



# A LAND USE MANAGEMENT PLAN FOR THE CHIAWKEE PRAIRIE-CAROL BEACH AREA OF THE TOWN OF PLEASANT PRAIRIE

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Special acknowledgement is due Donald M. Reed, SEWRPC Principal Biologist and William J. Stauber, AICP, SEWRPC Principal Planner, for their contribution to the preparation of this report.

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Allen K. Shea . . . . . Planning Analyst, Bureau of Water  
Resources Management, Wisconsin  
Department of Natural Resources  
Dr. Forest W. Stearns . . . . . Professor, Department of Botany,  
University of Wisconsin-Milwaukee  
Russell Van Herik . . . . . Director, Wisconsin Chapter,  
The Nature Conservancy

Special acknowledgement is due the following former Committee members and individuals who served as alternate members during the course of the planning program: Brent M. Haglund, Director of Land Stewardship, Wisconsin Chapter, The Nature Conservancy; Wayne E. Koessl, Supervisor, Kenosha County Board; Sharon K. Meier, Planning Analyst, Bureau of Water Resources Management, Wisconsin Department of Natural Resources; Francis J. Pitts, Commissioner, SEWRPC, and former Kenosha County Board Supervisor; Thomas W. Terwall, Supervisor, Town of Pleasant Prairie Board; and Donald H. Wruck, Chairman, Pleasant Prairie Town Board. In addition, recognition is due the following federal and state agency representatives who participated in the conduct of the planning program: Thomas E. Glatzel, Environmental Protection Specialist, U. S. Environmental Protection Agency; Ronald G. Spry, Fish and Wildlife Biologist, U. S. Fish and Wildlife Service; and Thomas J. Becker, Area Wildlife Manager, Clifford E. Germain, Natural and Scientific Areas Coordinator, James P. Morrissey, Assistant Environmental Impact Coordinator, David M. Pericak, Natural Resources Specialist, Ronald F. Piening, Water Inventory and Classification Specialist, Gregory R. Pilarski, Water Regulation and Floodplain Zoning Coordinator, Robert H. Read, Terrestrial Ecologist, William A. Smith, Natural Areas Biologist, William E. Tans, Environmental Specialist, Patricia A. Trochlell, Water Management Specialist, Steven M. Ugoretz, Environmental Impact Statement Coordinator, and Rhonda R. Yant, Water Management Specialist, all of the Wisconsin Department of Natural Resources.

# SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

916 NO. EAST AVENUE

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WAUKESHA, WISCONSIN 53187-1607

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**SUBJECT:** Certification of Amendment to the Adopted Regional Land Use and Water Quality Management Plans (Land Use Management Plan for the Chiwaukee Prairie-Carol Beach Area of the Town of Pleasant Prairie)

**TO:** The Legislative Bodies of Concerned Local Units of Government Within the Southeastern Wisconsin Region, namely: the County of Kenosha, the City of Kenosha, and the Town of Pleasant Prairie

This is to certify that at a regular meeting of the Southeastern Wisconsin Regional Planning Commission, held at the Walworth County Courthouse, Elkhorn, Wisconsin, on the 11th day of March 1985, the Commission did by unanimous vote by all Commissioners present, being 18 ayes and 0 nays, and by appropriate Resolution, a copy of which is made a part hereof and incorporated by reference to the same force and effect as if it had been specifically set forth herein in detail, adopt an amendment to the regional land use and water quality management plans, which plans were originally adopted by the Commission on the 19th day of December 1977, and the 12th day of July 1979, respectively, as parts of the master plan for the physical development of the Region. The said amendments to the regional land use and water quality management plans pertain to the location and extent of urban service areas, agricultural lands, and primary environmental corridors in the Chiwaukee Prairie-Carol Beach area of the Town of Pleasant Prairie, and consist of the inventory findings, maps, figures, and supporting data, plans, and plan implementation recommendations contained in SEWRPC Community Assistance Planning Report No. 88, A Land Use Management Plan for the Chiwaukee Prairie-Carol Beach Area of the Town of Pleasant Prairie, Kenosha County, Wisconsin, published in February 1985, attached hereto and made a part hereof. Such action taken by the Commission is hereby recorded on, and is a part of, said plan, and the plan, as amended, is hereby transmitted to the constituent local units of government for consideration, adoption, and implementation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and seal and cause the Seal of the Southeastern Wisconsin Regional Planning Commission to be hereto affixed. Dated at the City of Waukesha, Wisconsin, this 12th day of March 1985.

Anthony F. Balestrieri, Chairman  
Southeastern Wisconsin Regional  
Planning Commission

ATTEST:

Kurt W. Bauer, Deputy Secretary

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**RESOLUTION NO. 85-3**

**RESOLUTION OF THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION  
AMENDING THE ADOPTED REGIONAL LAND USE PLAN AND THE ADOPTED  
REGIONAL WATER QUALITY MANAGEMENT PLAN, THOSE PLANS BEING A PART  
OF THE MASTER PLAN FOR THE PHYSICAL DEVELOPMENT OF THE REGION  
COMPRISED OF THE COUNTIES OF KENOSHA, MILWAUKEE, OZAUKEE, RACINE,  
WALWORTH, WASHINGTON, AND WAUKESHA IN THE STATE OF WISCONSIN  
(LAND USE MANAGEMENT PLAN FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH  
AREA OF THE TOWN OF PLEASANT PRAIRIE)**

WHEREAS, pursuant to Section 66.945(10) of the Wisconsin Statutes, the Southeastern Wisconsin Regional Planning Commission, at a meeting held on the 19th day of December 1977, duly adopted a regional land use plan as documented in the two-volume SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, and at a meeting held on the 12th day of July 1979, duly adopted a regional water quality management plan as documented in the three-volume SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000; and

WHEREAS, the adopted regional land use and regional water quality management plans include delineations of urban service areas, primary environmental corridors, and agricultural lands; and

WHEREAS, the adopted regional land use and regional water quality management plans specifically recommended that the Commission work with the concerned local units of government toward refining and detailing those plans with respect to the urban service areas, primary environmental corridors, and agricultural lands so as to properly reflect local, as well as regional, needs and objectives; and

WHEREAS, Kenosha County and the Town of Pleasant Prairie in January and February of 1982, respectively, requested the Commission to assist the County and the Town in preparing a land use management plan for the Chiwaukee Prairie-Carol Beach area of the Town of Pleasant Prairie, such plan intended to refine and detail the land use development, environmental corridor, and agricultural land recommendations included in the adopted regional land use and regional water quality management plans; and

WHEREAS, with the assistance of a Technical and Citizen Advisory Committee and after public hearing, Kenosha County and the Town of Pleasant Prairie have completed a land use management plan for the subject area, such plan being set forth in SEWRPC Community Assistance Planning Report No. 88, A Land Use Management Plan for the Chiwaukee Prairie-Carol Beach Area of the Town of Pleasant Prairie, Kenosha County, Wisconsin, dated February 1985; and

WHEREAS, the aforereferenced land use management plan was adopted by the Technical and Citizen Advisory Committee, including Kenosha County and Town of Pleasant Prairie representatives, on January 15, 1985, and recommended to the Regional Planning Commission for adoption as an amendment to the regional land use and regional water quality management plans; and

WHEREAS, Section 66.945(9) of the Wisconsin Statutes authorizes and empowers the Regional Planning Commission, as the work of making the whole master plan progresses, to amend, extend, or add to the master plan or carry any part or subject matter thereof into greater detail.

NOW, THEREFORE, BE IT HEREBY RESOLVED:

FIRST: That the regional land use plan for the Southeastern Wisconsin Region, being a part of the master plan for the physical development of the Region and comprised of SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volumes One and Two, which was adopted by the Commission as a part of the master plan on the 19th day of

December 1977, and the regional water quality management plan for the Southeastern Wisconsin Region, also being a part of the master plan for the physical development of the Region, and comprised of SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, Volumes One, Two, and Three, which was adopted by the Commission as a part of the master plan on the 12th day of July 1979, be and the same hereby are amended to incorporate the land use management plan for the Chiwaukee Prairie-Carol Beach area of the Town of Pleasant Prairie as set forth in SEWRPC Community Assistance Planning Report No. 88.

SECOND: That the said SEWRPC Community Assistance Planning Report No. 88, together with all maps, charts, programs, and descriptive and explanatory matter therein contained, is hereby made a matter of public record; and the originals and true copies thereof shall be kept, at all times, at the offices of the Southeastern Wisconsin Regional Planning Commission presently located in the Old Courthouse Building in the City of Waukesha, County of Waukesha, and State of Wisconsin, or at any subsequent office that the said Commission may occupy, for examination and study by whomsoever may desire to examine the same.

THIRD: That a true, correct, and exact copy of this resolution, together with a complete and exact copy of SEWRPC Community Assistance Planning Report No. 88, shall be forthwith distributed to each of the local legislative bodies of the local governmental units within the Region entitled thereto and to such other bodies, agencies, or individuals as the law may require or as the Commission, its Executive Committee, or its Executive Director, at their discretion, shall determine and direct.

The foregoing resolution, upon motion duly made and seconded, was regularly adopted at the meeting of the Southeastern Wisconsin Regional Planning Commission held on the 11th day of March 1985, the vote being: Ayes 18; Nays 0.



Anthony F. Balestrieri, Chairman

ATTEST:



Kurt W. Bauer, Deputy Secretary

**COMMUNITY ASSISTANCE PLANNING REPORT  
NUMBER 88**

**A LAND USE MANAGEMENT PLAN FOR  
THE CHIWAUKEE PRAIRIE-CAROL BEACH  
AREA OF THE TOWN OF PLEASANT PRAIRIE  
KENOSHA COUNTY, WISCONSIN**

**Prepared by the  
Southeastern Wisconsin Regional Planning Commission  
P. O. Box 769  
Old Courthouse  
916 N. East Avenue  
Waukesha, Wisconsin 53186-1607**

The preparation of this report was financed in part through planning grants from the Wisconsin Department of Natural Resources, the U. S. Environmental Protection Agency, and the Wisconsin Coastal Management Program.

February 1985

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# SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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February 14, 1985

Mr. Angelo P. Capriotti, Chairman  
Kenosha County Board of Supervisors  
Kenosha County Courthouse  
912-56th Street  
Kenosha, Wisconsin 53140

Mr. Donald H. Wruck, Chairman  
Town of Pleasant Prairie  
Town Hall  
9915-39th Street  
Kenosha, Wisconsin 53142

Gentlemen:

The future of the Chiwaukee Prairie-Carol Beach area in the southeastern portion of the Town of Pleasant Prairie, Kenosha County, has been uncertain for some time because of conflicting natural resource preservation and urban development objectives for the area, and because of the relatively large number of public agencies and private interests which are concerned with future land use in the area. Recognizing this uncertainty, and in response to relatively recent changes in state and federal laws governing the use of wetlands in the area, the Town of Pleasant Prairie and Kenosha County in 1981 requested that the Regional Planning Commission bring together the concerned public agencies and private interests in a planning effort directed at the resolution of the conflicting objectives and the preparation of a long-range plan for the area. The requested planning program was initiated in March 1982, under the guidance of a Technical and Citizen Advisory Committee created for this purpose, and with necessary staff work provided by the Regional Planning Commission, the Wisconsin Department of Natural Resources, Kenosha County, and the Town of Pleasant Prairie. This report summarizes the findings of the extensive inventories and analyses carried out under the planning program, documents the alternative plans considered, and sets forth a recommended land use management plan for the area.

The recommended plan is intended to serve as a guide to federal, state, county, and local officials in considering both open space preservation and urban development proposals over time within the Chiwaukee Prairie-Carol Beach area. The plan seeks to preserve a substantial portion of the existing natural features of the area through the maintenance of a continuous environmental corridor connecting the Kenosha Sand Dunes on the north end of the area with the Chiwaukee Prairie preserve on the south end. The plan proposes that the lands within the corridor be acquired and maintained as a natural area/wildlife area by a combination of state and private conservancy interests. Land within the recommended open space preservation area would be acquired in the public interest at a fair market price on a willing-seller, willing-buyer basis, and the proposed land acquisition program would serve to mitigate the potentially harsh impacts of federal and state wetland regulatory programs on the owners of undeveloped platted lots in the area.

The plan also identifies areas within which additional urban development--primarily in the form of single-family residential development--would be accommodated and identifies further those areas to which public sanitary sewer service should be provided. The timing of the extension of sanitary sewers into these areas is a matter to be decided by the Town Board and the landowners concerned. The sanitary sewer service area presented in the plan is intended to constitute a refinement of the areawide water quality management plan adopted by the Regional Planning Commission in July 1979. Accordingly, upon adoption of this plan report by the local units and agencies of government concerned and the Regional Planning Commission, the report will be certified to the Wisconsin Department of Natural Resources, the Governor, and the U. S. Environmental Protection Agency as an amendment to the adopted regional water quality management plan. That certification will also ask that the Wisconsin Department of Natural Resources adopt the plan set forth in this report as that Department's master plan for the acquisition of land for resource preservation and protection purposes in the area.

The Commission commends the efforts of the Technical and Citizen Advisory Committee, the participating agency staff, and the town and county officials in seeking to resolve the complex and controversial issues facing this area. The resulting plan provides a technically sound, long-term guide to natural resource base protection and preservation, and to urban development in the area. Accordingly, careful consideration, adoption, and implementation of the plan presented in this report by all parties concerned is respectfully urged. The Commission and Commission staff stand ready to assist the County and the Town in the adoption and implementation of the plan over time.

Sincerely,



Kurt W. Bauer  
Executive Director



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## Chapter I

### INTRODUCTION

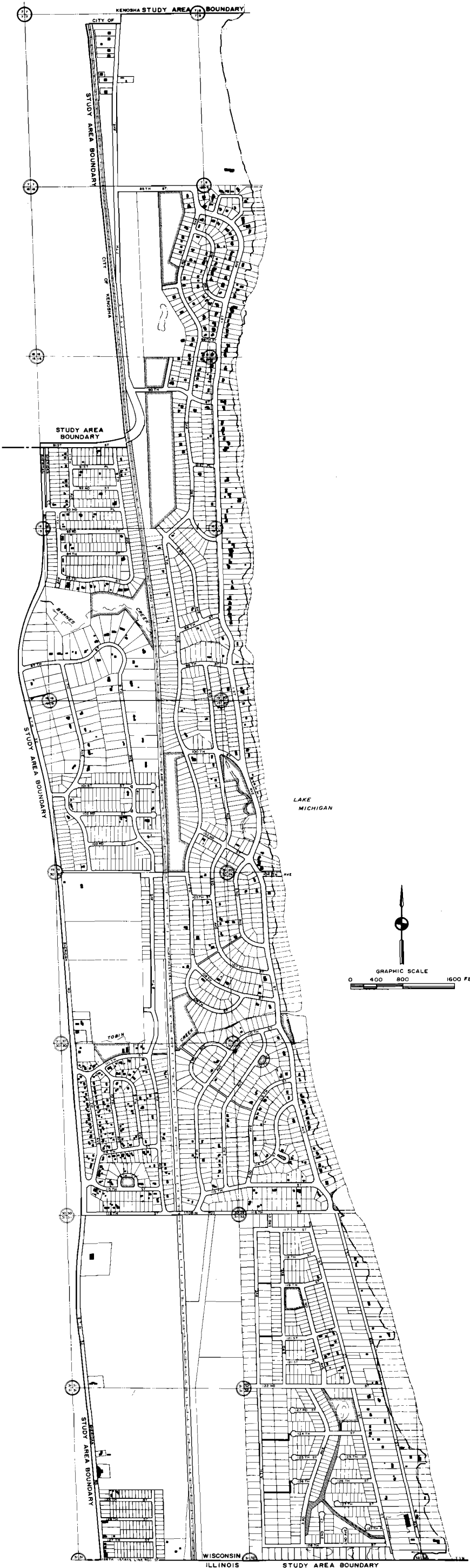
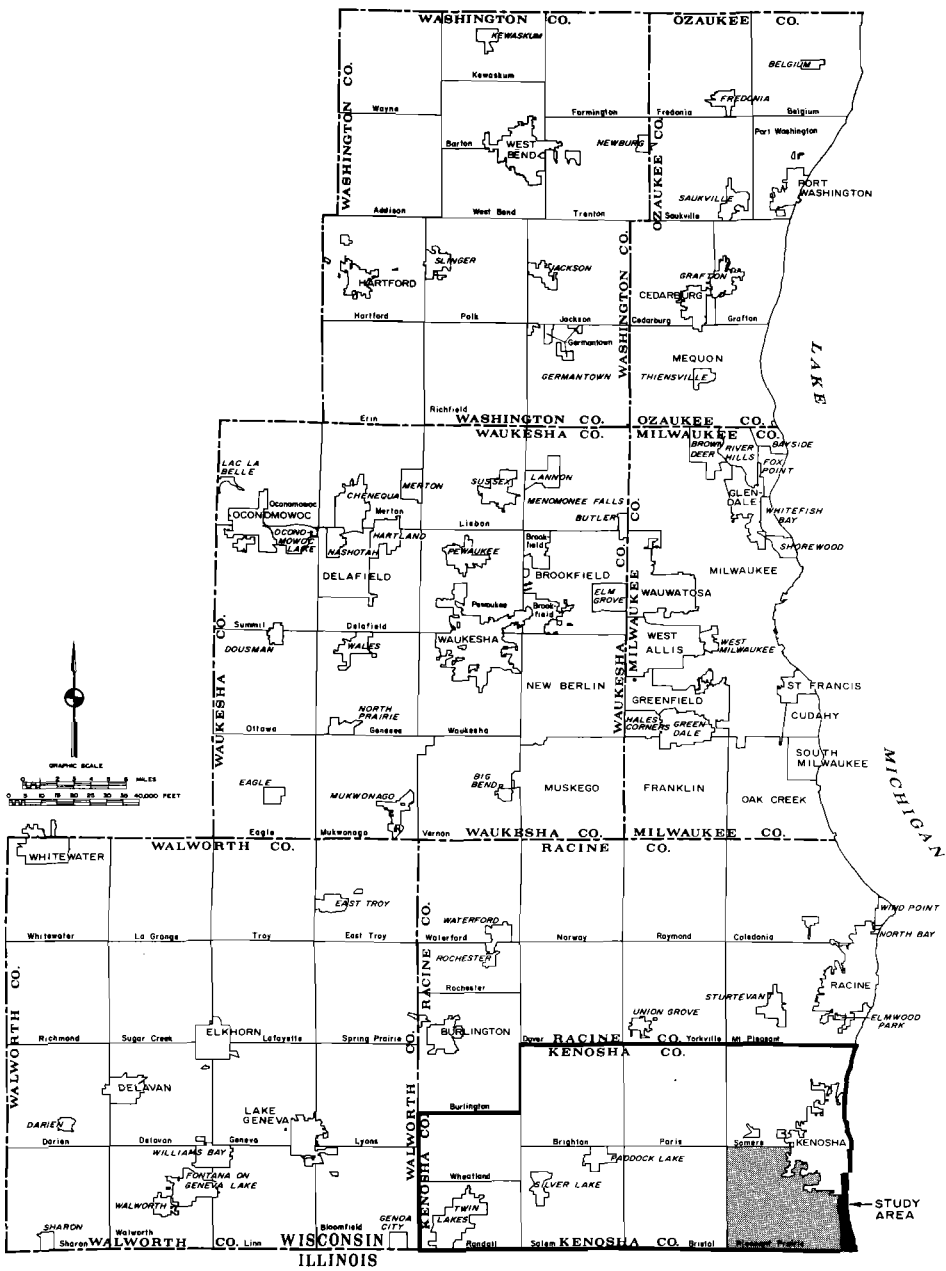
#### BACKGROUND AND NEED FOR THE PLANNING PROGRAM

The portion of the Town of Pleasant Prairie, Kenosha County, lying along the Lake Michigan shoreline east of State Trunk Highway 32 represents one of the outstanding natural resource areas in southeastern Wisconsin. This area, identified on Map 1, is characterized by a beach dune ridge and swale complex. High-quality wetlands and prairies are associated with the ridges and swales. Much of this area has been identified by the Regional Planning Commission as a primary environmental corridor--that is, an area containing concentrations of the best remaining elements of the natural resource base in southeastern Wisconsin. The Wisconsin Scientific Areas Preservation Council has identified a scientific area and two natural areas of statewide significance in this area. The identified scientific area is the Chiwaukee Prairie, a National Natural Landmark that is recognized as one of the best remaining examples of Lake Michigan shore low prairie in the upper Midwest.

