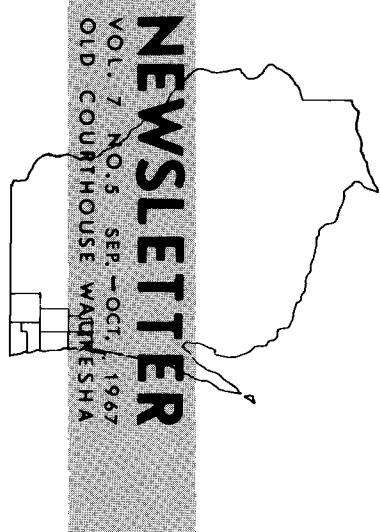


# SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION



## FLOOD DAMAGE WITHIN THE FOX RIVER WATERSHED

### INTRODUCTION

The study of the flood problems of the Fox River and its major tributaries is one major segment of the Commission's comprehensive Fox River watershed planning program. This planning program, which was initiated in 1965 and is scheduled for completion in November 1968, includes study of the pollution, deteriorating fish and wildlife habitat, park and open-space reservation, and changing land use problems of the watershed, as well as of the flood problems.

Flooding of the perennial stream system of the Fox River watershed is a common occurrence, with floods of at least nuisance level to be expected annually from spring snowmelt. Flood damage from these annual events and from much more severe, but less frequent, major floods has been, to a large extent, an unnecessary consequence resulting from the failure to recognize and understand the proper relationships which should exist between the use of land and the behavior of the river system. The unnecessary occupancy of the natural flood plains by flood-vulnerable urban and rural land uses, together with changes in the hydrologic regimen of the watershed brought about by the conversion of land from rural to urban uses, has increased flood risks from a nuisance level during the predominantly agricultural occupation of the watershed to substantial proportions in the now urbanized areas.

## FLOOD DAMAGE--continued

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### FLOOD DAMAGE SURVEY

A necessary step in preparing sound land use and water control facility plans for a watershed is a flood damage survey. Such a survey serves to assess the annual monetary risk of flood damage under present land-use and flow regimen conditions and provides the basis for forecasting such risks under alternative future watershed development proposals. Therefore, a flood damage survey was conducted in the Fox River watershed by the SEWRPC in the summer of 1966 using personal interview survey techniques. The primary objectives of the survey were to obtain accurate information on actual monetary flood losses and to solicit hydrologic information useful in the hydrologic and hydraulic investigations, such as maximum height of flood waters, time of flood crest, and duration of flooding.

The procedures developed by the SEWRPC in the conduct of the recently completed Root River watershed planning program were utilized in the flood damage survey of the Fox River basin. These procedures were developed in accordance with, and patterned after, established U. S. Army Corps of Engineers and U. S. Soil Conservation Service practices.

As a result of over 500 personal interviews with local government officials, homeowners and occupants, businessmen, and farm owners or operators, it was determined that the March-April 1960 flood was the most damaging flood of the watershed in recent times. A summary of the reported monetary losses resulting from the 1960 flood are shown in Table 1. The general extent of inundation during the March-April 1960 flood of the Fox River is shown on Map 1. The field survey results also indicated that there have been at least six other significant floods in the watershed since 1938. These facts have been substantiated by 28 years of streamflow records from the U. S. Geological Survey stream gaging station at Wilmot in Kenosha County.<sup>1</sup>

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<sup>1</sup> The USGS continuous recording stream gage at Wilmot, Kenosha County, was established in October 1939.

