service to areas not conveniently served by existing routes. Nearly 8 percent of choice rider recommendations suggested that conditions on the bus be improved.

One frequent recommendation was that bus drivers wait for persons hurrying to catch the bus. Other recommendations called for cleaner buses, air conditioning, and the elimination of rowdyism on buses. About 7 percent recommended that buses be kept on advertised time schedules, particularly at transfer points, and that printed schedules be posted at bus stops and be available from bus drivers. About 6 percent commented that the bus operation either be acquired or subsidized by a unit of government; additional bus stops be established on certain routes; smaller buses be used; or that transfer slips be accepted at any stop rather than restricted to points of intersecting bus routes (see Figure 86).

Figure 86

PERCENTAGE DISTRIBUTION OF COMMENTS AND SUGGESTIONS FOR IMPROVING TRANSIT TRAVEL BY CHOICE MASS TRANSIT RIDERS IN THE REGION: 1972



Source: SEWRPC.

Mass Transit Nonuser Survey

As part of the 1972 regional inventory of travel, a special mass transit nonuser survey was conducted in six relatively small residential areas. The areas were specifically selected to represent both older sections of the Region in which mass transit service had been maintained at a relatively high level but transit use had declined substantially, and newer sections of the Region where transit use had not met expectations despite extension of transit service to these developing areas. The principal reasons for conducting the nonuser survey were threefold: 1) the identification of reasons why residents have reduced the amount of transit travel or do not travel at all by transit on a regular basis; 2) the identification of the kinds of changes required in transit system operations to induce residents to begin, resume, or increase their travel by mass transit on a regular basis; and 3) the determination of the differences in survey findings resulting from the use of varying sample rates, ranging from 3 percent to 33 percent.

In the conduct of the nonuser survey, approximately one of three households in each of the six areas was randomly selected for personal interview, resulting in a total sample of 2,205 households. Of these 2,205 households, 1,827, or 83 percent, provided the information necessary to the survey. These 1,827 households were considered to represent the approximately 7,328 total households residing within the combined six areas.

Attitudes Toward Bus Travel: In the portion of the mass transit nonuser survey which deals directly with the attitudes of heads of households toward bus travel and with the characteristics of the bus trips they made, the following are the salient findings:

- Only 13 percent of the total heads of households responding indicated that they rode the bus on a regular basis.
- About 93 percent of those using the bus on a regular basis indicated that they expected to continue to use the bus regularly.
- The most common purposes of bus trips made by heads of households who rode the bus regularly, other than trips made to home, included trips to work (37 percent), to personal business (24 percent), and to shop (22 percent). Less common purposes included trips for social-recreational purposes (13 percent), and to attend school (4 percent).
- Reasons given by heads of responding households for choosing the bus over other means of travel included the lack of any alternative means of travel, including the unavailability of an automobile at the time the trip was made (80 percent), the greater convenience of bus over automobile travel, especially in the freedom from tensions of auto driving and from the problems of auto parking (13 percent), and the lesser cost of bus than automobile travel (7 percent).

- Of the total heads of households who were not using the bus on a regular basis at the time of the survey, nearly 85 percent indicated that they had not used it on such a basis at any time in the past. Of those who had used it in the past but not at the present, 27 percent indicated they had discontinued bus ridership on a regular basis within the past 12 months, 34 percent had discontinued riding from one to five years in the past, and 39 percent had discontinued riding for five years or longer in the past.

- The most common reasons given for discontinuing bus ridership on a regular basis were the acquisition of an automobile (40 percent), and the lack of need for daily bus service through, for example, retirement from work or because of ill health (26 percent). Less common reasons were that travel was more convenient by auto than by bus (12 percent), that existing bus service was inadequate (10 percent), the preference for riding in a car pool or as an auto passenger with friends or relatives (5 percent), the general dislike of riding a bus (3 percent), the high cost of fares (2 percent), the lesser safety of bus than of auto travel (1 percent), and miscellaneous reasons (1 percent).

- With respect to the conditions under which respondents not presently using the bus on a regular basis would begin or resume using the bus on such a basis, 39 percent indicated they would not consider doing so under any conditions; 27 percent would not do so unless an automobile was not available or if they had no other choice; 21 percent would do so if bus service were improved; 7 percent would do so if bus fares were reduced or if the cost of bus use was less than that of auto driving; 3 percent could not do so because of the impracticality of bus travel for the kinds of trips they made; and 3 percent would do so for a variety of reasons, including the conditions of obtaining employment or a change in place of employment which would necessitate travel by bus.

These replies clearly indicate the difficult problems involved in any attempt to induce new or past riders to begin or resume travel by bus. Nearly four of five riders in this survey had no other choice; more than four of five heads of households do not and never have used the bus on a regular basis; more than two of three who used the bus regularly in the past discontinued riding either because they had obtained access to an automobile or because they no longer had need for bus travel; and nearly three of five would not consider using the bus at all, or would not consider it unless an automobile was unavailable.

Of the replies favorable to bus usage, about one in five heads of households not presently riding the bus would do so if bus service were improved, and one in 14 would do so if bus fares or the costs of bus use were less than that of the automobile. It would appear it is to the last two issues that efforts to promote transit could be addressed.

Effects of Differing Sample Rates on Travel Data: As part of the mass transit nonuser survey, a home interview survey, which included personal and household socioeconomic data and detailed trip information, was also conducted at an approximately 30 percent sample rate in each of the six areas in order to provide data sufficient for examination of the variations resulting from application of differing sample rates. The samples obtained in the survey were utilized as the basis of random selections to obtain the equivalent of 20 percent, 10 percent, 5 percent, and 3 percent sample rates for each of the six areas. Data in each of these sample rate groups were independently expanded and summarized.

In each of the six areas, the differing sample rates obtained similar socioeconomic data for both household and population characteristics. Comparisons of tripmaking data obtained at differing sample rates indicated that within each test area the trip volumes, modal choice, and trip purposes remained substantially similar, although greater variations in these travel aspects are observed as the sample rate declined. Only in terms of the location and density of trip destinations did substantial differences result from the application of differing sample rates. In each of the six areas, the number of destination zones receiving internal person travel was less at the 3 percent sample rate by more than 50 percent of the number of such zones indicated by data resulting from a 30 percent sample rate. This finding simply underscores the necessity of the modeling process in order to assure responsible and accurate advanced transportation planning.

Major Traffic Generator Survey

A special major traffic generator survey was undertaken as part of the 1972 inventory of travel to obtain detailed information concerning the travel habits and patterns of employees or students at major commercial, industrial, and institutional centers within the Region. The purpose of the survey was to determine whether the home addresses of employees of a given firm or students of a given school were sufficiently concentrated by small area or along a route to warrant consideration of the provision of direct mass transit service or the establishment of car pooling service to and from work or school.

In this survey, 45 major commercial, industrial, and institutional firms and agencies located in 12 large employment areas were asked to provide complete rosters of employee or student home addresses and the time patterns of arrival and departure to and from work or school. Of the 45 firms and agencies, 29 firms and one university, or 60 percent of the total, provided the requested information, representing approximately 73,500 employees and students.

The first practical use of the survey data occurred in June 1973, when the University of Wisconsin-Milwaukee and the Milwaukee and Suburban Transport Corporation agreed to initiate direct bus service on a single route

beginning with the start of the university fall term. The success of that service in terms of ridership resulted in the initiation of direct service on three additional routes in 1974.

Subsequently, the management of the major mass transit firms in the Region have used the survey data in considering changes in routing and scheduling of transit service to better adapt it to the needs of the areas, thereby encouraging transit use.

These data also provide an important tool to the Commission in the conduct of future transit development planning, particularly in adapting the rapid transit or modified rapid transit systems to reverse and crosstown commuting patterns, and will permit an examination of the feasibility of operating transit vehicles directly between various areas of the Region on a nontransfer basis.

Personal Opinion Survey Findings[10]

As part of the 1972 home interview survey, a special survey was conducted to obtain the opinions, preferences, and attitudes of heads of households or spouses relating to the various aspects of transportation, housing, and recreation. Personal opinion questionnaires were distributed within the Region to approximately 15,400 households. Approximately 6,800 completed questionnaires, or about 44 percent, were returned. The salient findings of this survey are shown below and where possible, are compared with the findings of a similar, although less comprehensive, personal opinion survey conducted as part of the 1963 home interview survey.

One highly important finding of the 1972 survey concerned the pattern of new residential development which would result if the expressed preferences of respondents were exercised with respect to place of residence. Specifically, this pattern would be one of urban sprawl—a pattern experienced within the Region over the last decade. For example, while less than 19 percent of the households in 1972 resided in rural-suburban or rural areas, 39 percent indicated a preference to do so. The proportion of households willing to occupy a residence not connected to a public sanitary system was more than double the proportion who occupied such residences in 1972, and the proportion of households willing to occupy a residence not connected to a public water supply was double the proportion who occupied such residences in 1972. The implications these preferences have for decentralization of residential land use for the adopted SEWRPC regional land use plans are significant, and must be carefully considered in the regional land use plan reevaluation efforts.

Another important finding related to respondent opinion concerning continued freeway construction in the Region. In the survey, the respondent was asked to answer "yes" or "no" to five statements which, taken together, would provide the respondent's complete statement concerning the issue. The five statements listed in the survey questionnaire were: complete freeways now started, construct certain planned freeways but not other planned freeways, complete construction of the planned freeway system, expand the planned freeway system, and stop constructing freeways. The results of the survey indicate that although mixed opinions were expressed concerning the completion and/or expansion of the planned regional freeway system, the majority of respondents were in favor of continued freeway construction to some degree within the Region.[11]

In another finding, a shift was found in public opinion from 1963 to 1972 concerning how personal daily travel might best be improved. In the 1963 survey, the preferences were for the provision of additional high-speed highway facilities such as freeways and expressways, for improved arterial streets and highways, and for improved and increased mass transit facilities and services, in that order of importance. By 1972, with an effective freeway system in operation, the emphasis shifted to the improvement and increase in mass transit facilities and services and to the improvement of residential and arterial streets and highways.

In another finding, replies to the question of whether fares should be reduced for certain specific types of public transportation riders indicated that the large majority of respondents favored reduced fares for elderly riders, for the physically handicapped, and for students. Support for reduced fares for all public transportation riders and for public transportation riders receiving welfare payments were narrowly favored in each instance. The findings in this item may be useful in any future consideration of subsidization of public transportation riders in the Region.

In another finding, 27 percent of the households believed that lack of public transportation between home and certain areas of the Region prevented or severely limited family members from accepting employment, reaching shopping areas of their choice, reaching recreational areas, conducting necessary personal business, and visiting friends or relatives. This finding points out the need for a detailed examination of the trip desires of respondents related to the public transportation service offered. The finding also supports the premises implied in the

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[10]*For a more detailed presentation of the findings of this survey, see SEWRPC Technical Report No. 13, A Survey of Public Opinion in Southeastern Wisconsin—1972.*

[11]*On November 5, 1974, Milwaukee County voters in a referendum vote endorsed completion of five planned freeway segments. The segments and the official votes were: the Airport Spur—yes, 115,636, no, 83,131, for 58 percent supporting construction; the Park Freeway West—yes, 105,748, no, 89,412, for 54 percent supporting construction; the Stadium Freeway South—yes, 116,083, no, 79,281, for 59 percent supporting construction; the Lake Freeway Loop—yes, 113,790, no, 81,861, for 58 percent supporting construction; and the Lake Freeway South—yes, 114,602, no, 80,770, for 59 percent supporting construction.*

SEWRPC adopted regional transportation development objectives of providing the appropriate type of transportation needed by the various subareas of the Region at an adequate level of service.

Weekend Travel Survey

A weekend travel survey, the first of its kind in the Region, was undertaken by the Commission as part of the 1972 regional inventory of travel. The principal purposes of this survey were to determine the characteristics of average daily weekend travel and the differences in such characteristics between average daily weekend and average daily weekday travel, and to determine the effect these differences may have on the demand for transportation facilities and services.

In this survey, trip log forms were mailed for completion and return to approximately 10,000 households or about 2 percent of total regional households, and to the owners or operators of approximately 3,700 trucks and taxis. These households and truck and taxi firms had responded to the 1972 personal interview surveys of weekday travel. In addition, manual classification and machine traffic volume counts were taken at selected stations along the Kenosha, Milwaukee, and Racine screenlines, and the cordon line along the regional boundaries for comparison with weekday counts at the same locations.

Information requested in the trip log for household travel included, for each trip, the geographic locations and land uses at origin and destination; the trip purpose at destination; the time of start and arrival; the mode of travel; the number of blocks walked at trip origin and destination; and for auto drivers only, the number of passengers carried, the cost, duration, location and type of parking, whether a freeway was used for any portion of a given trip, and whether the trip being made was a part of a carpool. Information requested in the trip log for trucks included, for each trip, the geographic location and land uses at trip destination; the trip purpose at destination; the time of start and arrival; the kind and weight of commodities carried; and certain characteristics concerning vehicles such as garaging address, vehicle type, carrier type, and mileage traversed, among others. Information requested in the trip logs for taxis included for each trip: the geographic location of posting, pick up and delivery; the time and land use at pick up and delivery; the number of passengers carried; whether a freeway was used for any portion of a given trip; and the number of miles traversed.

Approximately 1,400 completed trip logs were returned by mail in the weekend home interview survey, or 14 percent of those mailed to regional households. In the weekend truck survey, approximately 800 were returned, or 24 percent of those mailed to truck owners, a normal response rate for this type of survey. Nevertheless, in order to further improve the rate of return, a follow-up procedure was used to obtain additional completed samples through personal interviews by telephone. This follow-up procedure brought the total of completed household returns to 5,484, or 54 percent of households sampled, and completed truck returns to 1,018, or 27 percent of trucks sampled. Of 303 trip logs mailed to taxi owners or operators, 192 completed logs, or 63 percent, were returned.

The survey response, representing about a 1 percent sample of the Region households, was expanded to represent the universe from which it was drawn. Comparisons of the expanded survey data with the results of the Commission's weekday travel survey and with census data were then made to check the validity of the weekend survey. These checks indicated that the expanded weekend survey data provided estimates of the total regional population and of the number of automobiles available to households of the Region, which were within 5 percent of those provided by the weekday survey. With respect to population characteristics, the expanded weekend survey indicated that minority groups represented 6 percent of the total resident population of the Region, compared to 7 percent reported in the 1970 U. S. Census and 8 percent in the Commission weekday survey. Expanded weekend survey data resulted in a very slight overrepresentation of males in the regional population—48.7 percent in contrast to 48.3 percent found in both the 1970 U. S. Census and the Commission weekday surveys; and underestimation of the number of zero-auto households—12 percent of total households compared to 16 percent in the weekday survey; and a nearly corresponding overstatement of two-or-more-auto households—39 percent of total households compared to 34 percent in the weekday survey.

It was accordingly concluded that the expanded weekend sample provides a valid representation of many of the characteristics of the regional population. However, as may be expected from a small sample survey obtained via mail-back and telephone techniques, the variability of the expanded data at subregional levels is greater than the 5 percent difference observed at the regional level. For example, the overestimation of population and automobile availability was found to range from about 5 percent to about 20 percent by county.

Analyses of expanded trip data indicated that, although the geographic distribution of trip ends, the purposes of the trips, and the modes of travel appear reasonable when compared with weekday travel characteristics, the number of trips undertaken on the weekend days appeared to be substantially underreported. A comparison of screenline counts made during both the weekday and weekend surveys suggested that internal weekend travel is about 70 percent of weekday travel. Traffic count patterns obtained independently by the City of Milwaukee also indicated the same general reduction in weekend travel. However, expanded survey results indicated that total weekend person trips and total weekend vehicle trips were only 52 percent and 43 percent, respectively, of total weekday travel. Vehicle miles of internal travel undertaken by regional residents as reported in the weekend travel survey were also about 50 percent below that found on weekdays.

A comparison of expanded survey trips crossing the Milwaukee screenline with weekend screenline traffic counts revealed that the survey trip data accounted

for only about 40 percent of recorded screenline crossings. Further comparison of screenline count data and expanded survey results indicated an apparent geographic as well as hourly distribution bias in trips reported, suggesting a significant underreporting of certain kinds of trips which would make it inappropriate to apply a uniform factor to the weekend trips. Therefore, the survey findings reported herein are based upon analysis of expanded but unadjusted survey results, the results of the volume count program, and a comparison of both surveyed and volume count data with average weekday travel data.

Weekend Travel Survey Findings: Although the travel information obtained in the weekend travel survey is not thought to be fully representative of total travel occurring in the Region on the average weekend day, the weekend travel data do provide valuable insight previously lacking into the characteristics of weekend travel habits and patterns. Those elements of the survey data which are believed to be useful in describing weekend travel characteristics include the modes, the purposes, and the destination land uses of trips, the time patterns of travel, and the geographic distribution of the trip ends reported in the survey.

The weekend travel data are not strictly comparable to the weekday travel data for two reasons. First, whereas the weekday home interview survey data are considered to represent an average weekday despite seasonal differences, the weekend travel survey data represent summer weekend travel only. Since it had been determined from an analysis of traffic volumes reported by permanent recording count stations within and adjacent to the Region that the largest proportion of high traffic volume weekend hours consistently occurred during the summer months, the survey was conducted during summer weekends between July 4 and Labor Day in order to obtain the weekend travel characteristics that would prove most relevant to transportation system planning and facility design. It is believed that this procedure best facilitates determination of the degree of importance inherent in weekend travel data as a portion of the total travel to be served by transportation facilities and systems within the Region.

Second, the weekday travel data have been linked, whereas the weekend travel data have not. The impact of this difference on the following comparisons between weekday and weekend travel is believed to be negligible in most instances, since those trips which would require linking (i.e., trips for purposes of changing mode of travel or serving a passenger) represent only about 4 percent of the total person travel, and only about 5 percent of the total vehicle travel recorded in the weekend survey. For the purposes of this text, the average summer weekend day will be referred to as the "weekend" or "weekend day," while the average weekday will be referred to as the "weekday."

Modes of Weekend Vehicle Trips: The increased influence of automobile travel on total vehicle travel during the summer weekend is shown in Table 165. Whereas automobile trips represented 88 percent of total internal vehicle travel on the weekday, automobile trips represented 93 percent of total internal vehicle travel on the summer weekend. Truck travel represented only 6 percent of internal vehicle trips on the weekend as opposed to 11 percent on the weekday. The proportion of taxi trips to total vehicle trips—0.4 percent on the weekday—increased to 0.9 percent on the weekend. Table 165 also shows a significant change in the proportions of truck trips by type, characterized by a preponderance of truck trips (89 percent) made by light trucks on the weekend day in contrast to the nearly even distribution of trips by light and medium trucks on the weekday.

Table 165

PERCENTAGE DISTRIBUTION OF INTERNAL VEHICLE TRIPS IN THE REGION BY TYPE OF VEHICLE ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Vehicle Type	Internal Vehicle Trips	
	Average Weekday	Average Weekend Day
Auto Driver	88.3	93.4
Trucks (Percent of Total Trucks)		
Light	50.1	88.5
Medium	46.8	9.2
Heavy	3.1	2.3
Subtotal	11.3	5.7
Taxi	0.4	0.9
Total	100.0	100.0

Source: SEWRPC.