The preservation and protection of the natural resources in this area is complicated by the fact that a large portion of the area has been platted for urban development. An initial plan for the development of the area as a model city to be known as Edithton Beach was developed in the 1920's. This plan was not implemented, however, because of the economic conditions following the stock market crash of 1929. The next intensive effort to develop the area occurred after World War II when substantial portions of the area were formally subdivided for residential development. As a result of this platting activity, streets were constructed and houses were built in scattered locations within the area. Wet soils and other physical development limitations, however, have significantly restricted urban development within this area. Certain streets, proposed in the original subdivision plats, have not been constructed. Certain other streets which were constructed are not used and have fallen into disrepair, and residential development in many portions of the area is scattered and sparse. While some concentrations of existing urban development in this area should be provided with public sanitary sewers and other urban services, other portions of the area may not be developable even with centralized sanitary sewer service. Despite past construction activities, wetland and prairie features have persisted in many areas because of the soils and other physical development limitations, and the natural resource values of much of this area remain intact.

The future of the Chiwaukee Prairie-Carol Beach area has been uncertain for some time because of the divergent natural resource preservation and urban development objectives attendant to the area, and because of the relatively large number of public agencies and private interests which are concerned with, or which may have a bearing on, future land use within the area. This uncertainty was recognized in the Kenosha County farmland preservation plan, which designated this portion of the Town of Pleasant Prairie as a special area requiring an in-depth study for the purpose of formulating a plan to guide future land use. Recognizing both the important natural resource values of the area and the inroads of urban development in the area, the Town of Pleasant

CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: SEWRPC.



Prairie and the Kenosha County Office of Planning and Zoning Administration in 1981 proposed a planning program which would bring together the concerned public agencies and private interests in an effort to reconcile conflicting urban development and open space preservation objectives.

Acting in response to this proposal, the Commission submitted an application to the Wisconsin Coastal Management Council--the administering agency of the federal coastal management program in Wisconsin--for funding in the amount of \$12,000 in support of such a planning program. In applying for the grant, the Commission agreed to provide an in-kind contribution equal to 20 percent of the estimated cost of the study. Both the Town of Pleasant Prairie and Kenosha County expressed support for the proposed study in letters to the Commission.

Upon notification of grant approval, the Regional Planning Commission, in turn, entered into a subcontract with the Town of Pleasant Prairie under which the town engineer and town planner assisted the Regional Planning Commission in the conduct of certain portions of the study. Under the subcontract, the Town received \$4,800 of the available federal coastal management monies to support the work of the town planner and town engineer on the study, with the Town agreeing to provide matching monies in the amount of \$1,200.

During the course of the planning program, the Wisconsin Department of Natural Resources applied for additional federal coastal management funds in the amount of \$24,500 on behalf of the Regional Planning Commission, enabling the Commission to undertake certain additional work tasks--including an in-depth analysis of wetlands in the study area in terms of the wetland rezoning criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code--the need for which became apparent as the program proceeded. The Regional Planning Commission provided an in-kind contribution equal to 35 percent of the cost of the additional work.

The planning program was conducted under the guidance of an advisory committee consisting of representatives of the Town of Pleasant Prairie, Kenosha County, the Wisconsin Department of Natural Resources, the U. S. Army Corps of Engineers, major affected landowners including the Wisconsin Electric Power Company and The Nature Conservancy, and citizen members. The full membership composition of this advisory committee is listed on the inside front cover of this report. The advisory committee meetings held during the course of the study provided the primary basis for the expression of public agency and private interest positions regarding the management of land use within the Carol Beach area and, ultimately, for the development of a land use management plan for the area.

## PURPOSE OF THE PLANNING PROGRAM

The primary purpose of the Chiwaukee Prairie-Carol Beach area planning program was to develop a detailed land use management plan which reconciles valid but conflicting open space preservation and urban development objectives within the area through the active involvement of all major concerned public and private interests. The land use management plan prepared under this program identifies the areas within the study area which should be preserved and protected to maintain its important environmental qualities; identifies which of those areas should be preserved and protected through public land use regulation and which

should be preserved and protected through public or private acquisition; and identifies those concentrations of existing urban development and areas of potential urban development which should be served by public sanitary sewers and other urban services in a manner which is sensitive to the unique natural resource features of the area.

The plan is intended to guide the concerned local units and agencies of government in the provision of basic urban services and facilities--including, most importantly, public sanitary sewer service; to guide local, county, state, and federal units and agencies of government in the exercise of their respective land use and related regulatory responsibilities; to guide public agencies and private interests in the acquisition of additional environmentally significant open space lands; and to provide a framework within which private interests can formulate plans for additional development within the Carol Beach area.

It should be noted that the sanitary sewer service area recommendations of the land use management plan as set forth in this report are intended to constitute an amendment to the sewer service area recommendations contained in the regional water quality management plan. The recommendations of the regional plan are necessarily general and do not reflect detailed local planning considerations. The sanitary sewer service area recommendations of the Carol Beach management plan will, upon formal adoption by the concerned local and county governments and by the Regional Planning Commission itself, be used by both the Regional Planning Commission and the Wisconsin Department of Natural Resources in the review and approval of locally proposed sanitary sewer service extensions, as provided for under Section NR 110.08(4) of the Wisconsin Administrative Code.

## SCHEME OF PRESENTATION

Following this introductory chapter, Chapter II of the report sets forth a descriptive analysis of the Chiwaukee Prairie-Carol Beach area, including inventory findings with respect to such important matters as wetlands, prairies, and platting activity. Chapter III describes the legal framework applicable to land use decision-making in the Chiwaukee Prairie-Carol Beach area, including federal and state wetland regulatory programs and county shoreland zoning requirements. Chapter IV describes the alternative land use management plans which were considered for the area, while Chapter V describes the recommended land use management plan, as presented for public review at a public hearing held in October 1984, and Chapter VI sets forth the public and private actions required to implement that plan. Chapter VII describes the public reaction to the plan expressed at the October 1984 public hearing; sets forth a final land use management plan, revised to take into account the major valid concerns expressed at the public hearing; and presents a summary of the major findings and recommendations of the planning program.

## Chapter II

### INVENTORY FINDINGS

#### INTRODUCTION

The preparation of a land use management plan for any area requires consideration of the existing land use pattern and of the natural resource base of the area, of the existing and anticipated future population levels, and of the attendant demand for additional residential and other urban land; and of the physical suitability of the area to sustain additional urban development. Accordingly, this chapter describes the Chiwaukee Prairie-Carol Beach study area, providing information on population levels, land use and land ownership patterns, the natural resource base, Lake Michigan shoreline recession, the suitability of soils for urban development, and existing sewage disposal facilities and problems.

#### GENERAL DESCRIPTION OF THE STUDY AREA

The Chiwaukee Prairie-Carol Beach study area is located in the eastern portion of the Town of Pleasant Prairie, Kenosha County, and is bounded by Lake Michigan on the east; by the Wisconsin-Illinois state line on the south; by STH 32 and the Chicago & North Western Railway right-of-way on the west; and by 80th Street on the north. The study area encompasses 1,825 acres, or about 8 percent of the total area of the Town of Pleasant Prairie. One residential lot located south of 91st Street, and the segment of 91st Street between STH 32 and the CNW railway right-of-way--both part of the City of Kenosha--are also located in the identified study area.

Vehicular access to the area is provided via STH 32, CTH T, CTH Q, and 116th Street. The study area is traversed in a north-south direction by the right-of-way of the Chicago & North Western Railway, which provides commuter-oriented passenger service between the Cities of Kenosha and Chicago, as well as railway freight service over this route.

No public or private centralized sanitary sewerage service is provided within the study area. The only public centralized water supply service is provided in the residential area located in the study area north of 90th Street. This service is provided by the Pleasant Prairie water utility, which obtains water on a wholesale basis from the Kenosha water utility. The only centralized private water supply service in the study area is provided by a small system which serves a residential subdivision located in the study area east of Sheridan Road and north of 116th Street.

#### POPULATION

##### Existing Population

According to the federal census, the resident population of the Chiwaukee Prairie-Carol Beach study area stood at 1,402 persons in 1980. This represents an increase of 286 persons, or 26 percent, over the 1970 study area population of 1,116. Population levels for the five subareas of the study area identified on Map 2 are presented in Table 1.

Table 1

**POPULATION IN THE CHIWAUKEE PRAIRIE-  
CAROL BEACH STUDY AREA: 1970 AND 1980**

Subarea (see Map 2)	Population			
	1970	1980	Change: 1970-1980	
			Number	Percent
A	158	324	166	105.1
B	627	607	- 20	- 3.2
C	266	377	111	41.7
D	20	27	7	35.0
E	45	67	22	48.9
Total	1,116	1,402	286	25.6

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

In the formulation of a land use management plan for the study area, it must be recognized that the area is not only a part of the Kenosha metropolitan area, but is located between the Chicago and the Racine and Milwaukee metropolitan areas, thus complicating the urban development pressures on the area. Population trends for the City of Kenosha and the Towns of Pleasant Prairie and Somers--which together comprise the Kenosha Planning District, consisting of all that area of Kenosha County east of IH 94--are presented in Table 2. As indicated in this table, the population of the Kenosha Planning District increased from 66,105 persons in 1950 to 98,094 persons in 1970, an increase of about 32,000 persons, or almost 50 percent, during that 20-year period. In contrast, there was virtually no change in the population of the planning district between 1970 and 1980. The population of the City of Kenosha decreased slightly, while the populations of the Towns of Pleasant Prairie and Somers increased slightly during the last decade. In this respect, it should be noted that the population of the Kenosha Planning District actually decreased slightly from 1930 to 1940, during the Great Depression.

### Future Population

The projection of probable future population levels for any geographic area is a difficult task, accompanied by uncertainties and subject to periodic revision as new information becomes available. The traditional practice followed in determining a future population level to utilize in physical development planning has been to prepare a single population forecast believed to be most representative of future conditions. This traditional approach works well in periods of social and economic stability, when historic trends can be anticipated to continue relatively unchanged over the plan design period. During periods of major change in social and economic conditions, however, when there is great uncertainty as to whether historic trends will continue, alternatives to this traditional approach may be required. One such alternative approach proposed in recent years, and utilized to a limited extent at the national level for public and quasi-public planning purposes, is termed "alternative futures." Under this approach, the development, test, and evaluation of alternative plans is based not upon a single, most probable forecast of future conditions, but upon a number of futures chosen to represent a range of future conditions which may be expected to occur over the plan design period.

Table 2

**POPULATION OF THE KENOSHA PLANNING  
DISTRICT: SELECTED YEARS 1850-1980**

Year	Population			
	City of Kenosha	Town of Pleasant Prairie	Town of Somers	Total
1850	3,818	959	680	5,457
1860	3,990	1,400	1,277	6,667
1870	4,309	1,377	1,359	7,045
1880	5,039	1,386	1,458	7,883
1890	6,532	1,646	1,632	9,810
1900	11,606	1,776	2,044	15,426
1910	21,371	3,217	1,788	26,376
1920	40,472	2,030	2,084	44,586
1930	50,262	3,457	3,046	56,765
1940	48,765	3,892	3,641	56,298
1950	54,368	6,207	5,530	66,105
1960	67,899	10,287	7,139	85,325
1970	78,805	12,019	7,270	98,094
1980	77,685	12,703	7,724	98,112

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

Recognizing the increasing uncertainty inherent in estimating future population levels, the Regional Planning Commission began incorporating the alternative futures approach into its planning program in the mid-1970's, the first known attempt to apply this approach to regional planning in the United States. In the exploration of alternative futures for the Southeastern Wisconsin Region, an attempt was made first to identify all those external factors that may be expected to directly or indirectly affect future development in the Region, together with the likely future range of prospects for these factors. Two alternative scenarios for regional growth and change, involving different assumptions regarding three major external factors--the cost and availability of energy, population lifestyles, and economic conditions--were thus defined. These scenarios represent opposite extremes of the future prospects identified for the external factors and, consequently, indicate relatively large potential differences in future population growth and in economic activity. The more optimistic scenario developed postulates moderate population and economic growth; the less optimistic scenario postulates a stable economy and a declining regional population. Two alternative regional land use plans, a centralized plan and a decentralized plan, were then developed for each of the two alternative future scenarios of external factors, thus providing, in effect, four alternative futures as a framework for physical development and planning in the Region.<sup>1</sup> Year 2000 population projections for the Kenosha Planning District--assuming centralized and decentralized population distributions under moderate growth and stable/declining growth scenarios--are presented in Table 3.<sup>2</sup>

The population levels anticipated under the moderate growth-centralized population distribution scenario are the basis for the Commission-adopted design year 2000 regional land use plan. Since the population levels in the regional land

<sup>1</sup>A detailed description of the four alternative futures is presented in SEWRPC Technical Report No. 25, Alternative Futures for Southeastern Wisconsin.

<sup>2</sup>The population projections presented in this chapter are based on the 1970 census.

Table 3

**ANTICIPATED POPULATION CHANGES IN THE KENOSHA PLANNING  
DISTRICT UNDER FOUR GROWTH ALTERNATIVES: 1970-2000**

Alternative Future Growth Scenario	Projected Population: 2000	Projected Change in Population 1970-2000	
		Persons	Percent
Moderate Growth Scenario			
Centralized Population Distribution.....	143,200	45,106	46.0
Decentralized Population Distribution...	162,800	64,706	66.0
Stable/Declining Growth Scenario			
Centralized Population Distribution.....	104,400	6,306	6.4
Decentralized Population Distribution...	96,800	- 1,294	- 1.3

Source: SEWRPC.

use plan are based upon the moderate growth-centralized population distribution scenario, the year 2000 population level for the Kenosha Planning District anticipated under that plan--143,200 persons--is significantly higher than the population levels that would be anticipated under a stable/declining growth scenario assuming either a centralized population distribution--104,400 persons--or a decentralized population distribution--96,800 persons. The adopted regional land use plan population level for the Kenosha Planning District is, however, significantly lower than the population of 162,800 persons which would be anticipated under the moderate growth scenario assuming a decentralized population distribution.

The regional land use plan anticipates a 1980 population of 114,400 persons for the Kenosha Planning District, an increase of 16,306 persons, or 17 percent, over the 1970 level. As noted above, however, there was virtually no change in the resident population of the Planning District between 1970 and 1980. The number of households in the Planning District, however, increased by 5,083, or 17 percent--from 29,663 households in 1970 to 34,746 households in 1980. The actual number of households closely approximates the figure of 35,300 anticipated in the regional land use plan. Thus, the number of households in the Planning District increased almost as anticipated between 1970 and 1980, while growth in the District population was significantly less than forecast.

The future population level of the Chiwaukee Prairie-Carol Beach area, like that of the overall Kenosha metropolitan area, is partially dependent on a number of external factors, including general economic conditions. Future population growth within the study area will, however, also be dependent on the physical capability of the area to accommodate additional urban development. Any significant increase in the population of the study area, given the soil limitations in the area, would require the extension of urban services and facilities, particularly public sanitary sewer service, to serve existing and new development within the area. As indicated in Chapter I, one of the primary purposes of this planning program is to identify a future urban service area within the Chiwaukee Prairie-Carol Beach area. The urban service area recommendations formulated under this planning program may thus be expected to have a significant influence on the future size and distribution of the population of this area.