## FLOOD DAMAGE—continued

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Table I

MAXIMUM REPORTED FLOOD LOSS FOR A SINGLE YEAR IN THE FOX RIVER WATERSHED:  
MARCH - APRIL 1960

Civil Division	Public Sector	Private Sector		Total
		Residential and Commercial	Agricultural	
Waukesha County				
Village of Menomonee Falls . . . . .	\$ 0	\$ 440	\$ 0	\$ 440
Town of Brookfield . . . . .	8,805	980	0	9,785
City of Brookfield . . . . .	0	1,607	200	1,807
Village of Pewaukee. . . . .	0	310	0	310
Town of Pewaukee . . . . .	0	2,235	0	2,235
City of Waukesha . . . . .	24,550	103,461	0	128,011
Town of Waukesha . . . . .	0	0	1,325	1,325
Town of Vernon . . . . .	0	4,298	500	4,798
Town of Mukwonago. . . . .	0	0	264	264
Village of Big Bend. . . . .	0	4,393	0	4,393
City of Muskego. . . . .	1,000	1,176	0	2,176
<i>Subtotal</i>	<i>34,355</i>	<i>118,900</i>	<i>2,289</i>	<i>155,544</i>
Racine County				
Town of Waterford. . . . .	0	8,970	0	8,970
Village of Waterford . . . . .	1,084	1,499	0	2,583
Town of Rochester. . . . .	0	0	0	0
Village of Rochester . . . . .	0	2,230	0	2,230
Town of Burlington . . . . .	0	5,450	4,818	10,268
City of Burlington . . . . .	7,000	22,060	0	29,060
<i>Subtotal</i>	<i>8,084</i>	<i>40,209</i>	<i>4,818</i>	<i>53,111</i>
Walworth County				
Town of Spring Prairie . . . . .	0	0	0	0
Town of Lyons. . . . .	0	1,685	10	1,695
<i>Subtotal</i>	<i>0</i>	<i>1,685</i>	<i>10</i>	<i>1,695</i>
Kenosha County				
Town of Wheatland. . . . .	1,000	138,990	6,308	146,298
Town of Salem. . . . .	0	49,030	8,250	57,280
Village of Silver Lake . . . . .	0	32,800	0	32,800
<i>Subtotal</i>	<i>1,000</i>	<i>220,820</i>	<i>14,558</i>	<i>236,378</i>
Detour Costs. . . . .	43,185	0	0	43,185
<i>Total</i>	<i>\$86,624</i>	<i>\$381,614</i>	<i>\$21,675</i>	<i>\$489,913</i>

Source: SEWRPC.

## FLOOD DAMAGE—continued

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The field survey further indicated that, due to the nature of the size and hydrologic characteristics of the Fox River watershed, many smaller floods recorded locally have not affected the total riverine area to the same extent. This fact is supported by the results of the historic newspaper survey, which revealed that there have been at least 17 floods in the Fox River valley in the area of the City of Waukesha since 1868,<sup>2</sup> whereas, in some cases other newspapers in the watershed gave little or no account of flooding for the same periods of time. These local floods were usually the result of locally heavy thunderstorms or special local conditions such as ice jams at bridges.

## FLOOD DAMAGE CHARACTERISTICS IN SELECTED MUNICIPALITIES

### City of Waukesha, Waukesha County

As already noted, there have been 17 damaging floods in the City of Waukesha since 1868. Fifteen of these floods were recorded during the 70-year period extending from 1868 through 1940. For a period of 19 years extending from 1941 to 1960, no floods of a damaging nature were recorded. Twelve of the historic floods occurred during the summer, and were associated with localized thunderstorms. The remaining five far more devastating floods have taken place during early spring thaws.

From the standpoint of monetary losses from flood damage, the March-April 1960 flood was the worst in the city's history. Approximately \$128,000, or 26 percent of the total damage cost (\$490,000) of the 1960 flood of the Fox River from its origin to the state line, can be traced to the four-mile channel reach in the City of Waukesha. This concentration of damage costs places the City of Waukesha in the second most heavily damaged reach in the watershed.

### City and Town of Burlington, Racine County

The Fox River traces a 10-mile stream course through this reach; and, in addition, the White River, which drains 275.70 square miles (29

<sup>2</sup> *Waukesha Freeman* (1868 - 1966).