Modes of Weekend Person Travel: The finding that 98 percent of internal person travel made on the weekend day is made either as an auto driver or passenger emphasizes the importance of the automobile to summer weekend travel. Auto driver travel constituted 54 percent of weekend person travel compared to 64 percent of weekday person travel. In contrast, auto passenger trips were found to comprise 44 percent of weekend person travel compared to 27 percent of weekday person travel. Transit trips, which represented 4 percent of weekday person travel, made up slightly less than 2 percent of weekend person travel. The decline in transit travel was anticipated, since historically the volume of revenue passengers carried on the average weekend day has been considered to be about half of the revenue passengers carried on the average weekday (see Table 166).

Auto Occupancy: The increase on the weekend in automobile passenger travel as a percent of total internal person travel produced substantially higher auto occupancy rates than on the weekday for total travel and within each trip purpose category other than work, as shown in Table 167. Trips to conduct personal business,[12]

[12]*Trips for personal business include trips to change mode or serve passengers on the weekend travel survey only.*

such as receiving medical or dental care, completing financial transactions, and attending religious services, among others, showed an increase of 0.42 persons per auto; trips to home, an increase of 0.41 persons per auto; trips for social-recreational purposes, an increase of 0.35 persons per auto; and trips for shopping, an increase of 0.21 persons per auto. In total, average auto occupancy on the weekend was 1.83 persons per auto, compared to a weekday average auto occupancy of 1.43 persons per auto.

Purposes of Weekend Person Travel: The percentage distribution of person trips by trip purpose as shown in Table 168 reflects characteristic differences between the weekend and weekday. Trips to attend work and school declined substantially, and as would be expected, the proportion of trips made for social-recreational and personal business purposes increased substantially. The proportion of trips to shopping showed only a slight increase. Trips made to home represented somewhat more than 40 percent of total person travel on both the weekday and the weekend. Figure 87, which graphically presents weekend trip purposes by mode of travel, further emphasizes the differences between weekend and weekday travel. The decrease observed on the weekend in work and school trips which was accompanied by the notable increases in social-recreational and personal business trips was found to be prevalent not only for total travel, but also within each travel mode.

Purposes of Weekend Truck and Taxi Travel: Despite the striking increase in the proportion of light to total truck trips on the weekend, the percentage distributions of weekend truck trips by trip purpose remained generally similar to the distributions of weekday truck trip purposes. The only significant differences were an increase in the proportion of trips made for personal business from 10 percent on the weekday to 15 percent on the weekend, and a corresponding decline in trips made to pick up and/or deliver goods, from 62 percent on the weekday to 57 percent on the weekend (see Table 169).

The purposes of weekend taxi travel were to pick up and/or deliver passengers (98 percent of total taxi trips) and to return to the base of operations (2 percent). This

Table 166

PERCENTAGE DISTRIBUTION OF INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Mode of Travel	Internal Person Trips	
	Average Weekday	Average Weekend Day
Auto Driver	64.3	53.7
Auto Passenger	27.2	44.4
Mass Transit	4.1	1.5
School Bus	3.9	--
Other	0.5	0.4
Total	100.0	100.0

Source: SEWRPC.

Table 167

AVERAGE OCCUPANCY OF INTERNAL AUTOMOBILE TRIPS IN THE REGION BY SELECTED TRIP PURPOSE ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Auto Occupancy	Destination Trip Purpose					
	Work	Personal Business	Social-Recreation	Shopping	Home	Total Trips
Weekday	1.15	1.35	1.91	1.46	1.43	1.41
Weekend Day	1.16	1.77	2.26	1.67	1.84	1.83

Source: SEWRPC.

Table 168

PERCENTAGE DISTRIBUTION OF INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Trip Purpose	Internal Person Trips	
	Average Weekday	Average Weekend Day
Home	40.8	42.3
Work	16.4	5.0
Personal Business[a]	14.5	18.3
School	4.9	0.1
Social-Recreation	11.3	21.7
Shopping	12.1	12.6
Total	100.0	100.0

[a] *Includes trips to change mode of travel and to serve passengers.*

Source: SEWRPC.

Table 169

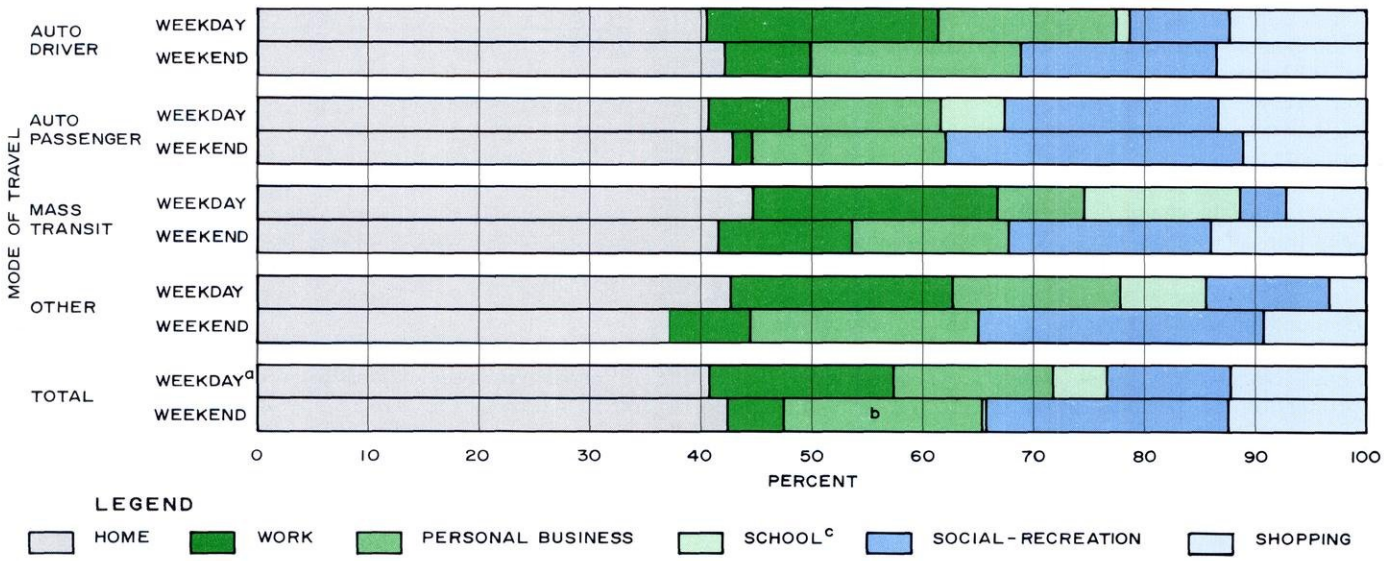
PERCENTAGE DISTRIBUTION OF INTERNAL TRUCK TRIPS IN THE REGION BY TRIP PURPOSE ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Trip Purpose	Internal Truck Trips	
	Average Weekday	Average Weekend Day
Pick Up and Deliver Goods	61.8	57.2
Work Connected Business	8.2	5.2
Base of Operations	15.1	16.6
Personal Business	9.6	15.2
Customer Service	5.3	5.8
Total	100.0	100.0

Source: SEWRPC.

Figure 87

PERCENTAGE DISTRIBUTION OF INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE BY MODE OF TRAVEL ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972



NOTE:

[a] The average weekday total includes trips made by school bus.

[b] Personal business on the average weekend day includes trips to change mode of travel and to serve passengers.

[c] On the average weekend day, trips for the purpose of attending school equal less than 0.1 percent within any given mode.

Source: SEWRPC.

distribution is very similar to the distribution of trip purpose of average weekday taxi trips, in which 96 percent of the trips were made to pick up and/or deliver passengers, 2 percent to return to the base of operations, and 2 percent for other purposes.

Land Use at Destination of Weekend Person Trips: In contrast to the average weekday, on the weekend a greater proportion of trips were made to residential and recreational areas and a smaller proportion of trips were made to all other major land use areas. Trips to residential land uses increased from 48 percent of internal person trip destinations on the weekday to 56 percent on the weekend, and trips to recreational and other land uses—the latter category including agricultural, open land, and water areas—increased from 2 percent on the weekday to 7 percent on the weekend. Showing significant declines were commercial land uses (28 percent on the weekday and 23 percent on the weekend) and industrial land uses (6 percent on the weekday and 1 percent on the weekend), as shown in Table 170.

Land Use at Destination of Truck and Taxi Travel: The types of land uses attracting truck trips on the weekend also showed marked changes from those attracting truck trips on the weekday. Showing increases were residential land uses, which attracted 51 percent of internal truck trips on the weekend compared to 32 percent on the weekday; governmental and institutional land uses,

Table 170

PERCENTAGE DISTRIBUTION OF INTERNAL PERSON TRIPS IN THE REGION BY LAND USE AT DESTINATION ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Destination Land Use	Internal Person Trips	
	Average Weekday	Average Weekend Day
Residential	48.3	55.8
Commercial	28.4	22.6
Industrial	6.5	1.4
Governmental and Institutional	13.5	11.8
Transportation, Communication, and Utilities	1.3	1.1
Recreation and Other	2.0	7.3
Total	100.0	100.0

Source: SEWRPC.

14 percent on the weekend compared to 7 percent on the weekday; and recreational and other land uses—the latter category including agricultural, open lands, and water areas—8 percent on the weekend and 4 percent on the weekday. Showing declines were commercial land uses,

18 percent on the weekend and 28 percent on the weekday; industrial land uses, 5 percent on the weekend and 20 percent on the weekday; and transportation, communication, and utility land uses, 5 percent on the weekend, and 9 percent on the weekday (see Table 171).

Comparisons of internal weekday and weekend taxi vehicle travel, as reported in the survey, also showed characteristic differences. Residential land uses at destination increased from 52 percent of internal taxi trips on the weekday to 64 percent on the weekend. With the exception of a slight increase in recreational land uses, all other land use categories showed declines in the proportion of internal to total taxi trip destinations.

Time Patterns of Weekend Travel: The hourly distributional patterns of weekend travel discussed below are based on travel data recorded on the weekend travel survey. Due to the substantial underreporting of trips on the survey, these patterns may not fully represent the total trip volumes actually attained within a given hour on an average weekend day.

The hourly distributional patterns of internal person trips by trip purpose as reported in the weekend travel survey showed striking differences from the patterns of weekday travel (see Figure 71 for weekday hourly distribution of person trips by trip purpose). The sharp early morning and midafternoon peaks observed in weekday travel were not present on the weekend day, due primarily to the relatively small number of trips made to and from work. The more evenly distributed travel to social-recreational activities and for personal business—including trips to religious services—became a prominent influence on the weekend. Figure 88 indicates the relative inactivity in the early morning hours followed by a general increase in activity as trips for personal business and shopping and to attend work commenced. The peak period of the day, as reported in the weekend travel survey, occurred at 11 a.m., influenced principally by trips to return home and trips for personal business. Between 11 a.m. and 4 p.m., activity declined slightly, with the bulk of trips being made for social-recreational, shopping, and personal business purposes. As residents returned home from these activities, a secondary peak occurred at 4 p.m., followed by a general decline in activity throughout the rest of the day.

The hourly distributional patterns of person trips by mode of travel also indicate notable differences between weekday and weekend travel as reported in the survey (see Figure 73 for weekday hourly distribution by mode of travel). There was an absence of noticeable peak periods in transit travel on the weekend, compared to the clearly defined morning and afternoon transit peaks created by persons traveling to or from work on the weekday. Auto passenger volumes, which never exceeded auto driver volumes in any hour of the weekday, were considerably greater on the weekend. Not only were they greater than auto driver volumes for the hours of 7 p.m. and 8 p.m., but they were also sustained within 5,500 trips of auto driver volumes for each hour from 6 p.m. through midnight (see Figure 89).

The hourly distribution of internal vehicle trips on the weekend as shown in Figure 90 reflects the influence of auto driver travel on total vehicle travel occurring on the weekend. Similar to the weekday, the influence of truck travel on total vehicle travel is attenuated by its hourly distributional pattern (see Figure 78 for weekday hourly distribution of vehicle travel). Truck trips peaked at 10 a.m., followed by a steady decline throughout the rest of the day with the exception of a small increase in activity at 4 p.m. On both the weekday and the weekend, the relatively small number of taxi trips were distributed evenly throughout most of the day.

Location of Weekend Travel: Despite the apparent underreporting of trips, the overall pattern resulting from the geographic distribution of internal trip destinations by traffic analysis zone on the average weekend day was found to be markedly similar to the distribution of week-

Table 171

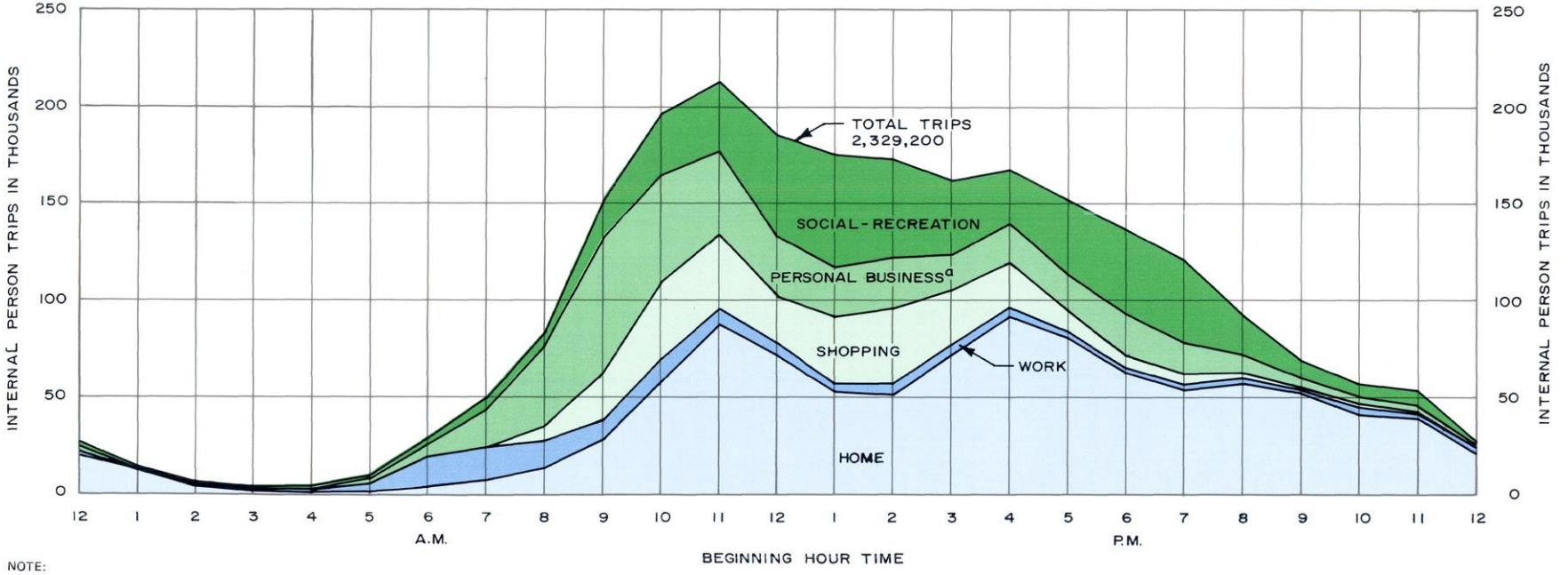
PERCENTAGE DISTRIBUTION OF INTERNAL TRUCK AND TAXI VEHICLE TRIPS IN THE REGION BY LAND USE AT DESTINATION ON THE AVERAGE WEEKDAY AND AVERAGE WEEKEND DAY: 1972

Destination Land Use	Internal Truck Trips		Internal Taxi Trips	
	Average Weekday	Average Weekend Day	Average Weekday	Average Weekend Day
Residential	31.8	50.8	52.3	64.3
Commercial	27.9	18.1	25.9	20.9
Industrial	19.7	4.8	1.9	0.4
Governmental and Institutional	7.1	13.6	7.2	4.2
Transportation, Communication, and Utilities	9.4	5.1	12.3	9.5
Recreation and Other	4.1	7.6	0.4	0.7
Total	100.0	100.0	100.0	100.0

Source: SEWRPC.

Figure 88

HOURLY VARIATION OF INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION ON AN AVERAGE WEEKEND DAY: 1972



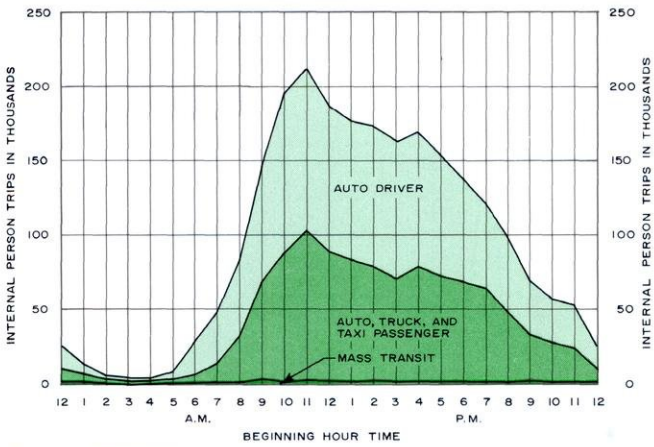
NOTE:

[a]Includes trips to change mode of travel and to serve passengers.

Source: SEWRPC.

Figure 89

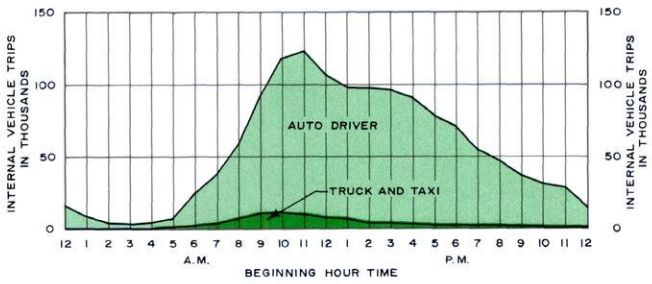
HOURLY VARIATION OF INTERNAL PERSON TRIPS IN THE REGION BY MODE OF TRAVEL ON AN AVERAGE WEEKEND DAY: 1972



Source: SEWRPC.

Figure 90

HOURLY VARIATION OF INTERNAL VEHICLE TRIPS IN THE REGION BY AUTO, TRUCK, AND TAXI ON AN AVERAGE WEEKEND DAY: 1972



Source: SEWRPC.

day internal person trip destinations shown on Map 118. The only notable difference was a substantial decline reported in the weekend travel survey in the volumes of trips made to the Milwaukee central business district and adjacent zones.

Impact of Weekend Vehicle Travel on Transportation Facilities: Machine counts of vehicle crossings at 20 selected stations along the Milwaukee screenline and at 37 stations along the external cordon line around the Region were taken to provide a basis for further analysis of the effects of weekend travel upon the regional highway transportation system, as well as a check upon the results of the weekend travel survey. Machine counts were conducted at each of the 57 stations for a 48-hour period consisting of a Saturday and Sunday.

Screenline Crossings on the Weekend: Total screenline crossings for an average weekend day were found to approximate 67 percent of the average weekday crossings. Saturday and Sunday vehicle crossings at the 20 screenline stations were about 74 percent and 62 percent, respectively, of the average weekday volumes at the same 20 stations.

