



DES PLAINES RIVER WATERSHED PLANNING PROGRAM PROSPECTUS

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DES PLAINES RIVER WATERSHED PLANNING PROGRAM PROSPECTUS

Prepared by the
Southeastern Wisconsin Regional Planning Commission
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September 13, 1991

STATEMENT OF THE CHAIRMAN

By resolution adopted on February 19, 1991, the Kenosha County Board of Supervisors formally requested the Southeastern Wisconsin Regional Planning Commission to prepare a prospectus for a comprehensive study of the Des Plaines River watershed. The study would look to the ultimate resolution of the serious and costly existing, and potential future, flooding, stormwater drainage, water pollution, and related problems within that watershed which affect the property and general welfare of its citizens and which can be properly resolved only within the context of a long-range, comprehensive watershed planning effort.

In response to this request, the Commission, on April 17, 1991, formed the Des Plaines River Watershed Committee, comprised of 19 local and state officials and concerned citizen leaders from throughout the watershed to assist the Commission in its study of the problems of the watershed. The Committee held its organizational meeting on July 2, 1991, and began to prepare the requested prospectus. At its July 17th meeting, the Committee recommended that the Southeastern Wisconsin Regional Planning Commission approve the attached prospectus.

The Des Plaines River Watershed Committee identified five serious resource-related problems that exist within the watershed and that require comprehensive, areawide study for sound resolution. The five major problems are: flooding and stormwater drainage, water pollution, changing land use, deterioration and destruction of the natural resource base, and soil erosion. These five problems are inextricably interrelated, a fact which precludes their individual study. Consequently, the prospectus proposes that a comprehensive watershed planning program be mounted for the Des Plaines River watershed as soon as possible, a program which would have as its objective the preparation of a plan that can serve as a basis for action programs directed toward resolving the serious and costly problems of the watershed.

Since the work of the Commission is entirely advisory in nature, approval of the prospectus and allocations of the funds required for the recommended study by the Kenosha and Racine County Boards and County Executives will now be necessary and are hereby respectfully requested.

Respectfully submitted,

Frank F. Uttech
Chairman

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Chapter I

INTRODUCTION

By resolution adopted on February 19, 1991, the Kenosha County Board formally requested the Southeastern Wisconsin Regional Planning Commission to investigate the need for a comprehensive study of the Wisconsin portion of the Des Plaines River watershed, a study looking to the ultimate resolution of the flooding, water pollution, and related problems existing within that watershed and affecting the property and general welfare of its residents. This request recognized that these problems can be properly resolved only within the context of a cooperative, long-range, comprehensive watershed planning effort involving all of the units and agencies of government concerned. The Commission accordingly on April 17, 1991, acted to create the Des Plaines River Watershed Committee, comprised of public officials and citizen leaders from within the watershed and including concerned public officials from northeastern Illinois. The Commission charged that Committee with assisting the Commission in its study of the water-related problems of the watershed. This prospectus presents the initial findings and recommendations of the Des Plaines River Watershed Committee. The full Committee membership is set forth on the inside front cover of this report.

THE REGIONAL PLANNING COMMISSION

The Southeastern Wisconsin Regional Planning Commission was created by an Executive Order of the Governor upon the unanimous petition of the county boards concerned in August 1960, pursuant to the provisions of Section 66.945 of the Wisconsin Statutes. It exists to serve and assist county and local units of government and their citizens in planning for the orderly and economic development of a seven-county Region comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties (see Map 1).

The Commission is comprised of 21 members, three from each county. Two of the three are appointed by the governor, and one is elected by the county board. The powers, duties, and functions of the Commission are set forth in the enabling legislation. The Commission is authorized to employ experts and a staff as necessary for the prosecution of its responsibilities. 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 assessed valuation. The Commission is authorized to request and accept aid in any form from all levels and agencies of government for the purpose of accomplishing its objectives and is authorized to deal directly with the federal government for planning grants. The present Commission committee and staff structure is shown in Figure 1.

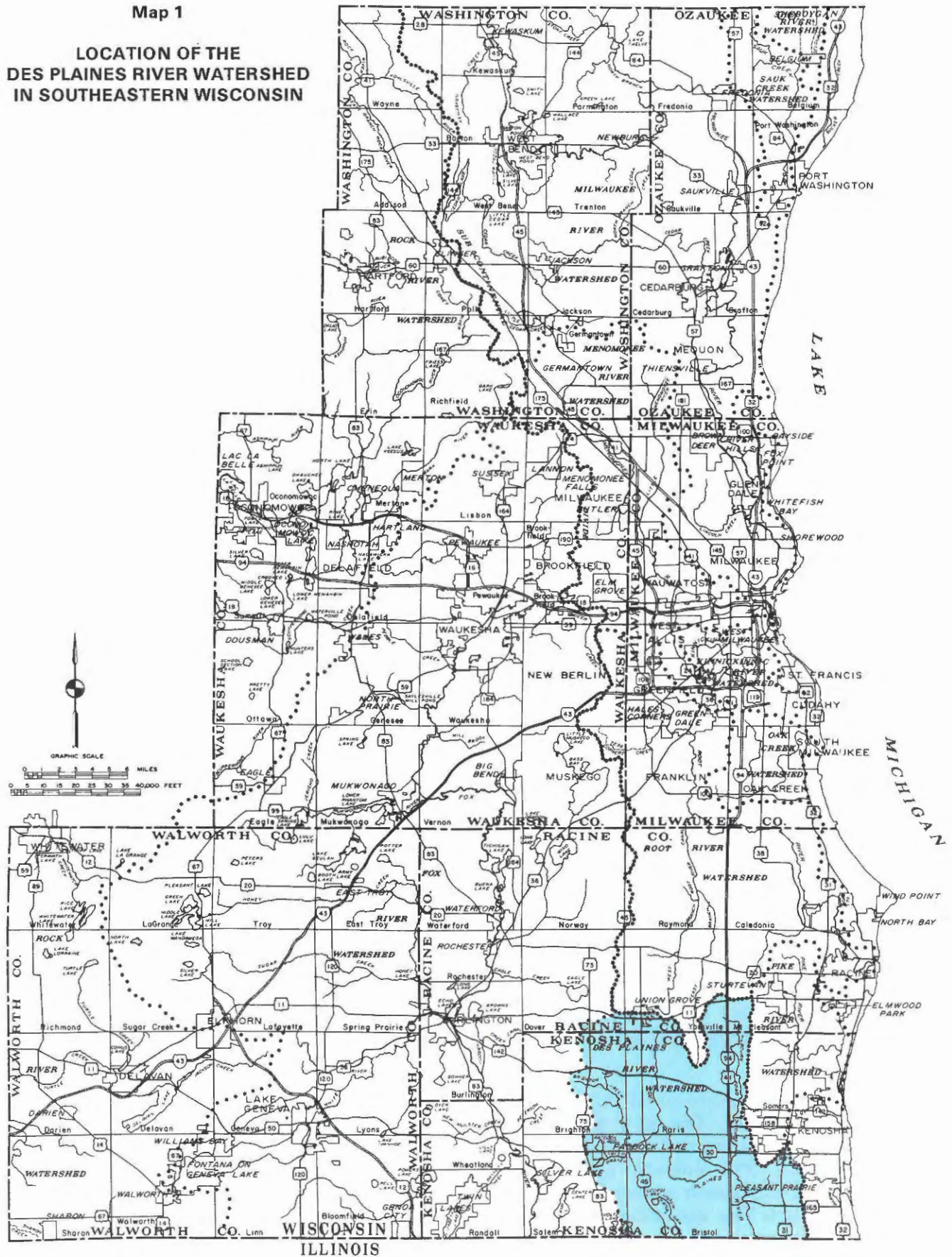
The Commission, as the official planning and research agency for one of the nation's large urbanizing areas, has three basic functions:

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, units, and agencies of government and private investors within the Region can better make development decisions.
2. **Plan Design:** The preparation of a framework of long-range plans to guide the physical development of the Region, these plans being limited to those functional elements having areawide significance. To this end, the Commission is charged by law with the function and duty of "making and adopting a master plan for the physical development of the Region." The permissible scope and content of this plan, as outlined in the enabling legislation, extend to all phases of regional development, but implicitly emphasize the preparation of alternative spatial designs for the use of land and for the supporting transportation utility facilities.
3. **Plan Implementation:** The promotion of plan implementation through the provision of a center for the coordination of the many planning and plan implementation activities carried on by the various levels, units, and agencies of government within the Region.

As conceived by the Commission, regional planning is not a substitute for federal, state,

Map 1

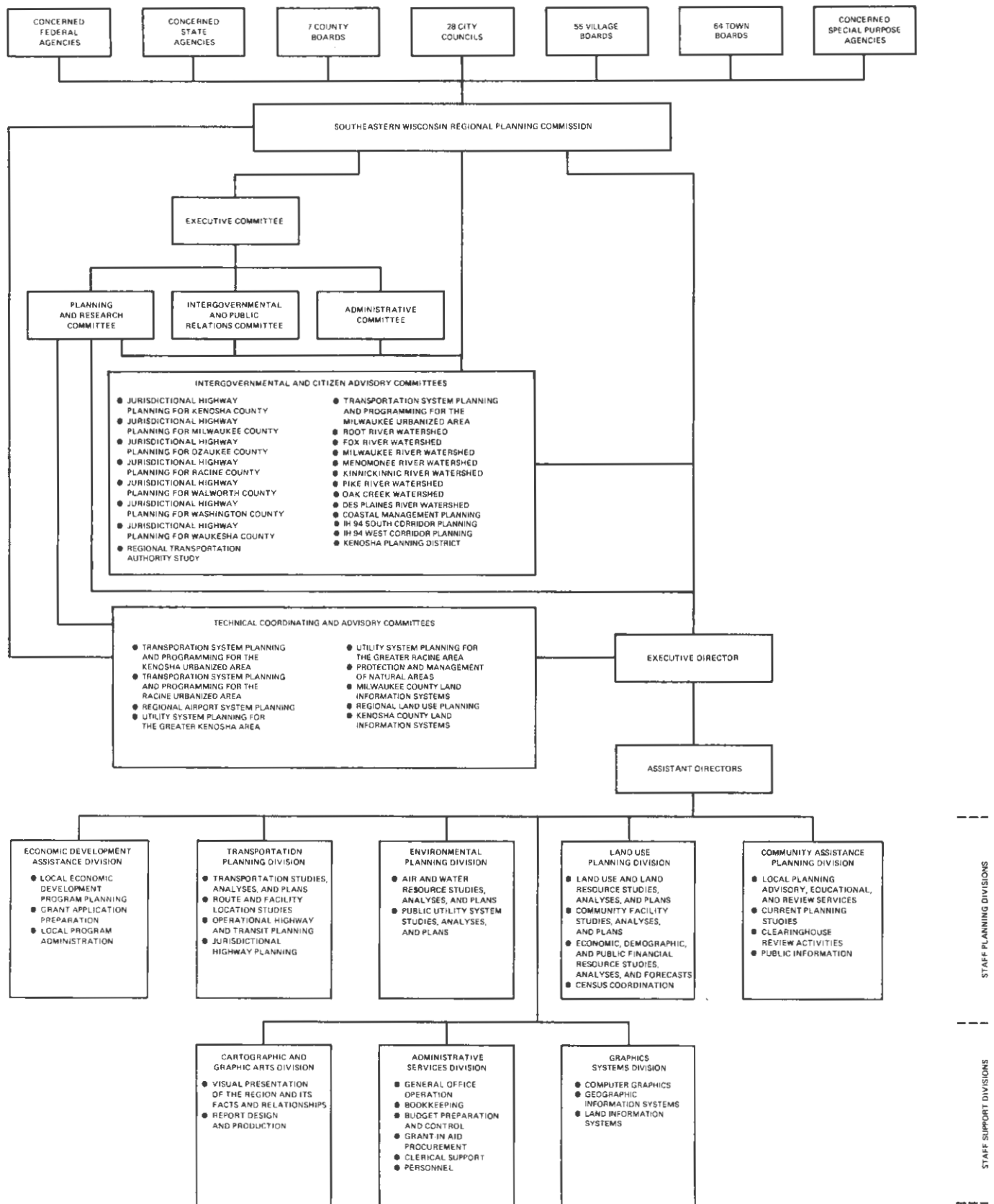
**LOCATION OF THE
DES PLAINES RIVER WATERSHED
IN SOUTHEASTERN WISCONSIN**



Source: SEWRPC.

Figure 1

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION ORGANIZATIONAL STRUCTURE



Source: SEWRPC.

and local planning efforts, but a supplement to such efforts. Equipped with research studies and carefully prepared plans, the Commission exists to assist units and agencies of government and concerned citizen groups in dealing with problems which cannot be properly resolved within the framework of a single municipality or of a single county.

WATERSHED PLANNING IN SOUTHEASTERN WISCONSIN

Stormwater management and flood control constitute such an areawide problem. Officials and citizens who are involved daily in the problem realize that it can be resolved only within a framework of areawide study and analysis, a framework within which local governments can join in cooperative efforts. Stormwater management and flood control problems are intensified by urbanization and require that a planning area smaller than the Region but larger than the individual municipalities which constitute the Region, namely, the watershed or drainage basin, be recognized and considered as a unit.

Stormwater drainage and flood control facilities must form a single, integrated system over an entire watershed, capable of carrying both the present runoff loads generated by existing land use patterns in the watershed and future runoff loads that may be generated by changing land use patterns. In addition, the drainage and flood control problem is closely related to other watershed-related problems, such as water pollution, sewerage and sewage disposal, park and open space preservation, and changing land use, not only with respect to the stream channel and its floodways and floodplains but with respect to the entire watershed. Practical solutions to any of these basic problems must, therefore, simultaneously consider solutions to all other water-related problems and needs. Thus, any effective water-related planning program must recognize watersheds as integrated land-water resource units which create a complex community of interest among their residents and which, as such, provide a good geographic unit for the necessary water resource-related planning efforts.

Solutions to water resource-related problems within Southeastern Wisconsin require the development of specific programs for the comprehensive study of each watershed within the Region. The ultimate purpose of these studies is to develop workable plans to guide the staged development of drainage and flood control, water quality management, and park and open space preservation within each watershed. These facility plans must be based upon a long-range land use plan for the watershed which must, in turn, be properly related to the urbanizing Region of which the watershed is an integral part.

ADVISORY COMMITTEE STRUCTURE

Recognizing that any comprehensive watershed study covers a broad spectrum of resource-related interests and governmental programs, the Commission established a Des Plaines River Watershed Committee to assist it in its study of the problems of the Des Plaines River watershed. To date, eight such watershed committees have been formed under the auspices of the Commission: the Root, Fox, Milwaukee, Menomonee, Kinnickinnic, and Pike River, the Oak Creek, and the Des Plaines River Watershed Committees.

The purpose of these watershed committees is to bring to bear on the problems the knowledge of public officials and interested citizen leaders having broad experience in various facets of community development and an intimate knowledge of specific problems of each watershed. The membership on the Des Plaines River Watershed Committee consists primarily of county and municipal officials and interested citizen leaders. Because the watershed extends into northeastern Illinois, public officials from that Region were also asked to serve on the Committee.

The Des Plaines River Watershed Committee was created by the Commission on April 17, 1991, and first met on July 2, 1991. The Committee, working from that date to July 17, 1991, prepared this prospectus for a comprehensive study of the Des Plaines River watershed.

Chapter II

PURPOSE OF THE PROSPECTUS

The purpose of this prospectus is to explore and recommend the means by which the stormwater management and flood control problems of the Des Plaines River watershed in Southeastern Wisconsin can best be defined and addressed. The prospectus is intended to provide sufficient information to permit the Kenosha and Racine County Boards and County Executives and other affected governmental agencies to consider the costs and benefits of the identified means and to determine the desirability of proceeding with such means.

To this end, the prospectus is intended to accomplish the following:

1. To establish and document the need for a comprehensive study of the stormwater management and flood control problems of the Des Plaines River watershed in Wisconsin.
2. To specify the purpose, scope, content, and main divisions of the study required to be

undertaken, along with the techniques to be applied in its execution.

3. To recommend the most effective method for establishing, organizing, and accomplishing the needed study, and suggest possible roles and responsibilities for the various levels and units of government concerned.
4. To recommend a practical schedule for the execution of the needed study.
5. To provide sufficient cost data to permit the development of an initial budget for the needed study and suggest a possible allocation of costs among the various levels and units of government concerned.
6. To determine the extent to which the various levels and units of government might be able to contribute assistance in the form of data and technical assistance toward the conduct of the necessary study.

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Chapter III

NEED FOR A COMPREHENSIVE WATERSHED PLANNING PROGRAM FOR THE DES PLAINES RIVER WATERSHED

DESCRIPTION OF THE WATERSHED

Definition and Delineation

The Des Plaines River watershed within Wisconsin is a natural surface water drainage unit of approximately 134 square miles in area. The watershed is one of the 11 major natural watersheds within the Southeastern Wisconsin Planning Region. The boundaries of the watershed and its salient hydrographic and cultural features within Wisconsin are shown on Map 2. The watershed ranks sixth in size of the watersheds within the Region, but ninth in total resident population.

The Des Plaines River watershed as defined herein is part of a larger watershed extending southerly into Illinois, as shown on Map 3. The entire Des Plaines River watershed to the point where the Des Plaines and Kankakee Rivers join to form the Illinois River near Morris, Illinois, has an area of about 2,111 square miles. The portion of the watershed in Wisconsin constitutes about 6 percent of the total watershed area, and lies largely, but not entirely, in Kenosha County. The entire watershed is roughly rectangular in shape, with the major axis lying approximately parallel to the western shoreline of Lake Michigan. The eastern boundary of the watershed is located from about three miles to about nine miles westerly of the Lake Michigan shoreline. The watershed widens from about 10 miles at its northern end to about 45 miles at its southern end. The Des Plaines River from its source in the Town of Yorkville, Racine County, Wisconsin, to its confluence with the Kankakee River to form the Illinois River has a total length of about 131 miles. Of this total, about 20 miles, or 15 percent, is located within Wisconsin. In the greater Chicago area, the River flows through Lake, Cook, DuPage, and Will Counties and through such suburban communities as Gurnee, Libertyville, Des Plaines, and Riverside. A small portion of the River and the watershed is located in the City of Chicago.

It should be noted that the Commission has, for comprehensive planning purposes, defined the term "watershed" as a geographic area of

overland drainage contributing surface runoff to the flow of a particular stream at a given point, and whose natural and man-made features are so interrelated and mutually interdependent as to create a significant community of interest among its residents. This definition contains within it references to socioeconomic, as well as physical, characteristics which a drainage basin must exhibit if it is to form a rational unit for comprehensive land and water resources planning.

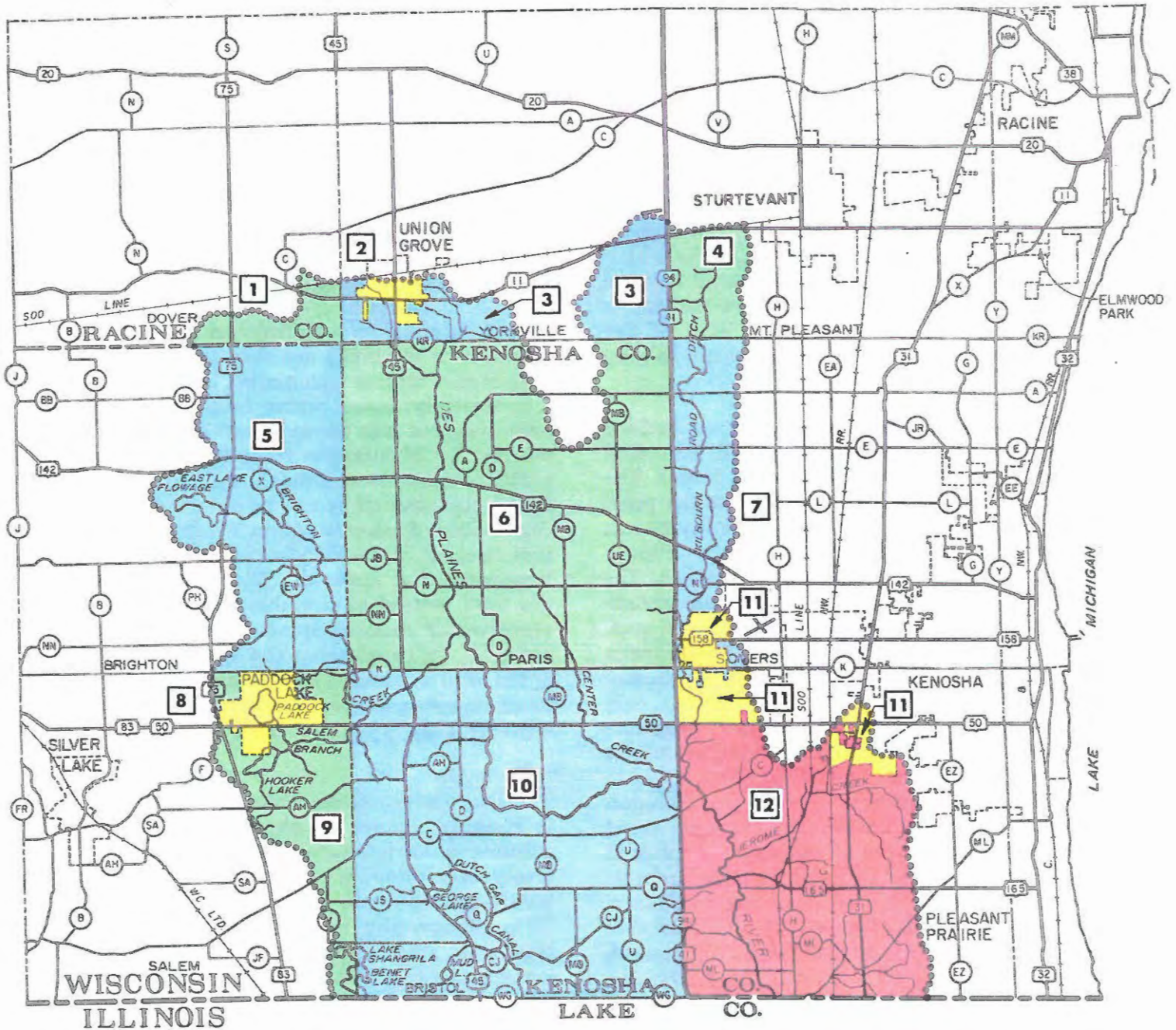
The Commission's definition of the term attempts to recognize not only the natural and man-made features which must be considered in a technically sound water resources planning operation, but also the existence of a significant community of interests from which the active participation of local officials and citizen leaders in the planning effort can be obtained. It is this community of interest within Wisconsin and the fact that all of the headwater area lies within Wisconsin that make the Wisconsin portion of the total watershed a viable planning area for stormwater management and flood control purposes. In considering the Wisconsin portion of the total watershed as a viable planning area, its relationship to the rest of the watershed must, however, always be considered.