## LAND USE

The Chiwaukee Prairie-Carol Beach study area contains a diversity of land uses, including certain sensitive wetland and prairie areas, many of which are essentially undisturbed by man's activities; areas which have been partially developed in residential use, where existing houses are scattered intermittently along an extensive street network; relatively highly developed areas that represent true residential neighborhoods; and remnant agricultural areas. The existing land use pattern is in large measure a result of the extensive land subdivision activity which has taken place despite the physical development limitations of the area. About 1,246 acres, or 68 percent of the total study area, have been subdivided for urban residential use. Plats for certain portions of the study area located south of 116th Street were recorded during the 1920's. Most of the platting activity within the study area, however, occurred between 1947 and 1956. A total of more than 2,700 residential lots have been platted along an extensive network of local streets within the study area (see Table 4 and Map 3).<sup>3</sup> While certain of the platted areas--particularly Carol Beach Estates Unit No. 1 and Carol Beach Estates-Unit W--have developed as residential neighborhoods, much of the platted land remains sparsely developed owing to the high water table and other physical development limitations in the area, and natural resource values remain intact in many such areas.

As indicated in Table 5, urban lands in combination encompass 517 acres, or 28 percent of the study area, while open lands--including wetlands, woodlands, agricultural lands, and unused lands--along with surface water encompass a total of 1,308 acres, or 72 percent of the area. Residential lands and transportation and utility lands account for most of the existing urban lands. Residential lands encompass 237 acres, or 13 percent of the study area. Residential development in the study area is located primarily between 116th Street and 85th Street (see Map 4). Concentrations of residential land occur along the Lake Michigan shoreline, as well as in Carol Beach Estates-Unit No. 1 and Carol Beach Estates-Unit W. Elsewhere, residential development is comparatively sparse and scattered in nature.

Lands devoted to transportation use and utility use in the study area in combination total 257 acres. These lands include existing local and arterial streets in the study area; the Chicago & North Western Railway right-of-way through the study area; and a small area devoted to utility use in the Wisconsin Electric Power Company property located north of 85th Street. There are about 4.8 linear miles of arterial streets--consisting of STH 32 and CTH T--encompassing about 46 acres in the study area. There are 21.4 linear miles of existing local streets in the study area, encompassing about 164 acres. Many segments of the local street network within the study area have fallen into disrepair. It should be noted that certain segments of the street network proposed in original subdivision plats--in combination totaling 6.0 linear miles and encompassing about 44 acres<sup>4</sup>--either were never constructed, have

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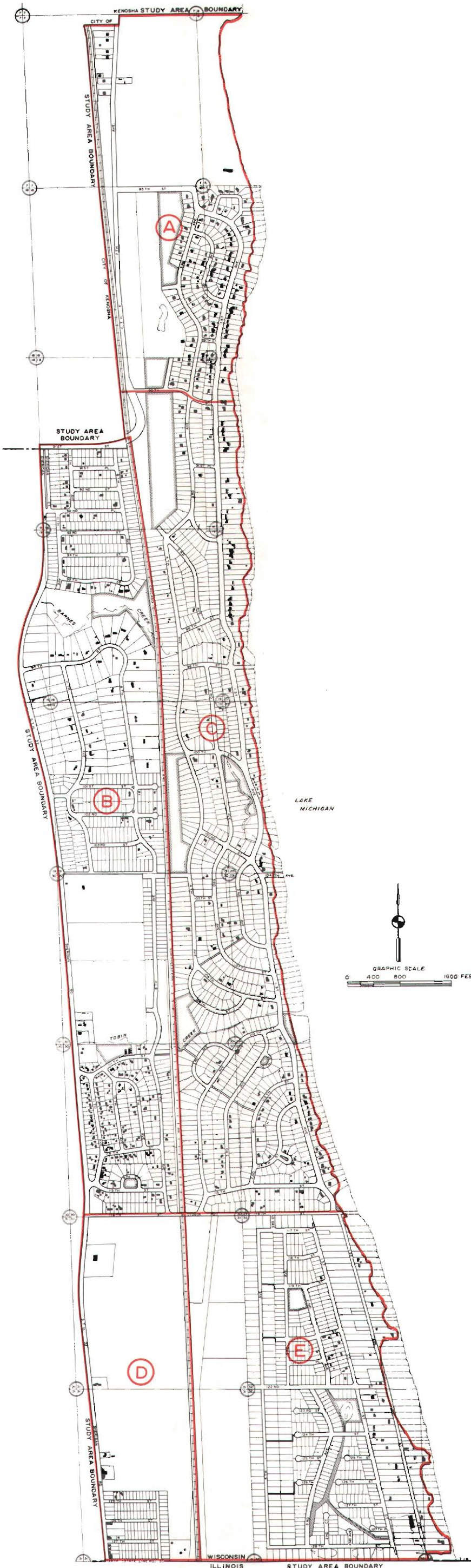
<sup>3</sup>It should be noted that some of the lots lying along the Lake Michigan shoreline are now partially or entirely submerged as a result of Lake Michigan shoreline erosion.

<sup>4</sup>This acreage is not included in the transportation and utility land use category for the study area.



Map 2

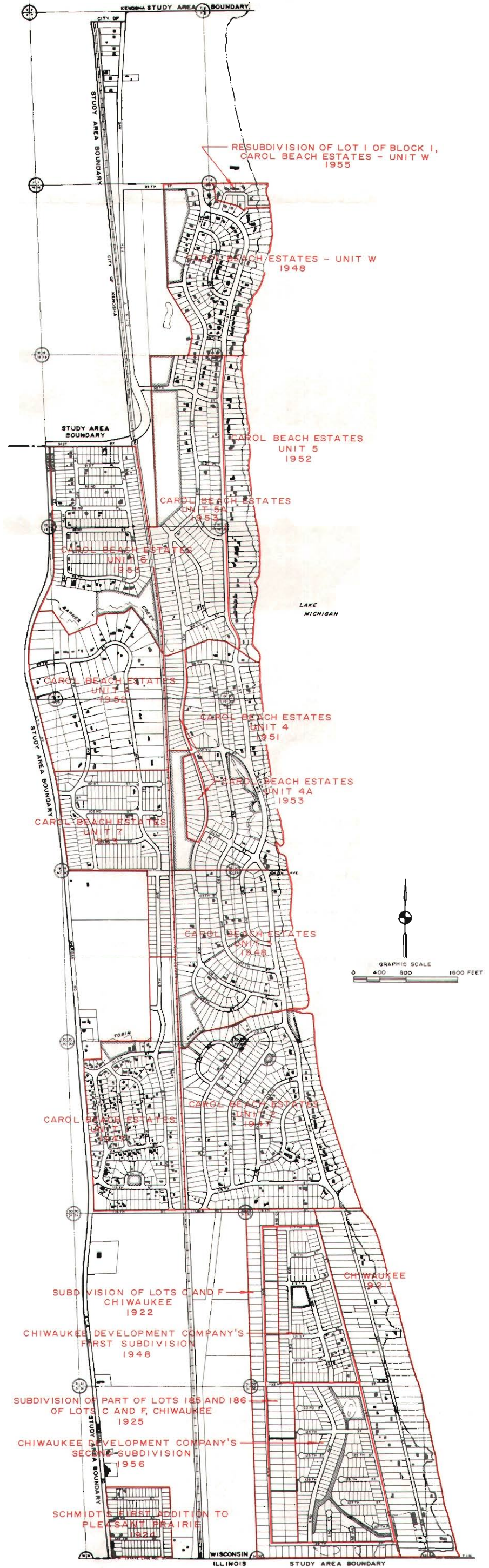
PLANNING SUBAREAS WITHIN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: SEWRPC.

Map 3

SUBDIVIDED LANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: SEWRPC.



Table 4

## RECORDED SUBDIVISIONS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA

Subdivision Name	U. S. Public Land Survey		Year Recorded	Subdivision Area (acres) <sup>a</sup>	Number of Lots			
	Section	Quarter Section			Developed	Undeveloped	Significantly Eroded <sup>b</sup>	Total
Carol Beach Estates-Unit W.....	17 18	NW, SW, NE, SE	1948	73	90	51	6	147
Resubdivision of Lot 1 of Block 1, Carol Beach Estates-Unit W.....	17	NW	1955	6	9	5	1	15
Carol Beach Estates-Unit 5.....	17	SW	1952	34	33	19	4	56
Carol Beach Estates-Unit 5A.....	20	NW	1953	113	41	171	--	212
	17	SW						
	18	SE						
	19	NE						
Carol Beach Estates-Unit 6.....	20	NW	1953	95	66	190	--	256
	18	SE						
Carol Beach Estates-Unit A.....	19	NE, NW	1952	102	34	48	--	82
	19	NE, NW, SE, SW						
Carol Beach Estates-Unit 4A.....	19	NE, SE	1953	18	--	40	--	40
Carol Beach Estates-Unit 4.....	19	NE, SE	1951	95	37	148	11	196
	20	NW, SW						
	30	NE						
	29	NW						
Carol Beach Estates-Unit 7 .....	19	SW, SE	1953	70	22	188	--	210
	30	NE						
Carol Beach Estates-Unit 3.....	29	NW	1948	91	28	157	25	210
	30	NE, SE						
Carol Beach Estates-Unit 1.....	30	NE, SE	1947	99	137	94	--	231
Carol Beach Estates-Unit 2.....	29	NW, SW	1947	142	74	259	10	343
	30	NE, SE						
Schmidt's First Addition to Pleasant Prairie.....	31	SE	1924	24	10	104	--	114
Chiwaukee.....	32	NW, SW, SE	1921	76	42	45	31	118
	32	NW, SW						
Subdivision of Lots C and F, Chiwaukee.....	32	NW, SW	1922	46	3	76	--	79
Subdivision of Part of Lots 185 and 186 of Lots C and F, Chiwaukee.....	32	NW, SW	1925	37	--	71	--	71
Chiwaukee Development Company's First Subdivision.....	32	NW	1948	53	17	149	--	166
Chiwaukee Development Company's Second Subdivision.....	32	SW	1956	72	--	200	--	200
Total	--	--	--	1,246	643	2,015	88	2,746

<sup>a</sup> Excludes the area of the submerged portions of platted lots along the Lake Michigan shoreline.

<sup>b</sup> Undeveloped lots along the Lake Michigan shoreline where 50 percent or more of the original lot area is now submerged because of shoreline erosion.

Source: SEWRPC.

Table 5

**EXISTING LAND USE IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA: 1983**

Land Use Category	Acres	Percent
Urban Land Uses		
Residential.....	237	13.0
Commercial.....	6	0.3
Transportation and Utilities.....	257	14.1
Governmental and Institutional.....	2	0.1
Recreational <sup>a</sup> .....	15	0.8
Subtotal	517	28.3
Open Space Uses (wetlands, woodlands, agricultural, water, and unused lands).....	1,308	71.7
<b>Total</b>	<b>1,825</b>	<b>100.0</b>

<sup>a</sup> Includes intensively used outdoor recreation areas.

Source: SEWRPC.

been overgrown by vegetation subsequent to construction, or, in one case, have been destroyed as a result of erosion of the Lake Michigan shoreline.

## LAND OWNERSHIP

Land ownership in the study area may be classified as public, quasi-public, or private. As indicated in Table 6, in 1982 publicly held lands in the study area totaled 421 acres, or about 23 percent of the study area; quasi-public lands totaled 243 acres, or about 13 percent of the study area; and private lands totaled 1,161 acres, or about 64 percent of the study area. The existing land ownership pattern within the study area is shown on Map 5 and summarized in Table 6.

### Public Lands

In 1982, publicly held lands in the study area consisted primarily of park and open space lands, tax delinquent property, and street and highway rights-of-way. The Town of Pleasant Prairie had acquired 73 acres, or 4 percent of the study area, for park and open space purposes through dedication in land subdivisions. The University of Wisconsin held title to a total of 91 acres, or 5 percent of the study area--all of these lands being located within The Nature Conservancy's Chiwaukee Prairie project area. Title to these areas was transferred to the University of Wisconsin by The Nature Conservancy under its Chiwaukee Prairie land acquisition program. Kenosha County had acquired, through forfeiture as a result of delinquent property taxes, a total of six lots totaling about 2 acres, or 0.1 percent of the study area. The Wisconsin Department of Transportation owned three lots--totaling slightly less than 1 acre, or less than 0.1 percent of the study area--located along the east side of Sheridan Road in the study area. Street and highway rights-of-way constituted 254 acres, or 14 percent of the study area--including 44 acres encompassed by rights-of-way which have been platted but never constructed or rights-of-way where streets were constructed but no longer exist.

Table 6

**LAND OWNERSHIP WITHIN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA: 1982**

Property Owner Classification		Area	
		Acres	Percent of Total
Public	Town of Pleasant Prairie.....	73	4.0
	Kenosha County.....	2	0.1
	University of Wisconsin.....	91	5.0
	Wisconsin Department of Transportation...	1	0.1
	Other Public Lands (street and highway rights-of-way).....	254	13.9
	Subtotal	421	23.1
Quasi-Public	The Nature Conservancy.....	52	2.9
	Utility (Wisconsin Electric Power Company).....	145	7.9
	Railroad (Chicago & North Western Railway).....	46	2.5
	Subtotal	243	13.3
Private	Private Interests Whose Total Land Ownership in the Study Area is Less Than 5.0 Acres.....	806	44.2
	Private Interests Whose Total Land Ownership in the Study Area is 5.0-24.9 Acres.....	88	4.8
	Private Interests Whose Total Land Ownership in the Study Area is 25.0 Acres or More.....	267	14.6
	Subtotal	1,161	63.6
Total		1,825	100.0

Source: Kenosha County Assessor's Office and SEWRPC.

### Quasi-Public Lands

In 1982, quasi-public lands in the study area included lands owned by The Nature Conservancy in the Chiwaukee Prairie area, lands owned by the Wisconsin Electric Power Company, and the right-of-way of the Chicago & North Western Railway through the study area (see Table 6 and Map 5). The Nature Conservancy owned a total of 52 acres of land within the Chiwaukee Prairie--an area which, as previously noted, represents one of the best remaining examples of prairie in the Great Lakes area.<sup>5</sup> The Nature Conservancy initially transferred the ownership of such land to the University of Wisconsin. The Nature Conservancy now maintains the title to additional lands as they are acquired under its continuing Chiwaukee Prairie land acquisition program. The Chiwaukee Prairie area itself is described in more detail in a later section of this chapter.

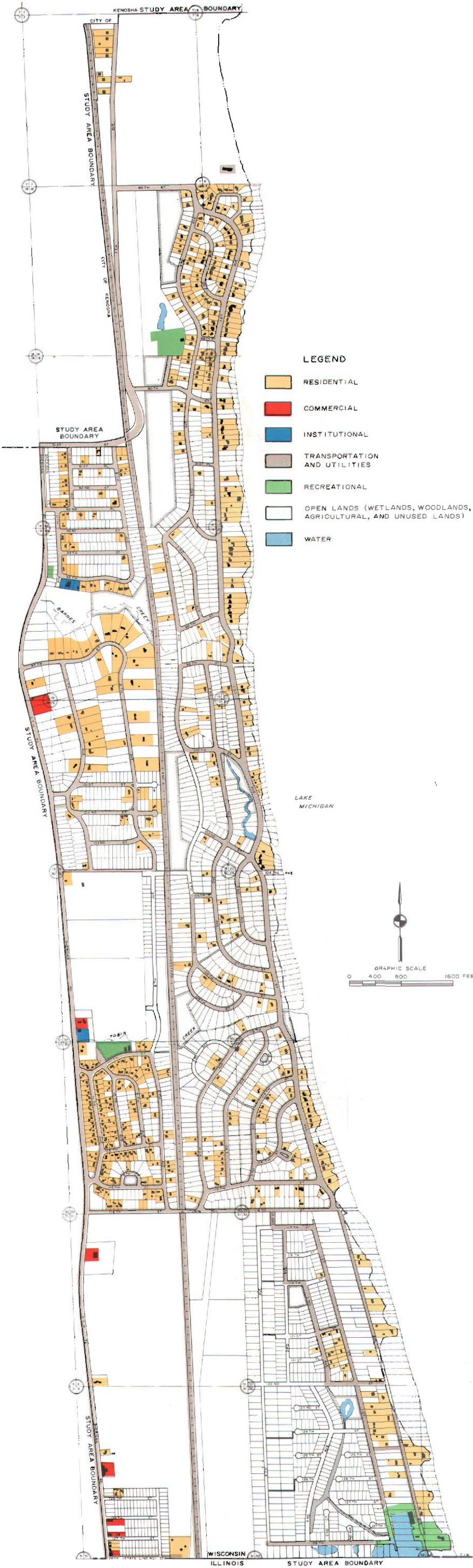
The Wisconsin Electric Power Company owned a total of 145 acres of land in the study area, including nearly the entire portion of the study area north of 85th Street, as well as certain lands adjacent to the Chicago & North Western

<sup>5</sup>As a result of additional land acquisition, lands held by The Nature Conservancy in the Chiwaukee Prairie increased to about 55 acres by the end of 1983.



Map 4

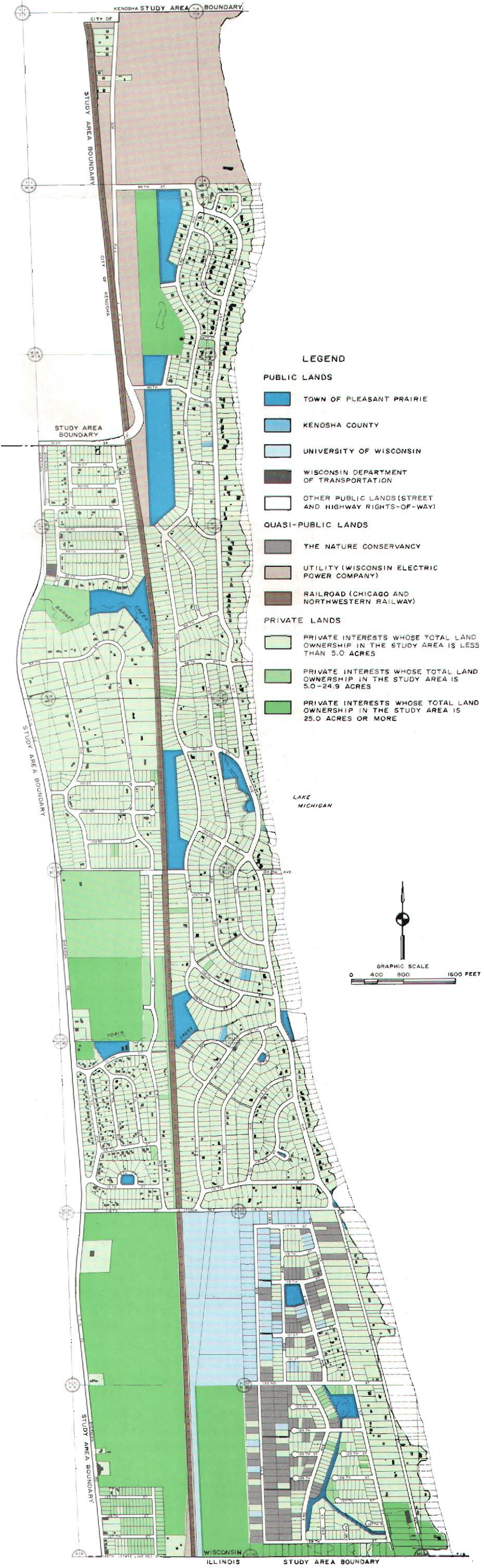
EXISTING LAND USE IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1983



Source: SEWRPC.