A station-by-station comparison revealed that 17 of the 20 screenline stations showed declines from weekday counts on both Saturday and Sunday in the number of recorded screenline crossings, such crossings ranging from 94 percent to 38 percent of weekday travel. Traffic volume at two stations, one located on S. Layton Boulevard and the other on Sunny Slope Road, when compared to weekday counts, showed slight increases in Saturday crossings (5 percent and 3 percent, respectively), while showing declines of 27 percent and 20 percent, respectively, in the number of Sunday crossings. Only one station, located at Mitchell Boulevard, which provides an approach to the Milwaukee County Stadium, showed higher vehicle counts on both Saturday and Sunday (1.52 percent and 1.91 percent, respectively) over weekday crossings.

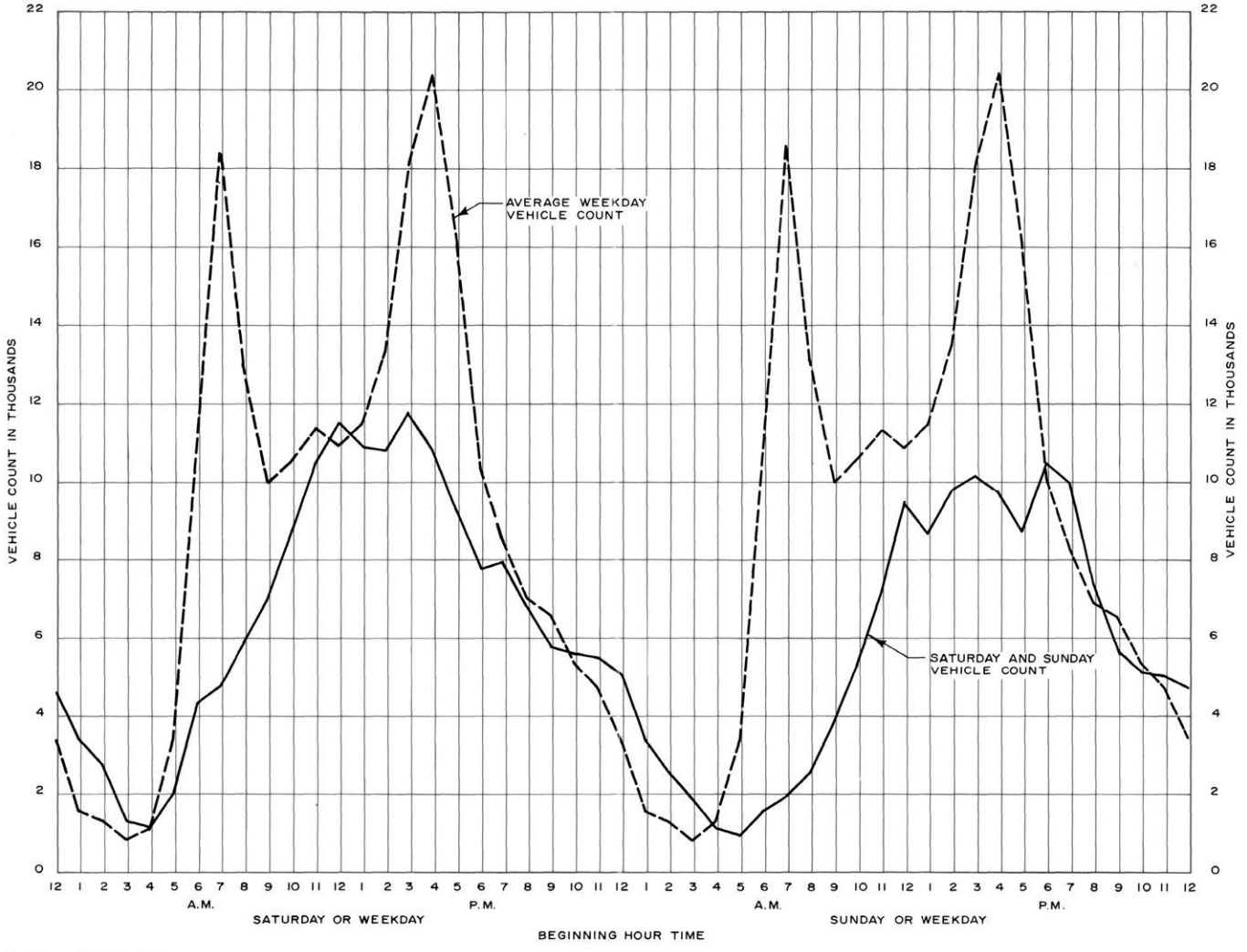
With the exception of the three stations located near the Stadium and one station located near a rural-recreational area—CTH CC south of Delafield, all stations showed greater declines in vehicle crossings on Sunday than on Saturday, with Saturday counts generally being 20 to 30 percent below, and Sunday counts approximately 40 to 50 percent below, weekday counts. On the weekend, in most instances, those stations showing the greatest declines in vehicle crossings were located in the central areas of the City of Milwaukee, while those stations exhibiting the smallest declines in vehicle crossings were located in the suburban and rural-urban fringe areas of the Region.

Figure 91 indicates the hourly distribution of Saturday, Sunday, and average weekday vehicle volumes at the 20 selected screenline stations. Screenline vehicle crossings on Saturday reached higher volumes earlier in the day than did screenline crossings recorded on Sunday. The hourly distributions indicate two distinct peaks in screenline crossings at 12 a.m. and 3 p.m. on both Saturday and Sunday. After 3 p.m. on Saturday, vehicle volume declined steadily over the remaining hours of the day, with the exception of a small increase from 6 to 7 p.m. In contrast, the Sunday pattern shows a third major peak occurring at 6 p.m., with a significant decline in the number of vehicle crossings not occurring until after 7 p.m. Although the decline from the peak period occurred earlier on Saturday than on Sunday, traffic volumes on Saturday between the hours of 9 p.m. and midnight were greater than during those hours on Sunday.

Both the Saturday and Sunday volume distribution curves are substantially different from the average weekday distribution with its sharp morning and afternoon peaks and midday valley. Comparison of the hourly distributional patterns of the average weekday, Saturday, and Sunday screenline crossings clearly indicates that at no time do the weekend peak volumes exceed those of the midday valley of an average weekday. Further analysis of the hourly distributions of Saturday, Sunday, and average

Figure 91

COMPARISON OF THE HOURLY VARIATION OF VEHICLE VOLUME ON SATURDAY, SUNDAY, AND AN AVERAGE WEEKDAY AT 20 SELECTED MILWAUKEE SCREENLINE STATIONS: 1972



Source: SEWRPC.

weekday traffic volumes at each of the 20 screenline stations revealed that at only one station, that at Mitchell Boulevard, do the peak period traffic volumes exceed those of the weekday peak period.

External Cordon Crossings on the Weekend: In contrast to the internal screenline crossings, vehicle crossings of the external cordon around the regional boundaries were about 36 percent greater on a weekend than on a weekday, with Saturday crossings approximately 29 percent greater and Sunday crossings approximately 43 percent greater. Increased vehicle volumes were found at 25 of the 37 external stations on Saturday, and at 27 of the 37 stations on Sunday. The count program further revealed that over 50 percent of total internal-external vehicle traffic on both Saturday and Sunday was accommodated at four stations: those located on USH 141 at the northern boundary of Ozaukee County, USH 41 at the northwestern corner of Washington County, IH 94 at the western boundary of Waukesha County, and IH 94 at the Wisconsin-Illinois border. As shown in Table 172, the total volume at these four stations was 44 percent above average weekday traffic volumes on Saturday, and 68 percent greater on Sunday. The total crossings recorded at the remaining 33 cordon stations showed overall increases above weekday traffic volumes of 17 percent on Saturday and 23 percent on Sunday.

With the exception of IH 94 at the Wisconsin-Illinois state line, weekend traffic volumes were less than weekday traffic volumes at all of the five cordon line stations located between USH 45 and Lake Michigan on both Saturday and Sunday. The decrease in weekend traffic ranged from a decline of about 450 vehicles per day, or 8 percent, from the weekday traffic of about 6,000 vehicles per day on USH 45, to a decline of about 3,500

Table 172

MACHINE COUNTS OF VEHICLE CROSSINGS INTO AND OUT OF THE REGION AT EXTERNAL CORDON STATIONS ON SATURDAY, SUNDAY, AND A TYPICAL WEEKDAY: 1972

External Cordon Station	Machine Counts of Vehicle Crossings							
	Typical Weekday		Saturday			Sunday		
	Number	Percent	Number	Percent	Percent Change From Weekday	Number	Percent	Percent Change From Weekday
1 (USH 141).	5,636	3.4	11,724	5.4	108.0	10,538	4.4	87.0
7 (USH 41)	13,317	7.9	25,818	11.9	93.9	30,485	12.7	128.9
15 (IH 94-West) . . .	17,356	10.3	23,252	10.8	34.0	24,841	10.3	43.1
34 (IH 94-South). . .	39,365	23.4	47,868	22.1	21.6	60,857	25.3	54.6
Subtotal	75,674	45.0	108,662	50.2	43.6	126,721	52.7	67.5
Remaining Stations	92,484	55.0	107,826	49.8	16.6	113,562	47.3	22.8
Total	168,158	100.0	216,488	100.0	28.7	240,283	100.0	42.9

Source: SEWRPC.

vehicles per day, or 53 percent, from the weekday traffic of about 6,500 vehicles per day on STH 32. In contrast, substantial increases in traffic volumes were found at all of the seven cordon line stations located between STH 83 and USH 14. These increases ranged from about 360 vehicles per day, or 34 percent, from the weekday traffic volume of about 1,000 vehicles on CTH EM, to an increase of about 4,700 vehicles per day, or 284 percent, from the weekday traffic volume of about 1,500 vehicles on STH 120.

Along the western boundaries of the Region, moderate increases in traffic volume were noted on Saturday and Sunday on all major roads, in contrast to moderate declines in weekend volume on highways not generally used for through travel or travel to summer recreational areas. Vehicle volume through cordon count stations located on most highways along the Region's northern boundary also showed substantial increases in traffic, ranging from an increase in weekend daily traffic of about 160 vehicles per day, or 12 percent, from the average weekday volume of about 1,300 vehicles at STH 28, to an increase of about 1,100 vehicles, or 110 percent, of the average weekday volume of about 1,000 vehicles on CTH S.

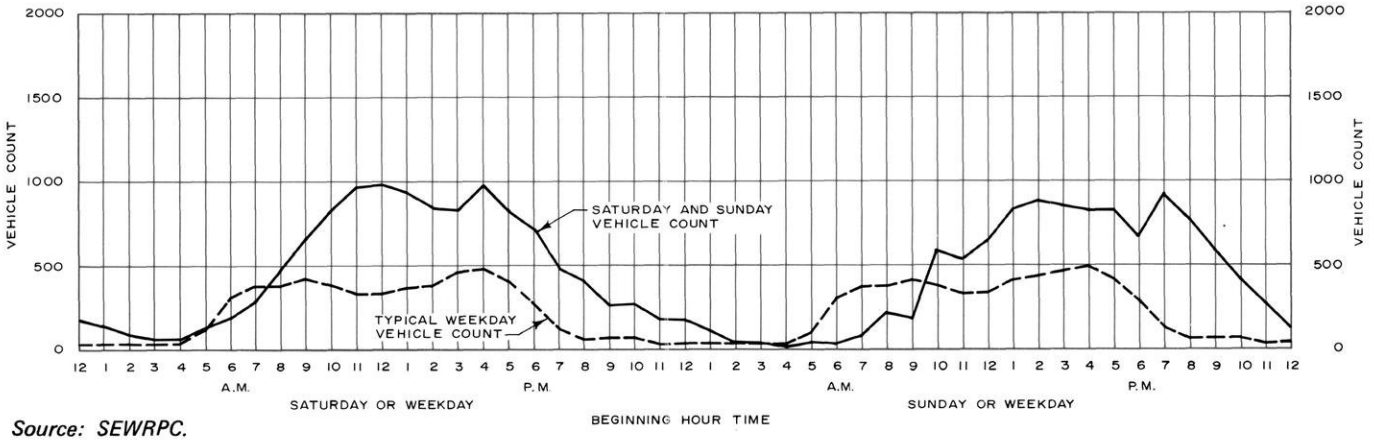
The hourly distributions of vehicle counts at the four external cordon stations which recorded over 50 percent of the total vehicle movements into or out of the Region on the weekend indicate some of the characteristics of external travel on a Saturday and Sunday. As shown in Figures 92 through 95, the traffic volumes at these four stations were sustained during most of the day on both Saturday and Sunday at rates in excess of the weekday peak periods of vehicle crossings at each of these stations. By Saturday noon, the peak period had been reached at each of the four stations, whereas the peak volume on Sunday occurred at 6 p.m. or later and, with the exception of the volume on USH 141, was greater than the peak volume on Saturday. Generally, the higher hourly volumes occurred later in the day on Sunday than on Saturday, and Sunday nighttime volumes were substantially higher than Saturday nighttime volumes.

Further analysis of the traffic count data obtained at each of these four cordon stations revealed that, despite the significant increases in the amount of vehicle traffic on the summer weekends, the levels of service found at these locations were considered adequate. The lowest level of service occurred on IH 94-South between 5 and 6 p.m. on Sunday where the vehicles on the six-lane facility were found to be operating at level of service "C." Level of service "C" is a level at which vehicles may maintain speeds in excess of 50 m.p.h. with safe, although limited, headways, and at which the mobility of the driver in changing lanes and obtaining access to or exit from the system, although influenced by the other automobiles on the roadway, is not unduly hampered.

It is recognized, however, that traffic volumes at some of the external stations may exceed the levels counted during some weekends, particularly during holiday weekends or at times of special events such as football games and during hunting season. The Wisconsin Department of Transportation maintains continuous traffic volume count stations on USH 41 in Fond du Lac County north of the Region and on IH 94 in Jefferson County west of the Region. Data from these stations were used to scale the summer weekend count results obtained by the Commission. The maximum hourly volume recorded during the traffic count program on Sunday on IH 94 at the western boundary of the Region was 2,010 vehicles. This compares to a peak hourly volume of 3,050, an increase of 52 percent, recorded on the same facility in Jefferson County on a Saturday, October 28, 1972. Volumes above 2,010 vehicles per hour were recorded

Figure 92

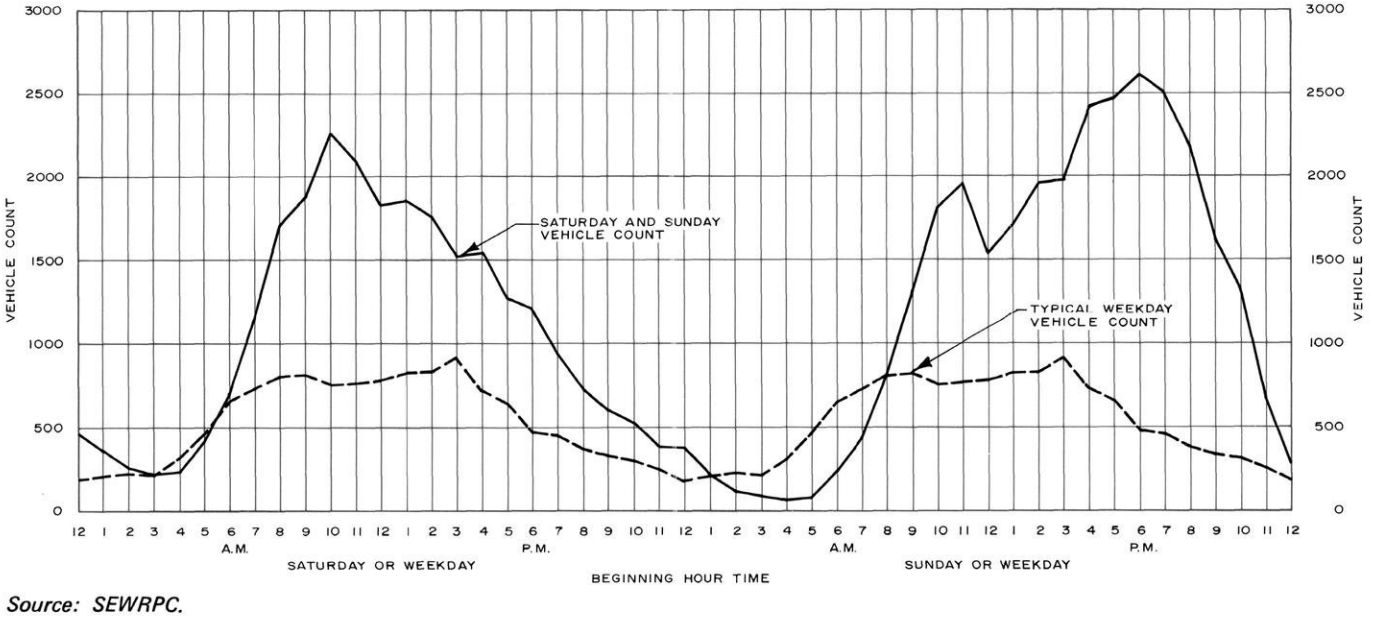
COMPARISON OF THE HOURLY VARIATION OF VEHICLE VOLUME ON A SATURDAY, SUNDAY, AND A TYPICAL WEEKDAY AT AN EXTERNAL CORDON STATION ON USH 141 IN OZAUKEE COUNTY: 1972



Source: SEWRPC.

Figure 93

COMPARISON OF THE HOURLY VARIATION OF VEHICLE VOLUME ON SATURDAY, SUNDAY, AND A TYPICAL WEEKDAY AT AN EXTERNAL CORDON STATION ON USH 41 IN WASHINGTON COUNTY: 1972



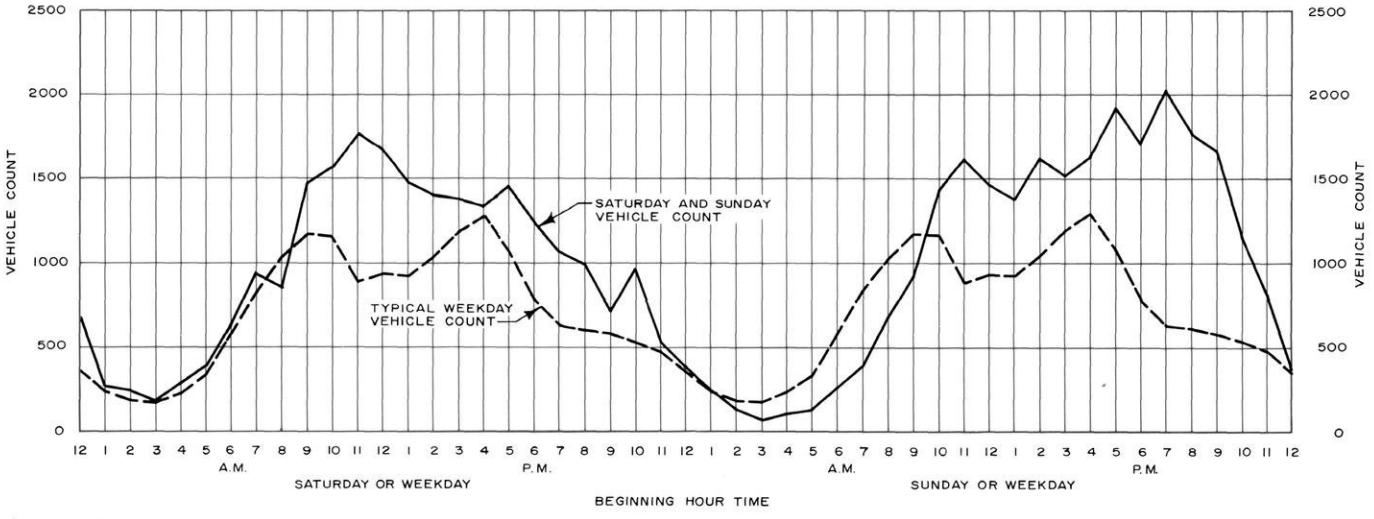
Source: SEWRPC.

during 65 hours of 1972 at the station in Jefferson County with all but six occurring during weekends, primarily autumn weekends. The peak hourly volume of 2,600 vehicles per hour counted by the Commission on USH 41 at the Washington County line during the weekend travel survey was exceeded 35 times during 1972 at the state's recording station on USH 41 in Fond du Lac County. All but one hour of these peak hours occurred on summer or autumn weekends or holiday weekends. The peak hour traffic, recorded on Wednesday, July 5, in 1972 on USH 41, however, was 5,120 vehicles, nearly twice that found in the Commission's weekend survey. The high traffic counts were recorded on USH 41 primarily during holiday periods such as the July 4 and Thanksgiving weekends.