Boundaries

The Des Plaines River watershed in Wisconsin is roughly square in shape. The watershed exhibits a varied topography, including relatively level floodplains, gently sloping and gently rolling lands, and steep hills and lakes. This topography reflects the effects of the Wisconsin stage of glaciation. Relief within the watershed ranges from a maximum elevation of approximately 891 feet above mean sea level in Section 35, Township 2 North, Range 20 East, in the Town of Paris, to a minimum elevation of approximately 668 feet above mean sea level in Section 32, Township 1 North, Range 22 East, in the Village of Pleasant Prairie, a total change of 223 feet. The watershed is bounded on the north by the Root River watershed, on the west by the Fox River watershed, and on the east by Pike River watershed and the Pike Creek direct drainage area to Lake Michigan. As already

Map 2

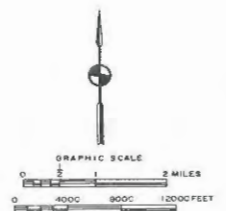
CIVIL DIVISIONS IN THE WISCONSIN PORTION OF THE DES PLAINES RIVER WATERSHED



LEGEND

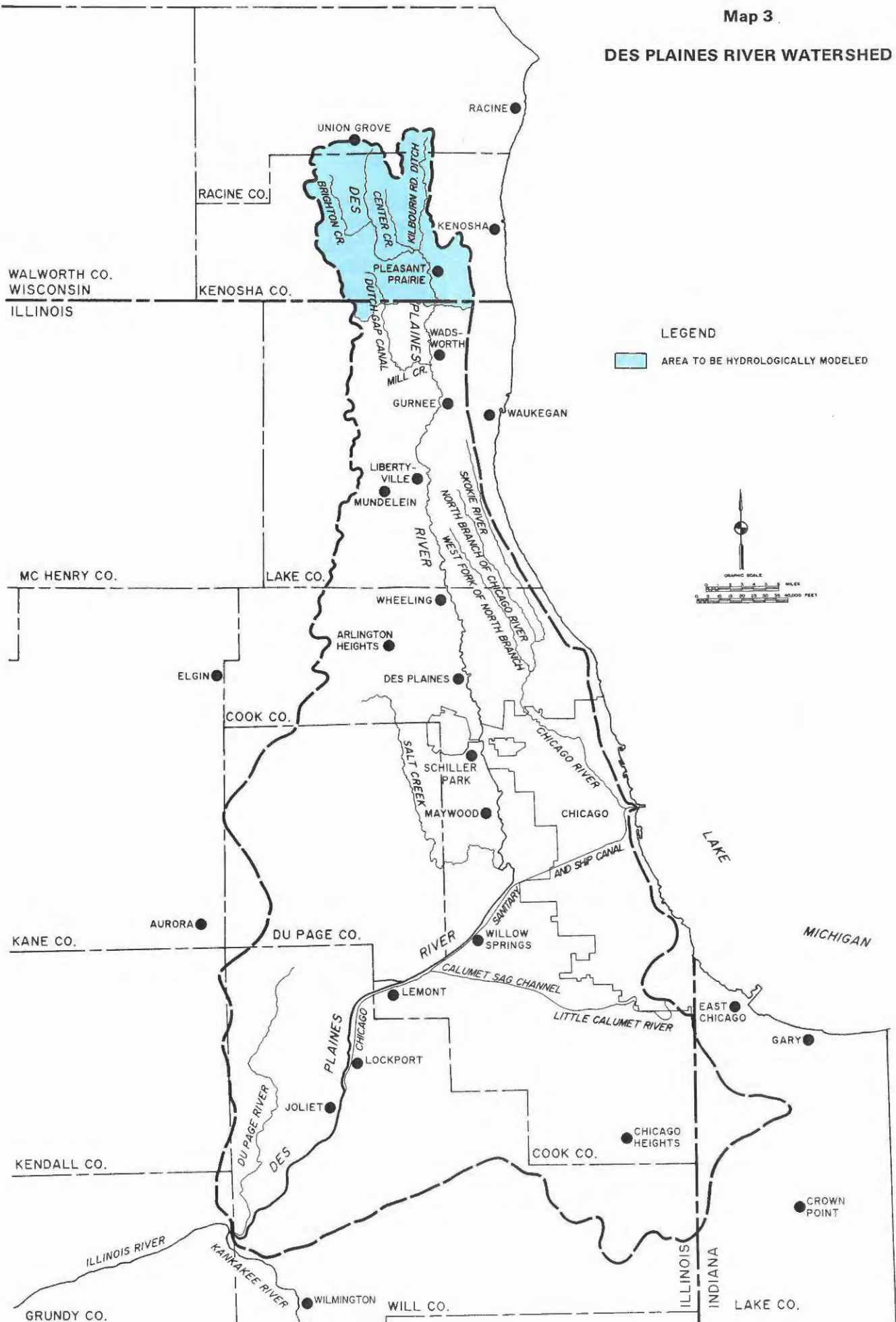
- | | |
|--------------------------|--------------------------------|
| 1 TOWN OF DOVER | 7 TOWN OF SOMERS |
| 2 VILLAGE OF UNION GROVE | 8 VILLAGE OF PADDOCK LAKE |
| 3 TOWN OF YORKVILLE | 9 TOWN OF SALEM |
| 4 TOWN OF MT. PLEASANT | 10 TOWN OF BRISTOL |
| 5 TOWN OF BRIGHTON | 11 CITY OF KENOSHA |
| 6 TOWN OF PARIS | 12 VILLAGE OF PLEASANT PRAIRIE |

Source: SEWRPC.



Map 3

DES PLAINES RIVER WATERSHED



noted, the Des Plaines and Kankakee Rivers join to form the Illinois River, which is tributary to the Mississippi River.

Surface Drainage System

The Des Plaines River watershed lies in a rapidly urbanizing portion of Kenosha County. The River has its source about 1,000 feet north of the Kenosha-Racine County Line (CTH KR) in the southwest one-quarter of Section 33, Township 3 North, Range 21 East, in the Town of Yorkville, about 0.4 mile east of the Village of Union Grove. From its source, the River flows southerly for approximately 10.7 miles to about the center of Section 16, Township 1 North, Range 21 East; then easterly for about four miles to its confluence with the Kilbourn Road Ditch just east of IH 94/USH 41; thence southerly for approximately 5.6 miles to the state line. The overall length of the main stem of the Des Plaines River in Wisconsin is, as already noted, about 20.3 miles. The perennial streams of the watershed are listed in Table 1 and are shown on Map 12 in Chapter IV of this prospectus.

The slope of the main channel of the Des Plaines River decreases progressively from its source to the state line. The uppermost reach, extending from the source to the Kenosha-Racine County line, a distance of about 0.6 mile, has a slope of approximately 12.7 feet per mile. The gradient decreases to approximately 4.0 feet per mile for the next 2.7 miles to STH 142. The slope decreases further to about 1.7 feet per mile between STH 142 and the Wisconsin-Illinois state line, a distance of about 17.0 miles.

Surface waters in the Des Plaines River watershed, as herein defined, consist of both lakes and streams. These surface water resources, in combination and individually, are comparatively less abundant than those of the Region as a whole. The surface areas of the ponds and streams together account for only 1,096 acres, or 1.3 percent of the total area of the watershed, compared to 2.8 percent for the Region as a whole. Wetlands are present, totaling only 6,640 acres, or 7.7 percent of the total area of the watershed, compared to 9.8 percent for the Region as a whole.

The Des Plaines River and its tributaries form an integral part of the major stormwater drainage system of the rapidly urbanizing watershed. The upper half of the Wisconsin portion of the stream, upstream from STH 50, has been exten-

sively channelized primarily to improve agricultural drainage. That channelization, along with ditching and drainage of the land tributary to the River, has altered the flow regimen of the River.

Demographic and Economic Base

The 1990 resident population of the Des Plaines River watershed is estimated at 19,600 persons. Thus the watershed, which comprises about 5 percent of the total area of the seven-county Region, contains approximately 1 percent of the total resident population of the Region. It is estimated that in 1985 the Des Plaines River watershed accounted for approximately 5,100 jobs, or about 0.6 percent of the almost 872,000 jobs which were available within the Region. The distribution of the population in the watershed by civil division is shown in Table 2.

Soils

Since soil types are a major determinant of the runoff characteristics that ultimately affect the streamflow regimen, groundwater recharge rates, and water quality of a watershed, the characteristics of the soils as they relate to runoff must be analyzed as part of any comprehensive watershed planning program. Due to the amount of land within the watershed still utilized for agricultural purposes, much of the soil in the watershed still remains in a relatively undisturbed state. Several soil types have evolved within the area of the Des Plaines River watershed from a variety of parent glacial or glacier-related materials. The predominant soils of the watershed are deep to moderately deep silt loams.

The suitability of watershed soils for residential development is an important factor affecting planned land uses. About 35 percent of the watershed area is covered by soils which are not suitable for residential development with sanitary sewer service, about 58 percent of the watershed is covered by soils which are poorly suited for residential development on lots of one acre or more without public sanitary sewerage facilities, and almost all of the watershed is covered by soils poorly suited for residential development on lots smaller than one acre without public sanitary sewer service.

Aquifers

Underlying the surface deposits of the watershed, which have an average thickness of about 145 feet, are bedrock formations of limestone,

Table 1
STREAMS IN THE DES PLAINES RIVER WATERSHED

Stream or Watercourse	Upstream Limit of Study Reach		Total Perennial Stream Length (miles) ^a	Length of Stream Included Under Federal Flood Insurance Study Which is Proposed to be Included Under the Watershed Study (miles)		Additional Length of Stream Which is Proposed to be Included Under the Watershed Study (miles)	
	Civil Division	U. S. Public Land Survey		Perennial	Intermittent	Perennial	Intermittent
<u>Des Plaines River</u>	Town of Yorkville	T3N,R21E, SW 1/4 Section 33	20.3 ^b	20.3 ^b	0.1	0.2	1.6
Unnamed Tributary No. 1 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 27	--	--	0.7	--	1.1
Unnamed Tributary No. 1a to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 34	--	--	--	--	0.9
Unnamed Tributary No. 1b to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 34	--	--	--	--	1.0
Unnamed Tributary No. 1c to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 27	--	--	--	--	1.3 ^c
Unnamed Tributary No. 1e to Des Plaines River	Town of Bristol	T1N,R21E, SE 1/4 Section 25	1.9	--	--	1.3	0.6
Unnamed Tributary No. 1f to Des Plaines River	Town of Bristol	T1N,R21E, NE 1/4 Section 36	0.6	--	--	0.6	0.2
Unnamed Tributary No. 2 to Des Plaines River	Town of Bristol	T1N,R21E, NW 1/4 Section 25	0.3	--	--	--	1.6
Unnamed Tributary No. 2a to Des Plaines River	Town of Bristol	T1N,R22E, NE 1/4 Section 25	--	--	--	--	0.5
Unnamed Tributary No. 3 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 29	0.9	--	--	--	--
Unnamed Tributary No. 5 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 21	1.3	--	--	1.3	0.6
Unnamed Tributary No. 5a to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, NE 1/4 Section 20	--	--	--	--	0.2
Unnamed Tributary No. 5b to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SW 1/4 Section 21	--	--	--	--	0.3
Unnamed Tributary No. 6 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 29	0.2	--	--	--	--
Unnamed Tributary No. 7 to Des Plaines River	Town of Bristol	T1N,R21E, NE 1/4 Section 26	0.2	--	--	--	--
Pleasant Prairie Tributary	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 17	0.8	--	--	0.8	0.2
Unnamed Tributary No. 9 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SW 1/4 Section 8	0.1	--	--	0.1	0.1
Unnamed Tributary No. 10 to Des Plaines River	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 13	0.5	--	--	0.2	0.5
Unnamed Tributary No. 17 to Des Plaines River	Town of Bristol	T1N,R21E, SE 1/4 Section 9	0.6	--	--	--	--
Unnamed Tributary No. 24 to Des Plaines River	Town of Paris	T2N,R21E, SE 1/4 Section 28	0.4	--	--	--	--
Unnamed Tributary No. 29 to Des Plaines River	Town of Paris	T2N,R21E, NW 1/4 Section 19	0.2	--	--	--	--
Unnamed Tributary No. 32 to Des Plaines River	Town of Paris	T2N,R21E, SE 1/4 Section 9	0.4	--	--	--	--

Table 1 (continued)

Stream or Watercourse	Upstream Limit of Study Reach		Total Perennial Stream Length (miles) ^a	Length of Stream Included Under Federal Flood Insurance Study Which is Proposed to be Included Under the Watershed Study (miles)		Additional Length of Stream Which is Proposed to be Included Under the Watershed Study (miles)	
	Civil Division	U. S. Public Land Survey		Perennial	Intermittent	Perennial	Intermittent
<u>Des Plaines River</u> (continued)							
Unnamed Tributary No. 33 to Des Plaines River	Town of Brighton	T2N,R20E, SE 1/4 Section 12	0.3	--	--	--	--
Union Grove Industrial Tributary ^e	Village of Union Grove	T3N,R21E, NE 1/4 Section 31	--	--	0.9 ^d	--	1.2
Fonk's Tributary	Village of Union Grove	T3N,R21E, SW 1/4 Section 31	--	--	0.3 ^f	--	0.3
Unnamed Tributary No. 37 to Des Plaines River ^h	Village of Union Grove	T3N,R21E, NE 1/4 Section 32	--	--	0.4 ^g	--	0.5
Unnamed Tributary No. 38 to Des Plaines River	Village of Union Grove	T3N,R21E, SW 1/4 Section 29	--	--	0.6 ^f	--	0.6
Unnamed Tributary No. 39 to Des Plaines River	Town of Paris	T2N,R21E, NW 1/4 Section 3	--	--	0.8 ^f	--	--
<u>Jerome Creek</u>	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 22	1.7	1.7 ^f	2.1	--	0.5
Unnamed Tributary No. 1 to Jerome Creek	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 16	0.4	0.4 ^f	0.2 ^f	--	--
Unnamed Tributary No. 2 to Jerome Creek	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 9	--	--	0.7 ^f	--	--
Unnamed Tributary No. 3 to Jerome Creek	Village of Pleasant Prairie	T1N,R22E, NW 1/4 Section 9	--	--	0.7 ^f	--	1.1
Unnamed Tributary No. 4 to Jerome Creek	Village of Pleasant Prairie	T1N,R22E, SE 1/4 Section 22	--	--	0.1	--	1.8
Unnamed Tributary No. 5 to Jerome Creek	Village of Pleasant Prairie	T1N,R22E, NE 1/4 Section 15	--	--	0.3 ^f	--	--
<u>Kilbourn Road Ditch</u>	Town of Mt. Pleasant	T3N,R22E, SW 1/4 Section 30	12.4 ⁱ	12.4 ^{i,j}	--	--	--
Unnamed Tributary No. 1 to Kilbourn Road Ditch	Village of Pleasant Prairie	T1N,R22E, NE 1/4 Section 7	0.1	--	--	0.1	0.4
Unnamed Tributary No. 2 to Kilbourn Road Ditch	Village of Pleasant Prairie	T1N,R22E, NE 1/4 Section 5	--	--	--	--	1.0
Unnamed Tributary No. 5 to Kilbourn Road Ditch	Town of Paris	T2N,R21E, NE 1/4 Section 35	--	--	--	--	0.8
Unnamed Tributary No. 8 to Kilbourn Road Ditch	Town of Paris	T2N,R21E, NE 1/4 Section 24	--	--	--	--	0.8
Unnamed Tributary No. 13 to Kilbourn Road Ditch	Town of Paris	T2N,R21E, NW 1/4 Section 13	--	--	--	--	0.8
Unnamed Tributary No. 15 to Kilbourn Road Ditch	Town of Yorkville	T3N,R21E, SE 1/4 Section 36	1.1	0.4	--	--	--
Unnamed Tributary No. 16 to Kilbourn Road Ditch	Town of Mt. Pleasant	T3N,R22E, SW 1/4 Section 31	0.1	--	--	--	--
Unnamed Tributary No. 17 to Kilbourn Road Ditch	Town of Mt. Pleasant	T3N,R22E, SE 1/4 Section 31	0.2	--	--	--	--

Table 1 (continued)

Stream or Watercourse	Upstream Limit of Study Reach		Total Perennial Stream Length (miles) ^a	Length of Stream Included Under Federal Flood Insurance Study Which is Proposed to be Included Under the Watershed Study (miles)		Additional Length of Stream Which is Proposed to be Included Under the Watershed Study (miles)	
	Civil Division	U. S. Public Land Survey		Perennial	Intermittent	Perennial	Intermittent
<u>Kilbourn Road Ditch</u> (continued)							
Unnamed Tributary No. 18 to Kilbourn Road Ditch	Town of Yorkville	T3N,R21E, SE 1/4 Section 35	1.0	0.6	--	--	--
Unnamed Tributary No. 19 to Kilbourn Road Ditch	Town of Mt. Pleasant	T3N,R22E, SE 1/4 Section 30	0.1	0.1	--	--	--
<u>Center Creek</u>	Town of Paris	T2N,R21E, NE 1/4 Section 15	5.6 ^k	3.4 ^{k,f}	--	--	--
Unnamed Tributary No. 1 to Center Creek	Town of Bristol	T1N,R21E, NE 1/4 Section 2	--	--	--	--	2.0
Unnamed Tributary No. 4 to Center Creek	Town of Bristol	T1N,R21E, NE 1/4 Section 2	--	--	--	--	0.9
<u>Brighton Creek</u>	Town of Brighton	T2N,R20E, NE 1/4 Section 14	7.8 ^l	6.8 ^{l,m}	--	--	--
Salem Branch of Brighton Creek	Town of Salem	T1N,R20E, SE 1/4 Section 3	2.4 ^k	0.3 ^f	--	1.9	--
Unnamed Tributary No. 1 to Salem Branch of Brighton Creek	Town of Bristol	T1N,R21E, SW 1/4 Section 17	1.1 ^k	--	--	1.1 ^k	--
Unnamed Tributary No. 2 to Salem Branch of Brighton Creek	Village of Paddock Lake	T1N,R20E, SE 1/4 Section 2	0.7	--	--	0.7	--
Unnamed Tributary No. 3 to Salem Branch of Brighton Creek	Town of Salem	T1N,R20E, SW 1/4 Section 12	--	--	--	--	0.7
Unnamed Tributary No. 1 to Hooker Lake	Town of Salem	T1N,R20E, SE 1/4 Section 14	--	--	--	--	1.9
Unnamed Tributary No. 6 to Brighton Creek	Village of Paddock Lake	T2N,R20E, SW 1/4 Section 35	0.7	--	--	--	1.9
Unnamed Tributary No. 8 to Brighton Creek	Town of Brighton	T2N,R20E, SW 1/4 Section 26	1.4	--	--	--	--
Unnamed Tributary No. 9 to Brighton Creek	Town of Brighton	T2N,R20E, NE 1/4 Section 22	1.3	1.3	--	--	--
<u>Dutch Gap Canal</u>	Town of Bristol	T1N,R21E, NE 1/4 Section 20	4.1 ^l	4.1 ^{l,f}	--	--	--
Mud Lake Outlet	Town of Bristol	T1N,R21E, NE 1/4 Section 32	1.4 ⁱ	1.4 ^{i,n}	--	--	--
Unnamed Tributary No. 3 to Dutch Gap Canal	Town of Bristol	T1N,R21E, SE 1/4 Section 19	0.6	--	--	0.6	0.7
Unnamed Tributary No. 4 to Dutch Gap Canal	Town of Bristol	T1N,R21E, NE 1/4 Section 29	--	--	--	--	0.3
Total	--	--	73.2	53.2 ^o	7.9 ^o	8.9 ^o	28.9 ^o

^aIf not indicated otherwise by footnotes, the stream length was measured from large-scale topographic maps.

^bFrom U. S. Army Corps of Engineers, Floodplain Information Report on the Des Plaines River-Illinois and Wisconsin, March 1966, and from U. S. Geological Survey quadrangle map.

Footnotes to Table 1 (continued)

^cFrom 1990 low-flight aerial photographs and large-scale topographic maps.

^d0.6 mile delineated based on approximate methods.

^eDesignated as Unnamed Tributary No. 1 to the Des Plaines River under the Federal Flood Insurance Study.

^fFloodplain delineated based on approximate methods.

^g0.2 mile delineated based on approximate methods.

^hDesignated as Unnamed Tributary No. 2 to the Des Plaines River under the Federal Flood Insurance Study.

ⁱFrom Federal Emergency Management Agency Flood Insurance Studies for Kenosha and Racine Counties, 1981, and U. S. Geological Survey quadrangle map.

^j0.3 mile delineated based on approximate methods.

^kFrom U. S. Geological Survey 7.5-minute quadrangle maps.

^lSEWRPC Staff Memorandum, "Assessment and Ranking of Watersheds for Nonpoint Source Management Purposes in Southeastern Wisconsin: 1990," August 1990.

^m4.2 miles delineated based on approximate methods.

ⁿ0.4 mile delineated based on approximate methods.

^oTotal length of stream which is proposed to be included under the watershed study is 98.9 miles.

Source: SEWRPC.

shale, and sandstone which dip gently toward Lake Michigan at about 15 feet per mile and provide the watershed with two generally distinct, vertically separated, but horizontally continuous groundwater reservoirs. The shallow aquifer consists of the glacial drift and interconnected Niagaran dolomite, while the Cambrian and Ordovician sandstones are the principal formations comprising the deep aquifer. The shallow aquifer is separated from the deep aquifer by relatively impermeable strata, such as the Maquoketa shales. The water table elevation ranges from about elevation 650 feet National Geodetic Vertical Datum (NGVD) in the southeastern part of the watershed to 760 feet NGVD in the western part of the watershed.

Civil Divisions

Superimposed on the natural irregular watershed boundaries is a rectilinear pattern of local political boundaries. Approximately 92 percent of the Des Plaines River watershed lies within Kenosha County while the remaining 8 percent lies in Racine County (see Map 2). The portions of the watershed lying within the jurisdiction of each of the civil divisions involved are shown in Table 3.

Land Use

Although the Des Plaines River watershed is presently experiencing a rapid conversion of land from rural to urban use in certain areas, 89 percent of the watershed was still in rural land uses in 1985. These rural uses included about 9 percent of the total area of the watershed in woodlands and open lands, about 9 percent in surface water and wetlands, and about 71 percent in agricultural and related rural uses. The remaining 11 percent of the total watershed was devoted to urban uses. Table 4 summarizes the existing land uses in the Des Plaines River watershed in 1985 and indicates the changes in such land uses since 1963.

As shown on Map 4, urban development within the watershed began essentially after 1900. With the exception of small areas in the Villages of Paddock Lake and Union Grove and in the Town of Bristol, almost all urban development within the watershed has occurred since 1940. Urban growth within the watershed since 1960 was accelerated by the opening of IH 94 in November 1960. From 1963 to 1985, urban land uses in the watershed increased from 6,147 acres to 9,569 acres, or by about 56 percent. As shown

Table 2

DISTRIBUTION OF POPULATION IN THE DES PLAINES RIVER WATERSHED: 1960, 1970, 1980, 1990

Civil Division ^a	1960		1970		1980		1990	
	Population	Percent of Total	Population	Percent of Total	Population	Percent of Total	Population	Percent of Total
Kenosha County Cities								
Kenosha	--	--	--	--	--	--	1,108	6
Villages								
Paddock Lake ^b	--	--	1,470	10	2,207	12	2,662	14
Pleasant Prairie ^c	2,862	24	3,804	25	4,659	26	4,008	20
Towns								
Brighton	619	5	763	5	690	4	721	4
Bristol	2,155	18	2,740	18	3,599	19	3,968	20
Paris	1,404	12	1,682	11	1,548	8	1,425	7
Salem	2,570	21	1,347	9	1,632	9	1,860	9
Somers	232	2	712	5	628	3	781	4
Subtotal	9,842	82	12,518	83	14,963	81	16,533	84
Racine County Villages								
Union Grove	1,482	12	1,646	11	2,286	13	2,327	12
Towns								
Dover	240	2	336	2	471	3	416	2
Mt. Pleasant	118	1	152	1	142	1	160	1
Yorkville	342	3	389	3	364	2	216	1
Subtotal	2,182	18	2,523	17	3,263	19	3,119	16
Total	12,024	100	15,041	100	18,226	100	19,652	100

^aThe civil divisions in the watershed and the boundaries of these civil divisions have changed over time because of incorporations and annexations.