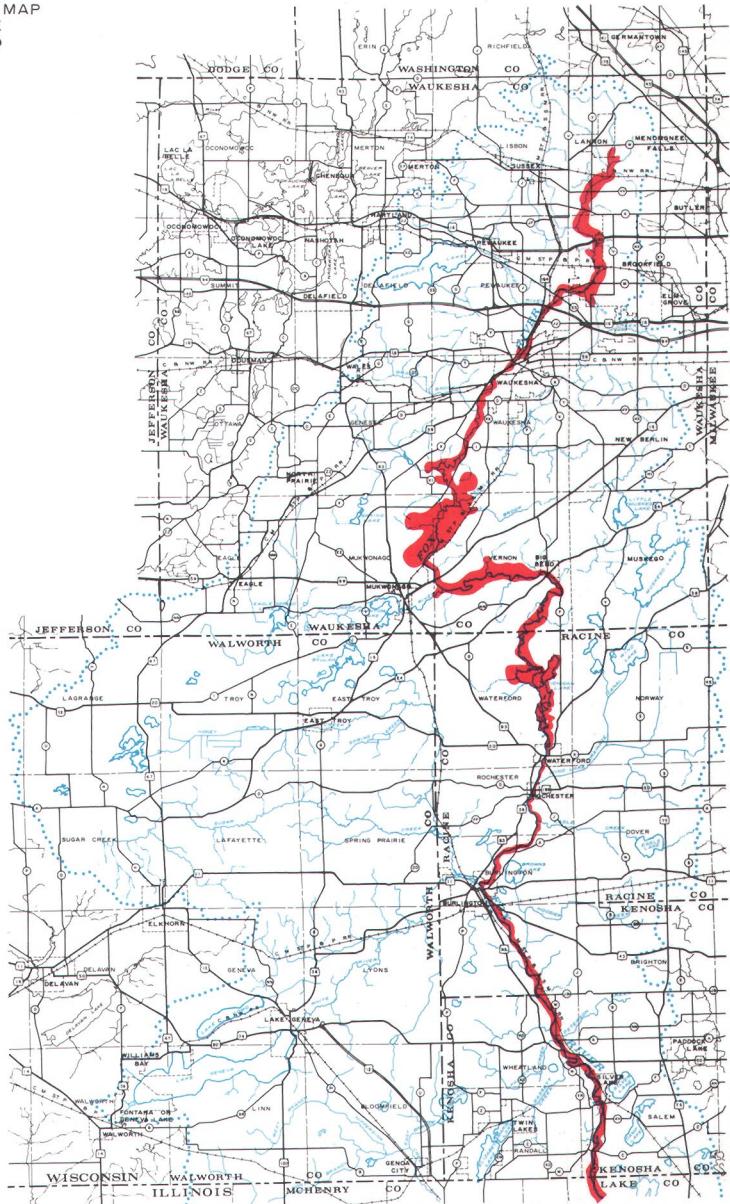
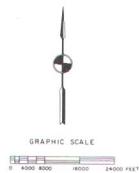
## FLOOD DAMAGE—continued

Map I

GENERALIZED FLOOD INUNDATION MAP  
OF THE FOX RIVER FOR THE  
MARCH - APRIL 1960 FLOOD

LEGEND

 AREA INUNDATED



## FLOOD DAMAGE—continued

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percent of the total watershed area) of the southwestern portion of the watershed, joins the Fox River in the City of Burlington.

Historically, the summer flood of 1938 was the worst flood of record in this reach. Because of the 28-year time lapse prior to the conduct of a flood damage survey, however, it was extremely difficult to reconstruct reasonable damage estimates. The March-April 1960 flood damage costs, as shown in Table 1, were approximately \$39,000. This figure includes only \$5,000 damage costs to agricultural property, and it can be reasonably assumed that a flood of the same magnitude occurring during the summer growing season would substantially increase the total agricultural damage costs.

Village of Silver Lake, Towns of Salem and Wheatland, Kenosha County  
This 12-mile reach of the Fox River in Kenosha County is the most damage-prone area of the entire watershed. Damaging floods frequently occur in the early spring of the year as a result of the combination of snowmelt, spring rains, and high runoff rates from the still frozen ground. Summer floods, associated with thunderstorms and certain antecedent conditions, also occur, but less frequently.

Approximately \$236,000 in damage costs, or over 48 percent of the total damage costs of the March-April 1960 flood, occurred in this reach. A total of 205 homes in this reach incurred some type of direct or indirect damage as a result of the 1960 flood. Residential damage costs amounted to a total of \$219,000 in this reach. The highest agricultural damage costs (\$15,000) of the 1960 flood also occurred in this reach, again indicating that a summer flood of the same magnitude would result in much higher agricultural damage costs.

Particularly susceptible to flooding have been the Oakwood Point development in the Town of Wheatland and the western portion of the Village of Silver Lake, which are located on low-lying areas of the flood plain. Homes located in these two areas, adjacent to the river, have received

## FLOOD DAMAGE—continued

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almost annual spring snowmelt-rainfall flood damage. The east bank of a three-mile-long portion of this reach, extending from the STH 83 and STH 50 bridge over the Fox River, contains 192 of the total 476 homes that sustained damage as a result of the March-April 1960 flood in the watershed. Of these homes, 124 sustained first-floor damage from direct overflow; and the remaining 68 sustained lawn and indirect damages.