The machine count program clearly indicated general weekend traffic volume conditions for consideration in transportation facility design and operation. The data collected in the special weekend home interview and truck and taxi travel surveys, in conjunction with the traffic volume counts taken at the screenline and external cordon stations, provide additional insight into weekend travel habits and patterns, and thus contribute to a more complete understanding of total travel affecting the Region.

Figure 94

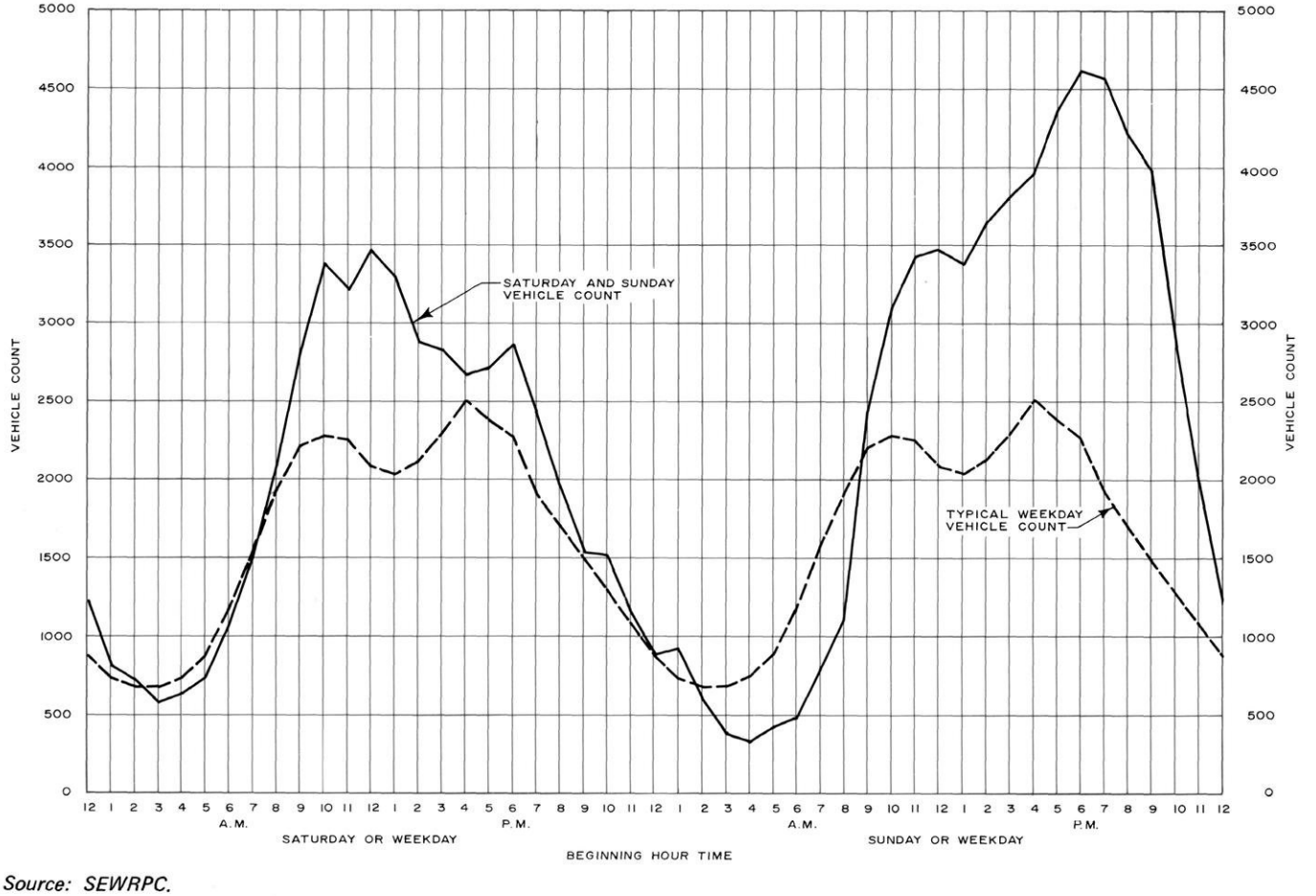
COMPARISON OF THE HOURLY VARIATION OF VEHICLE VOLUME ON SATURDAY, SUNDAY, AND A TYPICAL WEEKDAY AT AN EXTERNAL CORDON STATION ON IH 94-WEST IN WAUKESHA COUNTY: 1972



Source: SEWRPC.

Figure 95

COMPARISON OF THE HOURLY VARIATION OF VEHICLE VOLUME ON SATURDAY, SUNDAY, AND A TYPICAL WEEKDAY AT AN EXTERNAL CORDON STATION ON IH 94-SOUTH IN KENOSHA COUNTY: 1972



Source: SEWRPC.

SUMMARY

Travel is an orderly, regular, and measurable occurrence, evidenced by recognizable travel patterns. Recognition of those patterns and travel aspects which demonstrate a high degree of repetitiveness if a prerequisite to an understanding of future travel behavior and, consequently, to sound transportation planning. The inventory of travel describes in detail each of the component parts of total travel. Each of these parts is essential to a complete understanding of total travel and each contributes to the overall travel habits and patterns in the Region, and consequently, to the conceptual processes involved in establishing generalized norms of travel behavior.

This chapter has presented in summary form the basic findings of the 1972 regional inventory of travel. To measure the changes occurring in travel habits and patterns within the Region, comparisons have been made between the findings of the 1963 and 1972 travel inventories. Those findings discussed in the chapter which are salient to the transportation planning processes or bear special significance for regional land use-transportation plan development include:

- On an average weekday in 1972, nearly 4.7 million person trips and 3.4 million vehicle trips were made within the Region. These figures represented increases from 1963 to 1972 of 887,000 person trips, or 23 percent; and of 848,000 vehicle trips, or 33 percent. Nearly all of these person and vehicle trips, or more than 95 percent in each year, were made by residents of the Region. Therefore, the location and capacity of future transportation facilities and services must accommodate, to the degree possible, the patterns of travel of the regional residents.

- The number of automobiles available to residents of the Region increased from 527,000 in 1963 to 705,000 in 1972, an increase of 178,000 autos, or 34 percent, compared to an 8 percent increase in the regional population during that period. The proportion of total households having two or more autos available, moreover, increased from 24 percent in 1963 to 34 percent in 1972. In addition, while automobile travel increased from 87 percent in 1963 to 91 percent in 1972, mass transit travel decreased from 9 percent of total internal person travel in 1963 to 4 percent in 1972. These findings indicate that an even greater proportion of total person travel than now exists will be made by auto in future years, barring significant improvement in the regional transit system and/or a change in public and private attitudes toward transit.

- While substantial increases in tripmaking were found in all other travel modes on an average weekday, mass transit travel decreased sharply within the Region from 324,000 trips in 1963 to 186,000 trips in 1972, or 43 percent.

- In both 1963 and 1972, approximately 88 percent of total internal vehicle trips were made by automobile or taxi and only 12 percent were made by trucks. The distribution of truck trips did not exhibit the same sharp concentrations of tripmaking as did auto trips during peak periods, and did not coincide with the peak periods of auto travel, either by hour of the day or day of the week. These findings indicate that, with respect to highway facilities, the transportation problem within the Region is primarily the movement of people rather than goods.

- The hourly distributional patterns of internal person trips indicated that, although total person trip volumes increased substantially on an average weekday from 1963 to 1972, the regular ebb and flow of travel remained markedly similar both in the proportion of trips by trip purpose and in the proportion and times of peak periods. Approximately 32 percent of daily travel within the Region occurred in the two morning and two afternoon peak hours of the day in both 1963 and 1972. Of these peak hour movements, trips to and from work comprised 47 percent of the total in 1963 and 44 percent in 1972. These findings indicate that one of the primary transportation problems within the Region continues to be meeting the peak demand of the journey to and from work.

- Approximately 80 percent of total internal person trips within the Region on an average weekday in both 1963 and 1972 consisted of trips made to or from place of residence. It is apparent, then, that future travel facility requirements within the Region will be determined largely by the amount and location of future residential development.

- Trips to and from work accounted for 37 percent of all internal person trips made within the Region on an average weekday in 1963 and for 33 percent in 1972, and were second in importance of all trip purposes. The findings indicate that the location of future employment centers will be another important factor affecting travel demand within the Region.

- The percentage distributions which show the interrelationship of travel mode, trip purpose, and land use give clear evidence that person travel within the Region is an orderly, regular occurrence, exhibiting a high degree of repetitiveness between 1963 and 1972. Such knowledge leads to a fuller understanding of future travel behavior, and provides a sound basis for forecasts of future travel.

- The total number of person trip destinations in the Milwaukee central business district, the largest single generator of person trips in the Region, decreased on the average weekday from 140,000

trip destinations in 1963 to 133,800 in 1972, or about 4 percent. The number of transit trip destinations in this central business district on an average weekday decreased from 50,500 in 1963 to 29,000 in 1972, or 43 percent. Losses in person trip destinations were sustained also in the Racine and Kenosha central business districts, the former decreasing from 27,500 in 1963 to 20,900 in 1972 on an average weekday, or 24 percent; and the latter decreasing from 30,700 in 1963 to 29,800 in 1972, or 3 percent.

- In the 1972 public opinion survey, respondents, although expressing mixed opinions concerning the issue of completing and/or expanding the planned regional freeway system, were in favor, by a large majority, of continued construction of freeways to some degree within the Region.

- The pattern of new residential development within the Region would be one of urban sprawl if the expressed opinions of respondents to the 1972 public opinion survey were exercised. Thus, while 19 percent of the households in 1972 resided in rural-suburban or rural areas, more than double that percentage indicated a preference to do so. The proportion of households willing to occupy a residence not connected to a public sanitary system was more than double the proportion who occupied such residences in 1972, and the proportion of households willing to occupy a residence not connected to a public water supply was double the proportion who occupied such residences in 1972. The implications these attitudes have for decentralization of residential land use are significant, and must be carefully analyzed in the regional land use plan reevaluation effort.

- The findings of the 1972 weekend travel surveys indicate that total daily and peak hour travel demands are generally less than those occurring on average weekdays. However, certain facilities, primarily those providing access to recreational facilities within the Region and those serving major travel demands through the Region, do experience maximum volume loadings during weekends and on holidays. These findings indicate that transportation facilities designed to serve weekday travel demands will be sufficient for the most part for weekend travel.

Chapter X

SUMMARY AND CONCLUSIONS

Because of its important impacts on daily life and on regional development, transportation is, and may be expected to remain, 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 the spatial location and capacities of these facilities should be—involves public policy determinations that are as difficult as they are important.

Land use is another principal area 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 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 the demand for transportation, utility, and recreational facilities, is, therefore, of areawide concern.

Recognizing this, the Southeastern Wisconsin Regional Planning Commission, in January 1963, undertook a four-year study leading to the adoption in December 1966 of a regional land use plan and a regional transportation plan (highway and transit) for southeastern Wisconsin. The findings and recommendations of this intensive initial regional land use-transportation study effort, which culminated in the adoption of these two important regional plan elements, are documented in SEWRPC Planning Report No. 7, consisting of three volumes.

Even prior to the adoption of the regional land use and transportation plans, the Commission, its constituent local units of government, and the concerned state and federal agencies recognized the need to establish a continuing regional land use-transportation planning program within the Region. This program was needed to meet the planning requirements set forth in federal transportation legislation; to provide a means by which the data collected in, and the forecasts prepared under, the initial regional land use-transportation study could be continuously reviewed and updated; to provide a means by which the adopted land use and transportation plans could be periodically reviewed, revised as necessary, and the plan design year extended forward; to provide a means for the continued integration of land use and transportation planning within the Region into comprehensive, areawide planning; and to assist in the conversion of the plans prepared under the initial study effort into action programs for plan implementation, including the preparation of county jurisdictional highway system plans and improvement programs, urban area transit development programs, and a regional short-range transportation facility priority improvement program.

The study design prepared for the continuing regional land use-transportation study called for a complete reappraisal—and revision as necessary—of the adopted 1990 regional land use and transportation plans by 1975. This reappraisal was to be based upon the findings of a series of major planning reinventories identifying the changes which occurred in demographic, economic, public financial resource, land use, and natural resource base conditions, in public utility development, in transportation facility development, in local community development objectives, and in travel habits and patterns within the Region since 1963. This report sets forth, in two volumes, the findings and recommendations of that plan reappraisal. Together, the two volumes contain much new information pertinent to land use and transportation system planning and development within the Region. This, the first volume of the report, presents definitive data on the changes which have occurred over time in the basic factors affecting land use and transportation system development within the Region. Thus, this volume updates the inventory findings contained in SEWRPC Planning Report No. 7, Volume One. Although this report in its entirety supercedes Planning Report No. 7, that report will continue to have value as a source of historical data about land use and transportation system development within the Region.

The planning process employed by the Regional Planning Commission in both the initial and continuing regional land use-transportation studies seeks to 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 a set of regional land use and transportation plans scaled to future land use, travel, and resource demands and consistent with regional development objectives.

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 not only the first operational step in any initial planning process, but one of the most important functions of any continuing planning process. The inventory step is crucial, since no intelligent forecasts can be made, alternative courses of action formulated, the best course of action selected, nor existing plan elements reappraised without up-to-date knowledge of the state of the system being planned. Accordingly, the first step in the plan reappraisal process involved, as did the first step in the initial regional land use-transportation study, the collection of factual data on the resident population; economic activity; the existing land use pattern; local development objectives and constraints; the underlying natural resource and public utility bases; the demand for travel between various points within the Region and outside of the Region; the relative demand for alternative modes of transportation; and the existing and potential supply of transportation system capacity.

These data, when considered together and in conjunction with similar data previously collected, not only describe the existing situation in the Region with respect to land use and transportation development and with respect to the relationship of such development to the previously adopted regional plans, but identify the changes which have occurred in these important aspects of regional development over time, the problems with respect thereto, and the progress attained in the resolution of these problems over time.

The basic findings of the reinventories conducted under the plan reevaluation process are set forth in the foregoing chapters of this volume of the report. The most important findings of these reinventories are summarized below.

POPULATION

Overall Growth: Slowing Down

The resident population of the Region was approximately 1.81 million persons as of April 1972, an increase of about 140,000 persons, or about 8 percent, over the 1963 resident population of about 1.67 million persons. This population increase represents an average annual increase of approximately 15,000 persons, or about 1 percent per year. In contrast, the population of the Region increased at an average rate of about 33,000 persons per year during the period from 1950 to 1963. Thus, the Region is presently experiencing a substantially lower rate of population growth than it was experiencing when the initial land use and transportation plans were being prepared. This reduced rate of regional population growth probably signifies a return to the more normal growth rates experienced during the first one-half of this century, and it presently appears unlikely that the unprecedented population growth rates of the 1950s and early 1960s will recur within the Region in the foreseeable future.

The population forecast on which the original 1990 regional land use and transportation plans were based estimated the 1970 resident population of the Region at about 1.94 million persons, about 130,000 persons, or about 7 percent, above the actual 1972 population level. Within the Region the variances between the actual and forecast population levels by county indicate that the resident population has increased slightly faster than forecast in Ozaukee, Walworth, and Washington Counties and slightly slower than forecast in Kenosha, Racine, and Waukesha Counties. The only significant departure from the forecast occurred in Milwaukee County, which grew at a substantially slower rate than envisioned.

Components of Change: From In- to Out-Migration, From High to Low Birthrates

Migration and natural increase represent the two components of regional population change. Despite significant declines in birthrates within the Region since 1963, natural increase remains the most important component of regional population growth. This is indicated by the fact that natural increase accounted for about two-thirds of the total population increase of the Region from 1950 to 1960, and all of the population increase from 1960 to 1970. Migration accounted for about one-third of the population increase of the Region from 1950 to 1960, the Region having experienced a net in-migration during the period. Migration, however, accounted for none of the population increase of the Region since 1960, the Region having experienced a net out-migration during this period. The variances noted between the estimated and forecast 1972 regional population levels are principally the result of this reversal of past migration patterns and the substantial decline in the birthrate which has occurred within the Region. The crude birthrate fell from 22.5 persons per thousand in 1963 to 14.0 persons per thousand in 1972, or nearly 38 percent. Although a sharp decline in the birthrate was foreseen and reflected in the preparation of the original regional population forecasts, the full magnitude and rapidity of that decline was not foreseen.

Geographic Pattern: Continued Decentralization

Population within the Region is continuing to decentralize. The proportion of the total regional population residing in Milwaukee County decreased from about 65 percent in 1963 to about 59 percent in 1972, while the proportion of the total regional population residing in Waukesha County increased from about 11 percent in 1963 to about 14 percent in 1972. From 1963 to 1972 the proportion of the total regional population residing in Kenosha, Milwaukee, and Racine Counties decreased from 80 percent in 1963 to 75 percent in 1972, while the proportion of the total regional population residing in Ozaukee, Walworth, Washington, and Waukesha Counties increased from 20 percent to 25 percent. This decentralization of population has been accompanied by an areawide diffusion of urban devel-

opment and the intensification of developmental and environmental problems related to such development, including traffic congestion.

Continued decentralization is also evidenced by the change in migration patterns within the Region. Prior to 1963, all seven counties in the Region experienced net in-migration. Since 1963, however, that pattern has been reversed in Milwaukee County, which experienced a net out-migration of nearly 125,000 persons during the 1963 to 1972 period. All other counties in the Region continued to experience net in-migration during that period.

The composition of the regional population is continuing to become urban, although at a decreasing rate in recent years because there remain within the Region so few persons actually working on farms. By 1970 over 98 percent of the regional population was urban, and only about 2 percent, or 43,000 persons, was rural.

Age Group Trends: Increasing Dependent Population

Population increases over the last two decades have had a significant effect on the age structure of the regional population. During the 1950s, rapidly rising birthrates and declining death rates resulted in increases in the proportion of the regional population under age 20 and over age 64, while the labor force, represented by that portion of the population between the ages of 20 and 64, declined. This trend continued during the 1960s, offset somewhat by declining birthrates, the latter resulting in a decrease in the proportion of the total population under age 10. In general, however, the change in age composition has been one of a declining proportion of the population in the "productive" labor force age segment, and an increasing proportion of the population in the "dependent" segment of the population made up to persons under age 18 and over age 64.