^bThe Village of Paddock Lake was incorporated in 1960 after the conduct of the 1960 census.

^cIn 1989, the Town of Pleasant Prairie was divided, with portions being attached to the City of Kenosha, the Town of Somers, and the newly incorporated Village of Pleasant Prairie. Data presented for 1960, 1970, and 1980 are for the Town of Pleasant Prairie; 1990 data are presented for the Village of Pleasant Prairie.

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

in Table 4, residential land represents the largest urban land use in the watershed. Residential use has significantly increased within the watershed, from 2,701 acres in 1963 to 4,550 acres in 1985, a 68 percent increase.

Under existing land use conditions, the vast majority of the 100-year recurrence interval floodplain areas along the Des Plaines River and its major tributaries are in appropriate open

space uses. Under planned land use conditions, urban uses are expected to increase along the IH 94 corridor in the City of Kenosha, the Village of Pleasant Prairie, and the Towns of Bristol, Paris, and Somers; the STH 50 corridor in the City of Kenosha, the Villages of Paddock Lake and Pleasant Prairie, and the Towns of Salem and Bristol; in and around the Villages of Paddock Lake and Union Grove; in the unincorporated Village of Bristol; and in the area around George Lake.

Table 3

AREAL EXTENT OF CIVIL DIVISIONS IN THE DES PLAINES RIVER WATERSHED: 1989

Civil Division	Area Within Watershed (square miles)	Percent of Watershed Area Within Civil Division	Percent of Civil Division Area Within Watershed
Kenosha County			
Cities			
Kenosha	2.65	1.98	13.16
Villages			
Paddock Lake	1.72	1.28	98.22
Pleasant Prairie	19.95	14.88	60.51
Towns			
Brighton	15.40	11.48	42.86
Bristol	36.21	27.00	100.00
Paris	33.87	25.27	94.27
Salem	7.04	5.25	21.33
Somers	5.86	4.37	17.95
Subtotal	122.70	91.50	44.07
Racine County			
Villages			
Union Grove	0.57	0.43	57.00
Towns			
Dover	2.52	1.88	6.96
Mt. Pleasant	2.85	2.13	7.79
Yorkville	5.45	4.06	15.48
Subtotal	11.39	8.50	3.35
Total	134.09	100.00	--

Source: SEWRPC.

PROBLEMS OF THE WATERSHED

The problems of the Des Plaines River watershed that create the need for a comprehensive watershed planning program all arise from the present land and water use patterns, and from changes taking place in these patterns. These problems include 1) flooding and stormwater drainage, 2) water pollution, 3) changing land use, not only in the riverine areas but over the entire watershed, 4) a deteriorating natural resource base, and 5) soil erosion.

Flooding, Stormwater Drainage, and Attendant Flood Damages

The problems of flooding, stormwater drainage, and attendant damages in the Des Plaines River watershed have been a matter of concern for

many years. The problems stem from two related but distinctly separate water resource problems, flooding and inadequate stormwater management. Flooding may be defined as the inundation of the natural floodlands of a watershed that occurs along the major river and stream channels as a direct result of water moving out of and away from those river and stream channels to occupy low-lying areas along the stream channels. Inadequate stormwater management may be defined as inundation that occurs when stormwater runoff moving toward rivers, streams, and other low-lying areas of a watershed encounters inadequate conveyance or storage facilities and, as a result, causes localized ponding and surcharging of natural watercourses and of artificial storm and sanitary sewers.

Table 4
LAND USE IN THE DES PLAINES RIVER WATERSHED^a

Land Use Category	1963		1970		1975		1980		1985	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Urban										
Residential	2,701	3.14	3,264	3.79	3,971	4.61	4,485	5.21	4,550	5.28
Commercial	65	0.08	88	0.10	97	0.11	124	0.14	140	0.16
Industrial	54	0.06	94	0.11	104	0.12	133	0.15	164	0.19
Transportation, Communication, and Utilities ^b	2,846	3.31	3,058	3.55	3,173	3.69	3,541	4.11	3,607	4.19
Governmental and Institutional	177	0.21	229	0.27	233	0.27	235	0.27	236	0.27
Recreational	163	0.19	336	0.39	492	0.57	505	0.59	722	0.84
Unused	141	0.16	104	0.12	168	0.20	136	0.16	150	0.17
Subtotal	6,147	7.15	7,173	8.33	8,238	9.57	9,159	10.63	9,569	11.10
Rural										
Agricultural and Related	64,348	74.72	62,990	73.17	62,002	72.02	61,220	71.10	60,777	70.60
Lakes, Rivers, and Streams	805	0.93	1,027	1.19	1,089	1.26	1,092	1.27	1,096	1.27
Wetlands	7,275	8.45	7,128	8.28	6,972	8.10	6,835	7.94	6,640	7.71
Woodlands	4,810	5.59	4,652	5.40	4,645	5.39	4,621	5.37	4,663	5.42
Unused Lands	2,686	3.12	3,008	3.49	2,811	3.26	2,727	3.17	2,917	3.39
Landfills, Dumps, and Extractive	31	0.04	124	0.14	345	0.40	448	0.52	440	0.51
Subtotal	79,955	92.85	78,929	91.67	77,864	90.43	76,943	89.37	76,533	88.90
Total	86,102	100.00	86,102	100.00	86,102	100.00	86,102	100.00	86,102	100.00

^aAs approximated by whole U. S. Public Land Survey one-quarter sections.

^bIncludes all off-street parking.

Source: SEWRPC.

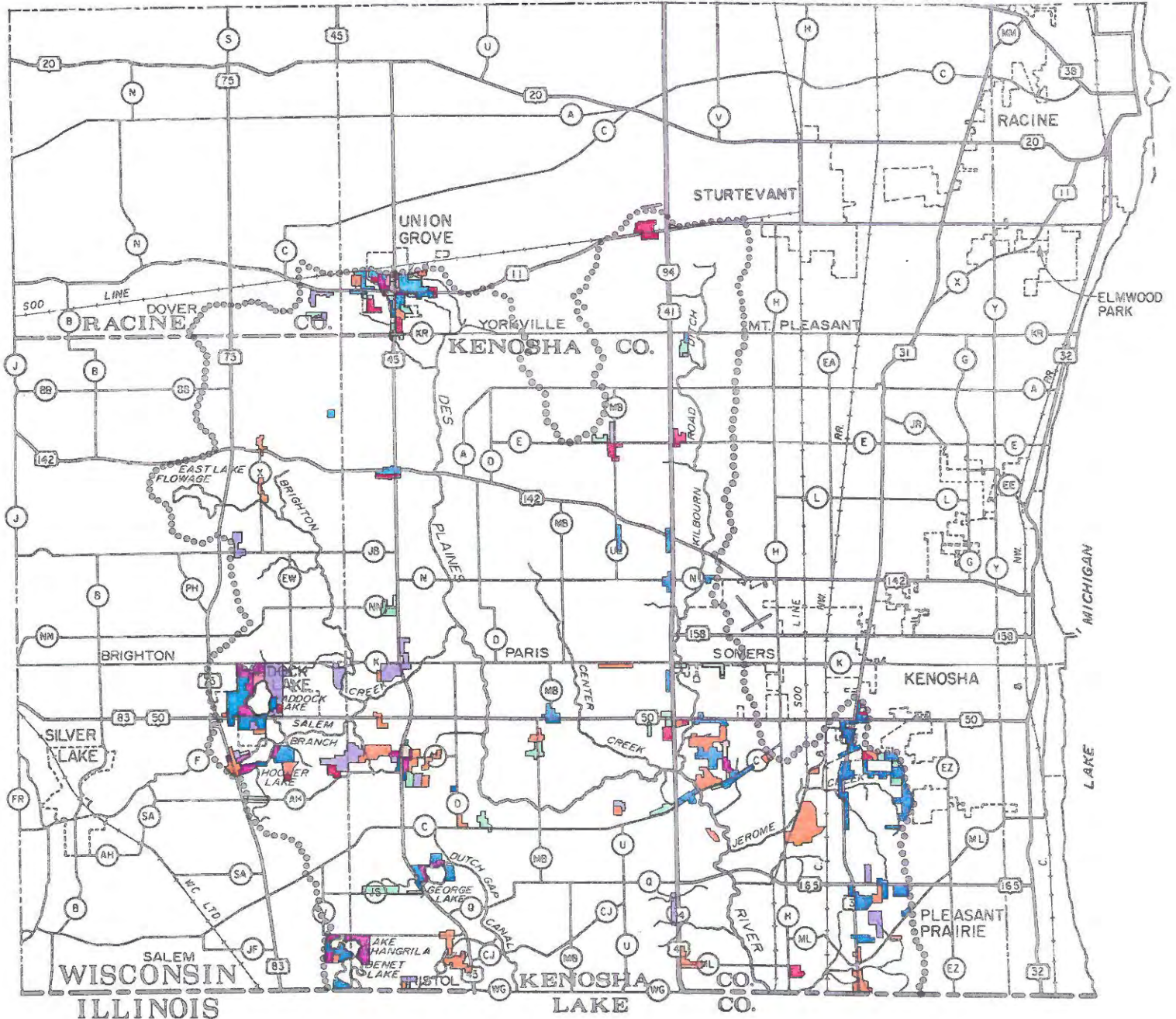
Areas experiencing stormwater drainage and attendant sanitary sewage and stormwater backup problems can only be delineated on the basis of detailed local engineering studies. In contrast to areas experiencing flooding, areas experiencing inadequate stormwater control tend to be discontinuous, consisting of a series of relatively small and scattered pockets, not necessarily located in the lowest areas or even near major stream channels.

The distinction between flooding and inadequate stormwater management is important in considering the scope and content of any comprehensive study of the Des Plaines River watershed. As already noted, stormwater management problems tend to be discontinuous and localized,

and their resolution requires a detailed analysis of local street and associated building grades and of minor watercourses and local stormwater drainage facilities important to the design and adoption of a stormwater drainage system plan by the local unit of government concerned. Flooding problems tend to be continuous and basinwide. Therefore, problems of flooding and attendant flood damage must be addressed on a basinwide basis, and require analysis of general topographic and cultural conditions and of the perennial and major intermittent streams that drain a natural watershed. Proper consideration of such problems, moreover, requires the involvement of all of the units and agencies of government affected by and having the authority to respond to the problem.

Map 4

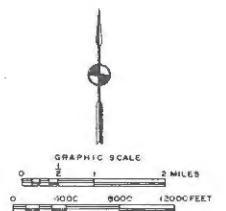
HISTORIC URBAN DEVELOPMENT IN THE DES PLAINES RIVER WATERSHED



LEGEND



Source: SEWRPC.



Because of the interaction between stormwater management and flood control facilities, a flood control plan must consider the potential impacts on alternative flood control measures of possible controls on stormwater runoff from areas tributary to the major stream channels. Such stormwater controls may include the provision of facilities for storage as well as conveyance. Facilities which store runoff may reduce peak rates and volumes of runoff to receiving streams, thus reducing the size of necessary flood control measures along those streams. In addition, in some instances the adequate conveyance of stormwater runoff to receiving streams, either with or without upstream storage, may require some modification to the receiving stream in order to provide hydraulically adequate outlets for the conveyance facilities. Therefore, good planning and engineering practice dictate that an areawide flood control plan consider potential major features of the tributary stormwater management systems and that such a flood control plan be completed prior to the preparation of detailed local stormwater management system plans. The flood control plan provides the basic framework within which the stormwater management system plans can be readily designed.

Accordingly, it is recommended that a comprehensive planning program for the Des Plaines River watershed 1) address the existing and anticipated flood problems of the watershed, 2) consider potential stormwater management alternatives which may be expected to have significant impacts on alternative measures to address flood problems, and 3) consider the need to provide hydraulically adequate outlets for stormwater management facilities. It is also recommended that subsequent or concurrent, but closely coordinated, local studies address stormwater management problems in detail. In addition, the plan should provide specific guidelines to be used in addressing stormwater management problems, including the best means of treating development proposals pending completion of local stormwater management plans. Finally, a priority will be recommended for preparing detailed local stormwater management plans.

Existing flood problems can be best described in terms of information on reported historic floods. Historic information valuable to problem definition includes data on high-water marks, peak

rates of discharge, channel conditions, location and capacity of hydraulic structures, land use, the areal extent of inundation, monetary damages to public and private property, injury or loss of life, and weather conditions leading to flooding.

Since 1967, streamflow has been continuously and systematically recorded at the U. S. Geological Survey (USGS) gage on the Des Plaines River at Russell, Illinois, about 0.8 mile south of the Wisconsin-Illinois state line. From 1962 through 1966 only annual maximum flows were recorded. There are no USGS streamflow gages within the Des Plaines River watershed in Wisconsin. Because of its proximity to Wisconsin, the gage at Russell, Illinois, can be used to characterize the magnitude of floods which have occurred on the Wisconsin portion of the River.

As shown in Table 5, the maximum recorded flood at the Russell gage had a peak rate of discharge of 2,120 cubic feet per second on March 21, 1979. The U. S. Federal Emergency Management Agency (FEMA) flood insurance study for Kenosha County estimated the 10-year and 100-year recurrence interval floods at the Wisconsin-Illinois state line to be 1,560 cubic feet per second (cfs) and 2,870 cfs, respectively, assuming existing land use and channel conditions.¹ Therefore, Table 5 shows that although a 100-year recurrence interval flood has not occurred during the 23-year period of continuous record at the gage, the 10-year recurrence interval flood as estimated for the flood insurance study has been exceeded five times in that period. Floods on the Des Plaines River prior to continuous recording of flows at the Russell gage are known to have occurred during the spring of 1938, March 1948, April 1950, April 1960, March 1962, September 1965, and June 1967. Large floods in the Des Plaines River watershed may be caused by heavy rainfall, snowmelt with frozen ground conditions, or a combination of rainfall and snowmelt with frozen ground conditions. The broad floodplain, flat stream gradient, and small hydraulic capacity of the main channel combine to produce floods of long duration along the Des Plaines River.

¹ U. S. Federal Emergency Management Agency, *Federal Insurance Administration, Flood Insurance Study, County of Kenosha, Wisconsin, Unincorporated Areas, August 1981.*

Table 5

**LARGE FLOODS RECORDED AT THE U. S.
GEOLOGICAL SURVEY GAGE 05527800 ON
THE DES PLAINES RIVER AT RUSSELL, ILLINOIS**

Date	Instantaneous Peak Discharge (cfs)
April 23, 1973	1,100
March 5, 1974	1,690
March 6, 1976	1,990
August 21, 1978	1,380
March 21, 1979	2,120
April 4, 1983	1,630
September 27, 1986	1,640

Source: U. S. Geological Survey and SEWRPC.

Under existing conditions, flooding along streams in the watershed causes damages primarily to cropland and pasture, including reduced crop yields and increased production costs. A 1976 flood control study prepared by the U. S. Soil Conservation Service stated that flooding of cropland and pasture in Kenosha and Racine Counties results in annual damages of about \$78,000, expressed in 1976 dollars.² An August 1974 report also prepared by the U. S. Soil Conservation Service, stated that inadequate drainage outlets for agricultural land suppresses crop yields on about 8,000 acres of land.³

Scattered instances of basement and first-floor flooding of homes have been reported during larger floods. A 1970 "Application for Assistance in Planning and Carrying Out Works of

²U. S. Soil Conservation Service, *Metropolitan Sanitary District of Greater Chicago, and State of Illinois, Floodwater Management Plan-Des Plaines River Watershed, January 1976*. This study concentrated on the portion of the watershed within the State of Illinois and neither detailed alternatives nor a recommended plan were developed for the Wisconsin portion of the watershed.

³U. S. Soil Conservation Service, *Preliminary Investigation Report-Des Plaines River Watershed—Kenosha and Racine Counties, Wisconsin, August 1974*.

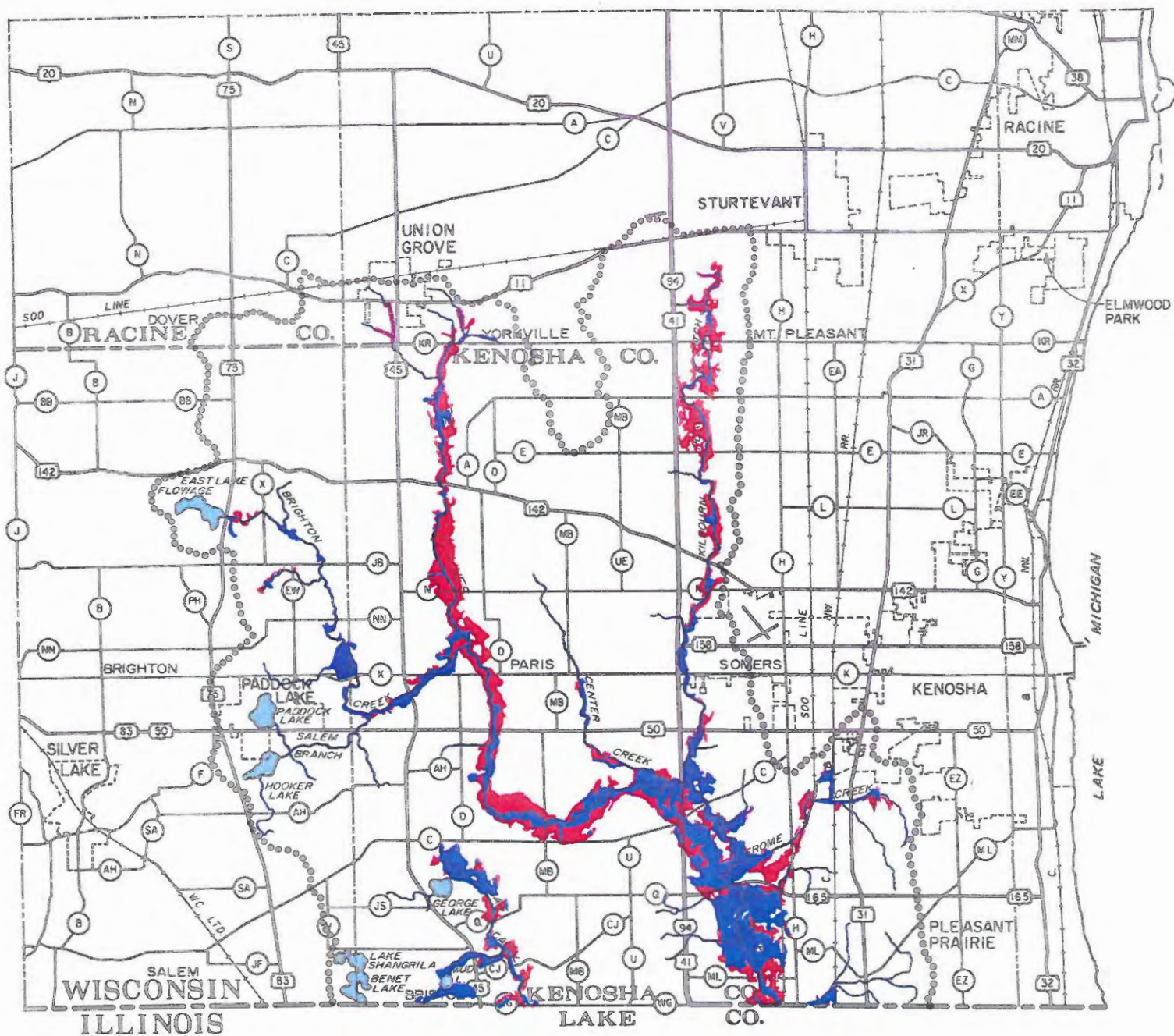
Improvement Under the Watershed Protection and Flood Prevention Act," prepared by the Kenosha and Racine County Soil and Water Conservation Districts, stated that structural flood damages during major floods along the Des Plaines River in Wisconsin were limited to the flooding of the basements of from 25 to 30 homes and first-floor flooding of a lesser number of homes.

As part of the federal flood insurance studies for Kenosha and Racine Counties, the land area which would be inundated by a 100-year recurrence interval flood was delineated along the Des Plaines River, Brighton Creek, Kilbourn Road Ditch, the Salem Branch of Brighton Creek, Center Creek, Jerome Creek, the Mud Lake Outlet, the Union Grove Industrial Tributary, Fonk's Tributary, three unnamed tributaries to the Des Plaines River, two unnamed tributaries to Brighton Creek, three unnamed tributaries to the Kilbourn Road Ditch, and four unnamed tributaries to Jerome Creek. Those floodplain delineations, which are based on existing land use and channel conditions, are shown on Map 5. The delineations cover 57.8 lineal miles of perennial streams, or 79 percent of the total perennial stream length in the watershed, and 8.2 lineal miles of intermittent streams, or 8 percent of the total intermittent stream length in the watershed. Of the 66.0 total lineal miles of floodplains, 26.3 miles, or 40 percent, were delineated using approximate methods. In addition, under the federal flood insurance studies, alternative and recommended flood control plans were not developed.




Heavily urbanized and rapidly urbanizing areas of the Des Plaines River watershed in the State of Illinois have experienced widespread flood damage. The Chicago District of the U. S. Army Corps of Engineers is currently preparing a flood control feasibility study for portions of the Upper Des Plaines River watershed in Illinois. The analyses performed under the watershed study proposed here should be coordinated with that study in order to avoid duplication of effort, in order to achieve consistency between the findings and recommendations of the two studies, and in order to avoid creating or exacerbating downstream flooding problems in Illinois.

Urban development in the Wisconsin portion of the watershed may be expected to accelerate in areas of the former Town of Pleasant Prairie

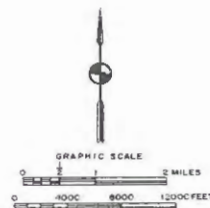
FLOODLAND DELINEATIONS IN THE DES PLAINES RIVER WATERSHED



COMPOSITION OF FLOODLANDS

-  MAJOR LAKES
-  WETLANDS, OTHER SURFACE WATER, PARK LAND, AND OTHER NATURAL OPEN USES
-  AGRICULTURAL AND DEVELOPED URBAN USES

Source: Federal Emergency Management Agency and SEWRPC.



which were attached to the City of Kenosha, in the Towns of Somers and Bristol, in the recently incorporated Village of Pleasant Prairie, in the Villages of Paddock Lake and Union Grove, and in the area around Lake George. The preparation of a sound, basinwide flood control plan for the watershed would not only address the existing flooding problems, but more importantly, would help to prevent the occurrence of potentially significant new problems attendant to the relatively large areas of planned, new urban development.