Map 5

EXISTING LAND OWNERSHIP IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1982



Source: Kenosha County Assessor's Office and SEWRPC.



Railway right-of-way south of this area. The portion of the study area located north of 85th Street and east of 7th Avenue is a unique sand dune-prairie complex, known as the Kenosha Sand Dunes, which is also described in more detail in a later section of this chapter.

The Chicago & North Western Transportation Company owned a total of 46 acres of land in the study area in 1982, consisting of its railway right-of-way which traverses the study area in a north-south direction.

### Private Lands

In 1982, a total of 1,659 private interests--individuals and corporations--owned real property within the study area totaling 1,161 acres, or about 64 percent of the study area. Of these, about 1,647 owned fewer than 5 acres of land each, and these landowners together accounted for a total of 806 acres, or about 44 percent of the study area (see Table 6). A total of seven private interests owned between 5 and 24 acres of land each, and together accounted for a total of 88 acres, or 5 percent of the study area. A total of five private interests owned 25 acres or more each, and together accounted for about 267 acres, or about 15 percent of the study area.

### NATURAL RESOURCE BASE

The proper management of the natural resource base is essential to the provision of opportunities for outdoor recreational activities, as well as scientific and educational pursuits; to the maintenance of a healthy environment for all forms of life; and to the maintenance of an area's cultural and natural heritage and beauty. The Chiwaukee Prairie-Carol Beach area contains some of the outstanding natural resource features of the Southeastern Wisconsin Region. A description of the most important remaining features of the natural resource base is presented in this section. For analysis purposes, the various features of the natural resource base--including existing prairies, wetlands, and wildlife habitat areas--are treated on an individual, element-by-element basis below. These features are not mutually exclusive, however, and there is considerable overlap among the natural resource features described herein. For example, much of the existing prairie area in the study area consists of wetlands. Moreover, certain wetlands and prairie areas constitute important wildlife habitat. The identification of areas where concentrations of the individual features of the natural resource base exist is at the heart of the environmental corridor concept, which is described at the conclusion of this section.

### Wetlands

Wetlands are defined as areas in which the water table is at or near the land surface and are characterized both by hydric soils, such as peats, mucks, or other organic soils, and by the growth of hydrophytes such as cattails, bulrushes, sedges, and willows. Wetlands in the study area perform an important set of natural functions which make them particularly valuable resources. Wetlands contribute to the maintenance of good water quality--except during unusual periods of high runoff following prolonged drought--by serving as traps which retain nutrients and sediments, thereby preventing them from reaching streams and lakes. They act to retain water during dry periods and hold it during flooding events, thus keeping the water table high and relatively stable. Wetlands are important resources for overall environmental health

and diversity. They provide essential breeding, nesting, resting, and feeding grounds and predator escape cover for many forms of fish and wildlife. The presence of water is also attractive to many upland birds and other animals. These attributes have the net effect of improving general environmental health; providing recreational, research, and educational opportunities; maintaining opportunities for hunting and fishing; and adding to the aesthetics of an area. A detailed description of the natural functions performed by wetlands in the study area is presented in Appendix A of this report.

Wetlands have severe limitations for residential, commercial, and industrial development. In general, these limitations are related to the high compressibility and instability, high water table, low bearing capacity, and high shrink-swell potential of wetland soils. In addition, the use of metal conduits in some wetland soil types is constrained because of the potential for corrosion. These limitations may result in flooding, wet basements, unstable foundations, failing pavements, and failing sewer and water lines. Moreover, there are significant and costly onsite preparation and maintenance costs associated with the development of wetland soils, particularly in connection with roads, foundations, and public utilities.

An inventory of wetlands in southeastern Wisconsin, including the Chiwaukee Prairie-Carol Beach study area, was recently completed by the Regional Planning Commission for the Wisconsin Department of Natural Resources under a statewide wetlands mapping program--officially known as the "Wisconsin Wetlands Inventory." The wetlands identified under the State Wetlands Mapping Program are shown on Map 6.<sup>6</sup> This map identifies three general wetland types, based upon vegetative cover: 1) wetlands typically covered by emergent plants, such as cattails, sedges, and grasses; 2) wetlands typically covered by broad-leaved deciduous shrubs; and 3) wetlands typically covered by broad-leaved deciduous trees. The wetlands identified on Map 6 encompass a total of 818 acres, representing 45 percent of the study area.

It should be noted that most of the wetlands located east of the Chicago & North Western Railway right-of-way occur in association with the beach dune ridge and swale complex which characterizes much of the study area. The swales, or low areas, between the ridges are wetlands and are covered by cattails, bulrushes, sedges, grasses, and other wetland vegetation; the ridges themselves are dry. The alternating ridges and swales in the study area are too small to be delineated individually, and much of the ridge and swale complex has been identified as wetland under the Wisconsin Wetland Inventory owing to the predominance of wetland vegetation.

Several fen areas have been identified within the Chiwaukee Prairie-Carol Beach area. Fens are a very rare type of wetland which is dominated by sedges and grasses growing on sandy peat soils and which generally develop in groundwater discharge areas. Areas within which fen plant communities have been identified are shown on Map 7. These areas encompass 62 acres, or about 3 percent of the study area.

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<sup>6</sup>The State Wetlands Mapping Program used as a primary data source aerial photography dated June 1979. Map 6 reflects wetland losses known to have occurred between June 1979 and April 1980.



Map 6

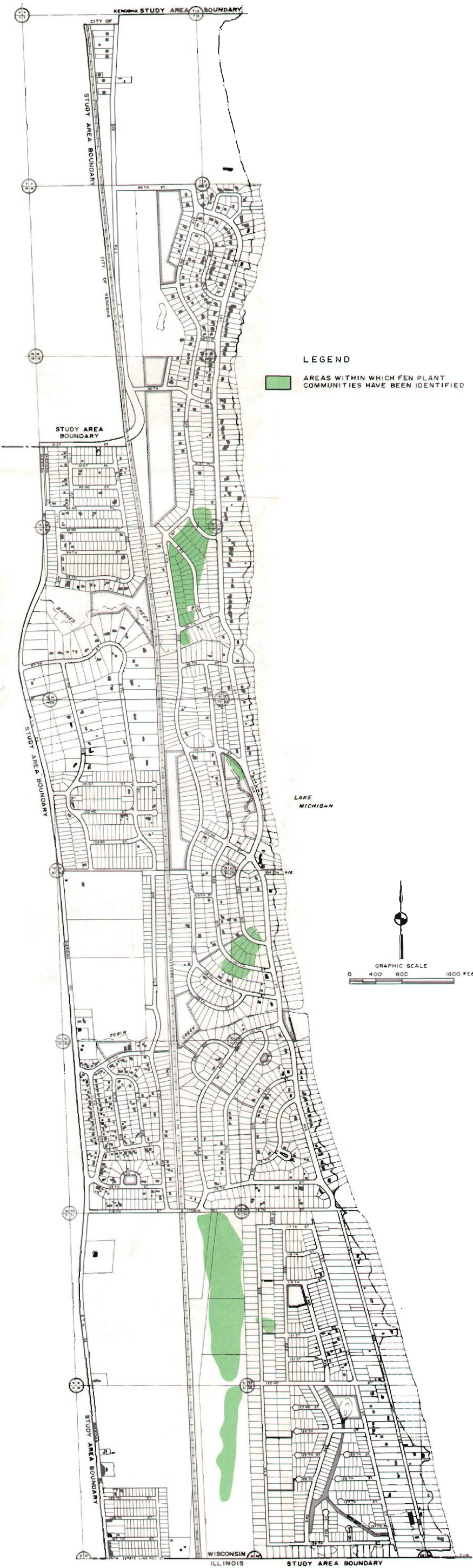
WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1980



Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 7

KNOWN FEN PLANT COMMUNITIES IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1982



Source: SEWRPC.



## Prairies

Prairies are open, or generally treeless, areas in the landscape which are dominated by native grasses. Such areas have important ecological and scientific values and consist of four basic types: low or wet prairie, mesic or moderately moist prairie, dry prairie, and oak openings. Inventories conducted by the Regional Planning Commission indicate that prairies cover a significant portion of the study area--860 acres, or 47 percent (see Map 8). The identified prairies range from wet to dry prairies.

Wet prairies in the study area tend to occur in the swales and are dominated by cord, bluejoint, big bluestem, and muhly grasses. In addition, they contain such forbs as New England aster, gayfeather, prairie dock, Culver's root, and golden alexander. Mesic prairies tend to occur on the dune slopes. These prairies are dominated by Indian grass, switch grass, and big bluestem grass. Typical mesic prairie forbs include, among others, smooth blue aster, wild indigo, rattlesnake master, New Jersey tea, and compass plant. Dry prairies occur on the well-drained dune ridges. The dominant grasses include prairie dropseed, little bluestem, panic grass, and needle grass. Forbs characteristic of dry prairies in the study area include bergamot, bush clover, orange paccoon, lead plant, stiff goldenrod, and purple prairie clover. Oak openings are savannas dominated by the dry prairie grasses with up to 17 oak trees per acre, and having less than a 50 percent canopy cover. The characteristic forbs in the oak openings are also the dry prairie species. The oak openings within the Chiwaukee Prairie-Carol Beach area are generally located on the higher, well-drained dunes. Most of the oak opening areas within the study area have been developed.

An additional prairie-like habitat within the study area is the unstable beach dune community. Unstable beach dunes are recently deposited lacustrine sands that are characterized by such pioneer grasses and forbs as dune reed, wild rye grass, beach grass, wormwood, silverweed, and sea rocket. The best example of this unstable beach dune community is located in the Kenosha Sand Dunes natural area. However, there are also good examples of unstable beach dunes along the undeveloped portions of the Chiwaukee Prairie-Carol Beach shoreline. This unstable beach dune community occurs nowhere else along the Lake Michigan shoreline in southeastern Wisconsin.

Prairies within the study area have been evaluated by the Regional Planning Commission based on a consideration of the diversity of native prairie plants present, the integrity of the plant community, and the extent of human disturbance. Based on this evaluation, prairie areas were assigned values of high, medium, and low quality (see Map 8).

High-value prairies show a rich diversity of native prairie plants, and exhibit a plant community structure and integrity representative of the presettlement landscape. These areas have not been significantly disturbed by, or have essentially recovered from, man's activities. The high-value prairie areas are of the quality expected to occur within a designated state scientific area and natural areas of statewide or greater significance.

Medium-value prairies show a good diversity of native prairie plants and exhibit a structure and integrity that is less than ecologically ideal. These areas have evidence of past or present human disturbance.



Low-value prairies retain a moderate amount of natural cover. Usually, these areas have been greatly disturbed in the past, but because of the large native seed source available, have begun to recover quite nicely.

It should be noted that both the medium- and low-value prairie areas, if left undisturbed, may be expected to increase in their native diversity and improve in their plant community structure and integrity with time.

About 368 acres, or 20.2 percent of the area, has been identified as high-value prairie. The most significant prairie area is the Chiwaukee Prairie located in the study area south of 116th Street. The Chiwaukee Prairie is recognized as one of the best remaining examples of wet to wet-mesic prairie in the Great Lakes region. Another large tract of high-value prairie--the western portion of the Kenosha Sand Dunes--is located in the study area north of 85th Street. Other notable high-value prairie areas include an area located east of 4th Avenue, north of 96th Street, within a sparsely developed portion of a residential subdivision--Carol Beach Estates-Unit 5A; and an area located west of 8th Avenue, south of 91st Street, within a partially developed residential subdivision--Carol Beach Estates-Unit 6.

Medium-value prairie areas cover about 343 acres, or 18.8 percent of the study area, while low-value prairie areas cover about 149 acres, or 8.2 percent of the study area. As shown on Map 8, these medium- and low-value prairie areas lie primarily between 116th Street and 85th Street. Prairie vegetation remains intact throughout much of this area despite the installation of a local street system and the partial development of the area in the form of scattered single-family housing units.

### Surface Waters and Floodplains

Surface water resources--consisting primarily of Lake Michigan but also of several minor streams tributary to Lake Michigan, narrow drainageways, and small ponds--form an important element of the natural resource base of the study area. The Lake Michigan shoreline along the eastern edge of the study area measures approximately 4.9 miles in length. The total length of major streams within the study area is about 3.3 miles. In addition, surface waters of the small ponds within the study area and of the Trident Marina basin within the study area in combination encompass about 10 acres, or less than 1 percent of the study area.

For planning and regulatory purposes, floodplains are normally defined as the areas subject to inundation by the 100-year recurrence interval flood event. This is the event that would be reached or exceeded in severity on the average of once every 100 years. Stated another way, there is a 1 percent chance that this event will be reached or exceeded in severity in any given year. Floodplain areas are generally not well suited to urban development, not only because of the flood hazard, but because of high water tables and the presence of soils poorly suited to urban use. The floodplain areas, however, generally contain important elements of the natural resource base such as high-value wetlands and wildlife habitat.

Flood hazard areas in the Chiwaukee Prairie-Carol Beach study area have been delineated by the Regional Planning Commission on large-scale, 1 inch equals 200 feet scale topographic maps. Floodplains identified along Barnes Creek

and other streams tributary to Lake Michigan are shown on Map 9. Also shown on this map is a narrow band along the Lake Michigan shoreline which is subject to inundation by Lake Michigan on the average of once every 100 years. This band includes those lands lying below an elevation of 583.9 feet National Geodetic Vertical Datum (Mean Sea Level Datum), but does not include lands above this elevation subject to storm wave runup which could occur during the 100-year event. In combination, the flood hazard areas shown on Map 9 total 61 acres, or about 3 percent of the total study area.

### Wildlife Habitat

Terrestrial Wildlife Habitat: Many of the wetland and prairie areas described above constitute significant wildlife habitat areas. A total of 214 game and nongame species--including seven species of amphibians, 14 species of reptiles, 161 species of birds, and 32 species of mammals--are known or likely to exist within the Chiwaukee Prairie-Carol Beach study area. Of these 214 species, four are identified as endangered in Wisconsin, and three are identified as threatened in Wisconsin. Moreover, 20 species are included on the Wisconsin watch list. The wildlife species in the study area are identified in Appendix A of this report.

A total of 702 acres of wildlife habitat have been identified within the study area and value rated as shown on Map 10.<sup>7</sup> High-value wildlife habitat areas encompass 320 acres, or about 18 percent of the study area. The identified high-value wildlife habitat is the Chiwaukee Prairie area situated east of the Chicago & North Western Railway right-of-way in the southernmost part of the study area. This area constitutes important songbird habitat. Medium-value wildlife habitat areas encompass 382 acres, or about 21 percent of the study area, and are located in the study area between 80th Street and 110th Street. No low-value wildlife habitat areas have been identified in the study area. Of the total identified wildlife habitat area, 611 acres, or about 87 percent, consist of wetlands; 87 acres, or about 12 percent, consist of upland open space lands; and 4 acres, or slightly less than 1 percent, consist of surface water.

Because of its location along the Mississippi flyway, the study area provides important habitat for the interstate and international migration of birds. As such, the study area contributes to the populations and, thus, the gene pools of wildlife habitat areas throughout the flyway.

Fishery: The Wisconsin Department of Natural Resources conducted a fishery inventory of Barnes Creek and Tobin Creek in 1975 and 1983. These surveys indicated that Barnes Creek and Tobin Creek support a diverse and balanced

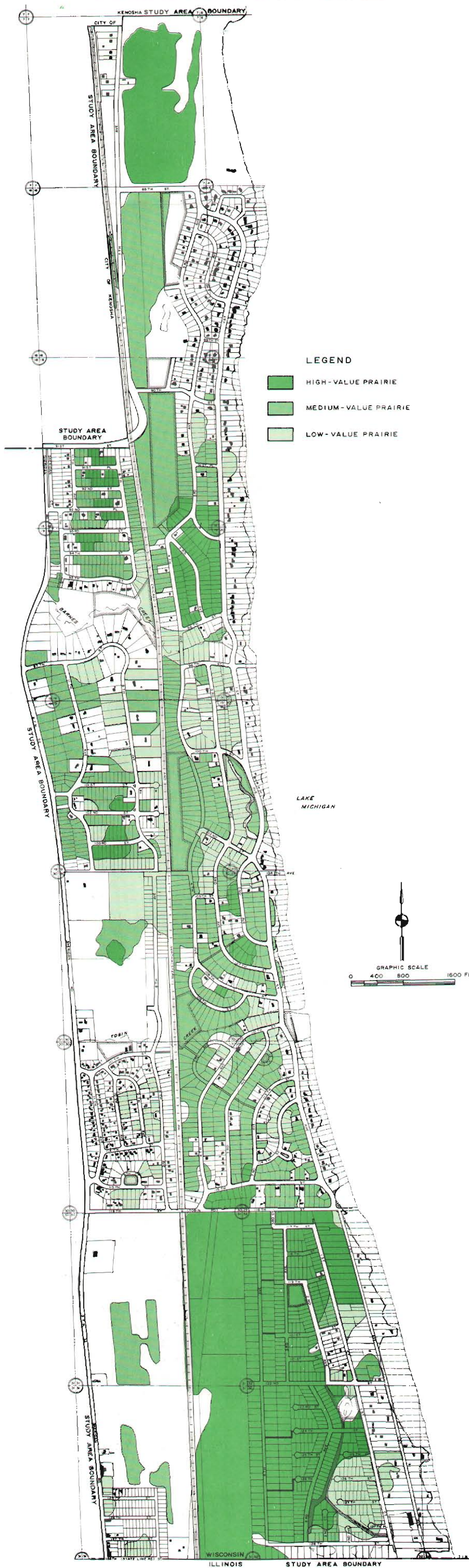
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<sup>7</sup>High-value habitat areas contain a good diversity of wildlife, are adequate in size to meet all of the habitat requirements of the species concerned, and are generally located in proximity to other wildlife habitat areas. Medium-value wildlife habitat areas generally lack one of the three criteria for a high-value wildlife habitat area. However, they do retain a good plant and animal diversity. Low-value habitat areas are remnant in nature in that they generally lack two or more of the three criteria for a high-value wildlife habitat, but may, nevertheless, be important if located in proximity to other high- or medium-value wildlife habitat areas, if they provide corridors linking higher value wildlife habitat areas, or if they provide the only available range in the area.