Sex, Marriage, and Race:
More Females, Singles, and Blacks

The sex composition of the regional population has changed over the last two decades. The number of males per every 100 females in the regional population declined from 98 in 1950 to 97 in 1960 and to 94 in 1970. Marital status, an indicator of potential population growth, has exhibited a trend since 1950 toward a larger proportion of single persons age 14 and over. This general trend apparently reflects decisions by younger persons in the Region not to marry or to marry at later ages. The number of persons 14 years and over who are widowed or divorced has also increased at a higher rate than the number of persons who are married. These trends affect household formation rates.

By 1970, the nonwhite proportion of the regional population had increased to 7 percent, or about 130,000 persons, up by 2 percent from the 1960 level of 5 percent. The overwhelming majority of nonwhites in the Region are persons of the black race. Nonwhites comprise 11 percent of the Milwaukee County population, 7 percent of Racine County, 2 percent of Kenosha County, and less than 1 percent in all other counties. Ninety-eight percent of all blacks in the Region live in the Cities of Kenosha, Milwaukee, and Racine.

Households: Growing Faster Than Population

From 1950 to 1970 the total number of households in the Region increased faster than the household population, resulting in a decline in the average number of persons per household from 3.36 in 1950 to 3.30 in 1960 and to 3.20 in 1970. This rapid decline in the average number of persons per household is due in large part to a substantial increase in the number of one-person households. This household formation trend is of particular importance to land use and transportation planning, helping to explain why such characteristics as automobile availability and vehicle miles of travel are continuing to increase despite lower than anticipated levels of population growth.

Personal Income: Increasing at a Decreasing Rate

Since 1950, personal incomes in the Region have been increasing at a decreasing rate. Total personal income in the Region increased by about 71 percent through the 1950s and by only 32 percent through the 1960s, measured in constant 1967 dollars. Average per capita income increased by 35 percent through the 1950s—from $1,853 to $2,505—and by only 18 percent through the 1960s—from $2,505 to $2,954. Although the rates of increase in total and per capita income have been decreasing, per capita income levels in the Region have remained substantially higher than those of the state or nation.

Housing Values: Keeping Pace With Inflation

During the 1950s, the median market value of single family housing units in the Region, measured in constant 1967 dollars, increased from $15,300 to $17,800, or by about 16 percent. During the 1960s, however, the median market value measured in constant dollars remained essentially unchanged, with increases in the real dollar value of single family housing units being offset by the rate of price inflation.

ECONOMIC ACTIVITY

Labor Force: Growing More Slowly Than State or Nation

The segment of the population which can be most closely related to the economy is the labor force, defined as those residents 14 years and older who are either employed or are actively seeking employment. From 1950 to 1960 the regional labor force increased by 18 percent, from 540,100 to 638,700, a rate of growth greater than that of either the state or the nation. From 1960 to 1970, the regional labor force increased by about 17 percent, from 638,700 to 744,500, a growth rate below that of both the state and the nation. Kenosha, Milwaukee, and Waukesha Counties exhibited trends similar to the Region as a whole, with decreasing rates of labor force growth in the 1960s as compared to the 1950s. In each of the four remaining counties, the labor force grew at faster rates in the 1960s than in the 1950s.

Participation Rate: More Working Females

The labor force participation rate expresses the relationship between the labor force and the total population.

This rate has increased from 57 percent in the 1950s to 58 percent in the 1960s and to 59 percent in 1970. Much of this increase is due to increases in the proportion of working age females in the labor force. From 1950 to 1970, the proportion of the total regional labor force made up of females increased by 85 percent—from about 155,000 to about 288,000—while the proportion of the labor force made up of males increased by only 18 percent, from about 385,000 to about 457,000. Over the same period, the female participation rate rose from 32 percent to 43 percent, while the male participation rate declined from 82 percent to 76 percent.

Jobs: Growing Faster Than Population

Growth in regional employment has generally conformed to the forecasts used in the preparation of the 1990 regional land use and transportation plans. Employment within the Region in 1972 totaled about 749,000 persons, an increase of about 118,000 persons, or about 19 percent, over the 1963 employment level of about 631,000 persons. This employment increase represents an average annual increment of over 13,000 jobs, or 2 percent per year since 1963. This compares with an average annual population increase of about 15,000 persons, or about 1 percent per year. While the number of jobs within the Region has increased substantially, the regional work force has increased at an even greater rate, resulting in increasing unemployment. By 1972 the unemployment rate had risen to 4.7 percent of the regional work force, up from 3.8 percent in 1960. Regional unemployment rates, however, have remained below those of the state or the nation.

The 1972 regional employment level as forecast under the initial regional land use-transportation study totaled about 729,000 persons, or about 3 percent below the actual 1972 employment level. Increases in employment, together with the increases in households, directly affect transportation demand and help to explain why such measures of transportation demand as automobile availability, trip generation, and vehicle miles of travel are holding close to the original forecast levels despite a less than anticipated population growth.

At the county level, growth in employment occurred somewhat at variance with the forecasts used in the preparation of the adopted plans. Actual employment increased substantially faster than forecast in the outlying counties of the Region, particularly Ozaukee, Walworth, Washington, and Waukesha Counties, and slightly faster in Racine County, while employment increased more slowly than forecast in Kenosha and Milwaukee Counties. About two-thirds of the net increase in jobs in the Region from 1963 to 1972 occurred outside of Milwaukee County. Accordingly, the Milwaukee County proportion of total regional employment declined from nearly 75 percent in 1963 to 68 percent in 1972. This change in employment distribution provides another measure of the trend toward decentralization of urban development within the Region during the 1960s from the older, well-established urban areas to the newer suburban and rural-urban fringe areas of the Region. This decentralization has profound effects upon land use and transportation facility development.

Regional Economy: Less Concentrated in Manufacturing

Historically, economic activity within the Region has been heavily concentrated in manufacturing. From 1963 to 1972, however, this concentration became less intense, with the proportion of the total regional employment engaged in manufacturing decreasing from about 43 percent in 1963 to about 34 percent in 1972. By contrast, the proportion of the total regional employment engaged in the private and government service groups increased from about 20 percent in 1963 to about 30 percent in 1972. These regional trends reflect to some degree changes in the national economy, which has also become less manufacturing and more service oriented.

PUBLIC FINANCIAL RESOURCE BASE

Local Government Revenues and Expenditures: Rising Rapidly

Total revenue and expenditure levels for general-purpose local units of governments and school districts in the Region increased at a rate of about 14 percent per year, from $507 million in 1960 to $1,399 million in 1972. Over this same period, per capita revenue and expenditure levels increased by about 12 percent per year, from $322 per capita in 1960 to $780 per capita in 1972. Price inflation increased at an average annual rate of about 3.5 percent from 1960 to 1972, indicating that most of the increase in local governmental revenues and expenditures during this period was due to real dollar increases rather than to price inflation.

Revenue Sources: Property Tax Becoming Less Important

Historically, the property tax levy has provided the largest source of revenue to local units of government in the Region. Property tax levies for the Region as a whole increased at an average annual rate of about 13 percent, from $227 million in 1960 to $588 million in 1972. During this same period, per capita property tax levies increased by about 11 percent, from $144 per capita in 1960 to $328 per capital in 1972. The proportion of total revenues provided by the property tax levy, however, has diminished over this 12-year period for all local units of government except school districts.

For all counties except Milwaukee County, the proportion of total revenues provided by the property tax levy decreased from 37 percent in 1960 to 33 percent in 1972. For Milwaukee County, the decline was from 46 percent in 1960 to 37 percent in 1972. For all cities except the City of Milwaukee, the proportion of total revenues provided by the property tax levy declined from 28 percent in 1960 to 25 percent in 1972. For the City of Milwaukee, the decline was from 41 percent in 1960 to 36 percent in 1972. For all villages, the proportion of total revenues provided by the tax levy declined from 11 percent in 1960 to 10 percent in 1972. For all towns, the proportion of total revenues provided by the property tax levy declined from 37 percent in 1960 to 10 percent in 1972. For all school districts, the proportion of total revenues provided by the property tax levy increased from 60 percent in 1960 to 70 percent in 1972.

One of the most rapidly increasing revenue sources to local units of government in the Region has been revenue

derived from public industries, which includes earnings from such special facilities and services as hospitals, airports, parks, and utilities. Revenues from such industries have increased from $41 million in 1960 to $232 million in 1972, a more rapid increase than all other revenue sources overall. Revenues from public industries have increased substantially in revent years in proportion to total revenues, and have become the leading source of revenue to villages and towns in the Region and the second leading source of revenue to all local units of government in the Region.

Expenditures: Relatively Less for Transportation

Education remains the largest expenditure category for all general-purpose local units of government and school districts in the Region, amounting to $152 million in 1960, or 30 percent of total expenditures, and $380 million in 1972, or 28 percent of total expenditures. Overall, expenditures for the construction, operation, and maintenance of highways in the Region have generally declined in proportion to total regional expenditures. In 1960, such expenditures amounted to $86 million, or 17 percent of total expenditures. By 1972, such expenditures amounted to $149 million, or 11 percent of total regional expenditures. Federal highway monies expended within the Region increased rapidly during the 1960s, peaked in 1964 at $28 million, or 25 percent of total regional highway expenditures, and declined since then to a level of $22 million, or 15 percent of total regional highway expenditures, in 1972. Per capita expenditures for highways increased by nearly 6 percent per year from 1960 to 1970, but declined from 1970 to 1972.

NATURAL RESOURCES AND PUBLIC UTILITY BASE

Air Pollution: Approaching Permissible Standards

Available evidence, although limited, indicates that air pollution problems exist in the highly developed portions of the Region, particularly in the central areas of the Region's three largest cities: Kenosha, Milwaukee, and Racine. This pollution is evidenced by atmospheric levels of particulate matter, sulphur dioxide, and photochemical oxidants which approach, and at times exceed, the national ambient air quality standards established by the U. S. Environmental Protection Agency. This air pollution is the result of commercial and industrial activities, transportation movements, waste burning, power generation, and space heating. The promulgation of national air quality standards requires that the impact of alternative regional land use and transportation plans on ambient air quality levels be considered in the plan reevaluation effort.

Soils: Poorly Suited for Development Without Sewers

The highly complex soil pattern of the Region, marked by extreme variability and intermingling of soils, together with the widespread occurrence of soils poorly suited for urban development, indicate a continuing need to prepare regional and local development plans which carefully consider soil limitations. As revealed by the detailed operational soil survey of the Region completed for the Commission by the U. S. Soil Conservation Service under the initial regional land use-transportation planning effort, about one-fourth of the total area of the Region is covered by soils poorly suited for urban development even with public sanitary sewer service, while about 60 percent of the Region is covered by soils poorly suited for residential development utilizing conventional onsite sewage disposal systems.

Recently, state supported research in Wisconsin has resulted in the development of new onsite soil absorption sewage disposal systems designed to overcome natural soil limitations with respect to permeability, high groundwater tables, and shallow bedrock. These new systems utilize mechanical facilities to pump septic tank effluent through a distribution system placed in fill on top of the natural soil. Should the use of these new systems be permitted by the state on a widespread basis in future years, soil limitations for onsite sewage disposal would be removed as a constraint on regional settlement patterns, thereby permitting substantial additional areas of the Region to be developed for urban use without centralized sanitary sewerage systems.

Water Quality: Little or No Change

Stream water quality has been markedly deteriorated by human activities within the Region, and evidence of persistently severe stream pollution is found in all of the 11 watersheds of the Region. Deteriorated stream water quality in turn impairs or negates the aesthetic and recreational water uses sought by an expanding segment of the population within the Region. Based upon an examination of stream sampling data collected since 1963, it is apparent that stream water quality conditions have neither markedly improved or deteriorated since that time, despite a significant increment in urban growth and development. It would appear, therefore, that efforts to improve stream water quality begun over the past decade have had a positive effect, since it is logical to assume that without such efforts stream water quality would have continued to deteriorate. If, however, the established water use objectives and supporting water quality standards for the Region's streams are to be met, concurrent effective areawide planning of land use and water quality control measures must be continued.

Woodlands: One Square Mile Lost Per Year

Woodlands assist in maintaining a unique natural relationship between plants and animals, reduce storm water runoff, contribute to atmospheric oxygen and water supply, aid in reducing soil erosion and stream sedimentation, provide the resource base for the forest product industries, and provide valuable recreational opportunities as well as a desirable aesthetic setting for attractive rural and urban development. From 1963 to 1970, woodlands were lost within the Region at a rate of over one square mile per year. Thus, a total of about 5,100 acres of woodlands have been lost since 1963, representing a 4 percent decline in the total area of woodlands within the Region. The great majority of the woodland losses occurred in Walworth, Washington, and Waukesha Counties, where significant amounts of woodlands were converted to urban residential use.

Wetlands: No Significant Change

Wetlands constitute a valuable recreational resource; support a wide variety of desirable forms of plant and animal

life; assist in reducing storm water runoff, stabilizing streamflows, and enhancing stream water quality; function as nutrient and sediment traps; and provide aesthetically pleasing vistas on the landscape. The amount of water and wetland areas in the Region remained relatively constant between 1963 and 1970. In both years, water and wetland areas amounted to about 10 percent of the total area of the Region.

Wildlife Habitat: Significant Loss of High-Value Areas

Wildlife habitat areas provide an important recreational resource, aid in controlling harmful insects and other noxious pests, and constitute a valuable aesthetic asset of southeastern Wisconsin. Wildlife habitat areas may be expected to change over time, such areas being both destroyed by urban development and created through reforestation, construction of impoundments and wetland areas, and the restoration of lands formerly used for agriculture to "natural" uses. On a net change basis, there were about 1,300 fewer acres of wildlife habitat in 1970, representing less than 1 percent of the wildlife habitat area existing in the Region in 1963. More significantly, however, about 3,000 acres of high-value wildlife habitat areas, representing about 3 percent of the total high-value areas existing in 1963, were lost or reclassified to a lower rating during the same period. The predominant cause of the loss of wildlife habitat was residential development.

Outdoor Recreation Sites: Significant Increases

In 1963 there were a total of 891 public and nonpublic outdoor recreation sites in use within the Region, having a combined total area of about 34,000 acres. By 1973 there were 1,348 such sites in use, an increase of 52 percent, with a combined total area of nearly 56,000 acres, an increase of 70 percent. Between 1963 and 1973, all counties in the Region showed increases in the amount of publicly owned recreational land in use per thousand population, and the amount of publicly owned recreational land per thousand population within the Region increased from 10 acres in 1963 to 16 acres in 1973.

Potential Park Sites: Substantial Preservation

In 1963 a total of 664 potential park sites were identified within the Region, encompassing a combined total of about 102,000 acres. By 1970, more than 9,700 acres, or about 9 percent of this total acreage, were placed in public or private recreational use. About 7,500 acres, or 7 percent of the total, were lost to urban development. Of the approximately 9,700 acres of potential park sites placed in recreational use since 1963, about 6,800 acres were placed in public recreational use. This amount actually exceeded the amount proposed to be preserved and developed in the adopted regional land use plan, which recommended an increment by 1970 of about 5,900 acres of public recreational lands.

Environmental Corridors: The Key to Resource Base Protection and Enhancement

The most important elements of the underlying and sustaining regional natural resource base, including the best remaining woodlands; wetlands; surface water and associated undeveloped shorelands and floodlands; wet or poorly drained soils; wildlife habitat; significant topography and geologic formations; groundwater recharge areas; and historic, scenic, and scientific sites, when combined, are found to occur in essentially linear patterns. These patterns have been termed by the Commission "environmental corridors." The corridors comprise a total area of about 534 square miles, or 20 percent of the total area of the Region. The preservation and protection of these corridors will do much to maintain a good environment for life within the Region as well as to preserve the unique cultural and natural heritage and natural beauty of the Region. Failure to properly adjust land use development 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 natural floodlands, destruction of significant physiographic and geologic formations, loss of water impoundment areas and reduction of groundwater recharge, loss of the best remaining woodlands, and continued deterioration of surface water quality within the Region.

From 1963 to 1970, about 4,000 acres of primary environmental corridor land, or about 1 percent of the total corridor area, were lost to urban development, particularly residential development which increased by about 3,000 acres in the corridors. Significant steps have been taken, however, by the state and local units of government toward permanent preservation of the primary environmental corridor lands as recommended in the adopted regional land use plan. By 1970, about 202 square miles, or about 38 percent of the total corridor area, were considered to be permanently preserved by virtue of either public ownership for park use or by protective floodland zoning. An additional 73 square miles of corridor, representing nearly an additional 14 percent of the total corridor area, were considered to be temporarily preserved through private park development or through such techniques as conservancy and park zoning, exclusive agriculture zoning, and country estate zoning.

Subcontinental Divide: An Important Geographic Feature

A subcontinental divide traverses the Region in a generally northwesterly-southeasterly direction and separates the Region into two major drainage areas: one flowing in a easterly direction and discharging into Lake Michigan, a part of the Great Lakes-St. Lawrence River drainage system; and one draining in a generally south and southwesterly direction, a part of the Mississippi River drainage system. 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 the utilization of conventional septic tank soil absorption sewage disposal systems.

Sanitary Sewers: A Growing Regional Service Area

Public utility systems are one of the most important and permanent elements of urban growth and development. Of particular importance to regional development is centralized sanitary sewerage. In 1963, centralized sanitary sewer service was provided to about 217 square miles, or about 8 percent of the area of the Region. By 1970 such service had been extended to about 309 square miles, or about 11 percent of the area of the Region, representing an increase of 92 square miles, or 42 percent. The total regional population served by public sanitary sewers increased from about 1.42 million persons in 1963 to about 1.49 million persons in 1970, an increase of about 70,000 persons, or only about 5 percent. The total proportion of the regional population served by public sanitary sewers remained virtually the same over the 1963-1970 period at about 85 percent. Gains in the proportion of total population served by sanitary sewers in the outlying counties of the Region did not materially increase the total proportion of the regional population served because the number of people served in highly urbanized Milwaukee County declined by about 40,000 persons.

Approximately 450 square miles of presently rural land in the Region have been proposed by local units of government for future sanitary sewer service. This area is about 1.5 times the size of the presently served area of the Region and could be expected to accommodate a future resident population increment of over two million persons, thus indicating a clear need to better coordinate regional land use development with the planned provision of sanitary sewer service.

Water Resources: Four Principal Sources of Supply

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 as provided primarily by Lake Michigan; surface water west of the subcontinental divide as provided by the inland streams and lakes; shallow groundwater in the glacial till and connected limestone aquifers; and groundwater in the generally deep sandstone aquifer. Urban development in the Region east of the subcontinental divide can readily utilize both Lake Michigan and the groundwater aquifers as a source of supply, but urban development west of that divide must depend primarily upon the two groundwater aquifers. Plans which influence the regional settlement pattern, as well as plans for water supply development within the Region, should recognize this important factor.

HISTORIC GROWTH AND LAND USE DEVELOPMENT

Urban Densities: Continuing to Decline

Although urban development within the Region has continually increased since 1850, a dramatic change in the character of this development occurred after World War II. The earlier pattern of new urban development occurring outward from established urban centers in tight, contiguous, concentric bands has been supplanted by a diffused pattern of areawide sprawl. This highly diffused pattern of urban development first became evident within the Region during the period 1950 to 1963 when a 39 percent increase in urban resident population was accompanied by a 146 percent increase in the land devoted to urban use. This pattern continued from 1963 to 1970, when a 6 percent increase in urban resident population was accompanied by a 17 percent increase in the land devoted to urban use. The direction and nature of this diffused 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 well into and in some areas beyond the Fox River Valley.