Water Quality

Evaluations of water quality data can be made only in terms of potential water uses. This is so because in a practical sense and regardless of the chemical or biochemical quality of the water, pollution does not exist if no reasonable beneficial water use is impaired. Therefore, in order to properly evaluate water quality data, the data must be compared to water use objectives and supporting water quality standards. As shown in Table 6, the Wisconsin Department of Natural Resources has set forth standards for temperature, dissolved oxygen, pH, chlorine, ammonia, and fecal coliform bacteria as related to various water uses.

As seen from Map 6, streams in the Des Plaines River watershed have been directed by the Department to meet the water quality standards necessary to support one of three water use objectives. The Des Plaines River, Jerome Creek, the Kilbourn Road Ditch, Center Creek, Brighton Creek, Dutch Gap Canal, Unnamed Tributaries No. 8 and 9 to Brighton Creek, the lower portion of the Salem Branch of Brighton Creek, Unnamed Tributary No. 1 to the Salem Branch of Brighton Creek, and Unnamed Tributary No. 3 to Dutch Gap Canal are to meet the standards necessary to support recreational use and warmwater fishery use objectives. The upper portion of the Salem Branch of Brighton Creek and the lower portion of the Union Grove Industrial Tributary to the Des Plaines River are to meet the standards to support recreational use and a limited forage fishery. Unnamed Tributaries Nos. 1a, 4, and 21 to the Des Plaines River, the Pleasant Prairie Tributary, Fonk's Tributary, the upper portion of the Union Grove Industrial Tributary to the Des Plaines River, Unnamed Tributary No. 1 to Mud Lake, and Unnamed Tributary No. 6 to Brighton Creek are to meet the standards to support recreational use

and limited aquatic life use objectives. In addition, the Regional Planning Commission has recommended that Benet/Shangrila Lakes, George Lake, Hooker Lake, and Paddock Lake meet the standards to support recreational use and warmwater fishery use objectives.

The available water quality data for streams in the watershed were collected during the 1964-65 Commission benchmark stream water quality study, the 1965-75 Commission stream water quality monitoring effort, the 1976 Commission sampling program for the regional water quality management plan, and the Wisconsin Department of Natural Resources sampling programs in 1973 and 1976. Those programs included sampling at three Commission stations: one on Brighton Creek, two on the Des Plaines River, and at one Wisconsin Department of Natural Resources sampling station on the Des Plaines River. The sampling station locations are shown on Map 7. The Department sampling during 1973 was carried out at a number of sites in the watershed. Biological condition data available in the Wisconsin Department of Natural Resources files were also used in the assessment of current water quality conditions. Water quality data collated by the Northeastern Illinois Regional Planning Commission for a sampling station located on the Des Plaines River in Lake County, Illinois, at Russell Road were also reviewed.

Based upon the available data, the water quality and biological characteristics of the Des Plaines River and its major tributaries were assessed with the results set forth in Table 7. Fish population and diversity is poor, except for Brighton Creek and the Salem Branch of Brighton Creek, where they are fair. Problems with dissolved oxygen concentrations occur in the Des Plaines River, Brighton Creek, and the Salem Branch of Brighton Creek. Ammonia and nitrate levels were not considered to pose problems in those streams of the watershed for which data were available. No data were available on nonpoint source toxic pollutants. In general, the biotic index ratings, which are indicators of biological diversity within a stream system, were very poor to poor, but Brighton Creek and Salem Branch had a fair rating and the Des Plaines River upstream of STH 50 had a fair to good rating. High levels of streambed sedimentation were noted in the Kilbourn Road Ditch, the Des Plaines River, and Center Creek.

Table 6

**EXISTING DEPARTMENT OF NATURAL RESOURCES (DNR) WATER USE
OBJECTIVES AND WATER QUALITY STANDARDS FOR SURFACE WATERS: 1991**

Water Quality Parameters	Warmwater Sport and Forage Fish and Aquatic Life	Limited Forage (intermediate) Fish and Aquatic Life ^a	Limited (marginal) Aquatic Life ^{b,c}	Recreational Use
Maximum Temperature (°F)	89 ^{d,e}	89 ^{d,e}	89 ^d	--
pH Range (standard units)	6.0-9.0 ^f	6.0-9.0 ^f	6.0-9.0 ^f	--
Minimum Dissolved Oxygen (mg/l)	5.0 ^e	3.0 ^e	1.0	--
Maximum Fecal Coliform (counts per 100 ml)	--	--	200-400 ^g	200-400 ^g
Maximum Total Residual Chlorine (mg/l)	0.01	0.5	0.5	--
Maximum Un-ionized Ammonia Nitrogen (mg/l)	0.04	--	--	--
Total Ammonia Nitrogen (mg/l)	--	3/6 ^h	--	--
Maximum Total Dissolved Solids (mg/l)	--	--	--	--
Other	-- ⁱ	-- ⁱ	-- ^j	--

^aAs set forth in NR 104.02(3)(a) and NR 104.06(2)(b) of the Wisconsin Administrative Code.

^bIncludes all effluent channels used predominantly for waste carriage and assimilation, wetlands, and diffuse surface waters and includes selected continuous and noncontinuous streams as specified by the DNR on the basis of field surveys and identified as "marginal surface waters." (See Wisconsin Administrative Code, Chapter NR 104.02(3)(b) and NR 104.06(2)(b).)

^cMay include explicitly designated agricultural drainage ditches.

^dThere shall be no temperature changes that may adversely affect aquatic life. Natural daily and seasonal temperature fluctuations shall be maintained. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5°F for streams and 3°F for lakes.

^eDissolved oxygen and temperature standards apply to streams and the epilimnion of stratified lakes and to the unstratified lakes; the dissolved oxygen standard does not apply to the hypolimnion of stratified inland lakes. Trends in the period of anaerobic conditions in the hypolimnion of deep inland lakes should be considered important to the maintenance of water quality, however.

^fThe pH shall be within the range of 6.0 to 9.0 standard units, with no change greater than 0.5 unit outside the estimated natural seasonal maximum and minimum.

^gShall not exceed a monthly geometric mean of 200 per 100 milliliters (ml) based on not fewer than five samples per month, nor a monthly geometric mean of 400 counts per 100 ml in more than 10 percent of all samples during any month.

^hAmmonia nitrogen (as N) at all points in the receiving water shall not be greater than 3 mg/l during warm temperature conditions, nor greater than 6 mg/l during cold temperatures, to minimize the zone of toxicity and to reduce dissolved oxygen depletion caused by oxidation of the ammonia.

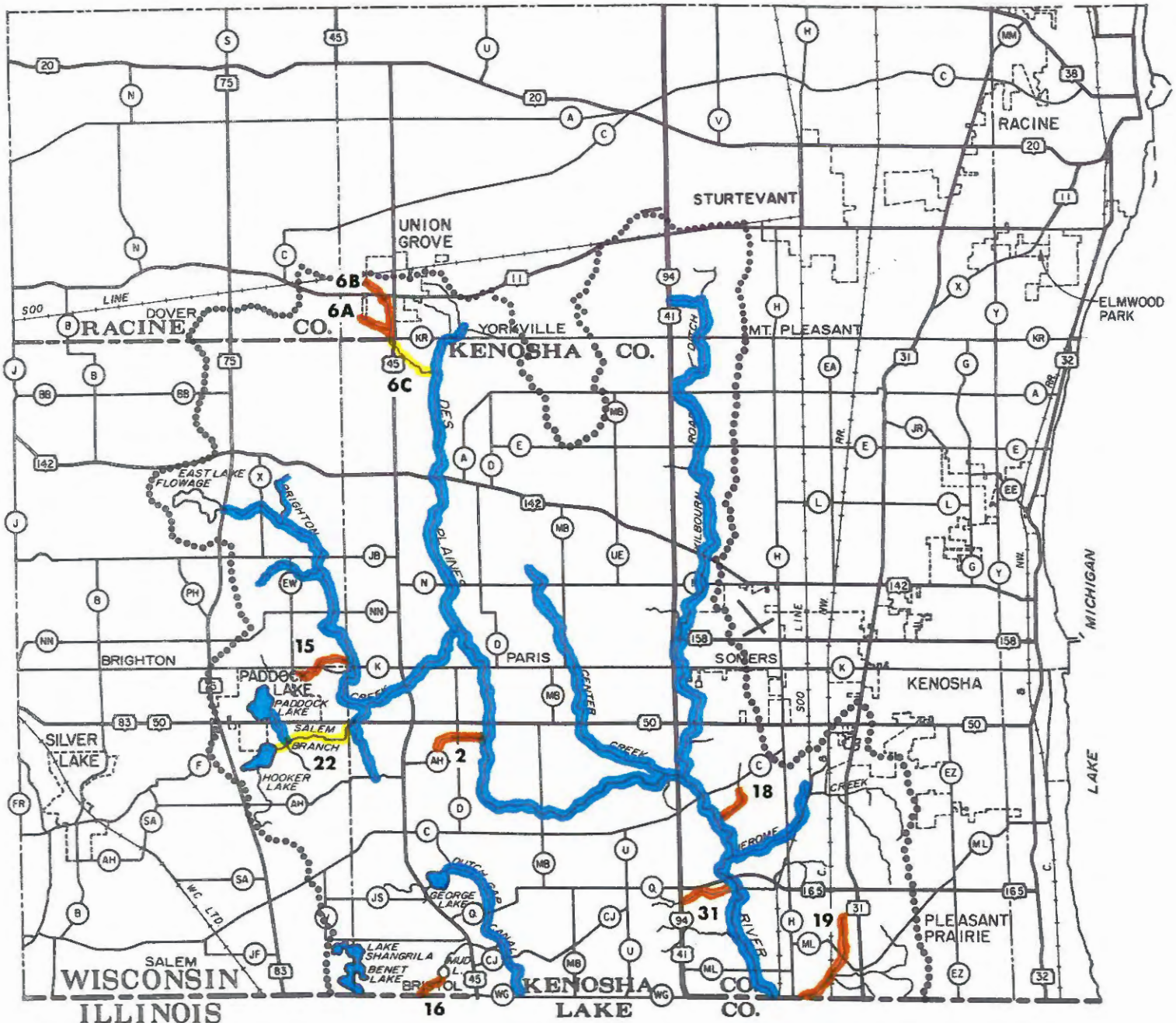
ⁱUnauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. The determination of the toxicity of a substance shall be based upon the available scientific data base. References to be used in determining the toxicity of a substance shall include, but not be limited to: Quality Criteria for Water, EPA-440/9-76-003, U. S. Environmental Protection Agency, Washington, D. C., 1976; Water Quality Criteria 1972, EPA-R3-73-003, National Academy of Sciences, National Academy of Engineering, U. S. Government Printing Office, Washington, D. C., 1974; and the Federal Register, "Environmental Protection Agency, Water Quality Criteria Documents; Availability," November 28, 1980. Questions concerning the permissible levels, or changes in the same, of a substance, or combination of substances, or undefined toxicity to fish and other biota shall be resolved in accordance with the methods specified in Water Quality Criteria 1972, and Standard Methods for the Examination of Water and Wastewater, 14th Edition, American Public Health Association, New York, 1975, or other methods approved by the Department of Natural Resources.

^jAll other substances shall meet the acute and chronic toxicity criteria for the limited aquatic life subcategory specified in or developed pursuant to Sections NR105.05 and 105.06 of the Wisconsin Administrative Code.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 6

DNR-ADOPTED WATER USE OBJECTIVES FOR STREAMS (1991) AND SEWRPC-RECOMMENDED WATER USE OBJECTIVES FOR MAJOR LAKES (1991) WITHIN THE DES PLAINES RIVER WATERSHED



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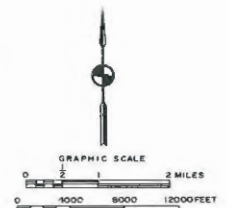
WATER USE OBJECTIVES

- WARMWATER SPORT AND FORAGE FISHERY AND AQUATIC LIFE, RECREATIONAL USE AND MINIMUM STANDARDS
- LIMITED FORAGE FISHERY AND AQUATIC LIFE, RECREATIONAL USE AND MINIMUM STANDARDS
- LIMITED AQUATIC LIFE, RECREATIONAL USE AND MINIMUM STANDARDS

- NOTES:**
1. THE ADOPTED WATER QUALITY STANDARDS THAT SUPPORT THE MAJOR WATER USE OBJECTIVES DEPICTED ON THIS MAP ARE SET FORTH IN TABLE 6, AND ARE BASED ON THE STANDARDS PUBLISHED BY THE DNR AS OF APRIL 1991. THESE OBJECTIVES AND SUPPORTING STANDARDS APPLY TO ALL SURFACE WATERS OF THE STATE. ONLY THOSE STREAMS IDENTIFIED AS PERENNIAL BY THE U. S. GEOLOGICAL SURVEY, OR ADDRESSED AS WASTEWATER RECEIVING STREAMS IN THE DEVELOPMENT OF THE AREA-WIDE WATER QUALITY PLAN, OR IDENTIFIED BY THE DNR IN FIELD SURVEYS AS BEING SUBJECT TO SPECIAL LIMITED USE STANDARDS, AND THOSE LAKES AT LEAST 50 ACRES IN SIZE ARE SHOWN ON THIS MAP.
 2. WHERE EXISTING WATER QUALITY EXCEEDS THE STANDARDS ESTABLISHED TO SUPPORT THE WATER USES SHOWN ON THIS MAP, THE WATERS SHALL BE MAINTAINED AT THE EXISTING HIGHER QUALITY.

- 2 STREAM NUMBER ASSIGNED UNDER CHAPTER NR 104 WISCONSIN STATE ADMINISTRATIVE CODE
- 2 UNNAMED TRIBUTARY NO. 21 TO THE DES PLAINES RIVER
- 6A FONKS TRIBUTARY
- 6B UNION GROVE INDUSTRIAL TRIBUTARY UPSTREAM OF JUNCTURE WITH FONKS TRIBUTARY
- 6C UNION GROVE INDUSTRIAL TRIBUTARY
- 15 UNNAMED TRIBUTARY NO. 6 TO BRIGHTON CREEK
- 16 UNNAMED TRIBUTARY NO. 1 TO MUD LAKE
- 18 PLEASANT PRAIRIE TRIBUTARY
- 19 UNNAMED TRIBUTARY NO. 1 TO THE DES PLAINES RIVER
- 22 SALEM BRANCH OF BRIGHTON CREEK
- 31 UNNAMED TRIBUTARY NO. 2 TO THE DES PLAINES RIVER

Source: SEWRPC.







Map 7

LOCATION OF WATER QUALITY SAMPLING STATIONS IN THE DES PLAINES RIVER WATERSHED



LEGEND

-  U. S. GEOLOGICAL SURVEY AND NORTHEASTERN ILLINOIS REGIONAL PLANNING COMMISSION
-  WISCONSIN DEPARTMENT OF NATURAL RESOURCES
-  SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
-  SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION INDEX CALIBRATION SITE

Source: SEWRPC.

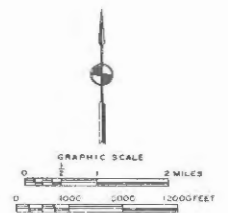


Table 7

**WATER QUALITY AND BIOLOGICAL CHARACTERISTICS
OF STREAMS IN THE DES PLAINES RIVER WATERSHED**

Stream Reach	Perennial Stream Length (miles)	Existing DNR Biological Use Objective	Outstanding or Exceptional Water Resource	Fish Population and Diversity	Recurring NPS-Caused Fish Kills	Water Quality Problems					Biotic Index Rating	Composition and Degree of Streambed Sedimentation	Physical Modifications to Channel
						DO	NH3	NO3	NPS Toxics	TSS			
Brighton Creek (and Salem Branch)	10.2	Brighton Creek—warmwater fish and aquatic life Salem Branch—intermediate aquatic life	No	Fair	No	Yes	No	No	NA	No	Fair	Low to moderate: silt	Major
Dutch Gap Canal	4.1	Warmwater fish and aquatic life	No	NA	No	No	NA	NA	NA	No	NA	Low to moderate: silt	Major
Kilbourn Road Ditch	12.1	Warmwater fish and aquatic life	No	Poor	No	NA	NA	NA	NA	Yes	Poor	High: silt	Major
Des Plaines River Upstream STH 50	7.1	Warmwater fish and aquatic life	No	Poor	No	Yes	No	No	NA	NA	Fair to good	High: silt, gravel	Major
Des Plaines River Downstream STH 50	13.2	Warmwater fish and aquatic life	No	Poor	No	Yes	No	No	NA	NA	Poor to very poor	High: silt, clay, detritus	Major
Center Creek	5.4	Warmwater fish and aquatic life	No	Poor	No	NA	NA	NA	NA	NA	Poor	High: silt, clay	Major
Total	52.1	--	--	--	--	--	--	--	--	--	--	--	--

NOTE: NA indicates data are not available.

Source: Wisconsin Department of Natural Resources and SEWRPC.

A 1990 nonpoint pollution source assessment and ranking prepared by the Regional Planning Commission rated the nonpoint source-related water resource problems of the Des Plaines River, Kilbourn Road Ditch, and Center Creek as severe and the problems of Brighton Creek, Salem Branch, and the Dutch Gap Canal as moderate.⁴ With the exception of the Salem Branch, all of the streams listed in Table 7 were assessed as having the potential to respond to nonpoint pollution source controls. The Salem Branch would not be expected to respond to such controls because its water quality characteristics are governed by the discharges from the Salem Utility District No. 1 and the Village of Paddock Lake sewage treatment plants and because of physical alterations of the stream.

The five major lakes in the watershed defined as lakes having a surface area of 50 acres or more, are Benet/Shangrila Lakes, East Lake Flowage, George Lake, Hooker Lake, and Paddock Lake. Table 8 presents evaluations of the existing water quality conditions, fish and wildlife values, and recreational values of those lakes and assesses their potential to respond to nonpoint source managements or other management measures. Although the water quality of those lakes for which data are available is rated as poor, the lakes have high fish or wildlife resource and recreational values. The water resource problems of all five of the lakes may be expected to respond favorably to the institution of nonpoint source pollution controls and other management measures.

Pollution of the Des Plaines River system comes from a variety of sources, including privately owned onsite sewage disposal systems, industrial wastewater discharges, construction activities, urban stormwater runoff, agricultural runoff, and publicly or privately owned nonindustrial sewage treatment plants discharging to the Des Plaines River and its tributaries.

⁴SEWRPC Staff Memorandum entitled "Assessment and Ranking of Watersheds for Nonpoint Source Management Purposes in Southeastern Wisconsin: 1990".

Table 8

**NONPOINT SOURCE EVALUATION AND RATING ANALYSIS
FOR MAJOR LAKES IN THE DES PLAINES RIVER WATERSHED**

Watershed	Lake Name	Area (acres)	Sensitivity to Phosphorus Loadings	Water Quality Conditions	High Fish or Wildlife Resource Value	High Recreational Value	Dystrophic	Water Resource Problems Responsive to NPS Controls or Other Management Measures	In-Lake Quality Data Available	Lake Rating for Nonpoint Source Control
Des Plaines River	Benet/Shengrila	180	No	Poor	Yes	Yes	No	Yes	Yes	High
	East Lake Flowage	123	No	NA	Yes	Yes	No	Yes	No	Medium
	George	59	No	Poor	Yes	Yes	No	Yes	Yes	High
	Hooker	87	Yes	NA	Yes	Yes	No	Yes	No	Medium
	Paddock	112	Yes	Poor	NA	Yes	No	Yes	Yes	High
Total	--	561	--	--	--	--	--	--	--	--

NOTE: NA indicates data are not available.

Source: SEWRPC.

With regard to point source discharges, the only significant known sources of pollution are the public and private sewage treatment plants. The recommendations set forth in the regional water quality management plan relating to point sources have largely been implemented through the Wisconsin Pollution Discharge Elimination System permitting process. No significant industrial sources of pollution or sanitary sewer system flow relief devices are known to exist in the watershed.

In 1985, the study area was served by five sanitary sewage treatment plants. The service areas of these plants are shown on Map 8. Selected characteristics of these plants are given in Table 9. In addition to these five public sewage treatment plants, six private sewage treatment plants were located within the watershed. These plants served the Wisconsin Department of Transportation Rest Area No. 36 in the Village of Pleasant Prairie, the Fonk Mobile Home Park in the Town of Dover, the Meeter Brothers in the Village of Union Grove, the Brightondale County Park in the Town of Brighton, the Paramski Mobile Home Park in the Town of Bristol, and the Kenosha Packing Company in the Town of Paris. The locations of these six private sewage treatment plants are also shown on Map 8.

In addition to the areas within the existing and proposed service areas of the aforementioned public sewage treatment plants, some areas of the watershed are still served by privately owned

onsite sewage disposal systems. These systems may contribute to surface water pollution through the surface ponding of malfunctioning systems and the discharge of polluted groundwater to the surface watercourses.

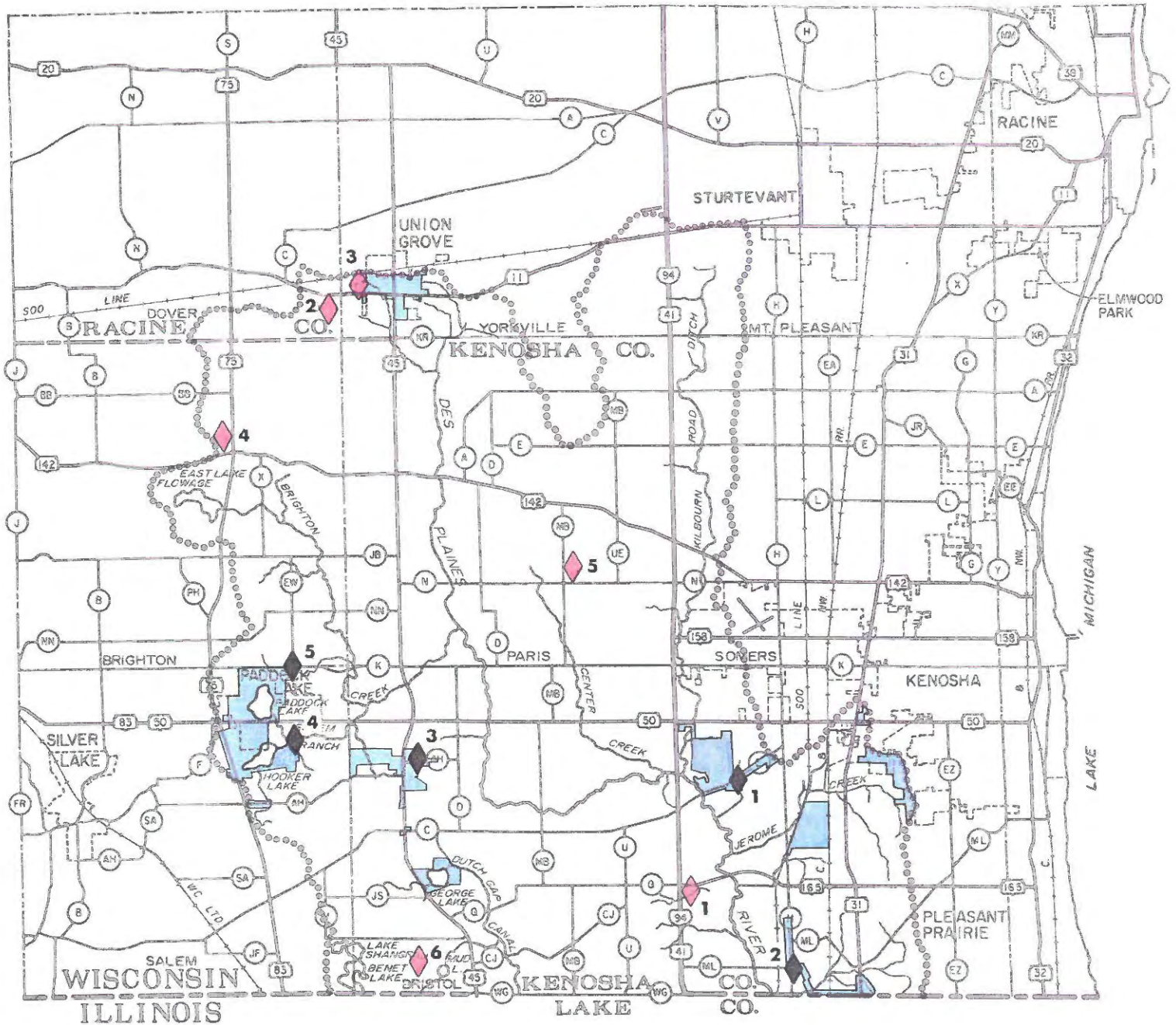
Urban runoff may cause pollution. Separate storm sewers convey rainfall and snowmelt runoff and the associated pollutants and contaminants from the urbanized areas into receiving waters. As already noted, the Commission land use inventory data (see Table 4) indicate that approximately 11 percent of the watershed was urbanized in 1985.