Map 8

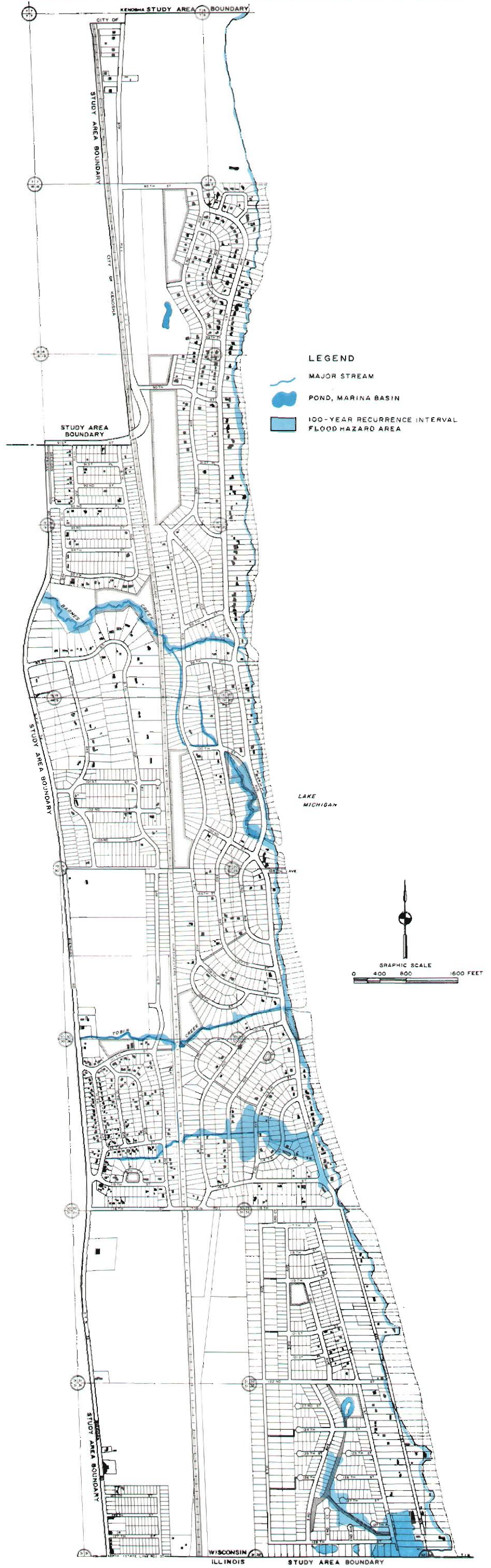
PRAIRIES IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1980



Source: SEWRPC.

Map 9

SURFACE WATER RESOURCES AND FLOODLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: SEWRPC.



population of forage minnows and other fish species. Small largemouth bass were found in Barnes Creek.<sup>8</sup> Barnes Creek is also a known spawning stream for rainbow smelt. While northern pike are not common in this part of Lake Michigan, the wetlands adjacent to Barnes Creek and Tobin Creek contain suitable northern pike spawning habitat. Moreover, they are accessible to northern pike when they come up from the lake to spawn during periods of high water in spring.

### Critical Plant Habitat Areas

A total of 18 of Wisconsin's rare, threatened, and endangered plant species are known to exist within the Chiwaukee Prairie-Carol Beach area.<sup>9</sup> Map 11 identifies areas within which the occurrence of these species has been documented and which, based upon field inspection during the summer of 1982, have been determined to be suitable for the long-term maintenance of these species. These "critical plant habitat" areas encompass 608 acres, or about 33 percent of the study area. Of the total identified critical plant habitat areas, 540 acres, or about 89 percent, consist of wetlands, and 68 acres, or about 11 percent, consist of upland open space land. The maintenance of these areas is important to the long-term survival of these species. Minimum area requirements for the successful reproduction of many of these plants are unknown, and thus it is necessary to maintain as large a tract as possible. In addition, the preservation of several populations of a particular species is important if its genetic diversity is to be maintained. This genetic diversity is also important to the long-term viability of a species. Also, the maintenance of several populations provides a buffer against any disease which may eliminate or impair the reproductive capacity of a particular species.

The rare species which exist in the study area are on watch status in Wisconsin because of their rarity of occurrence and/or declining population. Continued loss of their habitat would likely result in their official listing as a threatened or endangered species.

### Natural Areas

Natural areas are defined by the Wisconsin Scientific Areas Preservation Council as tracts of land and water so little modified by human activities or sufficiently recovered that they contain native plant and animal communities believed to be representative of the presettlement landscape. The Scientific Areas Preservation Council has identified seven natural areas in the Chiwaukee Prairie-Carol Beach study area (see Map 12). Four of these areas--the Chiwaukee Prairie, the Kenosha Sand Dunes, the Carol Beach Low Prairie and Panne', and the Tobin Road Prairie--have been identified as natural areas of statewide or greater significance. The remaining three areas--the Carol Beach Prairie, the Barnes Creek Dunes and Panne', and the Carol Beach Estates Prairie--have been identified as natural areas of countywide or regional significance. In combination, the identified natural areas encompass 493 acres,

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<sup>8</sup>A detailed description of the findings of the Department of Natural Resources fish surveys is presented in Appendix A of this report.

<sup>9</sup>A list of Wisconsin rare, threatened, and endangered plant species known to occur within the Chiwaukee Prairie-Carol Beach area is presented in Appendix A of this report.



Map 10

WILDLIFE HABITAT AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1983



Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 11

CRITICAL PLANT HABITAT AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1982



Source: SEWRPC.



or 27 percent of the study area. Of the total identified natural areas, 418 acres, or about 85 percent, consist of wetlands; 56 acres, or about 11 percent, consist of upland open space; 2 acres, or less than 1 percent, consist of surface water; and 17 acres, or about 3 percent, consist of existing streets and a portion of the Chicago & North Western Railway right-of-way. A description of the seven natural areas is presented in Table 7.

In addition to maintaining an inventory of natural areas, the Scientific Areas Preservation Council maintains an official state list of "scientific" areas available for research and the teaching of conservation and natural history. Such areas represent the best remaining natural areas and contain nearly intact plant and animal communities, or important geological or archaeological features. Furthermore, scientific areas serve as benchmark areas to which the impacts of human activities can be compared and measured. The Scientific Areas Preservation Council has designated one state scientific area in the study area, this being a portion of the Chiwaukee Prairie natural area adjacent to the Chicago & North Western Railway right-of-way (see Map 12). The boundaries of this area may be expected to be modified and the officially designated scientific area enlarged as planned land acquisition by The Nature Conservancy proceeds within the area.

### Archaeological Sites

According to the files of the State Historical Society of Wisconsin, a total of nine archaeological sites, consisting primarily of early American Indian campsites and villages, have been identified in the study area. The most significant archaeological site identified to date is the Barnes Creek site, located near Barnes Creek in Section 19 of U. S. Public Land Survey Township 1 North, Range 23 East, which has been listed in the National Register of Historic Places. The site contains important information concerning the history and settlement patterns of the Woodland Culture peoples (circa 200 B.C.-1200 A.D.) and earlier groups. Excavations at the site have been conducted by the University of Wisconsin-Parkside and the local archaeological society.

The State Historical Society has expressed a belief that the archaeological sites in the study area are significant. With the exception of the Barnes Creek sites, however, the archaeological sites in the study area have not yet been closely studied by archaeologists. Many of these sites were reported before 1925 and have not been examined since. Existing site boundaries are, for the most part, highly generalized.

### Environmental Corridors

Environmental Corridor Concept: Previous sections of this chapter have described the most important elements of the natural resource base in the Chiwaukee Prairie-Carol Beach study area. One of the most important tasks completed under the regional planning effort in southeastern Wisconsin has been the identification and delineation of those areas in which concentrations of natural resource elements occur. The process developed by the Regional Planning Commission for this purpose involves a mapping overlay technique through which areas containing concentrations of natural resource elements and natural resource-related elements are identified. The following natural resource elements are considered in this mapping process: lakes, rivers, and streams and their associated shorelands and floodlands; wetlands; woodlands;

prairies; wildlife habitat areas; wet, poorly drained, and organic soils; and rugged terrain and high relief topography. The Natural resource-related elements considered in this mapping process are the following: existing park and open space sites; potential park and open space sites; historic sites; significant scenic areas and vistas; and natural and scientific areas.

The delineation of these 12 natural resource and resource-related elements on a map results in an essentially linear pattern of relatively narrow, elongated areas within the Region which have been termed "environmental corridors" by the Commission. Primary environmental corridors include a wide variety of the above-mentioned important resource and resource-related elements and are, by definition, at least 400 acres in size, two miles in length, and 200 feet in width. Secondary environmental corridors connect with primary environmental corridors and are at least 100 acres in size and one mile in length.

It should be noted that while environmental corridors consist primarily of undeveloped open space lands having significant natural resource or natural resource-related features, small areas of urban development may, under certain circumstances, be included in the environmental corridor configuration. In this regard, small enclaves of existing residential development less than five acres in size surrounded by environmentally significant open space lands are included in the primary environmental corridor under the environmental corridor mapping process. Moreover, the primary environmental corridor encompasses, at a minimum, the lands--including developed lands--within 75 feet of the shoreline of major rivers and inland lakes. Along the Lake Michigan shoreline, because of the generally wider beach and bluff areas and other natural resource features associated with the shoreline, the environmental corridor encompasses, at a minimum, the width of the beach and an area 200 feet inland from the inland edge of the beach.

In any discussion of environmental corridors and important natural resource features it is important to point out that, because of the many interacting relationships between living organisms and their environment, the destruction or deterioration of a single important element of the total environment may lead to a chain reaction of deterioration and destruction. The drainage of wetlands, for example, may have far-reaching effects, since such drainage may destroy wildlife habitat, groundwater recharge areas, and natural filtration and floodwater storage areas of interconnecting stream systems. The resulting deterioration of surface water quality may, in turn, lead to a deterioration of the quality of groundwater resources. Similarly, the destruction of woodland cover may result in soil erosion, stream siltation, more rapid runoff, and increased flooding, as well as the destruction of wildlife habitat. Although the effects of any one of the environmental changes may not in and of itself be overwhelming, the combined effects may eventually lead to a serious deterioration of the underlying and supporting natural resource base and of the overall quality of the environment. The need to maintain the integrity of the remaining environmental corridors, to the maximum extent practicable, should thus be apparent.

Primary Environmental Corridors Within the Study Area: Primary environmental corridors typically encompass a relatively small portion of the total area of a community or group of communities. For example, within the Kenosha Planning District, primary environmental corridors encompass a total area of about

Table 7

# SCIENTIFIC AND NATURAL AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA

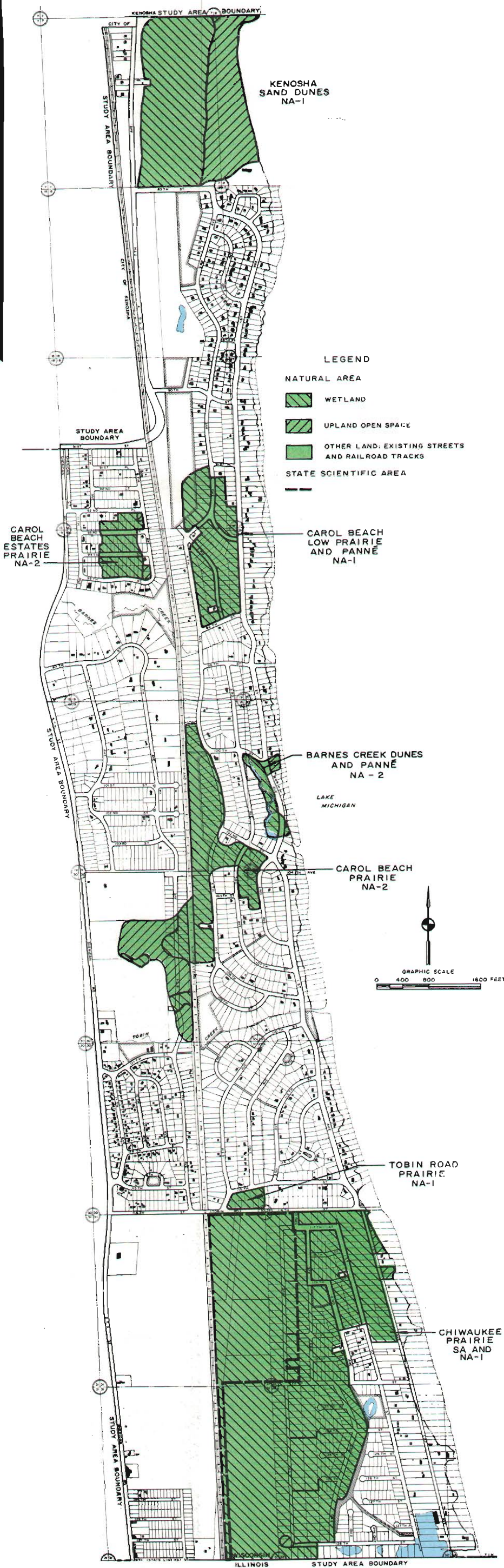
Name	Location	Owner	Acreage	Classification Code <sup>a</sup>	Description
Chiwaukee Prairie	T1N, R23E, Sections 31 and 32	The Nature Conservancy, University of Wisconsin, Town of Pleasant Prairie, and Private	271	SA and NA-1	Rich prairie and marsh on swell and swale topography created when the level of glacial Lake Michigan was lowered in stages. Over 350 plant species have been documented in the prairie, some of which are very rare in the State. Scattered oaks in portions give a savanna aspect to the tract. A National Natural Landmark and one of the most important prairies in Wisconsin. Critical plant species present. The boundaries of the identified NA-1 area are identical to the presently defined project boundary of The Nature Conservancy. The officially designated state scientific area represents a portion of this area adjacent to the Chicago & North Western Railway right-of-way (see Map 12)
Kenosha Sand Dunes	T1N, R23E, Sections 7 and 8	Wisconsin Electric Power Company	94	NA-1	One-half mile of frontage on Lake Michigan containing well-developed dunes and dune succession patterns (fore dunes to swale to wet prairie). The diversity of beach plant species is good. Some ditching has been done behind the dune area, but it remains in good condition and is an excellent observation area for migrating shore birds. An ancient hardwood forest bed was discovered in this area in the early 1960's as wave erosion exposed sections of the shoreline. The Lake Michigan shore has now been rip-rapped
Carol Beach Low Prairie and Panne'	T1N, R23E, Sections 17, 18, 19, and 20	Town of Pleasant Prairie and Private	35	NA-1	A rich low prairie and calcareous fen on a dune and swale topography. Critical plant species present
Carol Beach Estates Prairie	T1N, R23E, Sections 18 and 19	Private	14	NA-2	A rich wet to mesic prairie with some shrub invasion on sandy soils. Critical plant species present
Carol Beach Prairie	T1N, R23E, Sections 19, 20, 29, and 30	Town of Pleasant Prairie and Private	66	NA-2	A rich complex of low to dry prairie with fresh (wet) meadow, sedge meadow, shrub carr, and shallow marsh communities on a dune and swale topography. Critical plant species present
Barnes Creek Dunes and Panne'	T1N, R23E, Section 20	Town of Pleasant Prairie and Private	9	NA-2	An unusual mixture of dry prairie and calcareous fen plant species on a dune and swale topography adjacent to Barnes Creek. Critical plant species present
Tobin Road Prairie	T1N, R23E, Section 30	Private	4	NA-1	A portion of the northern Chiwaukee Prairie area containing a rich low prairie on a dune and swale topography. Critical plant species present

<sup>a</sup> NA-1 indicates a natural area of statewide or greater significance. NA-2 indicates a natural area of county or regional significance. SA indicates a state scientific area.



Map 12

NATURAL AND SCIENTIFIC AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1983



Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 13

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1980



Source: SEWRPC.



5,700 acres, or about 10 percent of the total area of the District. Within the Pleasant Prairie-Carol Beach study area, however, a comparatively large portion--69 percent, or about 1,264 acres of the 1,825-acre study area--has been identified as primary environmental corridor owing to the concentration of natural resource features in the area, particularly prairie areas, wetlands, and wildlife habitat areas. The identified primary environmental corridor extends the full length of the study area east of the Chicago & North Western Railway right-of-way, excluding only the intensively developed residential areas (see Map 13). The identified environmental corridor also includes a significant portion of the study area west of the Chicago & North Western Railway, although the environmental corridor is somewhat more fragmented by existing residential development west of the railway.

Secondary Environmental Corridors Within the Study Area: The only secondary environmental corridor in the Chiwaukee Prairie-Carol Beach area is a narrow band along the stream channel located just north of 111th Street. This area encompasses about four acres, or less than 1 percent of the total study area.