The areawide spread of urban development within the Region has been accompanied by marked reductions in urban population densities, which have dropped steadily since 1920 from 11,300 persons per square mile of developed urban area in that year, to about 8,500 persons per square mile in 1950, 4,800 persons per square mile in 1963, and 4,350 persons per square mile in 1970. Urban populations declined at a considerably faster rate between 1950 and 1963, however, than between 1963 and 1970. The adopted regional land use plan anticipated that urban population densities would continue to decline but at a much slower rate, so that the overall urban population density would approximate 4,350 persons per square mile by 1990. By 1970 that density had already been reached.

Although the Region was historically served by a highly developed electric interurban railway network, that network apparently had little influence on the spatial location of urban land use development in the Region. The advent of the high-speed, all-weather highway has had an important 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.

Residential Land: More Created Than Necessary

Urban land uses within the Region increased from about 340 square miles, or about 13 percent of the total area of the Region, in 1963 to about 397 square miles, or to about 15 percent of the total area of the Region, in 1970. The greatest proportion of this urban land, about one-half, is devoted to residential use. Nonurban land uses presently occupy about 85 percent of the total area of the Region, and the greatest proportion of this land, 75 percent, is devoted to agricultural use. From 1950 to 1963, about 16 square miles of land per year were con-

verted to urban uses. From 1963 to 1970 the rate of conversion approximated about eight square miles per year.

Residential land uses accounted for about 156,000 acres, or about 9 percent of the total area of the Region, in 1970. Between 1963 and 1970, the amount of residential land in the Region increased by nearly 27,000 acres, or by about 21 percent. This increase was considerably greater than that proposed in the adopted regional land use plan. The plan proposed that by 1970 there be about 140,000 acres of land in residential use within the Region, about 16,000 acres, or nearly 10 percent, less than that which existed in 1970. Moreover, the plan recommended that nearly all new residential development be served with public sanitary sewers. Yet, only 40 percent of the residential land created from 1963 to 1970 was so served.

The conversion of land from rural to residential use at a faster rate than proposed under the adopted plan, in spite of less than anticipated population growth and the continued creation of unsewered residential land, reflects the continued proliferation of diffused, low-density residential development. Such development has become a preferred life-style for many of the Region's residents, as evidenced by both actual land use development within the Region and the results of Commission attitudinal surveys. While about 19 percent of the Region's households are located in low-density rural or rural-suburban areas, about 40 percent of regional residents indicated a preference to reside in low-density residential areas in a 1972 Commission public opinion survey.

Major Urban Centers: Substantial Progress Toward Implementation

Substantial progress has been made relative to the preservation and development of land within the major regional activity centers identified on the adopted regional land use plan—the major outdoor park and recreation sites, the major retail and service centers, and the major industrial areas. By 1973, 10 of the 12 recommended new regional park sites had been fully or partially acquired by public agencies, with seven of the sites actually open for public use. Three of the 10 new retail and service centers proposed under the adopted plan have been developed and are in operation, and five of the remaining recommended sites have been reserved for future commercial development in local zoning ordinances. One new retail and service center was developed at a site not recommended in the plan. All six proposed new industrial areas have been reserved for future industrial development through local zoning, and were under some stage of development in the early 1970s.

Prime Agricultural Lands: Nearly Two Square Miles Developed Per Year

A major objective of the adopted 1990 regional land use plan is the preservation in agricultural use of most of the remaining prime agricultural lands in southeastern Wisconsin, the most productive farming areas of the Region. While the 1970 stage of the recommended plan anticipated a loss of about 2,100 acres of prime agricultural lands, almost 8,400 acres of prime agricultural lands were actually lost to urban development between 1963 and 1970, with the majority of these lands being located in areas not contiguous to existing urban centers. This loss represents about 2 percent of the total prime agricultural lands in the Region in 1963.

COMMUNITY PLANS AND ZONING

Overall Future Development Pattern: Decentralization

The long-range land use development objectives of the local communities comprising the Region, as reflected in local zoning ordinances examined in the early 1960s and again in the early 1970s, indicate for the most part an intent to continue the low-density urban development pattern prevalent in the Region since 1950. The continuation of such development in accordance with local zoning ordinances holds important implications for transportation and public facilities planning, and presents problems for the wise use and conservation of the natural resource base.

Residential Zoning: Holding the Line

Historically, communities in the Region have collectively grossly overzoned for future residential development. The amount of land zoned for residential use increased only slightly between 1964 and 1972, despite an increase of about 30,000 acres in the amount of land actually used for residential purposes. The relatively stable nature of residential land use zoning during this period may be largely attributed to the imposition of exclusive agricultural land use and conservancy zoning districts which have replaced improperly applied residential zoning districts. Except in scattered areas of the Region, however, there has been to date little overall zoning change since 1963 to more closely approximate the residential land use patterns envisioned in the adopted regional land use plan. For the Region as a whole, enough existing residentially zoned land remains to accommodate a population increase of approximately 2.5 million persons. The zoning of excessive amounts of land for future residential use tends to encourage urban sprawl and thus extend or intensify areawide developmental and environmental problems.

Commercial and Industrial Zoning: More Than Required

About 8,600 acres of additional land in the Region were rezoned for commercial land use purposes from 1964 to 1972, far more than the 2,900 acres of land developed for commercial uses during the same period. Similarly, about 13,300 acres of land were rezoned for industrial use during the same period, also far more than the 1,800 acres of land developed for such use. Gross overzoning tends to encourage extensive strip commercial and industrial development along major streets and highways, adding to traffic congestion and increased traffic safety hazards, tends to make transit service difficult to provide efficiently, and often results in premature development requiring the costly and untimely extension of essential municipal utilities.

Agricultural Zoning: A Trend Toward Preservation

As in 1964, the widespread use of "agricultural" zoning districts that permit residential subdivisions and scattered

residential development on one- to three-acre lots continued in the Region in 1972. Local units of government in the Region have, however, begun to take steps toward properly zoning agricultural lands. While no communities had enacted an exclusive agricultural use district in 1964, 17 communities in the Region had enacted such districts by 1972 and collectively applied proper agricultural zoning to about 236 square miles of agricultural land, representing about 15 percent of the approximately 1,540 square miles of land zoned for agricultural use within the Region in 1972. Included in this are about 65,000 acres of prime agricultural lands, representing about 14 percent of the prime agricultural land recommended to be permanently preserved in the adopted regional land use plan.

Floodland Zoning: Significant Achievements

The regional land use plan recommended that local communities adopt special floodland zoning regulations designed to prohibit filling and building in the natural floodlands, that is, in all of the area contained within the 100-year recurrence interval flood hazard lines, and thus preserve not only the existing floodwater conveyance and storage capacities of the riverine areas, but also important associated elements of the natural resource base. The Root, Fox, and Milwaukee River watershed plans identified those stream reaches where urban development had already encroached on natural floodlands and destroyed those resource base elements that had existed on the floodland fringe. In those instances, the watershed plans recommended the adoption of an urban floodway that would recognize existing development and preserve the remaining floodwater conveyance capacity.

Significant progress has been made since 1963 in carrying out these plan recommendations. By 1974, floodland zoning ordinances had been adopted by five of the six counties in the Region having unincorporated areas, by 12 of the 28 cities, and by 15 of the 54 villages. In all but four cases, these floodland zoning ordinances follow the plan recommendations and thereby fully protect the remaining natural 100-year recurrence interval floodlands, preserving both floodwater conveyance and storage capacities, as well as significantly contributing to the preservation of primary environmental corridor lands. In four cases—the Cities of Brookfield and New Berlin, the Village of Lannon, and the unincorporated areas of Ozaukee County—the existing floodland zoning ordinances, while meeting minimum state standards for the protection of floodwater conveyance capacity and abatement of potential flood damages, do not fully protect the natural floodlands because the ordinances permit filling and development along the floodland fringe. Such filling not only results in a loss of floodwater storage capacity and attendant changes in flood discharges and stages, but may destroy those elements of the natural resource base, such as woodlands, wetlands, and wildlife habitat areas, found in the riverine area.

Collectively, those ordinances based upon Commission recommendations fully protect the undeveloped floodlands along about 416 miles of perennial stream channel, or about 36 percent of the total perennial stream channel in the Region. The ordinances in the four communities which only partially protect the undeveloped floodlands pertain to an additional 64 miles of perennial stream channel, or about 6 percent of the total perennial stream channel in the Region.

Use of Soils Data: Nearly Universal

Since 1963, local units of government in the Region have acted in a significant way to incorporate soil restrictive regulations in sanitary, health, and subdivision ordinances, and thereby curb the very worst and costly abuses of the soil and water resources of the Region that occur when septic tank sewage disposal systems are placed in areas where they will not function properly. The regional soil survey and accompanying interpretive analyses now apply through regulatory ordinances to about 2,024 square miles, or about 76 percent of the area of the Region.

TRANSPORTATION FACILITIES

Arterial System: The Emergence of the Freeway

The period 1963 to 1972 can best be characterized with respect to transportation facility development as the period in which the freeway emerged as the singularly most important element of the regional transportation system. About 168 miles of freeways and accompanying ramps were opened to traffic in the Region between 1963 and 1972, resulting in a most significant improvement in the operation of the surface transportation system. Total street and highway mileage in the Region between 1963 and 1972 increased by about 10 percent, from about 8,900 miles in 1963 to about 9,800 miles in 1972. Arterial street and highway mileage, however, actually decreased slightly from nearly 3,200 miles in 1963 to about 3,100 miles in 1972. Freeways, which amounted to about 137 miles, or about 4 percent of the arterial street system in 1963, totaled about 305 miles, or about 10 percent, of the 1972 arterial street system. This freeway system, however, carried about one-third of total arterial average weekday travel which occurred within the Region in 1972.

Of the approximately 279 miles of freeway proposed in the adopted regional transportation plan, all but about seven miles are in various stages of implementation, with 63 miles actually open to traffic as of September 1974. Considerable delays, however, have been encountered in implementing some of the most important components of the recommended regional freeway system, particularly in the Milwaukee metropolitan area.

Several important factors have contributed to these delays, including new federal requirements pertaining to environmental protection and the taking of parklands for highway purposes, narrowly based neighborhood opposition to particular freeway segments, and more broadly based metropolitan-wide opposition to freeways in general. This freeway opposition led to advisory referenda in Milwaukee County on November 5, 1974 concerning completion of five freeway segments recommended in the adopted regional transportation plan—the Airport Spur Freeway, the Park Freeway—West, the Stadium Freeway—South, the Lake Freeway—Downtown Loop,

and the Lake Freeway—South. The Milwaukee County voters indicated support for the completion of all five freeway segments. The results of these referenda parallel the results of a 1972 Commission attitudinal survey where a very large majority of respondents believed that freeway construction should be continued to some degree within the Region.

Arterial Travel: Dramatic Increases

In 1963, approximately 13 million vehicle miles of travel occurred within the Region on the arterial street and highway system on an average weekday. By 1972, arterial vehicle miles of travel on an average weekday had grown to about 20 million, an increase of about 7 million vehicle miles per day, or about 54 percent, since 1963. Much of this increase—nearly 70 percent—occurred in Milwaukee and Waukesha Counties. About one-half of all arterial vehicle miles of travel occurred in Milwaukee County, where in 1972 about 13,400 vehicle miles of travel occurred per mile of arterial street or highway on an average weekday, compared to 9,300 vehicle miles of travel per mile of arterial in 1963. On a regionwide basis, two-thirds of the increase in arterial utilization has been absorbed by the developing freeway system. In Milwaukee County, freeway facilities absorbed an amount greater than the 3.3 million average daily vehicle miles of increase in travel demand within the county, with a corresponding decrease in traffic on the surface arterials.

Arterial Congestion: On the Increase Due to Delay in Plan Implementation

About 10 percent of the total arterial street and highway system in the Region, or 318 miles, were found to be operating either at or over design capacity in 1972. Most of the congested streets and highways were located within the intensely urbanized areas of the Region. Milwaukee County was found to have about 17 percent of its total arterial street and highway mileage operating at or near congestion levels. The congested arterial street and highway mileage decreased within the Region by about 4 percent, from about 332 miles in 1963 to 275 miles in 1970, and then increased to 318 miles in 1972. This pattern roughly parallels the pattern of freeway openings in the Region during the same time period: as more freeways were opened, arterial congestion decreased, and as fewer freeways were opened, arterial congestion again began to increase. The total net reduction in arterial traffic congestion was effected in spite of an 8 percent increase in population, a 40 percent increase in motor vehicle registration, a 25 percent increase in trip generation, and a 54 percent increase in arterial vehicle miles of travel. Without the regional freeway system, such increases in travel demand could not have been absorbed without extreme traffic congestion.

Mass Transit: Dramatic Ridership Loss

Significant reductions in the use of urban mass transportation occurred in the Region between 1963 and 1972. Within the Milwaukee urbanized area, annual revenue passengers decreased by 41 percent, from 89 million in 1963 to 52 million in 1972. Per capita transit use declined from 85 transit trips per capita per year to 50 transit trips per capita per year. Similar declines were evidenced in the Kenosha and Racine urbanized areas. Scheduled total bus and seat miles of service decreased from 85,000 bus miles and 3.4 million seat miles in 1963 to 64,000 bus miles and 3.3 million seat miles in 1972. Average weekday use of the transit service as measured by the ratio of scheduled seat miles of service to passenger miles of use declined from 30 percent to 17 percent in the Milwaukee urbanized area, from 24 percent to 18 percent in the Racine urbanized area, and from 19 percent to 9 percent in the Kenosha urbanized area. Moreover, the transit systems operating in the Region had to increase the total route mileage operated by about one-third, from nearly 850 route miles in 1963 to over 1,100 route miles in 1972, just to serve in 1972 a geographic area containing approximately the same resident population as was served within a smaller service area in 1963.

The single exception to the general decline in mass transit ridership since 1963 is the growth in the provision and utilization of "freeway flyer" service in the Milwaukee urbanized area. Starting in 1964 with an initial freeway flyer route between the Mayfair Shopping Mall in Wauwatosa and the Milwaukee central business district, this service had grown by 1974 to nine routes. Ridership on the freeway flyers increased from about 81,000 revenue passengers annually in 1964 to 721,000 annual revenue passengers in 1973.

While overall transit utilization fell dramatically, some steps were taken to implement the transit system recommendations contained in the 1990 regional transportation plan. For the Milwaukee area, that plan recommends the development of a rapid transit system operating over eight miles of exclusive busway and a modified rapid transit system operating over 107 miles of freeway facilities, together serving a total of 39 transit "stations" within the Milwaukee urbanized area. By 1974, three of the 39 stations had been established and placed in operation, with nine additional stations functioning on an interim basis at temporary locations. Freeway flyer service, a form of the recommended modified rapid transit service, was being provided over 43 miles of existing freeway. Implementation of the proposed busway in the Milwaukee East-West travel corridor was suspended in 1973, however, in favor of again exploring alternatives to the busway.

TRAVEL HABITS AND PATTERNS

Tripmaking: Growing Faster Than Population

Approximately 3.8 million person trips and 2.6 million vehicle trips were made on an average weekday in the Region in 1963. By 1972, the number of person trips made within the Region on an average weekday had risen to 4.7 million, an increase of 23 percent, and the number of average weekday vehicle trips had risen to 3.4 million, an increase of 33 percent. In both years it was found that almost all of this travel was internal, with over 95 percent of both total person and total vehicle trips being made by residents. Internal travel patterns, therefore, represent one of the primary determinants of the need for, and

location and capacity of, future transportation facilities within the Region. While tripmaking increased by about 33 percent, the resident population increased by only about 8 percent, and the number of households within the Region increased by 16 percent. Tripmaking increased from an average of 7.3 trips per day per household in 1963 to 7.9 trips per day per household in 1972.

Tripmaking reflects the socioeconomic 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.

Trip Purpose: Growing Importance of Non-Work-Related Trips

Trips to work, although comprising the largest category but one of trips made within the Region on an average weekday in both 1963 and 1972, declined as a proportion of all weekday trips from about 18 percent in 1963 to about 16 percent in 1972. Trips to work also exhibited the smallest relative increase from 1963 to 1972—about 11 percent. Trips to home constituted the singularly largest category of trips in both 1963 and 1972, in each year approximating 41 percent of all trips. Of growing importance were trips for personal business, school, social-recreation, and shopping. Together, these categories of trips now account for about 43 percent of all trips made within the Region on an average weekday.

Automobiles Available: Up by One-Third

The number of automobiles available to residents of the Region increased from 527,000 in 1963 to 705,000 in 1972, an increase of 178,000 autos, or 34 percent. Moreover, the proportion of households having two or more autos available increased from 24 percent in 1963 to 34 percent in 1972. In addition, the proportion of zero- and one-auto households decreased from 1963 to 1972.

Truck Travel: No Change

In both 1963 and 1972, approximately 88 percent of total internal vehicle trips were made by automobile or taxi, and only 12 percent were made by trucks. Moreover, truck travel did not exhibit in either year the same sharp concentrations of trip movement patterns as auto travel, neither by hour of the day or day of the week. These findings indicate that, with respect to highway facilities, the transportation problem within the Region is primarily one of the movement of people rather than goods.

Trip Origins and Destinations: The Importance of the Home

Approximately 80 percent of total person trips within the Region on an average weekday in both 1963 and 1972 consisted of trips made by family members to and from their place of residence. Clearly, then, the location of future residential development remains one of the strongest factors affecting future travel demand within the Region and, consequently, future transportation facilities as well.

Travel Patterns: Work Trips Continue to Dominate Peak Demand

The hourly distributional patterns of internal person trips observed in 1963 and again in 1972 indicated that despite substantial increases in total trip volumes from 1963 to 1972, the regular ebb and flow of travel remained markedly similar both in the proportion of trips by trip purpose and in the proportion and times of peak periods. Nearly one-third of all daily travel occurs in the two morning and two afternoon peak hours of the day. Of these peak hour movements, trips to and from work comprised about 47 percent in 1963 and 44 percent in 1972, indicating that one of the primary transportation problems within the Region continues to be meeting the peak demand of the journey to and from work. These findings further indicate that the location of future employment centers remains an important factor affecting both travel demand and transportation facilities within the Region.

Transportation Mode: The Dominance of the Automobile

In 1963, automobiles accounted for 87 percent of all internal person trips within the Region on an average weekday, compared to 9 percent for transit and 3 percent for school buses. By 1972, automobiles accounted for 92 percent of all internal person trips within the Region on an average weekday, compared to 4 percent for transit and 4 percent for school buses. The overwhelming and increasing predominance of the auto as a mode of travel within the Region, combined with the continued upward trend in automobile registrations and the persistent decline in transit utilization, presents a threat to the reestablishment, as well as the maintenance, of a balanced regional transportation system.

Trip Generators: Milwaukee CBD Remains Dominant

The Milwaukee CBD remained the largest single generator of person trips in the Region, despite a decrease of person trip destinations in the CBD on an average weekday from about 140,000 in 1963 to about 134,000 in 1972, a 4 percent decline. The number of transit trip destinations in the Milwaukee CBD on an average weekday decreased significantly, from about 56,000 in 1963 to about 29,000 in 1972, a 43 percent decline. No other single geographic area of the Region of comparable size to the Milwaukee CBD attracts more than 60,000 person trips or more than 8,500 transit trips on an average weekday.