This reach was first developed as a summer home and recreation area, and cabins were built only for summer use. In the past few years, however, many of the homeowners have remodeled the original cabins into year-around residences, increasing the value of the homes and greatly increasing the potential flood damage costs. This reach may be considered a prime example of the problems which are created by development of flood plains, not only in the form of potential monetary losses of private and public monies but also in the form of potential loss of life and personal injury during a flood and in the form of unnecessary human anguish and suffering.

The knowledge acquired from the flood damage survey, together with other facts and information gathered in this planning program, will enable the Fox River Watershed Committee to formulate alternative plans for reducing the risk of future flood damage. Such plans might consist of structural adjustments to the river system, such as channel improvements, diversion channels, and floodwater retarding and impoundment structures; floodproofing measures; and, finally, alternative flood plain land use measures, including flood plain zoning regulations and flood plain evacuation with concomitant parkway development. The flood damage abatement plans thus developed will be included within the framework of the comprehensive planning program for the Fox River watershed.

## OUTDOOR RECREATION SITE AND LOCAL RECREATION PLANNING INVENTORIES COMPLETED

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In April 1967 the SEWRPC entered into a cooperative agreement with the Division of Conservation, Wisconsin Department of Natural Resources, governing the conduct of a study of outdoor recreation facilities and local outdoor recreation planning and development programs in the Region. Three inventories were designed to provide the necessary information for the study: 1) an inventory of local planning programs, including studies, plans, and implementation devices prepared by the local communities; 2) an inventory of local park and recreation planning and development programs; and 3) an inventory of park, outdoor recreation, and open space sites. The Commission has received excellent cooperation from local government officials and technicians in conducting these inventories.

The information derived from these three inventories will serve two major purposes. First, it will help the Division of Conservation to update the State's Outdoor Recreation Plan, a plan used in support of local applications for federal aid for park and open-space acquisition and development under a program known as the Land and Water Conservation Fund Act (LAWCON). A number of local communities in the Region have already been aided in their park acquisition and development programs by this fund. Second, the information will be used to help meet the needs of the continuing regional land use-transportation study, particularly in the phases dealing with community plans and zoning and the natural resource base of the Region. The results of these inventories will be presented and analyzed in a forthcoming technical report to be issued by the Commission.

### Specific Objectives of the Study

This study of outdoor recreation facilities and local outdoor recreation planning and development programs has the following five major objectives:

1. To establish present and forecast probable future park and outdoor recreation needs within the Region.

## INVENTORIES COMPLETED—continued

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2. To assess the adequacy of existing county, city, and village programs to meet present and probable future park and outdoor recreation needs within the Region.
3. To determine the major problems encountered by counties and local communities in meeting these park and outdoor recreation needs.
4. To determine the responsibilities presently being accepted by the several levels of government in providing park and outdoor recreation opportunities within the Region.
5. To recommend methods of better meeting present and future park and outdoor recreation needs within the Region.

### Status of Local Recreation Planning

The recreation planning inventory revealed that, of the seven counties in the Region, three—Milwaukee, Washington, and Waukesha—have reported the completion of park and outdoor recreation plans. Kenosha, Racine, and Walworth counties indicated that they currently have park and recreation plans in preparation, while Ozaukee County anticipates the preparation of a plan within the next five years.

Of the 28 cities in the Region, 9 already have a park and recreation plan, 5 are in the process of preparing such a plan, and 10 more anticipate preparing such a plan within the next five years. Six of the 53 villages in the Region currently have a park and outdoor recreation plan.

These figures indicate that the pace of planning for parks and other outdoor recreation facilities in the Region is beginning to quicken. The need to plan for future park sites and to preserve open space is clear. As the urban population of the Region increases, more and more people will be seeking parks and related open spaces for leisure time activi-

## INVENTORIES COMPLETED—continued

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ties. Local communities must plan now to protect and preserve those areas having the highest potential for park and open-space use. Table 2 presents a summary of the present status of the outdoor recreation picture in the Region.

### Local Outdoor Recreation Land Acquisition Programs

The recreation planning inventory also revealed that local governments in the Region plan to acquire at least 6,000 acres of park and recreation land in the next five years. It is anticipated that this acquisition will cost an estimated \$14.8 million, with the local governments in the Region expected to provide nearly 70 percent of this total, or about \$10.3 million. The remaining \$4.5 million will have to come from other sources, primarily state and federal aid funds.