Isolated Natural Areas Within the Study Area: In addition to the primary and secondary environmental corridors, two isolated natural areas have been identified within the Chiwaukee Prairie-Carol Beach area. Isolated natural areas are areas of at least five acres in size which possess the natural resource features found within environmental corridors but which are isolated from environmental corridors by urban development or agricultural land. The isolated natural areas in the Chiwaukee Prairie-Carol Beach area are located east of Sheridan Road, south of 116th Street. These areas encompass about 34 acres, or about 2 percent of the total study area.

## SHORELINE EROSION

Shoreline erosion is a major problem for portions of the Lake Michigan shoreline in the Chiwaukee Prairie-Carol Beach study area and the balance of the Southeastern Wisconsin Region. The shore erosion study conducted under the Wisconsin coastal management program designated the Lake Michigan shoreline along the study area as the most critical reach of the entire Lake Michigan coast in Wisconsin in terms of shore damage and recession rates.<sup>10</sup> This section provides information on shoreline erosion processes, existing features of the Lake Michigan shoreline along the study area, and historic trends in recession of the Lake Michigan shoreline along the study area.

### Beach Erosion and Accretion Processes

A beach is an area consisting of unconsolidated materials which extends landward from the ordinary low water line to the place where there is a distinct change in physiographic form or to the line marking the start of permanent terrestrial vegetation.<sup>11</sup> Figure 1 illustrates the various features of

<sup>10</sup>D. M. Mickelson, et. al., Shore Erosion Study: Technical Report--Shoreline Erosion and Bluff Stability Along Lake Michigan and Lake Superior Shorelines of Wisconsin, 1977.

<sup>11</sup>U. S. Army Coastal Engineering Research Center, Shore Protection Manual, Vols. I, II, and III, 1977

a beach, including the relatively steep beach face or foreshore; the backshore on the landward side of the beach face, consisting of one or more relatively level berms; and the lake bottom immediately lakeward of the beach face exhibiting a slope of less than that of the beach face.

The features of a beach and the materials composing the beach are continuously in a state of flux as a result of the on-shore and off-shore transport of sand and gravel primarily in response to wave action. There is a constantly changing interplay between the forces that bring sand ashore and those that move it lakeward, with the position and configuration of the main mass of sand at any time serving as an index of the dominant forces. High, steep waves typical of storm events within the coastal area of southeastern Wisconsin tend to tear beaches down by removing material from them and transporting it in a lakeward direction. In contrast, the small waves characteristic of periods between storm events tend to build beaches up through a net landward transport of sediment. Thus, the beaches exhibit a continuous cyclic pattern of erosion and accretion in response to the nature of the waves impinging on the beach.<sup>12</sup>

Sediment is also transported parallel to the shoreline by longshore currents. Longshore currents are currents in the breaker zone running generally parallel to the shoreline and usually caused by waves breaking at an angle to the shoreline. Longshore currents transport sediment and other particulate matter--which is suspended in the current or bounced and rolled along the lake bottom--parallel to the shore. While the longshore currents within the coastal zone of southeastern Wisconsin may move in either a northerly or southerly direction in response to the direction of the incident waves, the net sediment transport is to the south. Evidence of this fact is the tendency for beaches to exhibit accretion on the north side of groins, piers, and other structures while erosion occurs on the southerly side of such structures.<sup>13</sup> Accretion of the extensive sand beach north of the northern breakwater of the City of Kenosha is a prime example of the effect of the net southerly transport of sediment associated with longshore currents.

The natural sloping beach face and adjacent beach dunes serve to absorb the energy of waves impinging on the coast. Structures such as groins can sometimes be used to develop beaches where they would otherwise be absent (see Figure 2), thereby protecting the adjacent shoreline development from wave attack. A problem with such structures is that they tend to block the supply of sediment downdrift of the structure, frequently resulting in a narrowing or elimination of the beach and potentially exposing the dunes in the downdrift region to wave attack.

#### Existing Shoreline Features<sup>14</sup>

Beaches in the study area generally consist of fine- to coarse-grained sand and gravel and in some places are covered with artificial fill. The width of the beach in the study area varies considerably, generally ranging from 0 to

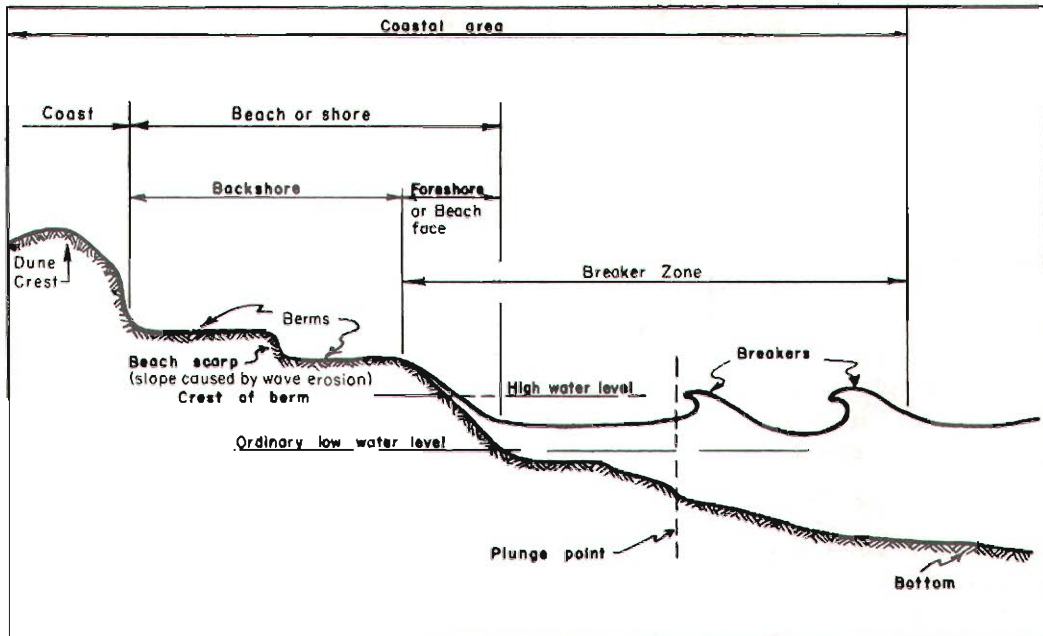
<sup>12</sup>SEWRPC, Lake Michigan Estuary and Direct Drainage Area Subwatersheds Planning Program Prospectus, 1978.

<sup>13</sup>Ibid.

<sup>14</sup>Michelson, op. cit.

Figure 1

### TYPICAL BEACH PROFILE



Source: U. S. Army Corps of Engineers.

Figure 2

A PORTION OF SECTION 17 OF U. S. PUBLIC LAND SURVEY SECTION T1N, R23E, SHOWING THE EFFECTS OF GROINS ALONG THE LAKE MICHIGAN SHORELINE IN SOUTHEASTERN WISCONSIN



Source: SEWRPC.

110 feet, with the variation being largely attributable to shore protection structures. Along many reaches, the rise from the lake level to upland surfaces is a gradually sloping beach and there is no bluff per se. Along other reaches there is a very low bluff, generally ranging in height from 5 to 10 feet.

Many shore protection structures, including groins and shoreline revetment, have been installed along the Lake Michigan shoreline in the study area. The most extensive shore protection effort is the rip-rap revetment which has been installed along the Wisconsin Electric Power Company property in the northern portion of the study area. Along many other reaches, numerous individual shore protection structures of varying type and quality have been installed. An inventory conducted under the shore erosion study in 1976 identified a total of 175 protection structures in the study area.

### Shoreline Recession Rates

Average annual Lake Michigan shoreline recession rates for the Chiwaukee Prairie-Carol Beach study area are shown on Map 14. Recent recession rates for the period 1970 to 1980 and long-term recession rates for the period 1835 to 1980 have been calculated. Shoreline recession was measured along east-west U. S. Public Land Survey section, quarter-section, and quarter-quarter section lines at 19 points in the study area.

As shown on Map 14, long-term recession rates over the period 1835 to 1980 ranged between 1.5 feet per year and 8.8 feet per year at the 19 measurement sites. For 13 of the 19 sites, the annual average recession rate was 5.0 feet or greater.

As further shown on Map 14, recession rates for the period 1970 to 1980 are generally lower than the 1835-1980 rates. Shoreline accretion was observed at six measurement sites. Such accretion may be due to artificial filling or to structural shore protection which extends the shoreline.

Three major factors have been identified as contributing to the excessive shoreline recession occurring in the study area:<sup>15</sup>

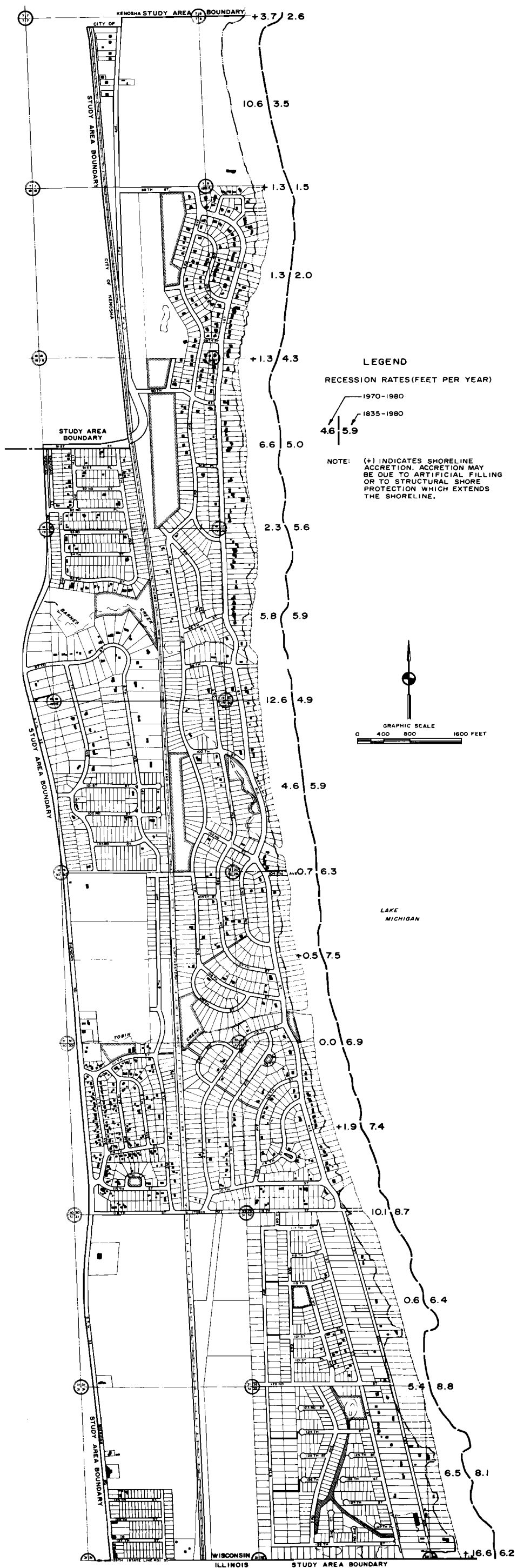
1. High lake levels in the recent past: The low to moderate sloping beaches within the study area may be entirely submerged by only one- to two-foot increases in the lake level, causing storm-wave energy to be directed against the dunes and toe of the bluff rather than being absorbed by the beach.
2. Character of the dunes: The sand dunes, because of their unconsolidated consistency, are readily eroded by wave action, particularly during storms.
3. The City of Kenosha harbor structures: These structures interrupt the natural longshore transport of sand along the beach. Therefore, sand lost in the study area because of storm-wave action is not replenished by a sufficient inflow of sand from the north.

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<sup>15</sup>Michelson, op, cit.

Map 14

RECESSION OF THE LAKE MICHIGAN  
SHORELINE ALONG THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA



Source: SEWRPC.

It is important to note that phenomena which contribute to shoreline erosion, including high lake levels and wave and wind action, while commonly considered to be the cause of environmental and developmental problems along the Lake Michigan shoreline, are, and always will be, natural phenomena active in the coastal system. Problems associated with shoreline recession developed only when homes, commercial and industrial buildings, and other structures were constructed along the shoreline without proper recognition of the natural erosion process. The result has been actual and potential destruction and damage to such structures. This situation may be expected to continue to occur, and even increase, if shoreline recession within the Chiwaukee Prairie-Carol Beach study area is not taken into account as development proceeds.

## SOIL SUITABILITY

In any land use planning program, it is necessary to examine not only how land and soils are presently used, but how they can best be used and managed. This requires a detailed soil survey which maps the geographic location of various kinds of soils; identifies their physical, chemical, and biological properties; and interprets these properties for land use and public facilities planning. Such a soil survey of the entire Southeastern Wisconsin Region was completed in 1965 by the U. S. Department of Agriculture, Soil Conservation Service, under contract to the Regional Planning Commission.

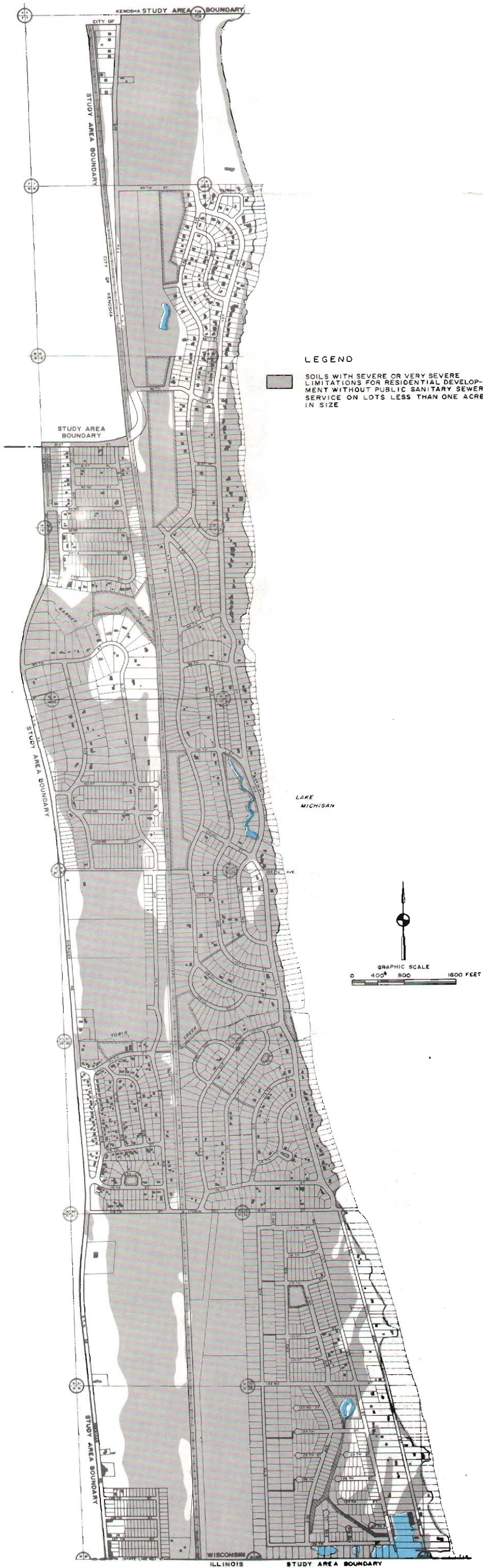
Through the use of data provided by the soil survey, the Commission staff has prepared interpretive maps showing the suitability of certain soil types for residential, recreational, and other land uses. Since much of the Chiwaukee Prairie-Carol Beach study area has been platted for residential development, attention is focused herein on the suitability of soils for such development.

Map 15 shows those portions of the Pleasant Prairie-Carol Beach study area which are covered by soils poorly suited for residential development without public sanitary sewer service on lots less than one acre in size. Most of the platted residential lots in the study area, it should be noted, are less than one-half acre in size. As shown on this map, much of the study area--1,450 acres, or 79 percent of the total area--is covered by soils which have severe or very severe limitations for such development. These soils generally have a high water table and, in some instances, low permeability rates, which prevent the proper operation of conventional onsite septic systems.

Map 16 shows those portions of the study area which are covered by soils poorly suited for residential development even with public sanitary sewer service. These areas--which encompass about 438 acres, or 24 percent of the study area--are distributed throughout the study area, being somewhat more prevalent east of the Chicago & North Western Railway, however. It is important to note that much of the study area is covered by soils having moderate limitations for residential development as a result of the high water table, which can hinder the installation and proper operation of sanitary sewers. It is recognized that potential sewer construction problems can be overcome through special techniques, including temporarily lowering the water table during construction. It is also recognized that pipe materials currently used for sanitary sewers can be operated with acceptable levels of infiltration and inflow even if installed below the water table, provided the sewers are properly designed

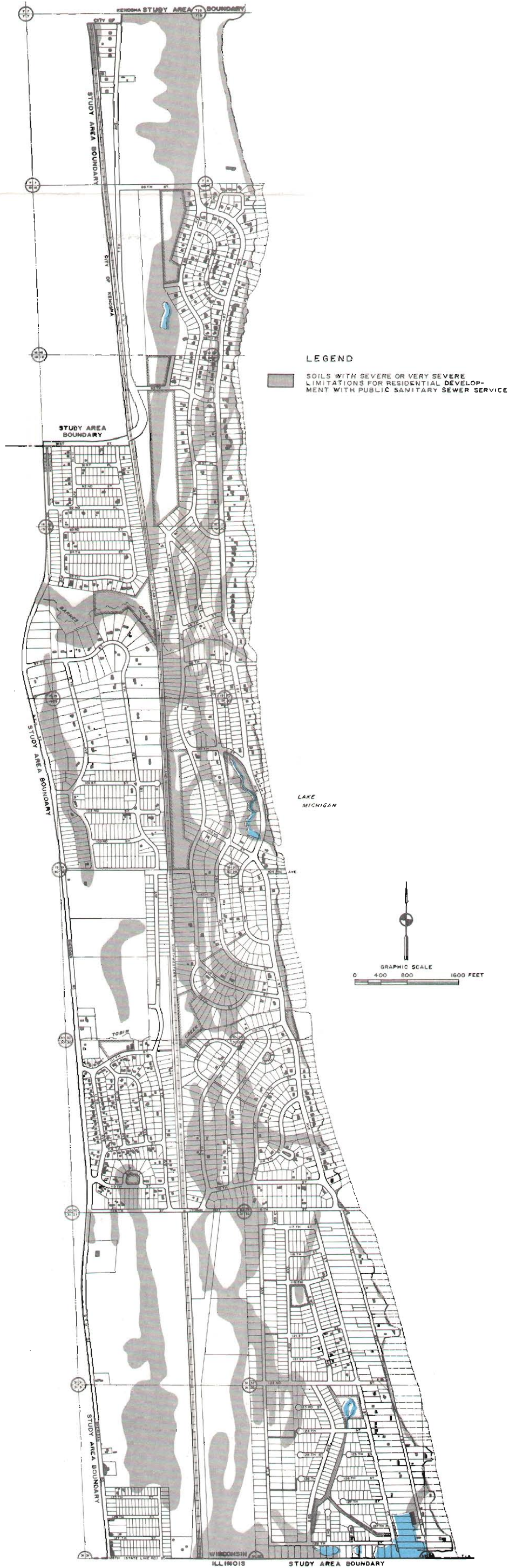


SUITABILITY OF SOILS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA FOR RESIDENTIAL DEVELOPMENT WITHOUT PUBLIC SANITARY SEWER SERVICE



Source: SEWRPC.