Weekend Travel: Should Not Influence Transportation System Design

A special weekend travel survey was made in 1972. The findings of this survey indicate that total daily and peak hour travel demands on weekend days are generally substantially less than those occurring on an average weekday. Traffic counts along the Milwaukee screenline and within the City of Milwaukee indicate average weekend day travel to constitute about 70 percent of average weekday travel. Weekend traffic counts on certain facili-

ties at the boundary of the Region, however, indicate average weekend day travel exceeds average weekday travel by about 36 percent. The hourly distributional patterns of weekend travel showed striking differences from the patterns of weekday travel. The sharp early morning and mid-afternoon peaks observed in weekday travel were not present on the weekend day, due primarily to the relatively small number of trips made on weekend days to and from work. The more evenly distributed travel to social-recreational activities and for personal business—including trips to religious services—are a prominent influence on the weekend travel patterns. The peak travel period of the weekend day occurs at about 11:00 a.m., with a secondary peak occurring about 4:00 p.m.

The findings of the weekend travel survey indicate that weekend travel should not influence transportation system design, since weekend travel can largely be accommodated on transportation facilities designed to serve weekday travel demands. Weekend day travel may, however, influence the design of certain transportation facilities, primarily those providing access to recreational areas in the Region and those serving major travel demands through the Region. Accordingly, weekend travel should be examined with respect to the specific design and traffic management of certain facilities, including IH 94, USH 41, and USH 141 through the Region, and other surface arterial facilities crossing the Wisconsin-Illinois state line and providing service to recreation areas in Kenosha and Walworth Counties.

CONCLUSIONS

The foregoing summary of inventory findings suggests the following major conclusions with respect to the state of development within southeastern Wisconsin in the early 1970s, as such development relates to land use and transportation system planning and development:

1. The scale of regional growth and urbanization is changing, and the very high rates of population increase and massive rural to urban migration experienced in the years immediately following the end of World War II appear to be coming to a close. The very high population growth rates exhibited in the Region from 1950 to 1963 will likely be replaced with more modest growth rates approximating those of the 1940s.

2. The pattern of urbanization within the Region is continuing to change from one of compact, concentric growth centered on the oldest and largest central cities of the Region to one of a highly diffused, multi-centered character. This areawide diffusion of urban land uses and of population and economic activity has been accompanied by declines in the population levels of the older central cities and first-ring suburbs. Factors contributing to this areawide diffusion of urban development include, with respect to population, changing preferences in residential location and density, the widespread availability of electric power and electronic communication facilities, the availability of the septic tank and private well as substitutes for centralized sanitary sewerage and water supply facilities, mass automotive transportation and all-weather highway systems, and the rising cost of land in close proximity to the existing urban centers. Such factors with respect to economic activity include the population decentralization itself, the availability of relatively low cost land on the urban periphery, the inability of commercial and industrial firms to readily and economically expand physical plants and to provide offstreet parking in established urban areas, and the relatively high level of transportation service offered by outlying sites.

3. The total impact of urban encroachment since 1963 with respect to two key elements of the adopted regional land use plan—the primary environmental corridors and the prime agricultural lands—has been relatively small. The primary environmental corridors and the prime agricultural lands remain as important to the future growth and development of, and to the overall quality of, the environment in the Region today as they were in 1963. Local units of government in the Region have since 1963 exhibited a greater willingness to utilize the zoning power to preserve and protect the environmental corridors and prime agricultural lands. Accordingly, and in light of less than anticipated population growth, there would appear to be no reason to change these key regional land use plan recommendations.

4. Significant progress toward implementation of the regional land use plan has also been made in the acquisition and development of the major activity centers identified in that plan. Ten of the 12 new major regional park and outdoor recreation sites recommended for public use in the plan have been acquired and at least partially developed, and significant progress has been made toward preservation and development of the planned new retail and service and major industrial centers. Conversely, the most significant departure from the regional land use plan has been the continued proliferation of residential land uses in a highly diffused pattern at lower than recommended densities resulting in the creation of scattered, incomplete neighborhoods for which the provision of essential facilities and services will be costly and inefficient.

5. While local communities in the Region have exhibited a willingness to utilize the zoning power to protect the Region's primary environmental corridors and, to a lesser degree, the prime agricultural lands, local communities in the Region have not as yet exhibited a willingness to adjust residential, commercial, and industrial land use zoning patterns to the regional land use pattern expressed in the adopted regional land use plan. In light of the continued strong preferences

for decentralized low density residential development, preferences expressed both in attitudinal and behavioral surveys, consideration in the land use plan reevaluation of an alternative plan based upon the continuation of low density residential development—in effect a "controlled sprawl" plan—appears warranted.

6. Despite less than anticipated regional population growth, actual development has occurred in general conformance with the forecasts of employment, automobile availability, trip generation, and vehicle miles of travel on which the adopted 1990 regional land use and transportation plans were in part based. Because of declining birthrates and reversing migration trends, the Region has fewer people. Regional residents, however, have more jobs and automobiles and make more trips than originally anticipated. Recent trends in household formation, land use development, and automobile availability provide reason to believe that such trip making will continue to increase in the foreseeable future. It is unclear what effect the more recent motor fuel shortages and increasing motor fuel prices may have on travel habits and patterns. The automobile industry has already begun to respond to motor fuel shortages and increasing motor fuel prices through the manufacture of motor vehicles that are more energy efficient. In light of the uncertain situation with respect to the effects of motor fuel cost and availability on regional development, it would appear prudent in the regional plan reevaluation to test the sensitivity of alternative regional transportation plans to differing levels of motor fuel availability and pricing structures.

7. In the last 10 years the freeway has emerged as the singularly most important element of the regional transportation system. During this time intercity railroad service in the Region has been significantly reduced, and urban mass transit service has continued to decline. Freeways now comprise about 10 percent of the arterial street and highway system in the Region but carry about one-third of the total daily travel load. In light of these trends, freeways may be expected to remain the dominant element of the regional transportation system for the foreseeable future.

8. The significant decline in mass transit utilization, which extends back to the end of World War II, and which occurred long before the emergence of the freeway as the dominant element of the regional transportation system, holds important implications for regional transportation system planning and development. Only 4 percent of all internal person trips in the Region on an average weekday are now made by transit, with 92 percent made by automobile. This overwhelming and increasing predominance of the auto as a mode of travel presents a formidable obstacle to the reestablishment of a regional transportation system more reliant upon mass transit. Mass transit utilization has declined so significantly that even a return to 1963 levels of use will require major efforts by all concerned. Even if mass transit utilization can be returned to 1963 levels, such increased utilization would have an insignificant effect on the need for arterial streets and highways to accommodate present and probable future travel demands. Furthermore, the continued trends toward regional land use decentralization and declining urban densities work directly against the development of a regional transportation system having an increasing dependence upon mass transit. Accordingly, mass transit must be viewed as a supplementary mode of travel rather than a substitute for the automobile.

The foregoing findings and conclusions provide a basis upon which the existing 1990 regional land use and transportation plans will be reevaluated and, as necessary, updated and refined. That portion of the major regional plan reevaluation effort is documented in the second volume of this planning report.

APPENDICES

Appendix A

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL LAND USE-TRANSPORTATION PLANNING

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Frank A. Wellstein . . . . . City Engineer, City of Oak Creek
Dan Wilson . . . . . Resource Development Agent, University of Wisconsin-Extension, Washington County

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Thomas R. Clark . . . . . Chief Planning Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
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James E. Foley . . . . . Airport Engineer, Milwaukee County Department of Public Works
Dr. Thomas N. Harvey . . . . . Regional Representative, Urban Mass Transportation Administration, Chicago
Frank M. Hedgcock . . . . . City Planner, City of Waukesha
Fred J. Hempel . . . . . Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
John O. Hibbs . . . . . Division Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
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George J. Novenski . . . . . Chief, Travel Statistics and Data Coordination Section, Division of Planning, Wisconsin Department of Transportation
Allan P. Pleyte . . . . . Traffic Engineer and Superintendent, Bureau of Traffic Engineering and Electrical Services, City of Milwaukee
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Donald V. Revello . . . . . Chief, Planning Methods and Forecasts Section, Division of Planning, Wisconsin Department of Transportation
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John E. Schumacher . . . . . City Engineer, City of West Allis
Harvey Shebesta . . . . . District Engineer, District 9, Division of Highways, Wisconsin Department of Transportation
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Melvin Noth . . . . . Director of Public Works, Village of Menomonee Falls
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Transit Subcommittee

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Edward A. Jenkins. . . . . Transportation Director, City of Kenosha
Robert F. Kolstad . . . . . Director of Community Development, City of Kenosha
Henry M. Mayer . . . . . President and Manager of Operations, Milwaukee Transport Services, Inc.
N. H. McKegney . . . . . Terminal Superintendent, The Milwaukee Road, Milwaukee
Dwayne Partain. . . . . Business-Industry Liaison Officer, Milwaukee Area Technical College
Allan P. Pleyte . . . . . Traffic Engineer and Superintendent, Bureau of Traffic Engineering and Electrical Services, City of Milwaukee
James F. Popp . . . . . Chief of Planning, U. S. Department of Transportation, Federal Aviation Administration, Great Lakes Region, Chicago
Joyce G. Poulsen. . . . . Executive Director, Southeastern Wisconsin Area Agency on Aging, Inc., Waukesha
Richard A. Rechlicz. . . . . Executive Secretary, Wisconsin School Bus Contractors Association
Donald V. Revello . . . . . Chief, Planning Methods and Forecasts Section, Division of Planning, Wisconsin Department of Transportation
Dr. Eric Schenker . . . . . Professor, Department of Economics, University of Wisconsin-Milwaukee
Harvey Shebesta . . . . . District Engineer, District 9, Division of Highways, Wisconsin Department of Transportation
Jack Taylor . . . . . President, Flash City Transit, Racine
Frank A. Wellstein. . . . . City Engineer, City of Oak Creek
Thomas N. Wright . . . . . Director of Planning, City of Racine

Appendix B

CITIZENS ADVISORY COMMITTEE ON THE FREEWAY-TRANSIT ELEMENT OF THE REGIONAL LAND USE AND TRANSPORTATION PLAN REEVALUATION

Richard W. Cutler Chairman	Attorney, Quarles and Brady, Milwaukee; Member, Secretary, SEWRPC
Evelyn Petshek Vice-Chairman	Director of Development, University of Wisconsin-Milwaukee; Former Chairman, City of Milwaukee Plan Commission
Orren J. Bradley	President, Boston Store Department Stores
Roger C. Cobb	Administrator, Milwaukee Legal Services Program
James N. Elliott	President, Milwaukee Building and Construction Trades Council, AFL-CIO
Sebastian J. Helfer	Director, Department of Planning and Construction, Marquette University
Leonard C. Hobert	Chairman of the Board, Gimbels Midwest; President, Citizens Governmental Research Bureau
Cynthia Kukor	Alderman, City of Milwaukee
Thomas P. Leisle	Mayor, City of Mequon
Harold A. Lenicheck	Chairman of the Board, Wisconsin Division, Chicago Title Insurance Company
Dr. Robert F. Purtell, Jr.	Brookfield, Wisconsin
John S. Randall	Management Consultant, Milwaukee
Lee G. Roemer	Chairman of the Board, Wisconsin Public Service Corporation
Dr. Eric Schenker	Professor, Department of Economics, University of Wisconsin-Milwaukee; Former Chairman, Harbor Commission, City of Milwaukee
Dr. Abraham Scherr	Citizens Regional Environmental Coalition
Wesley Scott	Executive Director, Milwaukee Urban League
Thomas M. Spellman	West Side Citizens Coalition, Milwaukee
Bert Stitt	Executive Secretary, Bradystreet Merchants Association
L. William Teweles	Management Consultant, Milwaukee

Appendix C

REGIONAL ZONING DISTRICT CLASSIFICATION SYSTEM: 1972

Regional Zoning District		Description
Name	Code	
Residential		
Low Density	R-1	Includes local zoning districts providing for a minimum lot area of 20,000 square feet or more per dwelling unit.
Medium Density	R-2	Includes local zoning districts providing for a lot area of from 6,000 to 19,999 square feet per dwelling unit.
High Density	R-3	Includes local zoning districts providing for a minimum lot area of less than 6,000 square feet per dwelling unit.
Commercial		
General and Local	B-1	Includes local zoning districts with such titles as General, Local, Neighborhood, and Restricted commercial zones; retail business zones; and local shopping zones.
Regional	B-2	Includes local zoning districts with titles relating to regional, downtown, or central business district zones.
Industrial		
Manufacturing and Related	M-1	Includes local zoning districts providing for all types of manufacturing and warehousing land uses.
Transportation, Communication and Utilities	T-1	Includes local zoning districts specifically providing for airports, railroads, and major streets and highways.
Governmental and Institutional		
Governmental and Institutional	I-1	Includes all local zoning districts specifically providing for governmental and institutional and semi-public land uses.
Recreational		
Private	P-1	Includes local zoning districts specifically providing for outdoor recreational facilities and areas as applied to privately owned lands.
Public	P-2	Includes local zoning districts specifically providing for outdoor recreational facilities and areas as applied to publicly owned lands.
Agricultural		
Agricultural and Related	A-1	Includes all local zoning districts that carry a title of agriculture or agricultural and related.
Other Uses		
Conservancy	C-1	Includes all local zoning districts specifically related to floodlands, woodlands, wetlands, and other related open lands.
Water	W-1	Includes those zoning districts related to lakes, rivers, and streams.
Unrestricted	UN	Includes any locally zoned areas where no particular specific land use is provided for in the zoning district.
Unzoned	UZ	Includes any lands to which no local zoning ordinance applies.

Source: SEWRPC.

Appendix D

GROUPING OF REGIONAL ZONING DISTRICT CATEGORIES AND REGIONAL LAND USE CATEGORIES INTO A COMMON CLASSIFICATION SYSTEM

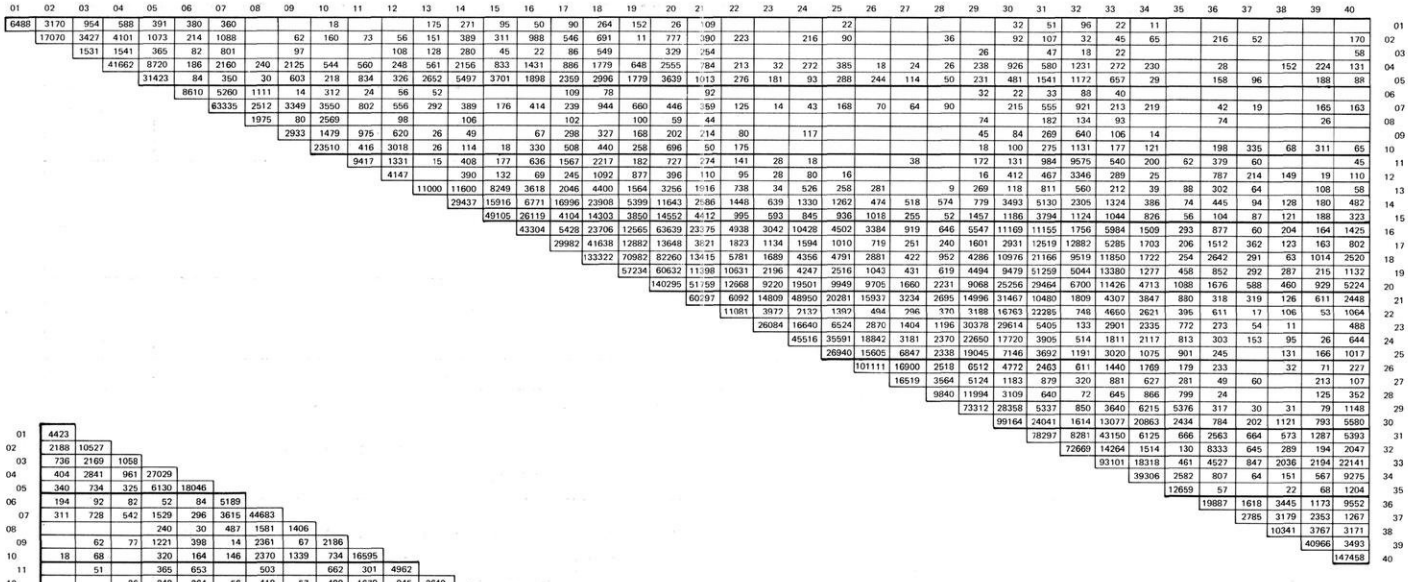
General Regional Zoning District Categories		Common Classification System Categories	General Regional Land Use Categories	
Name	Code		Name	1 Digit Code
Low Density Residential Medium Density Residential High Density Residential	R-1 R-2 R-3	Residential	Residential	0
General and Local Commercial Regional Commercial	B-1 B-2	Commercial	Retail and Services Wholesale	1 2
Manufacturing and Related Transportation, Communication and Utilities	M-1 T-1	Industrial	Manufacturing Transportation, Communications, and Utilities	3,4 5
Governmental and Institutional	I-1	Governmental and Institutional	Institutional and Governmental Services	6
Private Recreational Public Recreational	P-1 P-2	Recreation	Recreation	7
Agricultural and Related	A-1	Agriculture	Agriculture and Related	8
Conservancy Water Unrestricted Unzoned	C-1 W-1 UN UZ	All Other Uses	Other Open Lands, Swamps, and Water Areas	9

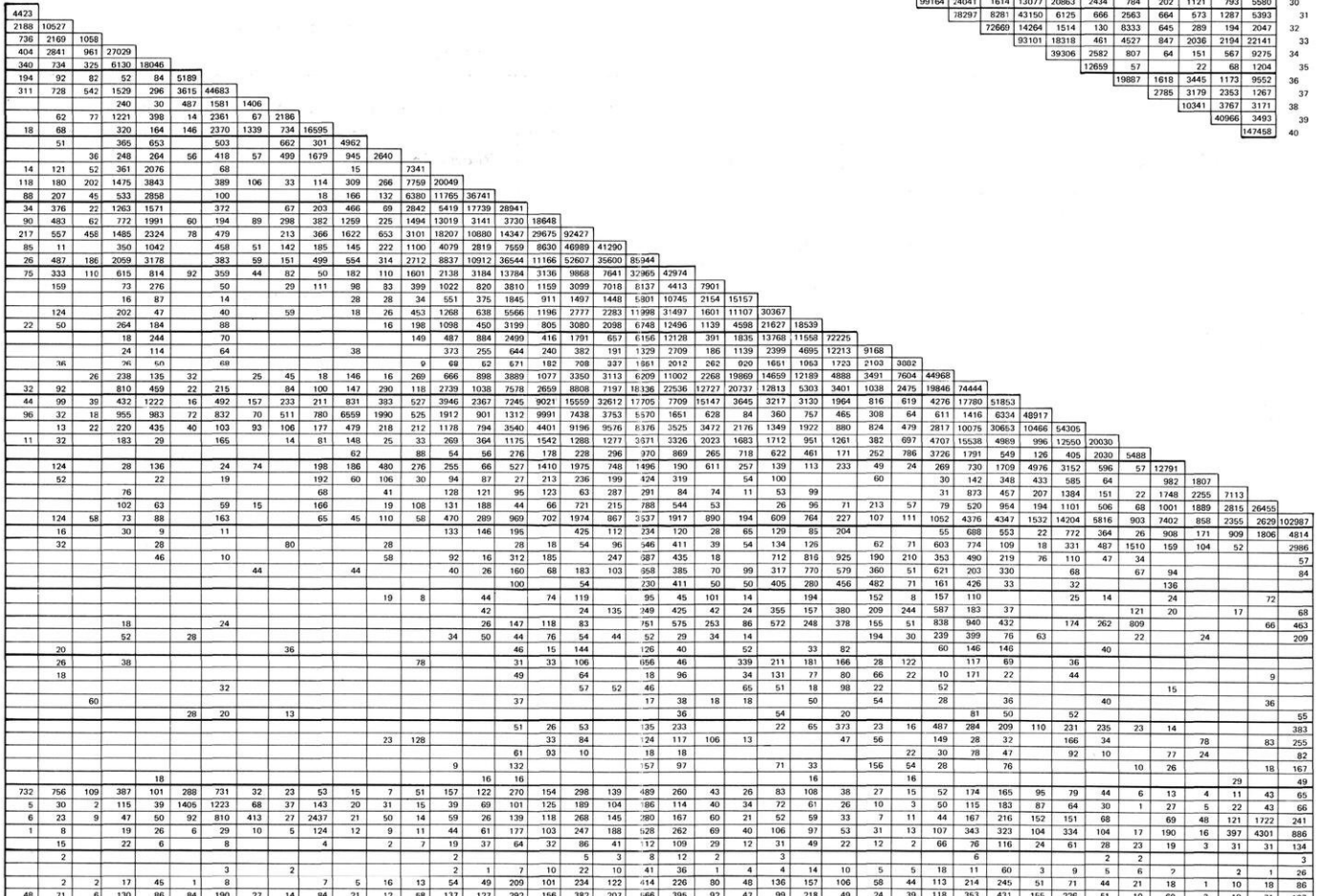
Source: SEWRPC.