### SEWRPC NOTES

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In conjunction with implementation of the Commission's regional transportation plan, contract amendments have been entered into for additional large-scale topographic mapping of the proposed Lake Freeway corridor in Racine and Kenosha counties and the proposed Bay Freeway corridor in Waukesha County. These large-scale topographic maps will be required in order to complete precise centerline location studies and are being funded by the State Highway Commission. The actual mapping work is being done by the firm of Alster and Associates, Inc., Photogrammetric Engineers, of Madison, Wisconsin, under contract to the SEWRPC acting as the administrative agency for the State Highway Commission.

All seven county boards have now adopted the regional transportation plan, and the Commission has accordingly requested the State Highway Commission to endorse and integrate the recommended regional transportation plan into the State long-range highway system plan as a functional guide to highway system development within the Region.

## INVENTORIES COMPLETED—continued

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Table 2  
PUBLIC OUTDOOR RECREATION IN THE REGION AT A GLANCE: SUMMER 1967<sup>a</sup>

The Total Public Supply	
Park and Active Outdoor Recreation Site Acreage . . . . .	18,891
Number of Sites . . . . .	551
Average Site Size (Acres) . . . . .	34
The State's Role	
Total Acreage . . . . .	808
Number of Sites, Including Waysides . . . . .	49
Average Site Size (Acres) . . . . .	17
Percent of Publicly Owned Acreage . . . . .	4
The Counties' Role	
Total Acreage . . . . .	14,243
Number of Sites . . . . .	129
Average Site Size (Acres) . . . . .	110
Percent of Publicly Owned Acreage . . . . .	75
The Local Governments' Role	
Total Acreage . . . . .	3,840
Number of Sites . . . . .	373
Average Site Size (Acres) . . . . .	10
Percent of Publicly Owned Acreage . . . . .	21

Source: SEWRPC.

<sup>a</sup> Public outdoor recreation site acreage includes all public sites owned and developed for outdoor recreation, except state-owned forest and conservation areas which have only a small portion of their area devoted to active recreation activities.

## **AROUND THE REGION**

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### **EXPANDED FREEWAY FLYER SERVICE PROPOSED**

The Milwaukee and Suburban Transport Corporation has proposed to operate two additional freeway flyer lines into downtown Milwaukee, one from the Brookfield Square shopping center at the intersection of Moorland and Bluemound Roads in the City of Brookfield, and the other from the Treasure Island Department Store located at Highway 100 and West Cleveland Avenue in the City of West Allis. The Transport Corporation already operates freeway flyer express buses into downtown Milwaukee from the Mayfair shopping center in the City of Wauwatosa and the Bayshore shopping center in the City of Glendale. The proposed expansion of modified rapid transit service to serve these two additional areas in the Milwaukee Commutershed follows closely the SEWRPC recommendations in the adopted regional transportation plan.

In addition to the Transport Corporation's proposed modified rapid transit service to the downtown Milwaukee area from the Brookfield Square shopping center, Wisconsin Coach Lines, Inc., has added a stop at that new center on its existing local bus runs between the cities of Waukesha, West Allis, and Milwaukee.

### **ANTI-POLLUTION PROGRESS**

The new \$1,250,000 expansion program at the City of Waukesha sewage treatment plant is now complete. The treatment process consists of extracting the sand and grit, which is carried along with the sewage; grinding the raw sewage; separating liquids and solids; clarifying and chlorinating the liquids; decomposing the solids; and finally dumping them into sludge lagoons. Because the plant's capacity has been more than doubled from 4 to 8.5 million gallons per day, it will be able to treat the liquid wastes to a greater degree and hold the sludge longer in digesters to give the solids more time to decompose. The effluent going into the Fox River should be clearer, having a lower BOD (biochemical oxygen demand), and thus help reduce pollution in the river.

## AROUND THE REGION—continued

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Rex Chainbelt, Inc., has received a \$198,000 research contract to work on a new process for treating excess flows from combined storm and sewer systems. During a heavy rainfall, the capacity of such systems is often overloaded; and, to avoid backup or flooding, some of the combined rainwater and sewage is diverted into lakes and rivers by-passing sewage treatment plants. Rex Chainbelt is seeking to provide a way to treat the overflow by using screening, chemical oxidation, and disinfection techniques. While more expensive and less effective than regular sewage treatment, the use of such techniques would be preferable to discharging untreated sewage directly into lakes and rivers.

The City of Kenosha has expended \$2.5 million to reduce city pollution of Lake Michigan. The new improvement adds secondary treatment facilities to the city waste water treatment plant, in addition to improving the primary treatment facilities.