SUITABILITY OF SOILS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA FOR RESIDENTIAL DEVELOPMENT WITH PUBLIC SANITARY SEWER SERVICE



Source: SEWRPC.



and constructed. However, the installation of sewers in areas with high groundwater levels will generally result in higher costs and a higher potential for infiltration and inflow. Thus, the identification of any future sewer service areas within the study area should take into account the prevalent high water table, the difficulties inherent in installing sanitary sewers in areas with a high water table, and the increased potential for infiltration which may cause operational problems. Furthermore, during the development process, residential units constructed in such areas should be properly sited and designed to avoid problems such as wet basements and sinking foundations which may occur in areas with high groundwater.

## SEWAGE TREATMENT PROBLEMS

There is no public or private centralized sanitary sewer service within the Chiwaukee Prairie-Carol Beach study area. Wastewater from existing urban development is disposed of through the use of onsite sewage disposal systems. Data presented in this chapter indicate that those forms of urban development which generate wastewater--including residential, commercial, institutional, and intensively developed recreational land--in combination account for 260 acres, or 14 percent of the total study area. Residential land alone accounts for 237 acres, or 91 percent of this total. There were about 523 housing units in the study area by the end of 1983.

An onsite sewage disposal system which is used to serve residential and other forms of urban development where centralized sanitary sewer service is not available may be a conventional septic tank system, a mound system, or a holding tank.<sup>16</sup> Of these, the conventional septic tank system is the most commonly used within the study area, and only a small number of mound systems and holding tanks have been installed. In this regard, a review of sanitary permits on file in the Kenosha County Office of Planning and Zoning Administration indicated that a total of six mound systems and 18 holding tanks had been authorized for installation within the study area by 1982 (see Table 8). Other existing residential development in the study area may be assumed to be served by conventional septic tank systems.

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<sup>16</sup>Conventional septic tank systems consist of two components--a septic tank, or water-tight basin, which is intended to provide partial treatment of raw wastewater by skimming, settling, and anaerobic decomposition; and a soil absorption field which is intended to provide final treatment and disposal of liquid discharged from the septic tank. Both components are installed below ground surface.

Mound systems differ from conventional gravity flow septic tank systems in that they utilize mechanical facilities to pump septic tank effluent through distribution pipes placed on fill on the top of the natural soil. When in place, this fill takes on the appearance of a mound. These systems are permitted on a limited basis in Wisconsin to overcome natural soil limitations due to impermeability, high groundwater, or shallow bedrock.

A holding tank is a water-tight tank which is placed below ground surface to collect and temporarily store wastewater until such a time that disposal is convenient or the tank is filled to capacity. The wastewater is then intended to be pumped out of the holding tank into a truck and transported to a sewage treatment plant for treatment and disposal.

Table 8

**MOUND SYSTEMS AND HOLDING TANKS AUTHORIZED FOR  
INSTALLATION AND FAILING SEPTIC TANK SYSTEMS IDENTIFIED  
IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea (see Map 2)	Mound Systems Authorized: June 1982	Holding Tanks Authorized: June 1982	Failing Septic Tank Systems Identified: July 1980- June 1982 <sup>a</sup>
A	1	1	2
B	3	8	5
C	2	8	3
D	0	0	0
E	0	1	1
Total	6	18	11

<sup>a</sup>Kenosha County initiated a private sewerage system regulatory program in July 1980.

Source: Kenosha County Office of Planning and Zoning Administration and SEWRPC.

Providing that the system is installed, used, and maintained properly and that there is an adequate depth of moderately permeable, unsaturated soil below the drainage field, a conventional septic tank system should operate with few problems for periods of up to 20 years. However, rural residential housing is not always developed in areas having ideal soil conditions. When septic tank systems are installed on unsuitable soils, septic effluent may not receive the benefit of soil filtration and may, instead, be discharged directly to the surface, creating a public health hazard as well as an obnoxious nuisance condition.

As noted in this chapter, most of the study area is covered by soils which are unsuitable for septic tank systems, owing to the generally high water table and, in some areas, low permeability rates. Between July 1980, when Kenosha County initiated a private sewage system regulatory program, and June 1982, the County identified 11 failing septic systems within the study area, with all of these systems serving residential structures. These 11 residential structures represent 2 percent of all residential structures in the study area. Most of these failing systems are distributed throughout the portion of the study area lying between 116th Street and 85th Street. Given the extent of existing residential development served by septic tank systems in areas covered by soils that are not suitable for such systems, there are probably many other failing septic systems in the study area. Although they are difficult to identify and are not always readily apparent even to individual property owners, such conditions must, insofar as possible, be taken into account in the identification of future sanitary sewer service areas within the study area.

## SUMMARY AND CONCLUSIONS

This chapter has described the Chiwaukee Prairie-Carol Beach study area, presenting information on population levels, land use and land ownership patterns, the natural resource base, and existing sewage disposal facilities and problems. The most important inventory findings of this chapter are summarized below:

1. The Chiwaukee Prairie-Carol Beach study area is located in the eastern portion of the Town of Pleasant Prairie, Kenosha County, and is bounded by Lake Michigan on the east; by the Wisconsin-Illinois state line on the south; by STH 32 and the Chicago & North Western Railway right-of-way on the west; and by 80th Street on the north. The study area encompasses 1,825 acres, or about 8 percent of the total area of the Town of Pleasant Prairie.
2. The resident population of the study area stood at 1,402 persons in 1980. Between 1970 and 1980, the study area population increased by 286 persons, or 26 percent over the 1970 population of 1,116.
3. About 1,246 acres, or 68 percent of the study area, have been subdivided for urban residential use. Plats for certain portions of the study area were recorded during the 1920's. Most of the platting activity, however, occurred between 1947 and 1956. A total about 2,746 lots have been created through this platting activity and about 643 lots, or 23 percent of the total, are actually developed. Some of the originally platted lots are now partially or entirely submerged as a result of Lake Michigan shoreline erosion. Much of the platted land remains sparsely developed owing to the high water table and other physical development limitations in the study area.
4. Urban land uses account for 517 acres, or 28 percent of the study area, while open lands--including wetlands, woodlands, agricultural lands, and unused lands--along with surface water encompass a total of 1,308 acres, or 72 percent of the area. Residential lands and transportation and utility lands account for most of the urban uses. Residential lands encompass 237 acres, or 13 percent of the study area. Concentrations of residential land are located along the Lake Michigan shoreline, as well as in Carol Beach Estates-Unit No. 1 and Carol Beach Estates-Unit W; elsewhere, residential development is comparatively sparse and scattered. Lands devoted to transportation and utility use in the study area total 257 acres, representing 14 percent of the study area. There are 4.8 linear miles of arterial streets--consisting of STH 32 and CTH T--encompassing about 46 acres in the study area. There are 21.4 linear miles of existing local streets in the study area encompassing about 164 acres. Certain segments of the street network proposed in the original subdivision plats--in combination totaling 6.0 linear miles and encompassing about 44 acres--either were never constructed, have been overtaken by vegetation subsequent to construction, or, in one case, have been destroyed as a result of erosion of the Lake Michigan shoreline.
5. About 421 acres, or 23 percent of the study area, consisted of publicly held lands in 1982. These public lands included 73 acres held by the Town of Pleasant Prairie; 2 acres held by Kenosha County; 91 acres held by the University of Wisconsin; slightly less than 1 acre held by the Wisconsin Department of Transportation; and 254 acres consisting of street and highway rights-of-way. About 243 acres, or 13 percent of the study area, consisted of quasi-public lands. These quasi-public lands included 52 acres held by The Nature Conservancy; 145 acres held by the Wisconsin Electric Power Company; and 46 acres held by the Chicago & North Western Transportation Company. About 1,161 acres, or 64 percent

of the study area, consisted of privately held land. A total of 1,659 private interests owned real property within the study area. Of these, about 1,647 owned less than five acres of land each and together accounted for a total of 806 acres, or 44 percent of the study area.

6. The Chiwaukee Prairie-Carol Beach study area contains some of the outstanding natural resource features found within the Southeastern Wisconsin Region. Despite the inroads of urban development within the study area, much of the natural resource base remains essentially intact. Although they have been described in this chapter on an individual, element-by-element basis, the various features of the natural resource base, including wetlands, prairies, wildlife habitat areas, critical plant habitat areas, and natural areas, are not mutually exclusive, and there is considerable overlap among them. Wetlands encompass a total of 818 acres, or 45 percent of the study area. Prairies cover 860 acres, or 47 percent of the study area. Portions of the study area encompassing a total of 702 acres have been identified as wildlife habitat, including 320 acres classified as high-value wildlife habitat and 382 acres classified as medium-value habitat. Both Barnes Creek and Tobin Creek in the study area support a diverse and balanced population of forage minnows and other fish species. Areas encompassing 608 acres, or 33 percent of the study area, have been identified as critical plant habitat areas--that is, areas within which certain rare, threatened, or endangered plant species have been observed and which remain suitable for the long-term maintenance of those species. A total of seven natural areas have also been identified in the study area, with four of these--the Chiwaukee Prairie, the Kenosha Sand Dunes, the Carol Beach Low Prairie and Panne', and the Tobin Road Prairie--being ranked as natural areas of statewide or greater significance, and three of these--the Carol Beach Estates Prairie, the Barnes Creek Dunes and Panne, and the Carol Beach Prairie--being ranked as natural areas of countywide or regional significance. The Chiwaukee Prairie area has been designated a National Natural Landmark, and remains one of the most important prairies in Wisconsin. Owing to the concentration of natural resource features throughout the study area, a large portion of the area--1,264 acres, or 69 percent of the 1,825-acre study area--has been identified by the Regional Planning Commission as primary environmental corridor. Secondary environmental corridor lands have been identified as encompassing about four acres, or less than 1 percent of the total study area, while isolated natural areas have been identified as encompassing about 34 acres, or about 2 percent of the total study area.
7. The Lake Michigan shoreline along the Chiwaukee Prairie-Carol Beach study area has been identified as the most critical reach of the entire Lake Michigan coast in Wisconsin in terms of shore damage and recession rates. Long-term recession rates over the period 1835 to 1980 ranged between 1.5 feet per year and 8.8 feet per year at 19 measurement sites. Recession rates over the period 1970 to 1980 are generally lower than the 1835 to 1980 rates. However, recent recession rates of 10 feet or more per year were measured at three points along the Lake Michigan shoreline in the study area.

8. Examination of soil types within the Chiwaukee Prairie-Carol Beach study area indicates that much of the area--1,450 acres, or 79 percent of the study area--is covered by soils which have severe or very severe limitations for residential development without public sanitary sewer service on lots less than one acre in size. Most of these soils have a high water table and, in some instances, low permeability rates, which prevent proper operation of conventional onsite septic systems. Moreover, about 438 acres, or 24 percent of the study area, are covered by soils which have severe or very severe limitations for residential development even with public sanitary sewer service. Much of the remainder of the study area is covered by soils having moderate limitations for sewered residential development as a result of the prevalent high water table.
9. There is no public or private centralized sanitary sewer service within the study area. Wastewater from existing urban development--which consists primarily of residential development, including about 523 housing units, is disposed of through the use of onsite sewage disposal systems, including conventional septic tank systems, mound systems, and holding tanks. County sanitary permit files indicate that six mound systems and 18 holding tanks had been authorized for installation within the study area by 1982. Other existing development may be assumed to be served by conventional septic tank systems. Between July 1980, when Kenosha County initiated a private sewage system regulatory program, and June 1982, the County identified 11 failing septic systems within the study area. Given the extent of existing residential development served by septic tank systems in areas which are covered by soils that are not suitable for such systems, there are probably many other failing septic systems in the study area.

The inventory findings presented in this chapter suggest several conclusions which should be considered in the formulation of a land use management plan for the Chiwaukee Prairie-Carol Beach study area. First, while the future population level of the study area is partially dependent on a number of external factors, including general economic conditions, future population growth within the study area will also be dependent on the physical capability of the area to accommodate additional urban development. In view of the dominance of soils in the study area having severe limitations for residential development served by onsite soil absorption sewage disposal systems, it is clear that any significant increase in the population of the study area would require the extension of public sanitary sewer service and other urban services to serve existing and new development.

Second, the extensive amounts of environmentally significant lands in the study area on one hand and the degree to which the study area has been committed to urban development on the other hand imply that the formulation of the land use management plan for the study area will necessarily involve difficult public policy decisions to satisfactorily reconcile open space preservation and urban development objectives. The most difficult public policy decisions in this regard may be expected to involve those partially developed portions of the study area where residential development is sparse and scattered among the remaining prairie and wetland areas, and where numerous private interests have acquired platted, but undeveloped, residential lots. While natural resource features remain at least partially intact in such areas, the preservation of

these features may be difficult to achieve in view of the commitment of such areas to urban use--commitment which is reflected in the existing street pattern; in the existing, although scattered, residential development; and, perhaps most importantly, in the expectations of the many private interests which have acquired residential lots in such areas. At the same time, it must be recognized that the provision of public sanitary sewer and other services to serve such areas may be costly and inefficient because of the sparse and scattered nature of existing housing units, and the existing physical development limitations of such areas.

## Chapter III

### LEGAL LAND USE MANAGEMENT FRAMEWORK

#### INTRODUCTION

There are a variety of regulatory measures by which local, county, state, and federal units and agencies of government can shape and guide urban development or otherwise manage land use in the public interest. In combination, these measures can be viewed as an overall legal land use management framework. This chapter describes those aspects of this management framework which are particularly relevant to, and may have a bearing on, the management of land use within the Chiwaukee Prairie-Carol Beach study area. Specifically, this chapter describes the federal wetland regulatory programs administered by the U. S. Army Corps of Engineers; various state wetland, shoreland, floodplain, navigable waters, and sanitary sewer extension regulatory programs administered by the Wisconsin Department of Natural Resources; and local land use controls--including zoning and land subdivision controls--administered by Kenosha County and the Town of Pleasant Prairie as they apply to the study area.

#### FEDERAL WETLAND REGULATORY PROGRAMS

The U. S. Congress has provided for the regulation of certain wetlands of the nation. Two major programs have been created by acts of Congress which specifically relate to the management and protection of wetlands, including wetlands in the Chiwaukee Prairie-Carol Beach study area. These two regulatory programs are provided for in Section 404 of the Federal Water Pollution Control Act of 1972, as amended, and Section 10 of the River and Harbor Act of 1899.

#### Section 404, Federal Water Pollution Control Act of 1972, as Amended

Section 404 of the Federal Water Pollution Control Act of 1972, as amended, requires the U. S. Army Corps of Engineers to regulate the discharge of dredged and fill materials into waters of the United States, including lakes, rivers, and adjacent wetlands. In carrying out this function, the Corps of Engineers has adopted regulations that identify waters and adjacent wetlands in which individual permits are required for the discharge of dredged and fill materials, and other waters and adjacent wetlands which are exempt from the individual permit requirement and within which such activities may be undertaken under a "blanket," nationwide permit. In addition to such "geographic" nationwide permits for certain waters and adjacent wetlands, the Corps of Engineers has granted nationwide permits for specific activities--such as the installation, under certain conditions, of outfall structures and associated intake structures--which are judged to be environmentally insignificant. It should be noted that in Wisconsin, the geographic nationwide permits and the nationwide permits for certain specific activities are qualified by "regional conditions," or additional restrictions which are specifically designed to protect the waters and wetlands of the State. It should also be noted that the Corps of Engineers does have discretionary authority under which it can override a nationwide permit on a case-by-case basis, as it deems appropriate.

Map 17 identifies those wetland areas within the Chiwaukee Prairie-Carol Beach area which are subject to regulation through individual permits under Section 404 and those wetland areas which are subject to the geographic nationwide permit.<sup>1</sup> As shown on this map, most of the wetlands located east of the Chicago & North Western (C&NW) Railway right-of-way, as well as certain wetlands immediately west of that right-of-way, are subject to regulation through individual permits under Section 404. Individual permits are required in these wetlands because they are considered to be adjacent to Lake Michigan. The Corps of Engineers has indicated that upland ridges within the area identified as subject to individual Section 404 permits--ridges which are too small to be individually delineated--are not under its jurisdiction. In addition, the Corps of Engineers has indicated that certain wetlands located east of the C&NW Railway right-of-way adjacent to streams which drain into Lake Michigan may be exempt from the individual permit requirement and that the determination of permit requirements for specific projects in such wetland areas will be made on a case-by-case basis.