Agricultural lands are known to contribute large amounts of nitrogen, phosphorus, and suspended solids to surface waters through stormwater runoff and attendant soil erosion. As shown in Table 4, 89 percent of the Des Plaines River watershed was in agricultural use in 1985. Consequently, agricultural runoff and erosion are likely to be significant factors affecting the surface water quality of the Des Plaines River watershed.















The pollution problems of the watershed, like its flooding problems, are related to more basic problems of land use and, therefore, need to be approached within the context of a comprehensive watershed planning program which recognizes this relationship and seeks to quantify it, link it to required water control facilities, and develop long-range solutions for pollution abatement.

Map 8

EXISTING SANITARY SEWERAGE FACILITIES AND SERVICE
AREAS IN THE DES PLAINES RIVER WATERSHED: 1985



LEGEND

- | | | | |
|---|--|---|---|
|  | PUBLIC SANITARY SEWER SERVICE AREA |  | PRIVATE SEWAGE TREATMENT PLANT |
|  | PUBLIC SEWAGE TREATMENT PLANT |  | 1 WISCONSIN DEPARTMENT OF TRANSPORTATION REST AREA 26 |
|  | 2 VILLAGE OF PLEASANT PRAIRIE SEWER UTILITY DISTRICT D |  | 2 FONKS MOBILE HOME PARK NO. 1 |
|  | 3 VILLAGE OF PLEASANT PRAIRIE SANITARY DISTRICT NO. 73-1 |  | 3 MEETER BROTHERS |
|  | 4 TOWN OF BRISTOL UTILITY DISTRICT NO. 1 |  | 4 BRIGHTONDALE COUNTY PARK |
|  | 5 TOWN OF SALEM UTILITY DISTRICT NO. 1 |  | 5 KENOSHA PACKING CORPORATION |
|  | 6 VILLAGE OF PADDOCK LAKE |  | 6 PARAMSKI MOBILE HOME PARK |

Source: SEWRPC.

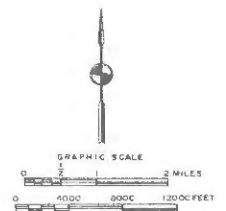


Table 9

**SELECTED CHARACTERISTICS OF EXISTING PUBLIC WASTEWATER
TREATMENT FACILITIES IN THE DES PLAINES RIVER WATERSHED**

Name of Public Sewage Treatment Plant	Estimated Total Population Served 1985	Date of Original Construction and Major Modification	Level of Treatment Provided	Disposal of Effluent	Existing Loading: 1989 ^a		
					Annual Average Hydraulic (mgd)	Maximum Monthly Average Hydraulic (mgd)	Average Annual Organic (pounds BOD5/day)
Town of Pleasant Prairie Sewer Utility District D	1,600	1966, 1985	Secondary	Tributary of Des Plaines River	0.28	0.36	385
Town of Pleasant Prairie Sanitary District No. 73-1	400	1975	Secondary	Des Plaines River	0.08	0.12	65
Town of Bristol Utility District No. 1	1,200	1965, 1971, 1988	Secondary	Bristol Creek	0.24	0.28	495
Town of Salem Utility District No. 1	1,100	1970	Secondary	Salem Branch	0.12	0.16	192
Village of Paddock Lake	2,300	1958, 1967, 1988	Secondary and tertiary	Brighton Creek	0.29	0.44	452

Name of Public Sewage Treatment Plant	Population	Average Hydraulic (mgd)	Average Organic (pounds BOD5/day)	Reserve Capacity		
				Average Hydraulic Capacity ^b (MGD)	Average Organic Capacity (pounds BOD5/day)	Population Equivalent ^b
Town of Pleasant Prairie Sewer Utility District D	3,300	0.55	460	0.19	75	1,700
Town of Pleasant Prairie Sanitary District No. 73-1	4,000	0.40	800	0.28	735	3,600
Town of Bristol Utility District No. 1	1,600	0.50	1,180	0.22	685	400
Town of Salem Utility District No. 1	3,000	0.30	510	0.14	318	1,900
Village of Paddock Lake	2,900	0.49	485	0.05	33	600

^aExisting loading data based upon values reported to the Wisconsin Department of Natural Resources during 1989.

^bThe reserve capacity was calculated as the difference between average hydraulic design capacity and maximum monthly average hydraulic loading.

Source: SEWRPC.

Changing Land Use

A watershed is basically a natural land unit which receives, stores, and delivers water, with every parcel of land within the watershed performing a vitally important function in receiving and disposing of water. Land use and water control facilities are closely and inextricably interrelated. The land use pattern is an important determinant of the hydraulic and pollution loads which the water control facilities must carry. Water control facilities and their effects upon the water resources of a watershed area are, in turn, important determinants of how land should be used. Even in a totally urbanized watershed, changes in land use such as increases in land use intensities and accompanying increases in impervious surfaces, such as large roofs and paved parking areas, may have detrimental effects, including a decrease in the time of concentration and an increase in peak flood flows. Changes in land use may also have a beneficial effect in that flood flows may be reduced by the incorporation of stormwater storage into the design of new urban development or redevelopment.

As noted previously, urban land use within the watershed, although accounting for only about 11 percent of the total watershed area in 1985, has been increasing and may be expected to continue to increase. Increases in land devoted to urban use may be expected to be accompanied by decreases in land devoted to woodlands, wetlands, and agricultural use in the watershed. These latter three land uses have decreased steadily since 1963. More specifically, wetland areas have declined from approximately 7,280 acres in 1963 to 6,640 acres in 1985, a 9 percent reduction.⁵ Woodland areas have declined from approximately 4,810 acres in 1963 to 4,660 acres in 1985, a 3 percent reduction. Agricultural lands have decreased from about 64,350 acres in 1963 to 60,780 acres in 1985, a 6 percent reduction.

Changing land use may be expected to have adverse effects on the streamflow regimen of the watershed, generally reducing low flows while increasing flood flows. Changing land use may also be expected to affect water quality

adversely. A comprehensive watershed plan is required if existing flooding and pollution problems are not to be exacerbated and if the creation of new flooding and pollution problems is to be avoided. This requirement is supported by previous planning studies for the Milwaukee, Menomonee, Fox, Root, Kinnickinnic, and Pike River watersheds and the Oak Creek watershed, all of which have documented the effects of urbanization on water quality and flooding.

Deteriorating Natural Resource Base

The identification and protection of natural areas in compatible open space uses are essential to the maintenance of a healthy environment for all life forms within the Des Plaines River watershed as well as to the maintenance of the natural beauty of the watershed. Natural areas are vital sanctuaries for the preservation of native plant and animal species, many of which are currently threatened or endangered as a result of urban encroachment and poor agricultural practices. In addition to providing outdoor laboratories for scientific research and educational instruction, natural areas serve as a standard against which the impacts of man's activities can be compared. The destruction of natural areas and removal of attendant ground cover contributes to erosion and subsequent sedimentation of the stream network and increases runoff and flood flows.

The generalized presettlement pattern of vegetative cover distribution in the Des Plaines River watershed is shown on Map 9. Approximately 1,161 acres, or only about 1.3 percent, of this presettlement vegetation is known to remain in the watershed. The original forest cover has been cut for building materials and cleared to provide croplands; the original wetlands have been drained or filled to provide land for various urban and rural uses.

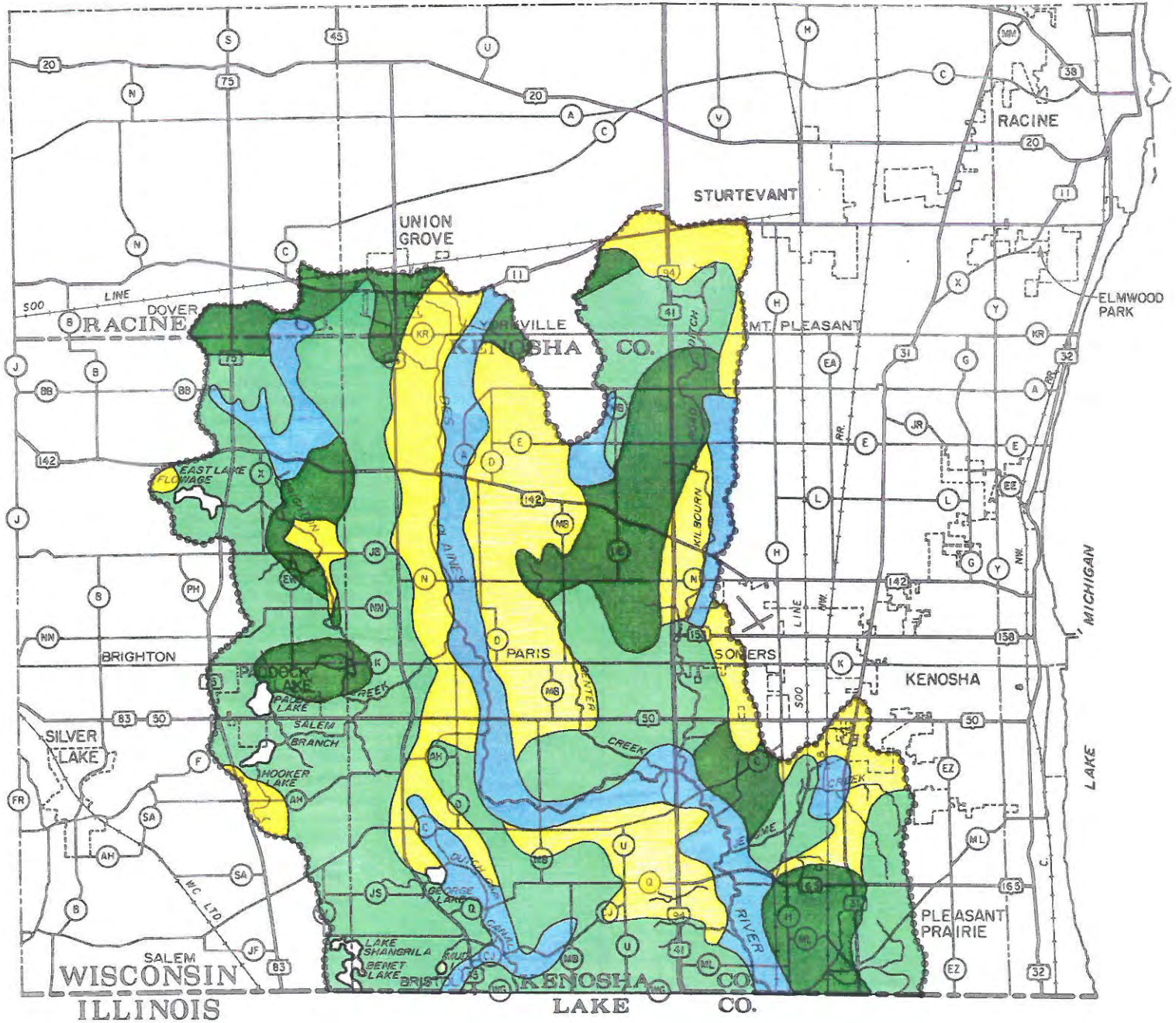
At present, there are seven designated natural areas of representative presettlement vegetation left in the Des Plaines River watershed. These areas are described in Table 10 and shown on Map 10. The Wisconsin Department of Natural Resources and the Regional Planning Commission are currently cooperatively preparing a report which will identify high quality natural areas and critical species in the Region and will propose a management plan for those areas.

Many of the best remaining elements of the natural resource base of the watershed, includ-

⁵Future decreases in wetland areas would be expected to be minimized due to the recent enactment of stringent state and federal controls on the destruction of wetlands.

Map 9

GENERALIZED PRESETTLEMENT VEGETATION IN THE DES PLAINES RIVER WATERSHED



LEGEND

DECIDUOUS FOREST



OAK—WHITE OAK, BLACK OAK, BUR OAK



OAK OPENINGS—BUR OAK, WHITE OAK, BLACK OAK

GRASSLAND AND BRUSH



PRAIRIE

WETLAND VEGETATION



MARSH AND SEDGE MEADOW, WET PRAIRIE, LOWLAND SHRUBS

Source: Robert W. Finley, Professor of Geography, Emeritus, University of Wisconsin-Extension and SEWRPC.

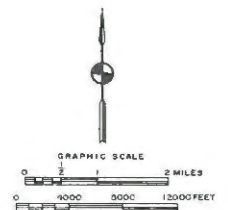


Table 10

LIST OF KNOWN NATURAL SITES LOCATED IN THE DES PLAINES RIVER WATERSHED

Number on Map 10	Name	U. S. Public Land Survey Town, Range, Section, Quarter Section	Acreage	Classification Code	Description
Racine County 9	Sturtevant Prairie	T3N, R21E NW Section 25, NE Section 26; T3N, R22E, SW Section 20, NW Section 29, NE Section 30	30	NA-1	Exceptionally good, deep soil, mesic prairie remnant. One of the two remaining remnants of the once extensive Barnes Prairie
Kenosha County 10	Des Plaines River Marsh and Woods	T1N, R22E SE Section 18 NE, NW, SW, SE Section 19 NW, SW Section 20 NE, NW, SW Section 29 NE, SE Section 30 NE Section 31 NW Section 32	910	NA-2	Woodland containing remnant oak-shagbark hickory with old growth of both red and white oak and black cherry timber. The undergrowth is generally shrubs, with hawthorns, black cherry, and raspberry dominant. An old meander of the Des Plaines River divides the woodland, now containing various wetland species. To the south there is an extensive wetland which is ditched in many places. Significant because of its open space and wildlife habitat
11	Benedict Prairie	T1N, R21E SE Section 11	6	NA-2	A small, but rich, six-acre wet-mesic to mesic prairie remnant located in an abandoned railroad right-of-way
12	Friendship Lake and Marsh	T2N, R20E SW Section 12 NW Section 13	55	NA-1	A small, but good-quality, kettle lake and marsh. Valuable feeding and nesting habitat for a variety of marshland birds
13	Harris Tract	T1N, R20E NE Section 1 T2N, R20E NE, SE Section 36 T2N, R21E NW, SW Section 31	150	NA-1	A large, good-quality marsh adjacent to Brighton Creek. A grazed oak opening is located to the east of the marsh. Managed by the University of Wisconsin-Parkside
16	Hooker Lake Marsh	T1N, R20E NE, NW, SW Section 11	60	NA-2	A large, deep and shallow marsh in Hooker Lake
27	Bain Station Road Prairie	T1N, R22E SE, SW Section 9	10	NA-3	A small wet-mesic to mesic prairie remnant dominated by big bluestem grass, switch grass, and prairie dock

Source: Wisconsin Department of Natural Resources and SEWRPC.

ing woodlands, wetlands, and wildlife habitat areas; areas covered by organic soils; areas containing rough topography and significant geological formations; and areas having scenic, historic, and scientific value, are contained in areas identified by the Commission as primary environmental corridors (see Map 10). Primary and secondary environmental corridors which are recommended for acquisition and protection by various levels and units of government are discussed in the park and open space plans which the Commission has prepared for Kenosha and Racine Counties.⁶

Park and outdoor recreation and related open space sites within the watershed, including parkways, have been identified, as shown on Map 11. Table 11 sets forth these sites by ownership. The park and open space preservation needs of the watershed should be reviewed under a comprehensive watershed planning program in light of existing and potential flooding and pollution problems.

Soil Erosion and Sedimentation

Soil erosion and stream sedimentation, resulting from inadequate soil conservation and management practices for rural land and developing urban land, are significant problems within the Des Plaines River watershed. Soil erosion reduces agricultural productivity through the loss of fertile topsoil and it also impairs or destroys aquatic habitat through the excessive deposition of sediment in wetlands and on streambeds. Table 7 identifies a high degree of streambed sedimentation along the Des Plaines River, the Kilbourn Road Ditch, and Center Creek.

The Commission has prepared agricultural soil erosion control plans for Kenosha and Racine Counties.⁷ Those plans identify priority areas

for cropland soil erosion control within these counties and the watershed, and, additionally, recommend farm management practices intended to reduce cropland soil erosion to tolerable levels.

While soil erosion resulting from the lack of application of good agricultural conservation practices has occurred within the watershed for many years, soil erosion from construction sites has become increasingly significant as urban development has accelerated in the watershed. Currently, there are no construction site erosion control ordinances in force within the watershed, although the Villages of Paddock Lake and Pleasant Prairie are drafting such ordinances. County requirements for control of construction site erosion are specified on an ad hoc basis.

Soil conservation and management are closely related to the issues of stormwater drainage, flood control, control of nonpoint source pollutants, changing land use, and deterioration of the natural resource base. Therefore, it is important that soil conservation be considered within the framework of a comprehensive watershed planning program which will enable the formulation of coordinated, long-range solutions.

Other Problems

Some of the problems that have been specifically studied in other watershed planning programs conducted by the Commission have not been discussed here as major problems of the Des Plaines River watershed because these problems either do not exist within the watershed, exist only to a very limited degree, are addressed by other current planning programs, or are considered to be of a short-term, transitional nature. The problems of groundwater availability, its quality, and public water supply are examples of such problems.

SUMMARY AND CONCLUSIONS

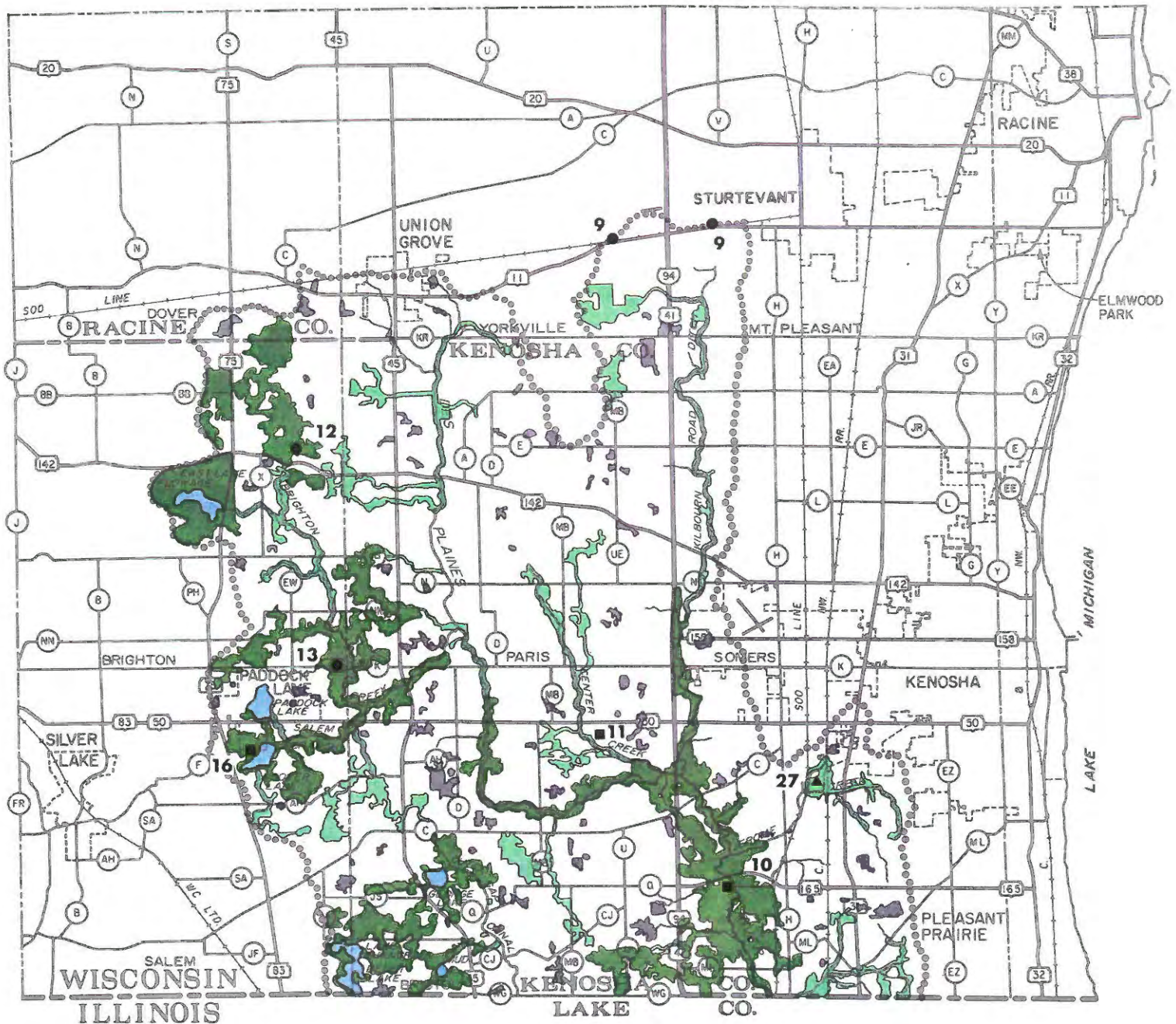
Increased demands on the natural resources of the Des Plaines River watershed within Wisconsin are expected to be imposed by the increasingly rapid conversion of land from rural to urban use. The major existing, or potential future, problems of the Des Plaines River watershed include flooding and flood damage caused by the development of the watershed in the

⁶See SEWRPC Community Assistance Planning Report No. 131, A Park and Open Space Plan for Kenosha County, November 1987, and SEWRPC Community Assistance Planning Report No. 134, A Park and Open Space Plan for Racine County, September 1988.









⁷SEWRPC Community Assistance Planning Report No. 164, Kenosha County Agricultural Soil Erosion Control Plan, April 1989; and Community Assistance Planning Report No. 160, Racine County Agricultural Soil Erosion Control Plan, July 1988.