Appendix E

TOTAL VEHICLE AND PERSON TRIPS–PLANNING ANALYSIS AREA TO PLANNING ANALYSIS AREA

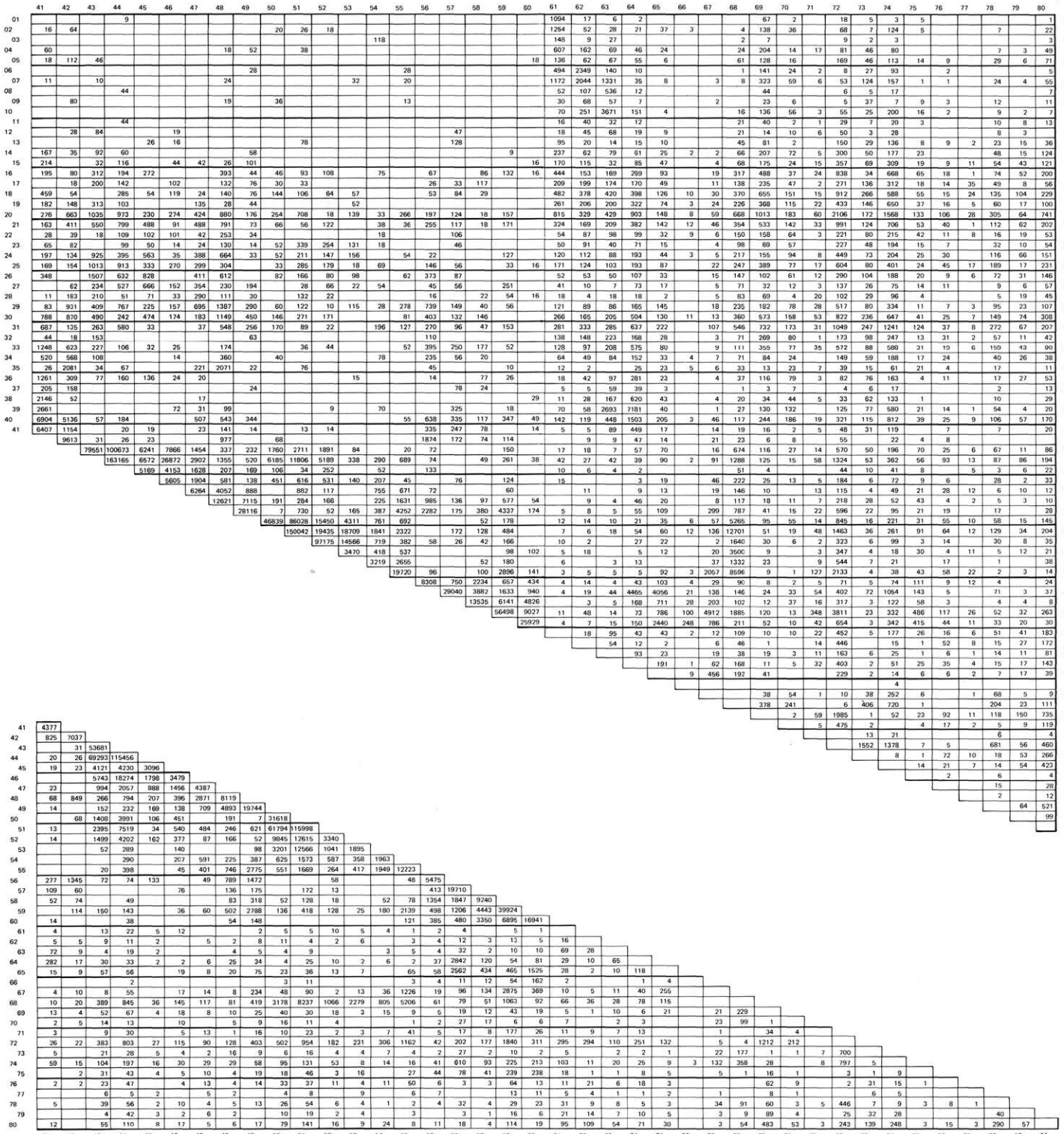
Total Person Trips





Total Vehicle Trips

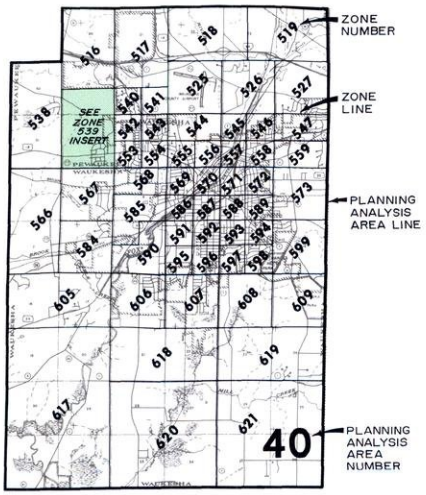
Total Person Trips



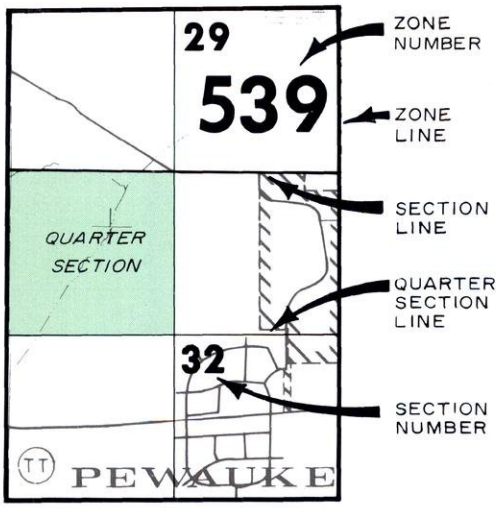
Total Vehicle Trips

Figure F-1

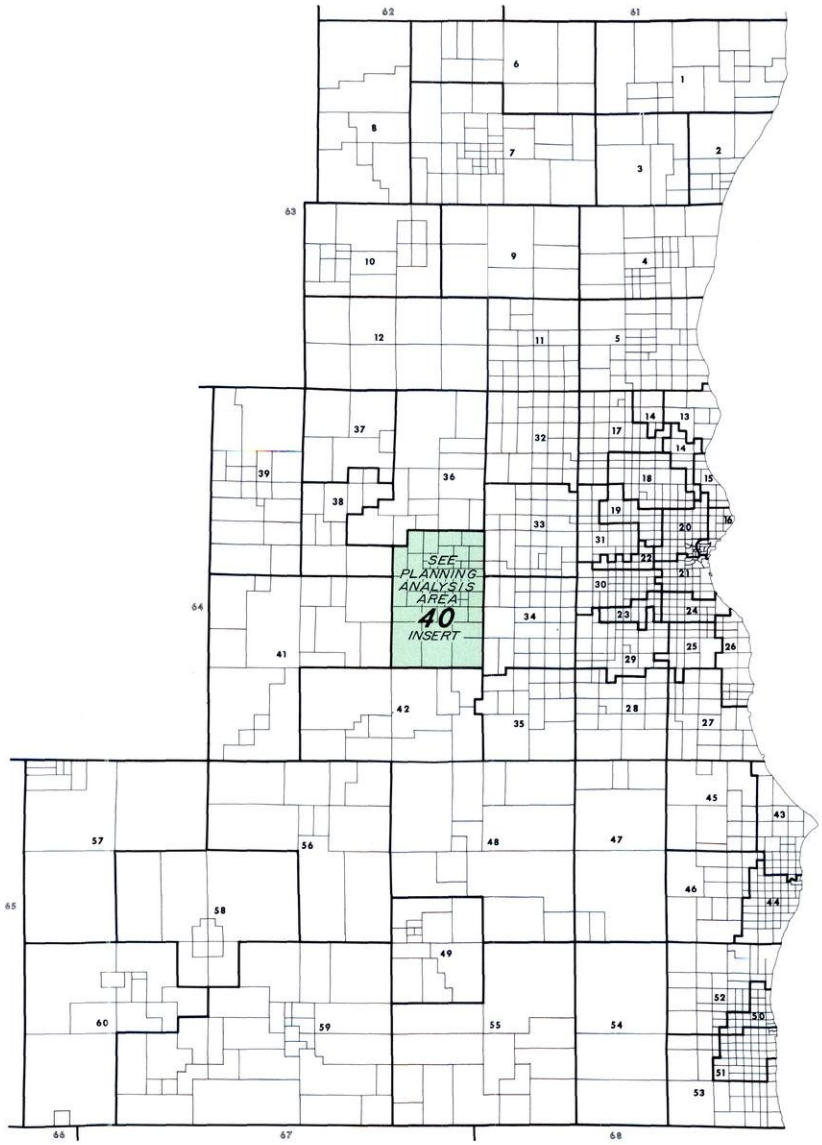
GEOGRAPHIC IDENTIFICATION SYSTEM USED FOR THE 1972 REGIONAL LAND USE-TRANSPORTATION PLAN REEVALUATION



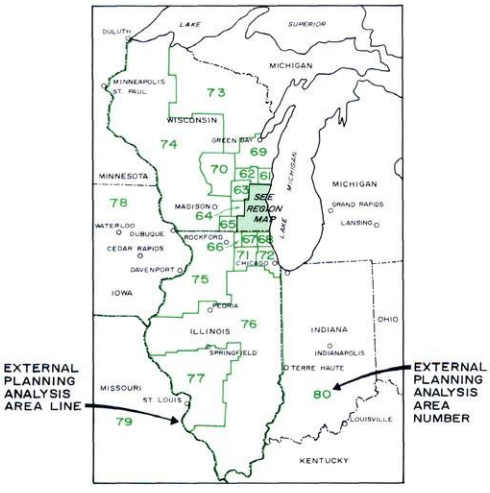
PLANNING ANALYSIS AREA 40 INSERT



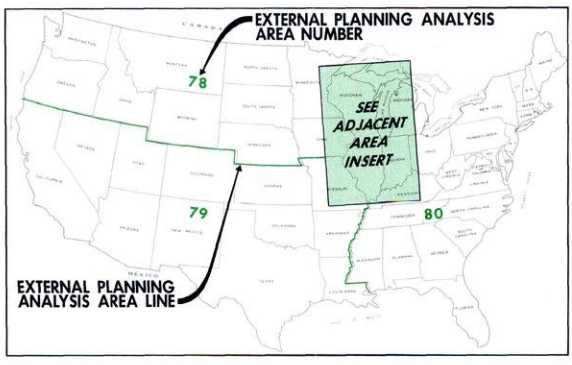
ZONE 539 INSERT



PLANNING ANALYSIS AREAS IN THE REGION



PLANNING ANALYSIS AREAS IN ADJACENT STATES



PLANNING ANALYSIS AREAS IN THE UNITED STATES

Appendix F

GEOGRAPHIC IDENTIFICATION

INTRODUCTION

The collection analyses and use of land use-transportation planning data, requires the establishment of a sound means for relating the inventory data to the geographic area from which it is collected. This requires the adoption of a basic areal unit which is: 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 as a primary unit of geographic identification is well adapted to machine data processing methods, and if properly devised permits analysis by geographic unit of almost any degree of coarseness or refinement. The U. S. Public Land Survey system provides a geographic reference system which both conceptually and actually divides the landscape into grid squares about one half mile on the scale. 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 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 containing approximately 160 acres. The quarter-section was accordingly selected by the Commission as the primary unit of geographic identification for the summarization of land use and travel inventory data throughout the Region.

Where the one-half mile grid square, as such, is a unit too large for any desired analysis, it can be readily broken down into one-quarter mile grid squares 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 data processing. In addition, it is possible with this system to closely approximate such natural topographic boundaries as rivers, lakeshores, and watersheds as well as such artificial boundaries as civil division limit lines.

The U. S. Public Land Survey quarter-section was used as the primary unit of geographic identification in both the initial 1963 regional land use-transportation planning effort and in the 1972 plan reevaluation effort. For a more detailed description of the U. S. Public Land Survey system, see "A Backward Glance" SEWRPC Technical Record, Volume One, Number 2.

1963 DATA AGGREGATION SYSTEM

To provide an analysis unit larger than the one-half mile grid square, and to decrease the number of geographic units for which data must be handled and forecasts made, traffic analysis zones were delineated in the initial 1963 regional land use-transportation study comprising aliquot parts of, entire, or combinations of, quarter sections (see Figure on page 178, SEWRPC Planning Report No. 7, Volume One, Inventory Findings—1963). Within the Region, 619 such traffic analysis zones were delineated, ranging in area from 0.04 square mile in the Milwaukee central business district to 38.09 square miles in the most sparsely settled portion of the Region. Criteria considered in the delineation of the 1963 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, homogenous land uses.

To provide still larger data analysis units in the 1963 study, the traffic analysis zones were grouped into traffic analysis districts. The traffic analysis districts were further grouped into rings concentric about the Milwaukee central business district and into sectors radiating from the Milwaukee central business district. Beyond the boundaries of the Region, sector lines were extended to encompass hypothetical "trafficsheds" in the continental United States, Canada, and Mexico.

1972 DATA AGGREGATION SYSTEM

By 1972 the overall Commission regional planning program had been considerably broadened to include planning efforts relating to housing, sanitary sewerage facilities, watershed development, and urban area planning. In carrying out these supplemental planning programs and in attempting to integrate such planning efforts with the ongoing regional land use-transportation study, it became apparent that a new, more comprehensive unit of planning analysis was needed above and beyond the basic U. S. Public Land Survey quarter-section, the traffic analysis zone, and the traffic analysis districts, sectors, and rings established under the 1963 regional land use-transportation study. Accordingly, the concept of a planning analysis area was created. Planning analysis areas are intended to comprise rational subareas for planning analysis purposes, and as such are generally intended to be comprised of a number of "neighborhoods" which together form a "community for physical planning purposes," and which accordingly consist of groups of minor civil divisions—cities, villages, and towns—and in some cases subareas of minor civil divisions throughout the

Region. A total of 60 such planning analysis areas were identified within the Region (see Figure F-1). The factors considered in determining the boundaries of these areas included, in addition to the corporate limits of the minor civil divisions, current census tract boundaries; existing and potential centralized sanitary sewer and public water supply service areas; existing and potential mass transportation service areas; availability of certain other facilities and services; residential neighborhood boundaries; travel patterns centered on major commercial and industrial land use concentrations; school district boundaries; natural and manmade constraints, such as environmental corridors, watershed boundaries, and major transportation routes existing and probable future land use development; soils; and the assumed existence of a community of interest that can be marshalled in the establishment of subregional urban planning programs. In cases where single minor civil divisions were considered too large to constitute a meaningful planning analysis area, subcommunity areas were delineated within the civil division as the planning analysis areas.

The development of the system of planning analysis areas was accompanied by the development of a new traffic analysis zone system. This new zone system created a total of 1,220 traffic analysis zones, nearly double the number utilized in 1963. Generally, the new 1220 zone system was created by further subdividing the 619 zones established in 1963. Minor changes were made, however, to eliminate zones which straddled county lines and to enable the aggregation of traffic analysis zones to the newly established planning analysis area system of data aggregation and presentation. The more refined traffic analysis zone system was established to permit a more precise simulation of the operation of the transportation system.

It is important to note that the establishment of the new 1220 zone system in 1972 did not render the 619 zone system established in 1963 obsolete. Since the basic travel inventory data collected in both years was coded to the quarter-section level of detail in nearly all cases, it is possible through machine data processing methods to aggregate nearly all travel inventory data to either the 619 or the 1220 zone systems. For example, the travel analyses set forth in Chapter IX of this report were based upon an aggregation of the 1972 travel inventory data to the 1963 619 zone system. Similar aggregation of the 1972 data to the districts, rings, and sectors established in 1963 could be effected to perform additional analyses.

In 1972 the planning analysis areas identified on Figure F-1 were utilized as the primary unit of data analysis and forecast. External planning areas were also identified throughout Wisconsin, Upper Michigan, and Illinois and the remainder of the United States as shown on Figure F-1.

ERRATA SHEET

Chapter VI

Page 177, Table 63 (continued), the total change in acres for Kenosha County should be: "2[f]."
Table 63 (continued), the total change in percent for Kenosha County should be: "--[g]."
Page 199, Table 81, column heading should read: "Transportation, Communication, and Utility Land Use[a]."
Table 81, footnote should read: "[a] *Includes off-street parking of more than 10 spaces.*"

Chapter VII

Page 245, left column, 3rd paragraph, line 8, should read: "446,500 acres..."
Page 247, Map 80, caption, line 1, should read: "...about 446,500 acres..."
Page 259, left column, 3rd paragraph, line 5, should read: "...446,500 acres..."

Chapter VIII

Page 267, right column, 3rd paragraph, line 14, should read: "...total local street mileage..."
Page 270, Table 107, footnote c should read: "[c] *Represents the single officially designated federal aid route in the Region on a new alignment which does not coincide with an existing or proposed arterial facility.*"
Page 271, left column, 4th paragraph, line 2, should read: "...vehicles per 24 hours,..."
Page 279, Level of Service - E should read: "Unstable flow, low operating speeds with momentary stoppages of flow"
Page 290, right column, lst paragraph, line 11 should read: "...By 1973,..."
Page 298, Table 113, percent change in local mass transit service provided for the Milwaukee urbanized area should be: "0."
Page 308, right column, 4th paragraph, line 6, should read: "1973,..."

Chapter X

Page 392, right column, 3rd paragraph, line 9, should read: "...By 1973,..."
Page 393, right column, 4th paragraph, line 8, should read: "...from about 50,500 in 1963..."