### NAMES IN THE NEWS

Mr. Albert Newbauer has been named as the new Superintendent of Parks in the City of Kenosha. His appointment fills the vacancy left by the death of Mr. Albert Reis last April. Mr. Newbauer has been a city employee for 11 years and was selected following written and oral examinations.

Mr. Bill R. Hippenmeyer, formerly Planning Director for the City of Waukesha, has been appointed Planning Director of the City of Oak Creek. He is filling the position vacated by Mr. Norbert Theine, who is now Planning Administrator for the City of Wauwatosa.

Mr. Robert Hasselkus has been appointed Executive Director of the Waukesha County Park and Planning Commission, replacing the late Mr. Harold McMiller. Mr. Hasselkus has been with the Park and Planning Commission for many years and has worked closely with the Regional Planning Commission in its various work programs.

## QUESTION BOX

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THE ADOPTED REGIONAL LAND USE PLAN RECOMMENDS 12 ENTIRELY NEW MAJOR PUBLIC OUTDOOR RECREATION SITES. WHAT PROGRESS HAS BEEN MADE TO DATE IN RESERVING AND DEVELOPING LAND AT THESE SITES?

The recommended regional land use plan proposed that 12 entirely new<sup>3</sup> major regional parks be established by 1990. These are parks which should have a minimum site area of 250 acres containing high-value recreational resources suitable for multi-purpose use. Although development might proceed more slowly, it was recognized that land would have to be reserved and acquired early in the planning period in order to prevent loss of these sites to competing land uses. As of October 1, 1967, the following actions are reported to have been taken:

<u>Recommended Site</u>	<u>Action Taken</u>
Abandoned Bong Air Base— Town of Brighton	Over 360 acres purchased by Kenosha County for park purposes; remaining acreage owned by the Wisconsin Department of Natural Resources.
Root River— City of Franklin	More than 400 acres purchased by Milwaukee County for Oakwood Park, including the recommended low-flow augmentation and recreational reservoir, and the Root River Parkway.
Lake Michigan— Town of Belgium	About 212 acres purchased by Wisconsin Department of Natural Resources, with 500 more acres to be acquired; to be known as Harrington Beach State Park.

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<sup>3</sup> *Planning Report No. 7, Volume 3, Recommended Regional Land Use-Transportation Plans-1990, calls for 13 new major outdoor recreation areas. One of these, Hawthorne Hills Park in Ozaukee County, existed in 1963 and was recommended to be expanded in size and scope so as to be of regional significance. The remaining 12 areas would be developed on entirely new sites.*

## QUESTION BOX—continued

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<u>Recommended Site</u>	<u>Action Taken</u>
Lake Michigan— Town of Caledonia	Approximately 220 acres purchased by Racine County; to be known as Cliff-side Park.
Tichigan Lake— Town of Waterford	No action taken.
Sugar Creek— Town of Lafayette	No action taken.
Rice Lake— Town of Whitewater	Part of Kettle Moraine State Forest; about 50 acres have been developed as the Whitewater Lake Recreation Area.
Paradise Valley— Town of West Bend	About 100 acres in the area purchased by Washington County; area known as Ridge Run Farm.
Pike Lake— Town of Hartford	Approximately 320 acres purchased by Wisconsin Department of Natural Resources, with 700 more acres to be acquired; will become the Pike Lake Recreation Area.
Monches— Town of Merton	No action taken.
Ottawa Lake— Town of Ottawa	Part of Kettle Moraine State Forest; nearly 100 acres now being developed as the Ottawa Lake Recreation Area.
Waukesha County Park— Town of Waukesha	Nearly 300 acres acquired by Waukesha County; now being developed as Minooka Park.

QUOTABLE QUOTE.....

"But what now is manifest and clear is, that neither are there future nor past things. Nor is it fitly said, 'There are three times, past, present, and future; but perchance it might be fitly said, 'There are three times, a present of things past, a present of things present, and a present of things future.' For these three do somehow exist in the soul, and otherwise I see them not: present of things past, memory; present of things present, sight; present of things future, expectation."

St. Augustine

SOUTHEASTERN WISCONSIN REGIONAL  
PLANNING COMMISSION

Old Courthouse  
P. O. Box 769  
Waukesha, Wisconsin  
53186

Phone: 542-8083

Kurt W. Bauer  
Executive Director

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