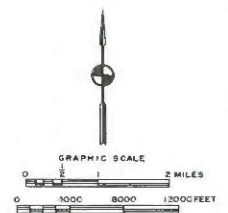
Map 10

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL
AREAS IN THE DES PLAINES RIVER WATERSHED: 1980



LEGEND

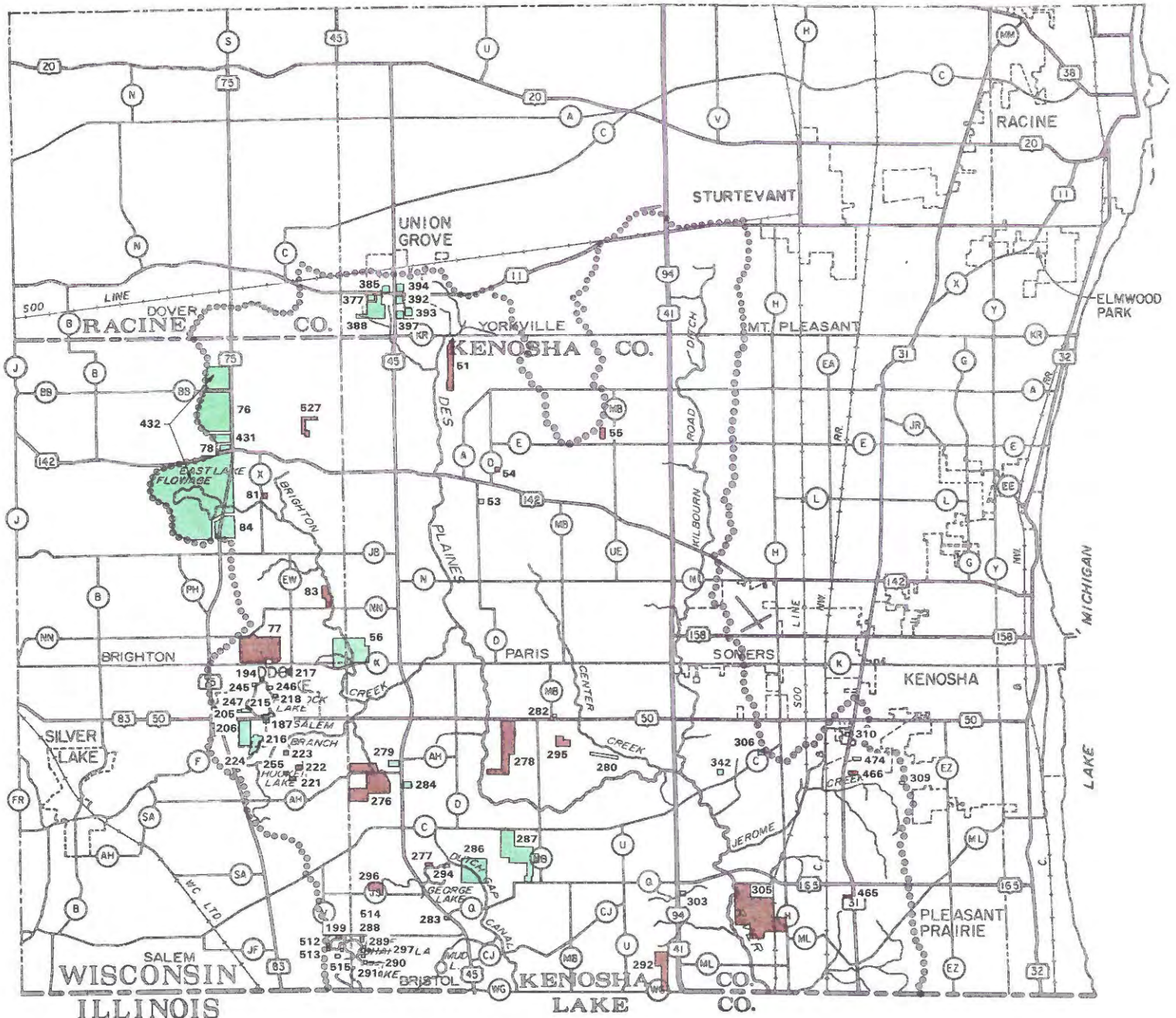
- | | | | |
|--|----------------------------------|---|---|
|  | PRIMARY ENVIRONMENTAL CORRIDOR |  | NATURAL AREA OF STATEWIDE OR GREATER SIGNIFICANCE (NA-1) |
|  | SECONDARY ENVIRONMENTAL CORRIDOR |  | NATURAL AREA OF COUNTYWIDE OR REGIONAL SIGNIFICANCE (NA-2) |
|  | ISOLATED NATURAL AREA |  | NATURAL AREA OF LOCAL SIGNIFICANCE (NA-3) |
|  | MAJOR LAKE |  | SITE NUMBER (SEE TABLE 10. NUMBERS ASSIGNED FOR SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 131, A PARK AND OPEN SPACE PLAN FOR KENOSHA COUNTY, AND NO. 134, A PARK AND OPEN SPACE PLAN FOR RACINE COUNTY.) |



Source: SEWRPC.

Map 11

LOCATION OF EXISTING PUBLIC AND PRIVATE PARK, OUTDOOR RECREATION,
AND OPEN SPACE SITES IN THE DES PLAINES RIVER WATERSHED: 1985



LEGEND

- EXISTING PUBLIC SITE
- EXISTING NONPUBLIC SITE

385 SITE NUMBER (SEE TABLE 11. NUMBERS ASSIGNED FOR SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 131, A PARK AND OPEN SPACE PLAN FOR KENOSHA COUNTY, AND NO. 134, A PARK AND OPEN SPACE PLAN FOR RACINE COUNTY.

Source: SEWRPC.

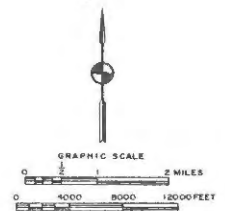


Table 11

**LIST OF PUBLIC AND PRIVATE PARKS AND OUTDOOR RECREATION
AND OPEN SPACE SITES IN THE DES PLAINES RIVER WATERSHED: 1985**

Civil Division	Site Ownership	Number ^{a,b}	Site Name	Area ^c	Location ^d
Kenosha County					
City of Kenosha	Public	474-04	Gangler Park	5	0122-10
Village of Paddock Lake	Public	187-03	Old Settlers Park	16	0120-02
		205-05	Village Park	1	0120-03
		206-08	Salem Central Union High School	11	0120-11
		215-02	Paddock Lake Marsh	9	0120-02
		216-02	Hooker Lake Marsh (part)	27	0120-11
		217-05	Village Park	4	0120-02
		218-05	Public Access	1	0120-02
		245-05	Village Park	1	0120-02
		246-05	Village Park	1	0120-02
	Nonpublic	194-10	North Shore Paddock Lake Community Club	1	0120-02
		247-12	Paddock-Hooker Lake Association Park	1	0120-02
Village of Pleasant Prairie	Public	303-02	Kenosha Tourist Information Center	13	0122-30
		306-08	Pleasant Prairie School	4	0122-08
		309-08	Whittier School	2	0122-14
		310-08	Green Bay School	1	0122-10
	Nonpublic	342-06	Pleasant Prairie Ball Park	6	0122-07
		305-12	Pheasant Valley Hunting Club	382	0122-29
		465-11	Lagoon Tavern Picnic Ground	10	0122-27
		466-11	Colonial Inn Picnic Ground	5	0122-10
Town of Brighton	Public	056-02	University of Wisconsin Nature Area (part)	80	0220-36
		076-03	Brighton Dale Park	360	0220-10
		078-08	Brighton School	8	0220-15
		084-08	Kenosha School Forest	113	0220-22
		431-08	Salem School Forest	160	0220-10
	Nonpublic	432-02	Bong State Recreation Area	4,515	0220-16
		077-10	Union League Boys Club Camp	235	0220-35
		081-10	St. Francis Xavier School	3	0220-14
		083-11	Happy Acres Campground	42	0220-25
		527-10	Kenosha Achievement Center	23	0220-12
Town of Bristol	Public	056-02	University of Wisconsin Nature Area (part)	6	0121-06
		279-08	Bristol School	3	0121-07
		280-02	Benedict Prairie	8	0121-11
		282-08	Woodworth School	2	0121-03
		283-02	Wayside	1	0121-29
		284-06	Richard Hansen Memorial Park	7	0121-17
		286-02	State Wetland Area	160	0121-21
		287-03	Bristol Woods County Park	206	0121-22
		289-06	Park No. 1	1	0121-31
		290-06	Park No. 2	1	0121-31
		291-06	Park No. 3	1	0121-31
		294-06	Town Land	1	0121-20
		297-06	Wildlife Refuge	3	0121-31
		276-10	Conservation Club of Kenosha	179	0121-07
		277-11	George Lake Beach	1	0121-20
		278-11	Bristol Oaks Country Club	152	0121-09

Table 11 (continued)

Civil Division	Site Ownership	Number ^{a,b}	Site Name	Area ^c	Location ^d
Town of Bristol (continued)	Nonpublic	288-11	Lake Shangrila Resort	3	0121-31
		292-11	King Richard's Faire	88	0121-36
		295-10	Kenosha Bowmen	25	0121-10
		296-10	Waukegan Bowmen	25	0121-30
Town of Paris	Public	053-08	Paris School	6	0221-21
		056-02	University of Wisconsin Nature Area (part)	126	0221-31
	Nonpublic	051-11	Van's Great Lakes Dragaway	63	0221-05
		054-10	St. John's Catholic School	1	0221-16
		055-12	Sowers Rod and Gun Club	17	0221-11
Town of Salem	Public	056-02	University of Wisconsin Nature Area (part)	19	0120-01
		224-06	Public Access	1	0120-11
		512-06	Town Land	1	0120-36
		513-06	Town Land	1	0120-36
		514-06	Town Land	2	0120-36
		515-06	Town Land	3	0120-36
	Nonpublic	199-11	Jo-Ann's Resort	4	0120-36
		221-12	Subdivision Park	1	0120-14
		222-12	Subdivision Park	2	0120-11
		223-12	Subdivision Park	4	0120-11
		255-12	Montgomery Lake Highlands Park	1	0120-14
Town of Somers	Public	488-06	Town Land	103	0222-31
Racine County					
Village of Union Grove	Public	385-05	Well No. 3 Park	1	0321-30
		393-08	Union Grove Middle School	6	0321-32
		394-08	Union Grove Grade School	5	0321-32
		397-05	Well No. 4 Park	1	0321-32
Town of Yorkville	Public	377-03	Old Settlers Park	13	0321-31
		388-03	County Fair Grounds	83	0321-31
		392-03	Sunny Grove School	1	0321-32

NOTE: All school-site acreage represents actual area developed for outdoor recreational facilities, not ownership boundaries.

^aA site identification number, the first three digits of numbers in this column, was assigned to all sites included in the 1973 inventory of park and open space sites in the Region. This inventory is documented in Appendix D, SEWRPC Planning Report No. 27, A Regional Park and Open Space Plan for Southeastern Wisconsin: 2000. Additional sites identified and included in the 1985 inventory were assigned a new site number.

^bThe ownership code numbers, the final two digits in this column, are divided into public and nonpublic as follows:

<u>Public</u>		<u>Nonpublic</u>
02 - State	05 - Village	10 - Organizational
03 - County	06 - Town	11 - Commercial
04 - City	08 - School District	12 - Private

^cTotal site area, including, if any, the area outside the Des Plaines River watershed.

^dThe location numbers represent the U. S. Public Land Survey township, range, and section numbers in which the site is located.

Source: SEWRPC.

absence of a floodland management plan; pollution of the surface waters caused principally by agricultural and urban runoff, malfunctioning onsite sewage disposal systems, industrial wastewater discharges, and publicly or privately owned nonindustrial sewage treatment plants; changing land use; the deterioration of the watershed's natural resource base; and soil erosion.

Solutions to these basic and interrelated problems can best be devised within the framework of a basinwide, comprehensive planning program which recognizes the watershed as an integrated land-water resource unit having a complex community of interest among its residents. The conduct of such a planning program is an important step in the wise management of the resources of the Des Plaines River watershed.

Chapter IV

MAJOR ELEMENTS OF A COMPREHENSIVE WATERSHED PLANNING PROGRAM FOR THE DES PLAINES RIVER WATERSHED

The following outline sets forth the essential major work elements of a proposed comprehensive planning program for the Des Plaines River watershed in Southeastern Wisconsin. The planning program has been designed to provide sound, long-range solutions to the existing and potential problems of the watershed as those problems have been set forth in the previous chapter of this prospectus.

While sufficiently detailed to permit the development of initial cost estimates and time schedules, the outline is not intended to be a detailed study design. It is intended to be sufficiently general to permit latitude in the selection of specific procedures and techniques as the actual planning program proceeds.

The outline is based upon the following assumptions:

1. That the ultimate purpose of a comprehensive study of the Des Plaines River watershed is to assist in the abatement of the water-related problems of the watershed by developing a workable plan to guide the sound development and redevelopment of land use and the staged development of supporting water control facilities within the watershed.
2. That effective solutions to the problems of the watershed and full realization of its development potential can be achieved only by considering all important aspects of the natural resource base together with all existing and proposed significant human modifications and uses thereof. This requires that the planning effort be comprehensive in both functional scope and geographic area, fully recognizing the interrelationship of the land and water use problems of the watershed, as well as the need to consider the entire watershed within Wisconsin as a rational planning unit.
3. That the study will utilize the latest planning and engineering techniques in developing a comprehensive plan for the watershed.
4. That the task of establishing a comprehensive watershed planning program, the collection and analysis of basic data under such a program, and the formulation of improvement plans and of related plan implementation programs all require close and continuing cooperation among the various levels and agencies of government concerned with, and involved in, the land and water use problems of the watershed. While the study will not specifically address the downstream portion of the watershed in Illinois, the downstream impacts of alternative plans will be evaluated.
5. That full use will be made of all previously published and unpublished surveys, reports, and other pertinent data on the Des Plaines River watershed including, but not limited to, technical information assembled by the following agencies of government: the U. S. Department of the Army, Corps of Engineers; the U. S. Department of the Interior, Geological Survey; the U. S. Department of Agriculture, Soil Conservation Service; the Wisconsin Department of Natural Resources; Kenosha County; Racine County; and the Villages of Paddock Lake, Pleasant Prairie, and Union Grove; as well as the Illinois Department of Transportation, Division of Water Resources; and Lake County, Illinois. Additional data collection activities will be conducted only as necessary to develop essential original data either currently unavailable or to supplement, or update, existing data. Thus, to the maximum extent possible, emphasis in the survey will be on problem analysis and plan synthesis, testing, and evaluation rather than on data collection.
6. That the study will deal primarily with flooding problems, but will also address stormwater management aspects to the extent that such aspects are interrelated with flood control issues. The flood control plan to be prepared under the Des Plaines River watershed study will provide a

framework within which detailed local stormwater management system plans can be readily prepared. Accordingly, the approximately 98.9 lineal miles of stream and watercourse channel shown on Map 12 and listed in Table 1 in Chapter III of this prospectus will be studied in the proposed planning program.

7. That, while the study will not provide for detailed local stormwater management plans, the study will provide specific guidelines to be used in addressing stormwater management problems, including the best means of treating development proposals pending completion of detailed local stormwater management plans. Such local plans would be properly related to the flood control plans for the major streams and watercourses of the watershed.

It is intended that the proposed study culminate in the selection and adoption, from among the various alternatives available, of a comprehensive watershed plan providing for the abatement of the water resource and water resource-related problems of the watershed in an economically feasible, socially responsive, functionally sound, and environmentally sensitive manner. To the greatest extent possible, the alternative plans which provide a basis for final plan selection shall be composed of various combinations of land use and water control facility elements.

The study is to employ a seven-step watershed planning process through which the principal functional relationships existing within the watershed can be accurately described both graphically and numerically, the performance of the natural stream channels and appurtenant water control facilities simulated, and the effect of different courses of action with respect to land use and water control facility development tested and evaluated. The seven steps involved in this planning process are: 1) study design, 2) formulation of objectives and standards, 3) inventory, 4) analysis and forecast, 5) preparation, testing, and public evaluation of alternative plans, 6) plan selection and adoption, and 7) preparation of precise plans.

STUDY DESIGN

On the basis of the experience obtained in the conduct of the Root, Fox, Milwaukee, Menomo-

nee, Kinnickinnic, and Pike River and Oak Creek watershed studies, the Regional Planning Commission staff recommends that the Des Plaines River watershed study be carried out by the Commission staff under the guidance of a watershed committee, supplemented by consultant services as necessary on an individual work element basis. The staff and consulting work would be assigned and directed in accordance with a detailed outline of the final planning report. The format for, and scope and content of, the final planning report as set forth in the outline would be developed by the staff and Watershed Committee on the basis of this prospectus, which would, thus, constitute the necessary study design. By continuously utilizing the outline of the final planning report as an overall guide to the performance of the work, a good plan and planning report should be produced, effective use should be made of Commission staff resources and any consulting services that may be required, and a sound basis should be provided for the coordination of the study participants.

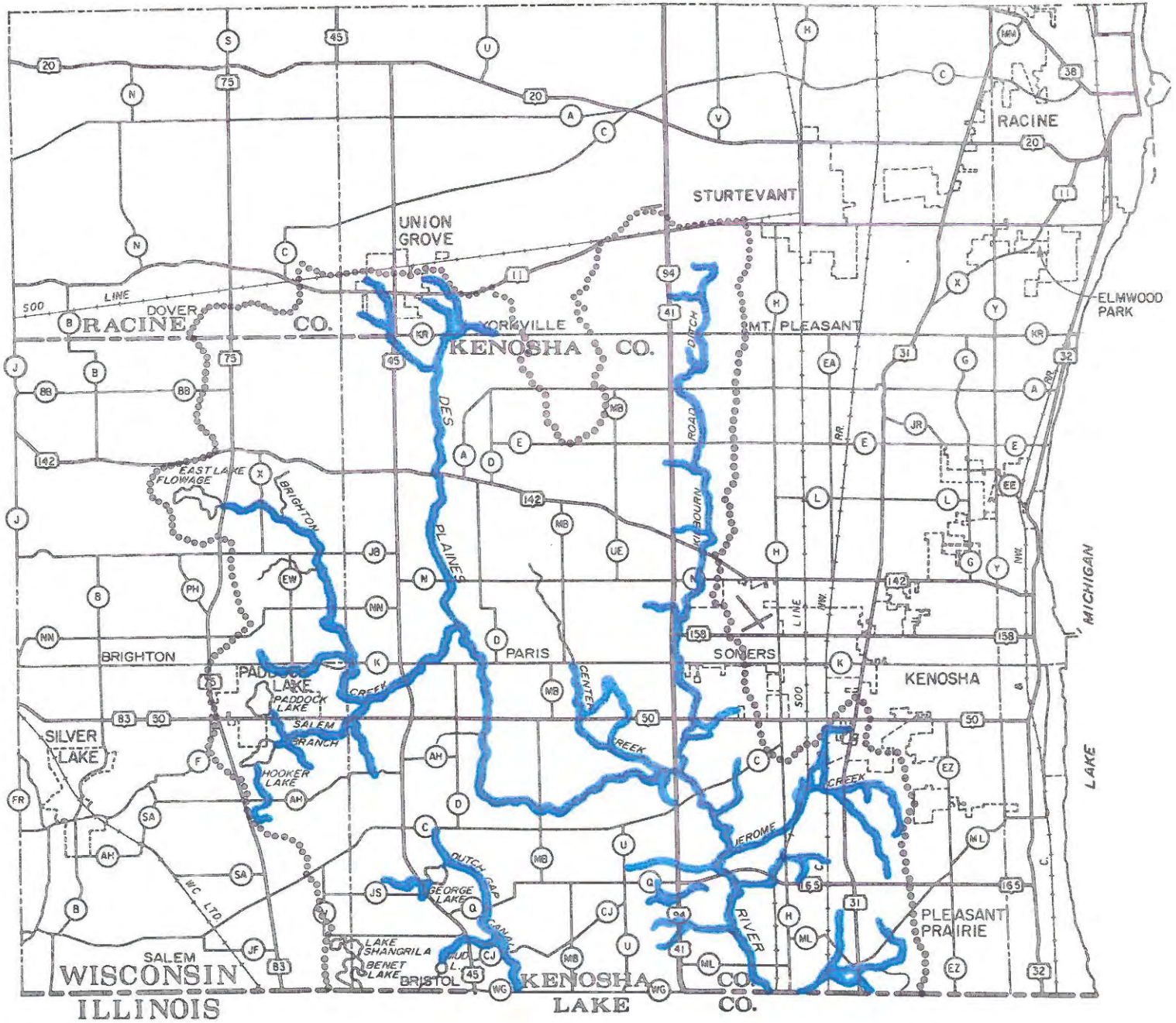
FORMULATION OF OBJECTIVES AND STANDARDS

The formulation of watershed development objectives is an essential task which must be undertaken before plans can be prepared. In order to be useful in the watershed planning process, the objectives to be defined must not only be clearly stated and logically sound, but must be related in a demonstrable way to alternative physical development proposals. Only if the objectives can be clearly related to physical development and subject to objective testing can a plan that best meets the needs of agreed-upon objectives be selected from among alternative plans. Finally, logically conceived and well expressed objectives must be translated into detailed design standards to provide the basis for plan preparation, testing, and evaluation.

In scope, the watershed development objectives and standards may range from land use development objectives for the watershed as a whole to detailed planning and engineering criteria covering rainfall intensity-duration-frequency relationships, rainfall-runoff relationships, channel capacity formulas, backwater computations, and water quality parameters. The watershed development objectives and standards must be agreed upon by all parties concerned if plans

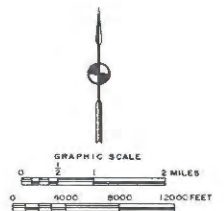
Map 12

STREAM REACHES FOR WHICH ALTERNATIVE AND RECOMMENDED
STORMWATER AND FLOOD MANAGEMENT PLANS WILL BE DEVELOPED



LEGEND

— STREAM REACHES RECOMMENDED FOR
DEVELOPMENT OF FLOOD HAZARD INFORMATION



which can be adopted cooperatively and implemented jointly are to be evolved. The formulation of development objectives and standards is a matter of public policy determination and is dependent on many nonengineering, as well as engineering, considerations.

Criteria and methods for the design of channel modifications, dikes and floodwalls, and storage system reservoirs, as well as of urban storm-water management systems relating to such facilities, will have to be agreed upon among the various levels and agencies of government involved. Pollution will have to be defined, state-established water use objectives will have to be reviewed and agreed upon; and standards for surface water quality, based upon the existing and potential water and land uses by channel reach, will have to be established. Finally, benefit-cost analyses for any public works improvements necessary to protect and enhance the water resources of the basin and to abate existing, and avoid future, drainage and flood control problems will have to be developed and agreed upon.

The adoption of such criteria and standards by all parties concerned is important, since these criteria and standards will be used as the basis for the determination of the adequacy of existing water-related facilities, as the basis for plan preparation, and as the basis for determining the relative urgency among various needs. The consideration and adoption of any and all of these and other criteria and standards will, therefore, have to be preceded by appropriate studies, after which all concerned levels and agencies of government will have to participate in the formulation of the required objectives and standards. It will be important that the criteria and standards adopted meet the requirements of such federal and state agencies as the U. S. Environmental Protection Agency; the U. S. Department of Agriculture, Soil Conservation Service; the U. S. Department of the Army, Corps of Engineers; and the Wisconsin Department of Natural Resources, which may eventually be asked to participate in plan implementation and may be involved in the permitting and approval process for any recommended improvements.

INVENTORY

Reliable basic planning and engineering data collected on a uniform, areawide basis are

essential to the formulation of workable watershed development plans. Consequently, inventory becomes the first operational step in the planning process, growing out of the study design. The following inventory operations will have to be conducted as a part of the proposed planning programs.

1. Mapping

Essential to any watershed planning effort is definitive knowledge of the topographic and cultural features of the watershed. Such knowledge can best be derived from topographic and cadastral maps of the required scale and accuracy. Information will be required on such natural features as drainage area boundaries, relief, areas subject to inundation, and locations of streams, ponds, and wetlands, as well as on such man-made features as real property boundary lines, highways, railways, and principal buildings.

a. General Base Maps

General base maps of the watershed will be required to provide a medium for recording and presenting in graphic form the results of the planning studies, as well as the natural and man-made features of the watershed. Regional base maps have been prepared by the Regional Planning Commission and are available for the study. These maps can be used to portray the Region and subareas thereof, such as the Des Plaines River watershed, at three scales, 1:24,000, 1:48,000, and 1:96,000, and can be readily adapted to show the watershed as a unit. These base maps can be expanded or reduced in scale for use in various phases of the study, and show, among other information, all streams and watercourse lines; all railways, streets, and highways; all U. S. Public Land Survey township, range, and section lines; and all civil division boundary lines. These maps are compiled to National Map Accuracy Standards utilizing the Wisconsin State Plane Coordinate Grid South Zone as the map projection.

b. Aerial Photographs

Current aerial photography at appropriate scales will be required to provide detailed planimetric data as a basic

source for land use data and as a data source for the necessary updating of all base maps. Aerial photography of the entire Region was obtained by the Regional Planning Commission in April of 1963 and 1967, and at five-year intervals from 1970 through 1990. The Commission aerial photographs, which are ratioed and rectified to the Commission survey control network, are available for the study at scales of 1:48,000 and 1:24,000.

c. Flood Hazard and
Land Reservation Maps

As the study attains a more precise and definitive stage, maps providing detailed information on property boundary lines and topography to a much greater degree of accuracy and precision than that furnished by the general base maps and aerial photographs will be required. The degree of accuracy which can be attained in such plan implementation activities as floodplain regulation depends upon the accuracy and scale of available detailed planning maps. Such maps will have to be available at a scale of 1:2,400, with contours having a two-foot vertical interval compiled by stereophotogrammetric methods, and should meet National Map Accuracy Standards. In order to properly correlate topographic and cadastral data, such maps should be based upon a monumented control survey network which relates the U. S. Public Land Survey System to the State Plane Coordinate System. These maps will be required for areas along all major stream channel reaches that the ultimate plan may indicate as requiring land use controls for floodplain reservation or as requiring the reservation of land for the ultimate construction of drainage and flood control facilities. These maps will provide the basis for the preparation of local plans and plan implementation devices. In addition, these maps will be used to obtain readily certain data necessary to the calculation of the hydraulic capacity of the stream network, specifically, channel cross sections.

As shown on Map 13, large-scale topographic and cadastral maps prepared to Commission specifications at a scale of 1:2,400 are available for all of the watershed. The large-scale maps for a 2.5-square-mile area which lies predominantly within the Village of Pleasant Prairie, but partially within the City of Kenosha, were prepared in 1966. That area includes stream reaches for which it may be expected that flood management plans will be developed. The area has also experienced urban development since the date of mapping. It is therefore recommended that the large-scale topographic maps prepared in 1966 for 2.5 square miles of the watershed be revised and updated by Kenosha County under its ongoing program to update older topographic and cadastral maps.

2. Surface Water Data Inventory—
Hydrologic and Hydraulic Investigations

If the comprehensive planning process is to be applied to finding sound solutions to the problem of the development of the land and water resources of the watershed, information will have to be gathered on the essential aspects of the origin, distribution, movement, storage, and discharge of streamflow within and from the watershed. The inventory should focus not only on the elements of the hydrologic cycle and the natural conditions of streamflow, but on related man-made elements significantly affecting the hydraulic behavior of the perennial stream system. These data should include meteorologic data adequate to form a basis for rainfall and streamflow frequency-intensity-duration analyses, and particularly for flood flow studies; the morphological characteristics of the drainage areas, including channel and upland slopes, drainage patterns, stream course configurations, and subbasin areas; the streamflow discharge-duration-frequency relationships in the perennial stream system, with emphasis on the high and low ranges of streamflows; the hydraulic characteristics of the waterways, including channel cross sections and constructions, channel roughness, the dimensions and roughness of apparent floodways and floodplains, the dimensions and characteristics of waterway openings of all bridges

AVAILABILITY OF LARGE-SCALE TOPOGRAPHIC MAPPING WITHIN THE DES PLAINES RIVER WATERSHED



and culverts, and the dimensions and performance characteristics of dams and channel linings; the historic flood damages which have accrued to private citizens and public bodies; and the historic high water marks, high water surface profiles, and related areas of inundation.

Much, although not all, of the needed information has been collected and completed by various public agencies. Twenty-three years of streamflow has been recorded by the U. S. Geological Survey at a continuous streamflow gaging station maintained by the Survey in cooperation with the Illinois Department of Transportation, Division of Water Resources, on the Des Plaines River at Russell, Illinois, about 0.8 mile south of the Wisconsin-Illinois state line. Structural elevations and dimensions have been obtained by the Regional Planning Commission for 39 of the 213 bridges and culverts and for five of the 15 dams on the stream network of the watershed, as shown on Map 14. Data on flood stages and attendant areas of inundation and damages which have been assembled by the Commission and the local units of government will be collated and utilized in the watershed planning effort.

3. Groundwater Basic Data Studies

The Des Plaines River watershed lies west of the subcontinental divide and, therefore, relies primarily upon groundwater for its water supply.¹ Currently, there are some known groundwater quality and supply problems. These problems have been identified with respect to the public groundwater supply systems operated in the portions of the study area generally located east of and up to one mile west of IH 94. A detailed evaluation of alternative means of resolving these problems is currently near-

ing completion.² For other areas of the watershed, required groundwater studies may be limited to those necessary to establish the general quantitative and qualitative relationships between groundwater and surface water, using available data. Thus, the groundwater study should include the collation and analysis of all existing information on groundwater levels and potential interference through any proposed works, such as channel improvements or reservoirs; groundwater-precipitation-streamflow relationships; and areas presenting special problems to development because of high water tables. These studies would not include the consideration of extremely localized conditions important only to detailed engineering design studies. No field work is anticipated for the purpose of collecting additional information about the groundwater resources of the basin.

Natural springs are known to exist in the Des Plaines River watershed. These springs will be inventoried, with data collected regarding the location, flow characteristics, and effects on the base flows of the stream network. The plan will include consideration of the need for protective measures for these springs and will make appropriate recommendations with respect thereto.

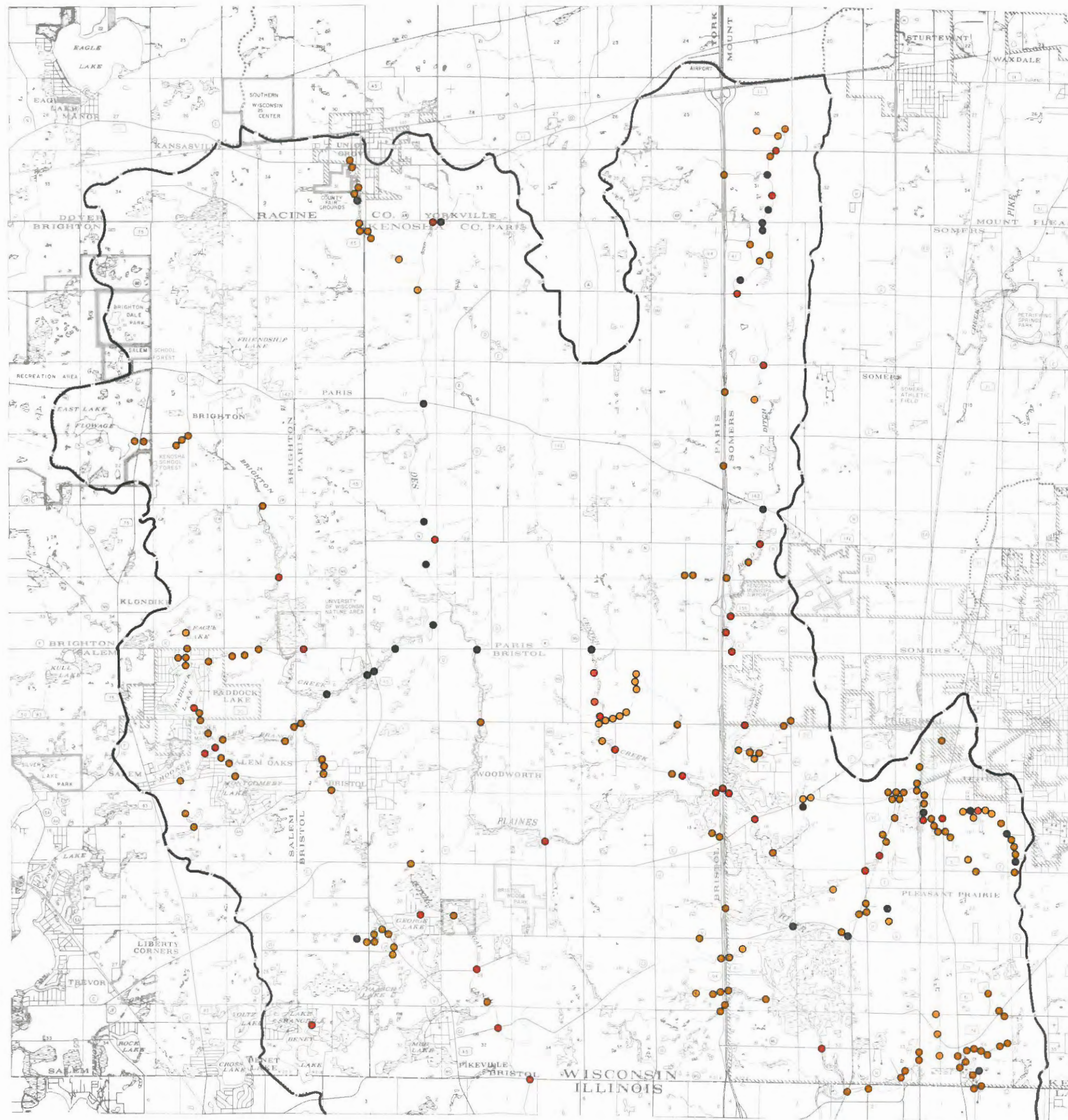
4. Water Quality Inventory

Existing and potential beneficial water uses are directly related to water quality as well as quantity. It will, therefore, be necessary to establish a generalized but comprehensive understanding of the quality of the surface waters of the Des Plaines River watershed in order to determine suitability for all general kinds of use, including recreation, maintenance of a fishery and of other desirable forms of wildlife, industrial supply, and the dilution and assimilation of wastewater. This will require the collation of data on the chemical, physical, and biological quality of

¹Recently-annexed portions of the City of Kenosha which have been provided with municipal sanitary sewer service receive their water supply from Lake Michigan. Also, cooling water for the Wisconsin Electric Power Company electrical generating plant in the Village of Pleasant Prairie is obtained from and returned to Lake Michigan.

²Coordinated Sanitary Sewer and Water Supply System Plans for the Kenosha Area, in preparation.

Map 14
HYDRAULICALLY SIGNIFICANT
STRUCTURES IN THE DES PLAINES
RIVER WATERSHED



- LEGEND**
- WATERSHED BOUNDARY
 - STRUCTURE FOR WHICH DETAILED FIELD MEASUREMENTS HAVE BEEN OBTAINED
 - STRUCTURE FOR WHICH DETAILED FIELD MEASUREMENTS ARE NEEDED
 - STRUCTURE FOR WHICH DETAILED FIELD MEASUREMENTS MAY BE NEEDED



Source: SEWRPC.

streamflow, groundwater, and effluent discharges in the watershed. Long-term seasonal and, in some cases, instantaneous peak loadings of pollutants and the resultant responses in the stream system environments will be established by the collation of existing data.

The data assembly and collation, as well as the water quality management recommendations, for the Des Plaines River watershed will be based on the findings and recommendations of previous Regional Planning Commission work programs. Historical data will be collated from the SEWRPC benchmark study of water quality at three sampling stations in the watershed, as documented in SEWRPC Technical Report No. 4, Water Quality and Flow of Streams in Southeastern Wisconsin. Data on long-term trends in water quality will be collated from inventory and from the Commission analyses of such trends at these same three stations, plus one additional Wisconsin Department of Natural Resources sampling station, as those trend analyses are set forth in SEWRPC Technical Report No. 17, Water Quality of Lakes and Streams in Southeastern Wisconsin: 1964-1975.

Another body of water quality information to be collated and used in the proposed planning program will be the findings and recommendations of the areawide water quality management planning program, documented in SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000. These findings and recommendations rely not only upon the aforereferenced historical water quality data, but also on the results of water quality simulation modeling under existing and probable future land use and wastewater discharge conditions and alternative levels of non-point source water pollution control. In addition, water quality and biological condition data from the files of the Wisconsin Department of Natural Resources and water quality data obtained at the U. S. Geological Survey Russell Road stream gage on the Des Plaines River in Lake County, Illinois, will be used in the proposed study. Data will also be collated on

the existing and potential future condition sources of water pollution, including both point and nonpoint sources.

The collated information will allow analysis of the water quality of the perennial stream system, of the probable effects of public sewage treatment plant and industrial wastewater effluent on the streamflow and quality, of the probable effects of nonpoint source control, and of the probable effects of changing land use conditions.

5. Water Use Inventory

An investigation will be required of the various kinds and intensities of water uses relating both to water quality and land use. The existing water uses must be identified in terms of quantity, quality, place, and time. In the Des Plaines River watershed, the potential use categories include agricultural water supply, waste assimilation, protection and propagation of fish and wildlife, recreation, and aesthetic uses. The extent to which these uses are presently served will have to be determined.

6. Soil Capabilities Inventory

Detailed soil capability information, including type and depth of major horizons, depth to bedrock, depth to water table, permeability and runoff characteristics, susceptibility to erosion, suitability for development using onsite sewage disposal systems, and suitability for impoundment sites and diversion structures, will be required for the as yet undeveloped areas of the watershed. A detailed operational soil survey of the entire Region, including planning and engineering interpretations for rural and urban development and, specifically, for hydrologic and hydraulic investigations, has been carried out by the Regional Planning Commission in cooperation with the U. S. Soil Conservation Service, and the findings of that survey will be available for application in the watershed planning work for most of the watershed where the natural soil has not been disturbed.³

³SEWRPC Planning Report No. 8, Soils of Southeastern Wisconsin, June 1966.

7. Land Use Inventory

Since land use is an important determinant of water use and of quantity and rate of runoff, a land use inventory will be required as an integral part of the watershed study. Such an inventory must determine the existing amount, type, intensity, and spatial distribution of land use in sufficient detail to enable the establishment of historic patterns and trends and to provide a basis for the preparation of a basinwide land use plan. In selected areas, such as in the riverine areas, supplementary data may have to be collected on market values, attractions and liabilities of sites, and local land use plans and on public development policies. Essentially, much of the land use data needed for the watershed are available through the inventories conducted by local units of government and by the Commission as a part of its continuing regional planning program.

8. Economic and Population Base Study

It will be necessary to inventory and analyze the socioeconomic factors that underlie the urbanization and the demand for the land and water resources of the watershed, and that are accentuating the problems of pollution and flood damage within the watershed. Such a study will include a determination of trends in population and economic activity and a correlation of these trends with the supply and availability of land and water resources in the watershed. Population and economic base studies of the Region have been completed by the Regional Planning Commission and will be available to the study.

9. Natural Area, Park, and Related Open Space Inventory

An inventory of the natural area and recreational resources of the watershed, including the remaining woodlands, wetlands, prairies, and wildlife habitat areas, together with an inventory of existing and potential park and related open space facilities, will be required. Results from the existing County park and open space plans prepared by the Regional Planning Commission for Racine and Kenosha counties; from the woodland, wetland, and wildlife habitat inventories conducted by the Commission; and from the current program

being carried out cooperatively by the Wisconsin Department of Natural Resources and the Regional Planning Commission to identify high quality natural areas and critical species habitats in the Region, and to prepare a plan for the sound management of such areas and habitats will be available for use in the watershed planning work.

10. Public Utility Facilities Inventory

An inventory of the existing and proposed public utility service areas within the watershed, including particularly the existing and possible future sanitary sewer and public water supply service areas, will be required to determine future urban land use capabilities. As previously noted, sanitary sewer and water supply system plans for the Kenosha area are nearing completion. Recent refinements to other sanitary sewer service areas are documented in sanitary sewer service area reports for the Village of Paddock Lake and the Towns of Salem and Bristol.⁴ Special attention will have to be given to identifying storm sewer outlets, and to the delineation of the tributary areas served by those outlets.⁵ These data

⁴SEWRPC Community Assistance Planning Report No. 143, Sanitary Sewer Service Area for the Town of Salem Utility District No. 2, Kenosha County, Wisconsin, February 1986; and SEWRPC Community Assistance Planning Report No. 145, Sanitary Sewer Service Area for the Town of Salem Utility District No. 1, Village of Paddock Lake, and Town of Bristol Utility Districts Nos. 1 and 1B, Kenosha County, Wisconsin, October 1986.

⁵In the future, the U. S. Environmental Protection Agency may issue regulations governing the issuance of permits for stormwater discharges from municipal separate storm sewer systems serving populations less than 100,000. Such regulations have already been issued for municipalities with populations of 100,000 or greater. The watershed study inventory of the stormwater management system, along with associated water quality, land use, and population inventories, would be useful for addressing the anticipated requirements of those stormwater discharge regulations.

should be available from local planning and engineering programs.

11. Water Law Inventory

A detailed study of water law in Southeastern Wisconsin has been completed by the Regional Planning Commission⁶ and should be adequate to describe the general legal framework within which the study must be carried out and its recommendations presented. To complement that study, a complete inventory should be made of the status and substance of administrative regulations which pertain to the Des Plaines River watershed and represent more or less committed decisions to which plan adjustments must be made. Since the subcontinental divide forms the eastern boundary of the watershed, these inventory data would include pertinent current contractual agreements and policies and the associated watershed planning implications relating to interbasin diversion of water to and from the Great Lakes area. In addition, this inventory would also include: 1) permits issued by the Wisconsin Department of Natural Resources and its predecessor agencies for the construction of dams, piers, docks, and other shoreline improvements, and authorized streamflow rates and lake levels; 2) permits issued by the Wisconsin Department of Natural Resources and its predecessor agencies for the construction of high-capacity wells; 3) discharge permits and orders issued by the Wisconsin Department of Natural Resources and its predecessor agencies for the abatement of pollution; and 4) county and local floodplain and wetland zoning ordinances and related regulatory policies and devices.

Navigability determination by the Wisconsin Department of Natural Resources has important implications for the exercise of land use controls, particularly joint state and county shoreland and wetland zoning. In addition, state permits under Chapter 30 of the Wisconsin Statutes are required for

any flood control projects on streams determined to be navigable by the Department. Accordingly, the Department will be asked to make a determination of the navigability on an areawide basis within the entire watershed so that the navigable streams can be mapped as a part of the watershed planning effort. If the Department can respond favorably to such a request in a timely manner, then such mapping of the navigable streams can be reflected in the watershed plan. If the Department is unable or unwilling to make the desired navigability determination on an areawide basis within the watershed, then the plan will have to be prepared utilizing a surrogate measure of navigability. In that case, it will be assumed that all the perennial streams as mapped by the U. S. Geological Survey are also navigable streams.

ANALYSIS AND FORECAST

Inventories provide factual information about historic and present situations, but analyses and forecasts are necessary to provide estimates of future needs for land, water, and recreation and open space resources, and for related facility development and management measures and devices. These future needs must be determined from a sequence of interlocking forecasts. Economic activity and population forecasts enable a determination of the general level of future growth which may be anticipated within the watershed which, in turn, can be translated into future demands for land and water use, in terms of both quality and quantity, and for water control facilities and land use regulation. These probable future demands can then be scaled against the existing situation, and plans formulated to meet any deficiencies.

1. Technical Analyses of Water Resource

Problems, Characteristics, and Capabilities
Careful and detailed analyses of the hydrologic and hydraulic data collated and collected will be required, and should include an identification of the extent of existing and probable future flood hazards through the preparation of inundation maps and through an analysis of the character of the flood flow velocities, durations, and causative factors. Noteworthy historic floods in the watershed and in the

⁶SEWRPC Technical Report No. 2, second edition, Water Law in Southeastern Wisconsin, April 1977.

Region surrounding the watershed should be analyzed and related to the probable flood hazard and to flood-frequency data. Data on past flood damages should be analyzed and related to probable future flood frequencies and stages. Any general deterioration of the stream relating to pollution sources, erosion, sedimentation, and debris and rubbish accumulation should be analyzed. Probable average and sustained low flow data should be analyzed and related to both water quality and potential consumption rates by various land and water use categories.

2. Analysis of Population Growth Trends and Resource Requirements

A careful and detailed analysis of human activities within the watershed as they affect water resources will be required. This analysis will include an examination of the economic and population structure and trends within the watershed and the preparation of forecasts of future population and economic activity levels; the establishment of future resource requirements based upon the estimated future population and economic activity levels; an estimation of the probable spatial distribution of these future requirements, based upon analyses of existing county and local development plans and policies and the capacities of public utility facilities to support them; and an estimation of soil and water capabilities. Future development patterns will have to be analyzed to determine their effects upon demands for outdoor recreation facilities, increasing water supply and waste disposal needs, and continuing encroachment on floodplains and stream channels. Particular attention should be given to the desirable preservation of the best remaining elements of the natural resource base, including the best remaining woodlands, wetlands, prairies, and wildlife habitat areas.

PREPARATION, TESTING, AND PUBLIC EVALUATION OF ALTERNATIVE PLANS

The ultimate purpose of the proposed watershed planning program is the preparation and evaluation of a number of feasible alternative watershed plans and the selection, from among these alternatives, of a final plan for adoption and

implementation. Alternative plan elements may include proposals for land use, erosion and sedimentation control, streamflow maintenance and augmentation, water quality protection and pollution abatement, park and open space acquisition and development, flood control, stormwater management, stream channel stabilization and beautification, and land use controls.⁷ Each alternative plan must be quantitatively tested to establish the ability of existing and proposed water control facilities to carry the hydraulic loadings within adopted standards.

Any single plan for specific water management facilities carries with it far-reaching decisions and effects on general land and water use patterns, allocation of resources, public investment policies, and broad community "benefits" and "costs." Decisions regarding such matters should not be made by technicians alone. Such decisions properly belong in the realm of public policy-making, and should actively involve elected public officials and interested citizens. If an adopted watershed plan is to represent more than technical decisions, therefore, the related physical, economic, social, and legal effects of alternative watershed plans must be analyzed and presented to elected public officials and interested citizens for study and evaluation. This should be done through the preparation of a planning report describing the corollary effects and broad benefits and costs of alternative plans.

A planning report adequate for plan selection and public policy-making purposes should include, in addition to a description of feasible alternative plans, clear statements providing information on the following:

⁷Specific alternatives for stormwater management and flood control might include various combinations of the following measures: 1) decentralized detention storage, 2) centralized detention storage, 3) structure floodproofing and removal, 4) extension of floodland zoning regulation to land not currently regulated as floodplain, 5) reservation of floodlands for recreational and related open space uses, 6) control of land use outside floodplains, 7) construction of dikes or floodwalls, 8) channel modification and enclosure, and 9) diversion of floodwaters.

1. The purpose of the watershed planning program and the resultant planning report as an instrument for public decision-making.
2. The existing and potential water and water-related resource problems of the watershed as revealed by the inventories and analyses.
3. The alternative means for abating the identified watershed problems.
4. The benefits and costs, broadly defined, of the short- and long-term economic, environmental, and social impacts of the alternative means for abating the watershed problems.
5. The critical decisions that need to be made in the watershed in light of the problems.

PLAN SELECTION AND ADOPTION

On plan should be chosen, after public hearings, as the final plan to be used to guide the long-range physical development of the watershed and, through cooperative adoption by all levels and agencies of government involved, to serve as the basic reference for decision-making concerning future urban development patterns, soil and water management programs, investment in public works, and detailed drainage and sewerage design within the watershed. The final published planning report should include a clear graphic and written description of the general plan and the reasons for its selection.

As noted earlier, the detailed stormwater management and flood control component of the plan will be limited to the selected stream system network covering about 98.9 lineal miles and will not include detailed local level stormwater management plans. Rather, the recommended plan will address the stormwater management needs of the area to the extent that stormwater management and flood control are interrelated. As such, the flood control plan will present a framework for preparing and carrying out local level stormwater management plans. In addition, the recommended plan will include the provision of specific guidelines to be used in addressing stormwater management problems including the best means of treating develop-

ment proposals pending completion of detailed local stormwater management plans.

An administrative and financial study will be required to suggest practical organizational and financial arrangements under which the selected watershed plan can be implemented. The study should analyze the capabilities of local units of government to implement the various plan recommendations, identifying federal and state financial and technical assistance for such implementation, and should identify an appropriate agency for implementation of each element of the overall watershed plan.

PREPARATION OF PRECISE PLANS

The primary objective of the planning study is to motivate specific action toward the solutions of the most pressing watershed problems. While a plan setting forth the general location and characteristics of any proposed water management facility is necessary as a statement of mutually agreed-upon long-range objectives, it is quite ineffective as a sound basis for plan implementation through land reservation and as a basis for extending technical planning assistance and advice to concerned local units of government.

With respect to the stormwater management and flood control problems of the watershed, the application of such devices as floodland zoning, temporary and permanent floodland evacuation, park and open space preservation, floodproofing, urban redevelopment, warning signs, tax adjustments, and development policies for the regulation of land use in floodplains, as well as the proper design of local stormwater management facilities, requires the preparation of precise and definitive plans. These precise plans should set forth the ultimate development of each major stream channel reach so that both present and possible future floodways and floodplains can be delineated and flood hazard maps prepared. In the case of stormwater management and flood control facilities, such plans should set forth proposals as to the approximate centerline location of channel improvements; the location and extent of storage sites, floodways, and restrictive zones; the waterway openings required; channel bottom elevations; and the

Figure 2

TIMING OF MAJOR WORK ELEMENTS OF THE DES PLAINES RIVER WATERSHED PLANNING PROGRAM

MAJOR WORK ELEMENTS	FIRST YEAR												SECOND YEAR											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A. STUDY ORGANIZATION AND DETAILED STUDY DESIGN																								
B. FORMULATION OF OBJECTIVES, PRINCIPLES AND STANDARDS																								
C. COLLECTION AND ANALYSIS OF BASIC ENGINEERING AND PLANNING DATA																								
1. MAPPING																								
2. SURFACE WATER INVENTORY -- HYDROLOGIC, HYDRAULIC, AND FLOOD DAMAGE INVESTIGATIONS																								
3. GROUNDWATER INVESTIGATIONS																								
4. SURFACE WATER QUALITY INVESTIGATIONS																								
5. WATER USE INVENTORY																								
6. SOIL CAPABILITIES INVENTORY																								
7. LAND USE INVENTORY																								
8. POPULATION, FINANCIAL, AND ECONOMIC BASE STUDY																								
9. NATURAL AREA, PARK AND OPEN SPACE INVESTIGATIONS																								
10. PUBLIC UTILITY FACILITIES INVENTORY																								
11. LAND AND WATER LAW INVENTORY																								
12. LAND AND WATER RESOURCE PROBLEMS, CHARACTERISTICS, AND CAPABILITIES ANALYSIS																								
D. FORECASTS OF POPULATION, EMPLOYMENT, LAND USE, AND FINANCIAL RESOURCES																								
E. PREPARATION, TEST AND PUBLIC EVALUATION OF ALTERNATIVE PLANS																								
F. PLAN SELECTION AND ADOPTION																								
G. PLAN IMPLEMENTATION AND PREPARATION OF PRECISE PLANS																								
H. PUBLICATION OF REPORTS																								

Source: SEWRPC.

elevations of hydraulic gradients at peak discharge rates.

As part of the plan preparation, the delineation of the primary environmental corridors in the watershed will be refined to reflect the findings of the new large-scale floodland mapping based upon the analyses conducted under the watershed study. In addition, the corridor refinement may consider such other factors as the location and configuration of real property boundary lines.

TIME SCHEDULE

An estimate time schedule for the accomplishment of the major elements of the study is shown in Figure 2. As shown, it is estimated that completion of the study will require a period of two years. This schedule is subject to revision upon detailed study design, but represents the best estimate possible in the absence of such a design. The recommended study organization and the cost estimates are predicated, in part, upon the recommended time schedule.

Chapter V

ORGANIZATION FOR THE STUDY

STAFF REQUIREMENTS

The proper execution of the recommended comprehensive watershed planning program for the Des Plaines River watershed will require a staff trained and experienced in many different skills and professional disciplines, including demographic and economic base and structure studies; land use and water resources planning; hydrologic, hydraulic, and sanitary engineering; and resource conservation. The complexity of the problems in the watershed and their close interrelationship, coupled with conflicting interests in, and demands on, the natural resource base, make an interdisciplinary approach to the planning work particularly important.

It is, therefore, recommended that the proposed study be carried out in a manner similar to that used for the previous comprehensive watershed planning programs within the Region; that is, by the staff of the Southeastern Wisconsin Regional Planning Commission, assisted, as necessary and desirable, by the staffs of other governmental agencies and by private consultants. The Commission should assume direct responsibility for all work elements which might logically be considered of a general regional planning nature. These work elements might include staff work necessary for the provision of population, economic activity, and land use data; for the conduct of the hydrologic, hydraulic, and sanitary engineering analyses; and for the coordination of the preparation and adoption of watershed development objectives and standards by the various levels and agencies of government and by private interests concerned, the design and evaluation of alternative plans, and the selection of a final watershed plan.

It is estimated that this portion of the work would require the equivalent services of two full-time planners over the period of the study, together with supporting administrative, clerical, and drafting services. The Commission should be responsible for interpreting the results of the studies to the local units of government concerned and for assisting these local units of government in plan implementation through the enactment, as necessary, of appropriate land use controls, and through the development of local

planning, development, and resource management programs, thus assuring continuity in the planning program after completion of the study proper and promotion of plan implementation.

It is further recommended that this nucleus planning staff be supplemented by the use of contractual services to provide the other professional skills required to complete the study successfully, particularly for the field survey of hydraulic structures, stream and floodplain cross sections, and the photogrammetric engineering skills required for the compilation of the recommended topographic mapping. In addition, contractual service agreements might be arranged with those governmental agencies possessing special skills, such as in certain aspects of natural resource conservation and management. In particular, contractual service agreements may be arranged for any special surface water and groundwater investigations found to be necessary as the work proceeds. It is important, however, that the proposed study, including the contractual services, be carried out under the administrative direction of the staff of the Regional Planning Commission. The size and complexity of the task to be accomplished require that all participants in the study function as a smoothly operating team geared to tight production schedules.

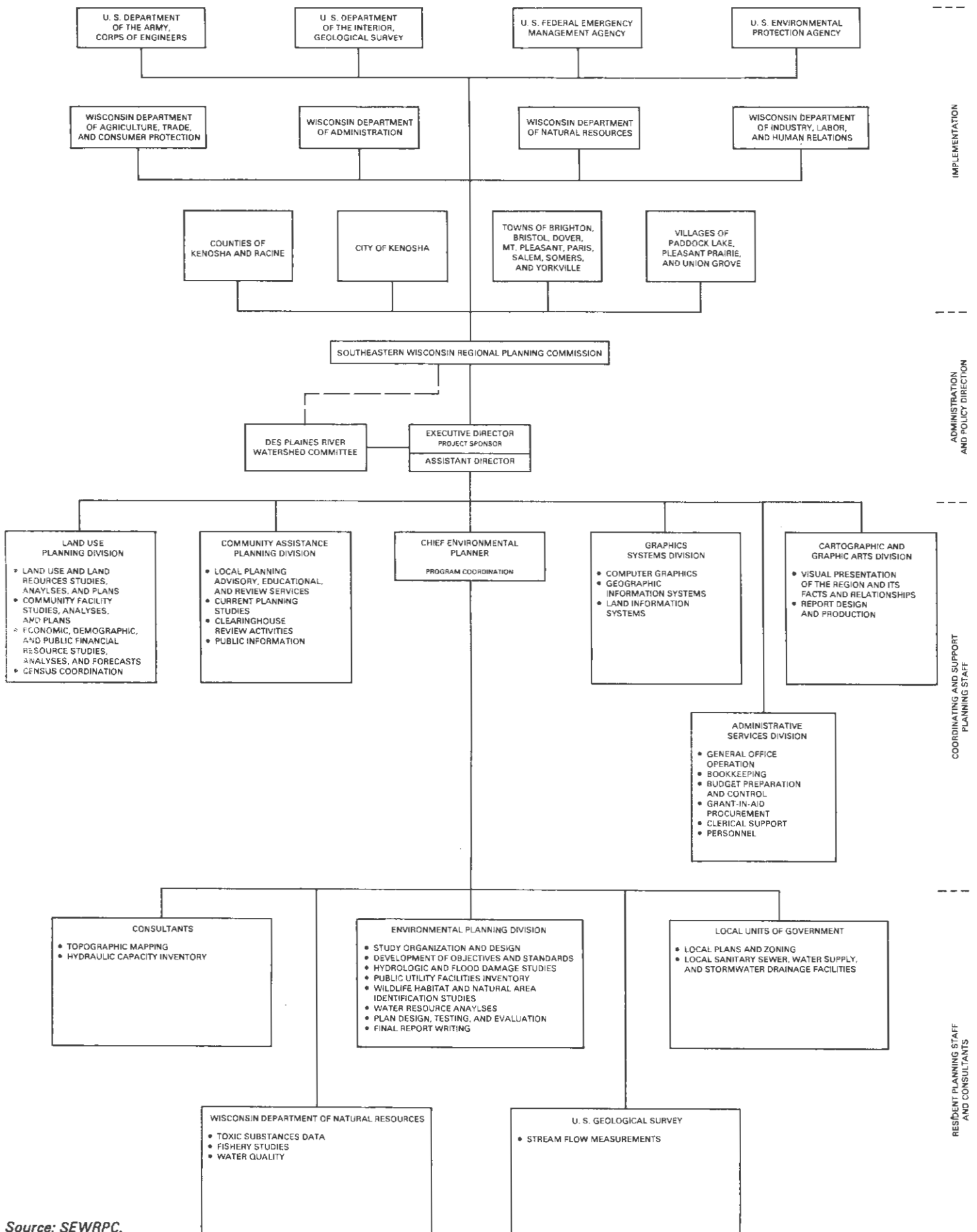
The recommended staff organization is indicated in Figure 3, as are the recommended lines of authority and responsibility and a possible functional designation of tasks. It must be recognized that actual service agreements negotiated with participants during detailed study design could change the personnel requirements, the lines of authority and responsibility, and, particularly, the functional designation of tasks. Moreover, it must be recognized that certain functions must be shared, in particular the technical analysis of resource problems; the adoption of design criteria and standards; plan synthesis, testing, and evaluation; and administrative and financial analyses.

COMMITTEE STRUCTURE

As shown in Figure 3, it is recommended that one advisory committee be made an integral part of

Figure 3

ORGANIZATIONAL STRUCTURE FOR THE DES PLAINES RIVER WATERSHED PLANNING PROGRAM



the organization for the study, namely, the Des Plaines River Watershed Committee. This Committee was created by, and is advisory to, the Commission and is presently organized and operating. The composition of the Committee was described in Chapter I of this prospectus, and is set forth in full in Chapter VII of this prospectus.

The basic purpose of the Des Plaines River Watershed Committee will be to involve the various governmental bodies, technical agencies, and private interest groups within the watershed actively in the watershed planning process, and to assist the Commission in determining and

coordinating basic policies involved in the conduct of the study and in the resultant plans and programs. This Committee will have a particularly important role in the selection of the final plan and in assuring its financial and administrative feasibility. The Committee will assist in familiarizing the political, business, and industrial leadership within the watershed with the study and its findings, and in fostering the understanding of the basic objectives of the plan and the implementation procedures. It is recommended that the existing membership of this Committee be retained, but that the possibility of an expanded membership remain open.

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Chapter VI

BUDGET

COST ESTIMATES

Estimated study costs, as shown in Table 12, are based upon the scope of work, time schedule, and study organization set forth in this prospectus. The cost estimates were prepared by the Regional Planning Commission staff on a work element-by-work element basis and are based upon estimates of both staff and consultant direct labor and associated overhead costs as well as upon separate estimates of the cost of such items as travel, data processing, and printing.

In any consideration of these cost estimates, it must be recognized that precise cost estimates are impossible in the absence of a detailed study design. This is particularly true with respect to the analytical phase of the work, since both the depth and detail of the analysis required become apparent only as the work progresses. Consequently, the cost estimates presented in Table 12 must be considered tentative with respect to allocation of the total cost among the various work elements, and changes in this allocation must be expected upon completion of the detailed study design and as work on the study proceeds. Overall study costs, however, should not vary greatly from those estimated.

COST ALLOCATIONS

Clearly, a comprehensive watershed planning program, such as the one outlined herein, affects and is, therefore, of concern to many levels and agencies of government. In recognition of these interests and concomitant responsibilities, past comprehensive watershed planning programs conducted by the Commission have utilized funds available through the U. S. Department of Housing and Urban Development, the U. S. Environmental Protection Agency, and the

Wisconsin Department of Natural Resources. However, these agencies have indicated to the Commission an unwillingness to continue to fund watershed studies in southeastern Wisconsin because of changes in their program priorities and increasingly austere planning budgets and annual appropriations. For this reason, it is believed that it would be fruitless to try to obtain federal and state funding for the proposed watershed study. Therefore, it is recommended that the necessary funds be provided by Racine and Kenosha Counties, in which the Des Plaines River watershed lies. It is further recommended that the funding responsibilities set forth in Table 13 form the basis for the actual allocation of funds. This method of apportioning the costs of the study on the basis of the estimated proportion of the equalized assessed valuation within the watershed was followed in the execution of the Root, Fox, Menomonee, Milwaukee, and Pike River watershed planning programs, and is herein recommended as representing the fairest distribution of costs for the Des Plaines River basin. Such apportionment implicitly recognizes the extent of the actual drainage area within the boundaries of the county concerned as well as the extent of the man-made improvements in the watershed. Such a method of apportionment is, moreover, consistent with state legislation enabling regional planning to be carried on cooperatively by the local units of government within the Region.

The cost allocations set forth in Table 13 are based upon 1990 equalized valuations within Kenosha and Racine Counties. Those valuations and the proportion of such valuations within each County may change somewhat by the time the study funding is secured. In addition, the total cost of the study could change if lengthy postponement is involved, given the effects of general price inflation.

Table 12

COST ESTIMATES FOR THE DES PLAINES RIVER WATERSHED PLANNING PROGRAM

Work Element	Estimated Cost (expressed in 1992 dollars)
A. Study Organization and Detailed Study Design	\$ 2,200
B. Formulation of Objectives and Standards	\$2,200
C. Collection and Analysis of Basic Engineering and Planning Data	
1. Mapping	
a. General Base Maps	\$ 4,600
b. Aerial Photographs	- ^a
c. Flood Hazard and Land Reservation Maps	- ^b
2. Surface Water—Hydrologic, Hydraulic, and Flood Damage Investigations	55,000
3. Groundwater Investigations	2,600
4. Surface Water Quality Investigations	6,000
5. Water Use	1,700
6. Soil Capabilities	1,200
7. Land Use	1,200
8. Population, Financial, and Economic Base	3,400
9. Natural Area, Park, and Open Space Investigations	2,100
10. Public Utility Facilities	1,200
11. Land and Water Law	1,000
12. Land and Water Resource Problems, Characteristics, and Capabilities	<u>50,000</u>
Subtotal	\$134,400
D. Forecasts of Population, Employment, Land Use, and Financial Resources	\$ 6,700
E. Preparation, Testing, and Public Evaluation of Alternative Plans	\$ 80,000
F. Plan Selection and Adoption	\$ 15,000
G. Plan Implementation and Preparation of Precise Plans	\$ 17,000
H. Publication of Reports	\$ 20,000
I. Travel, Equipment Rental, and Data Processing	\$ 5,000
Total	\$278,100

^aWork items to be accomplished by the Regional Planning Commission under other work programs and furnished at no direct cost to the project.

^bUpdated large-scale topographic maps covering a 2.5-square-mile area would be prepared by the Regional Planning Commission for Kenosha County under the County's ongoing program to update older topographic and cadastral maps.

Source: SEWRPC.

Table 13

RECOMMENDED COST ALLOCATION FOR THE DES PLAINES RIVER WATERSHED PLANNING PROGRAM

County	Total 1990 Equalized Value in Watershed ^a	Percent of Total Equalized Value in Watershed	Cost Allocations			Total
			First Year	Second Year	Third Year	
Kenosha	\$ 992,827,400	89	\$82,503	\$82,503	\$82,503	\$247,509
Racine	121,122,000	11	10,197	10,197	10,197	30,591
Total	\$1,113,949,800	100	\$92,700	\$92,700	\$92,700	\$278,100

^aEstimated as the sum of the products of the fraction of the total land area of each civil division which lies in the watershed and the total 1990 equalized assessed value for each civil division.

Source: SEWRPC.

Chapter VII

CONCLUDING RECOMMENDATIONS

The Des Plaines River Watershed Committee, after careful study and consideration, submits the following findings and recommendations to the Southeastern Wisconsin Regional Planning Commission and its constituent local units of government.

1. Five serious resource-related problems presently face the local units of government within the Des Plaines River watershed and require resolution if further environmental deterioration of the watershed is to be avoided. These problems are:
 - a. Flooding, inadequate stormwater drainage, and attendant damages;
 - b. Water pollution;
 - c. Changing land use, as related to flooding and inadequate stormwater drainage and to water pollution;
 - d. Deterioration and destruction of the natural resource base, particularly the loss of important natural areas and wildlife habitat; and
 - e. Soil erosion and sedimentation.

These resource-related problems are all closely interrelated and may be expected to intensify as urbanization continues within the watershed. Particularly important is the close interrelationship existing between the water control facilities required within the watershed and the land use pattern which these facilities must sustain and support. Flood control facilities must form an integrated system over the entire watershed capable of carrying both present and future runoff loadings; and the design of these facilities must be properly related to water quality, adjacent land uses, and recreation and public

open space requirements. The preparation of local stormwater management plans should be based on the agreed-upon basin-wide flood control plan.

2. Resolution of the water resource-related problems of the watershed requires the preparation of a comprehensive watershed plan based upon factual information on overall potential land and water use needs within the watershed as well as upon the major determinants of such needs. Such a watershed plan must contain specific practical recommendations for the abatement of the flooding, pollution, and deteriorating natural resource base problems of the watershed. To be effective, such a comprehensive plan must be cooperatively prepared and capable of being jointly implemented by all of the levels, units, and agencies of government concerned. The study will consider the need to create an institutional structure for implementation of the recommended watershed plan. In this respect consideration will be given to utilization of the existing public agencies as well as to the creation and use of an areawide drainage and flood control agency.
3. Preparation of the necessary comprehensive watershed plan is financially feasible with county funding. This feasibility assumes that the local units of government involved will assist in the provision of locally available inventory data at no direct cost to the study.

The Committee, therefore, recommends that a comprehensive watershed study be conducted for the Des Plaines River watershed in southeastern Wisconsin at the earliest possible date and that the scope, techniques, time sequence, staff and Committee structure, and cost allocations for

such a study be as recommended in this prospectus. Because of the critical nature of the flooding and stormwater drainage, water pollution, changing land use, deteriorating natural resource base, and soil erosion and sedimentation problems existing in this watershed, the Committee respectfully urges the Southeastern Wisconsin Regional Planning Commission and Kenosha and Racine Counties to give careful consideration to this prospectus, to act favorably

thereon, and to initiate the necessary watershed study as quickly as possible. Every effort should be made by all concerned to initiate the study in 1992.

Respectfully submitted,

Des Plaines River Watershed Committee

SEWRPC DES PLAINES RIVER WATERSHED COMMITTEE

George E. Melcher	Chairman	Director of Planning and Development, Kenosha County
Kurt W. Bauer	Secretary	Executive Director, Southeastern Wisconsin Regional Planning Commission
Nancy Braker		Director of Science and Stewardship, The Nature Conservancy
Lawrence B. Christmas		Executive Director, Northeastern Illinois Planning Commission
Arnold L. Clement		Director of Planning and Development, Racine County
Raymond Forgianni, Jr.		Director, City Development, City of Kenosha
Richard E. Hart		Kenosha County Board Supervisor; Member, Kenosha County Land Use Committee
David D. Holtze		Chairman, Town of Somers
Leonard R. Johnson		Kenosha County Board Supervisor; Chairman, Kenosha County Land Conservation Committee
Wayne E. Koessl		WISPARK Corporation
Norman H. Krueger		President, Village of Paddock Lake
Gary L. Nelson		Supervisor, Water Regulation and Zoning Program, Wisconsin Department of Natural Resources
O. Fred Nelson		Manager, City of Kenosha Water Utility
Michael R. Pollocoff		Administrator, Village of Pleasant Prairie
Phil Sander		Southeast Wisconsin Sportsmen's Federation
Carroll Schaal		Planner, Lake County Stormwater Management Commission
Audrey J. Van Slochteren		Chairman, Town of Bristol
Pamela A. Wallis		Kenosha County Conservationist
August Zirbel, Jr.		Chairman, Town of Paris