To streamline the Section 404 regulatory process, federal regulations provide for the advanced identification of the suitability of areas for activities involving the discharge of dredged and fill material. Under the advanced site identification process, a preliminary federal regulatory position is assumed to facilitate local planning activities. However, the process does not carry with it the presumption that a permit for the discharge of dredged or fill material will or will not be issued. Under the advanced identification process, the wetlands within the study area east of the C&NW Railway right-of-way have been designated generally unsuitable for the discharge of dredged or fill materials. While this does not preclude the granting of a Section 404 permit, it does provide a preliminary indication that the granting of a permit would be unlikely.

#### Section 10, River and Harbor Act of 1899

Section 10 of the River and Harbor Act of 1899 requires the U. S. Army Corps of Engineers to regulate structures or work in or affecting navigable waters of the United States. As defined by the Corps of Engineers, navigable waters of the United States include those waters which are presently used, have been used, or may be susceptible to use to transport interstate or foreign commerce, including Lake Michigan. Section 10 regulations apply to navigable waters, and associated wetlands, up to the ordinary high-water mark.

Under Section 10 of the River and Harbor Act, permits are required for the placement of structures including, but not limited to, piers, breakwaters, bulkheads, revetments, permanent mooring structures, and power transmission lines below the ordinary high water mark of navigable waters. Permits are also required for any dredging or disposal of dredged materials, filling, or other modification done below the ordinary high-water mark of a navigable water.

#### Executive Orders Regarding Environmental Protection

Presidential orders require federal agencies to explicitly take into account needed wetland and floodplain protection in the conduct of the agency's

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<sup>1</sup>Work authorized by nationwide permits for specific activities, as such permits apply in Wisconsin, would not require individual Section 404 permits.



responsibilities. Executive Order 11988, issued in May 1977, requires each federal agency to "take action to reduce the risk of flood loss to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for 1) acquiring, managing, and disposing of federal lands and facilities; 2) providing federally undertaken, financed, or assisted construction and improvements; and 3) conducting federal activities and programs affecting land use including, but not limited to, water and related land resources planning, regulating, and licensing activities." Executive Order 11990, also issued in May 1977, similarly requires each federal agency to take action to "minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands" in carrying out the agency's responsibilities with respect to the activities noted above. These executive orders also prescribe specific procedures which federal agencies must follow to prevent the undue loss of wetland and floodplain areas.

## STATE POLICIES AND REGULATORY PROGRAMS

A number of policies and regulatory programs of the State of Wisconsin have a direct bearing on the use of the land and water resources of the Chiwaukee Prairie-Carol Beach area. Almost invariably, the statutes and programs which are discussed below rely heavily on strong and direct participation by local units of government. Moreover, it is at that level of government where the legislation will probably succeed or fail.

### Chapter NR 1.95--Wetlands Preservation, Protection, and Management

The State of Wisconsin wetlands preservation, protection, and management policies are set forth in Chapter NR 1.95 of the Wisconsin Administrative Code. Specifically, Chapter NR 1.95 establishes the rules by which the Wisconsin Department of Natural Resources (DNR) administers its regulatory and management authorities regarding wetlands. Such rules require the DNR to evaluate all reasonable alternatives, including the alternative of no action, in making regulatory decisions concerning such processes requiring permits as sanitary sewer extensions, dredging and filling, the construction of dams and bridges, and stream course alterations where adverse impacts to wetlands may occur as a result of such activities. In addition, land acquisition programs should emphasize acquisition of high-value wetlands; enforcement activities regarding unlawfully altered wetlands should, to the extent practicable, require restoration; and the avoidance or minimal use of wetlands should be advocated in liaison activities with federal, state, and local units and agencies of government. Administrative rules and legislation aimed at protecting and enhancing wetland values and ecology, and at providing education about wetlands, may be promulgated by the DNR.

### Shoreland and Floodplain Zoning in Wisconsin

The Water Resources Act of 1965 was adopted by the State Legislature in recognition of the adverse effects that water pollution had on the public health and general welfare of the citizens of the State. It set in motion a comprehensive program to protect human life and health; fish and aquatic life; scenic and ecological values; and domestic, municipal, recreational, industrial, agricultural, and other uses of water. The Act attempts to achieve these objectives

by mobilizing efforts and resources at all levels of government to enhance the quality of all the waters of the State. Toward that end, the State Legislature authorized and required the zoning of shorelands and floodplains.

**Shoreland Regulations:** Section 59.971 of the Wisconsin Statutes requires counties of the State to enact ordinances to regulate all shoreland areas within the unincorporated areas of the counties. The regulations apply to lands within the following distances from the ordinary high-water mark of navigable waters: 1,000 feet from a lake, pond, or flowage, and 300 feet from a river or stream, or to the landward side of a floodplain, whichever distance is greater. The standards and criteria for the ordinances are set forth in Chapter NR 115 of the Wisconsin Administrative Code. They include restrictions on lot sizes, building setbacks, filling, grading, and dredging, and sanitary regulations. Counties are required to keep their regulations current and effective in order to remain in compliance with the statutes and minimum standards established by the Wisconsin Department of Natural Resources. In the event that the county fails to meet the standards, the DNR will adopt a shoreland ordinance to be administered by that county.

The shoreland area within the Chiwaukee Prairie-Carol Beach area, based upon navigability determinations made by the Wisconsin Department of Natural Resources in 1984, is shown on Map 18. The Department's navigability determinations are based on physical observations and navigation in fact of the streams and ponds involved. The Department has indicated that there may be other small navigable ponds in the area in addition to those identified in its 1984 field surveys and, accordingly, that the shoreland area identified on Map 18 is the minimum area which must be governed by shoreland regulations.

Under Chapter NR 115, all counties in the State must place wetlands five acres or more in size and located within the statutory shoreland zoning jurisdiction area in a shoreland-wetland zoning district to ensure their preservation.<sup>2</sup> A Wetlands Mapping Program currently being conducted by the DNR will result in the preparation of wetland maps covering the entire State and will be utilized in the identification of wetlands to be regulated under NR 115. Counties will have six months after the receipt of the final wetland inventory maps to amend shoreland zoning ordinances to protect the mapped wetlands. Only those wetlands in the shoreland areas will be regulated under NR 115. The Wisconsin Wetlands Mapping Program is described later in this section.

It should be noted that Kenosha County has not placed all of the wetlands located in the shoreland jurisdiction area in a shoreland-wetland zoning district. The findings and recommendations of this planning program are intended to provide a basis for determining, within the context of Chapter NR 115, which wetlands will be placed in such a district.

**Floodplain Protection:** The Water Resources Act also provides for the regulation of floodplains. The delineation of floodplains and the minimum criteria that the regulations must meet are set forth in Chapter NR 116 of the Wisconsin

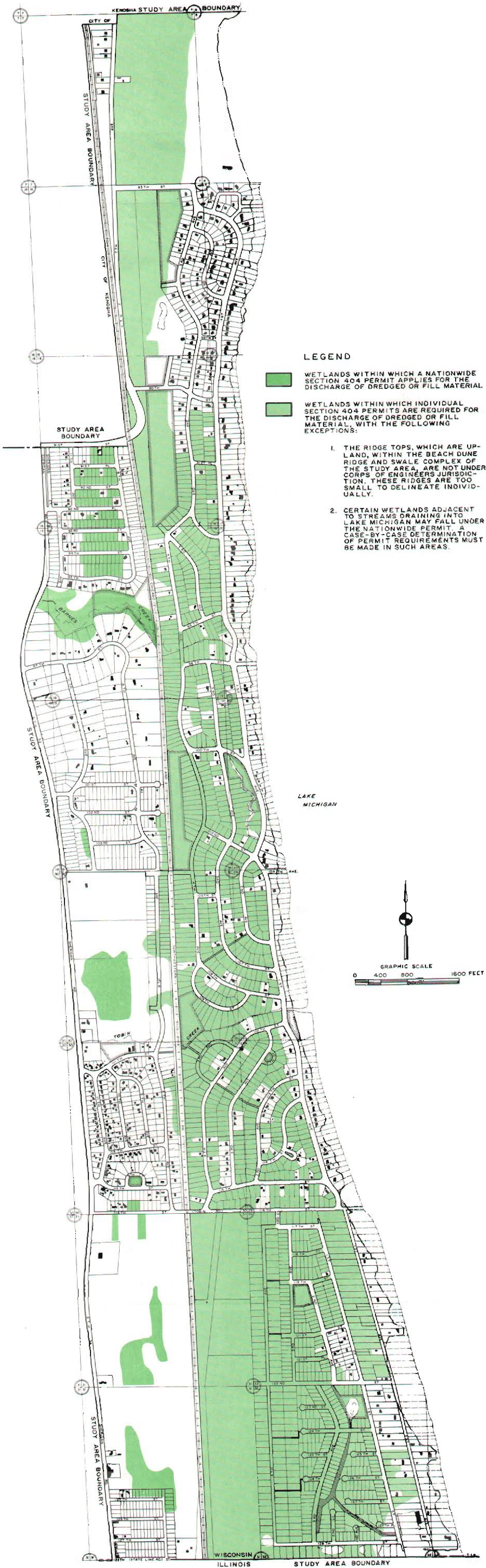
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<sup>2</sup>Chapter 330, Laws of 1981, enacted on April 29, 1982, requires that cities and villages also place wetlands located in the statutory shoreland zoning jurisdiction area in a shoreland-wetland zoning district. Administrative regulations implementing this law are set forth in Chapter NR 117 of the Wisconsin Administrative Code.



Map 17

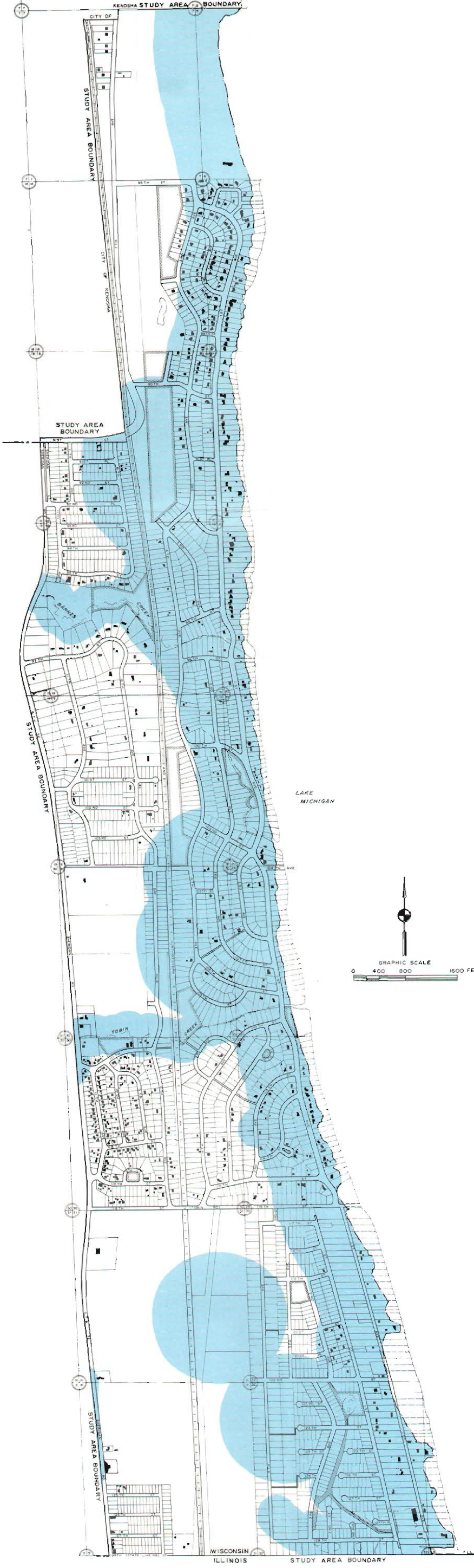
FEDERAL SECTION 404 JURISDICTION AREA IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: U. S. Army Corps of Engineers and SEWRPC.

Map 18

STATUTORY SHORELAND ZONING JURISDICTION AREA IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: Wisconsin Department of Natural Resources and SEWRPC.



Administrative Code. The statutes mandate that the floodplain zoning ordinances be adopted by the appropriate jurisdiction--county, city, or village. If a county, city, or village fails to adopt such an ordinance, the Wisconsin Department of Natural Resources may, upon its own motion or upon the petition of a municipality or of another state agency, hold a public hearing and fix the limits and regulate the use of any floodlands, an action that will have the same effect as if adopted by the local jurisdiction. Modification of any local ordinance, once adopted, requires written approval of the Wisconsin Department of Natural Resources.

When a violation of any ordinance occurs through the construction of a structure, fill, or development in the floodplain, it is deemed to constitute a public nuisance and, as such, may be enjoined through an action by a municipality or by the State or any of its citizens.

It should be noted that Kenosha County has adopted floodplain regulations in conformance with Chapter NR 116 of the Wisconsin Administrative Code. These regulations apply to the floodplains identified on Map 9 in Chapter II of this report.

### Chapter 30, Navigable Waters, Harbors, and Navigation

Under Chapter 30 of the Wisconsin Statutes, the Wisconsin Department of Natural Resources has the authority to regulate the deposition of materials upon the bed of any navigable body of water; the straightening or altering of stream courses; the dredging of material from the bed of a lake or river; the enlargement of any navigable waterway; and diversions from any body of water. Navigable waters include those wetland areas below the ordinary high-water mark of an adjacent navigable lake or stream. The issuance of a Chapter 30 permit for any of the above-mentioned activities in navigable waters would be subject to the policies stipulated in Chapter NR 1.95 of the Wisconsin Administrative Code, as described above, and to the provisions of the Wisconsin Environmental Policy Act, which established a state policy to encourage harmony between human activity and the environment, to promote efforts to reduce damage to the environment, and to stimulate an understanding of important ecological systems.

### Chapter 31, Regulation of Dams and Bridges Affecting Navigable Waters

Under Chapter 31 of the Wisconsin Statutes, the Wisconsin Department of Natural Resources has authority to regulate the location, construction, and operation of dams and bridges affecting a navigable body of water. The issuance of a Chapter 31 permit would also be subject to the policies stipulated in Chapter NR 1.95 of the Wisconsin Administrative Code and to the provisions of the Wisconsin Environmental Policy Act.

### Wisconsin Wetland Inventory

In response to public concern that many acres of wetlands throughout the State are being lost each year, the Wisconsin Legislature, in Chapter 23.32 of the Wisconsin Statutes, directed the conduct of a statewide wetlands inventory. Responsibility for this inventory and attendant mapping program was assigned by the Legislature to the Wisconsin Department of Natural Resources. The objective of the Wetlands Mapping Program is to systematically identify, delineate, and classify all wetlands of five acres or more in size in accordance with

statewide standards. For the purposes of this mapping program, the Legislature defined a wetland as "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions."<sup>3</sup> In accordance with this definition, wetlands ranging from cat-tail marshes, bogs, and tamarack swamps to areas covered by poorly drained soils and supporting wetland types of vegetation such as sedge meadows and shrub carrs are to be delineated in the inventory and mapping program.

The Wisconsin Department of Natural Resources contracted with the Regional Planning Commission to conduct the Wetland Mapping Program in southeastern Wisconsin. Historically, the Commission has identified and delineated wetlands in the Region as necessary for its planning programs. However, the Commission has now refined this past work in accordance with the state standards using aerial photographic interpretation.

The wetland areas for Kenosha County have been delineated on 1 inch equals 2,000 feet scale, ratioed and rectified aerial photographs. The mapped areas have been checked for consistency against U. S. Soil Conservation Service soil survey maps, the best available topographic maps, and the Commission's own historic wetland delineations. Field checks were conducted to verify the wetland boundaries. These wetland delineations are consistent with, and have been incorporated into, the various inventory maps which have been prepared for use in this planning program for the Chiwaukee Prairie-Carol Beach study area.

It should be noted that the wetland maps which have been prepared for Kenosha County are preliminary maps. Under the procedures established by the Department of Natural Resources and set forth in Chapter NR 115, such preliminary maps are provided to the counties concerned for review. Chapter NR 115 requires that the county zoning committee hold at least one public hearing to receive comments on accuracy and completeness of the preliminary wetland maps. Subsequently, the county zoning committee will meet with the Department of Natural Resources to discuss any changes to the maps recommended by the county. Finally, the Wisconsin wetlands inventory staff will prepare final wetland maps for the county. As previously noted, the county will then have six months to amend its shoreland zoning ordinance to protect the mapped wetlands.

### Review of Sanitary Sewerage System Plans

Under Chapter 144 of the Wisconsin Statutes, the Department of Natural Resources is required to review and take action to either approve, approve conditionally, or reject plans for proposed sewage treatment plants and sewerage systems, including all extensions of sanitary sewers. Chapter NR 110 of the Wisconsin Administrative Code sets forth the procedures to be followed and criteria to be used by the Department of Natural Resources in the review of such proposals. Under Section NR 110.08(4), all sewerage system plans must be in conformance with an approved areawide waste treatment management plan, if such a plan exists. As indicated in Chapter I, such a plan has been prepared and adopted by the Regional Planning Commission for the Southeastern Wisconsin Region and endorsed by the Wisconsin Department of Natural Resources. The recommendations of this plan are, however, necessarily general and do not reflect detailed local planning considerations. The sanitary sewer service area

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<sup>3</sup>Wis. Stats. 23.32(1).



recommendations of the land use management plan for the Chiwaukee Prairie-Carol Beach study area as set forth in Chapter V of this report are intended to constitute an amendment to the sewer service area recommendations contained in the regional plan and to be used by the Department of Natural Resources, as well as by the Regional Planning Commission, in the review of specific sewerage system proposals in the study area.

### Environmental Impact Statement

Under Section 1.11 of the Wisconsin Statutes, the Wisconsin Environmental Policy Act, each state agency is required to consider the environmental implications of all its actions and proposals. Before proceeding with any major action significantly affecting the quality of the environment, a detailed statement concerning the environmental effects of the proposed action and alternatives must be prepared.

The Wisconsin Department of Natural Resources has determined that, pursuant to the Wisconsin Environmental Policy Act, an environmental impact statement must be prepared for Department approval of an amendment of the areawide water quality management plan for the Chiwaukee Prairie-Carol Beach area. The Department has further determined that the environmental impact statement should also evaluate the environmental consequences of departmental approval of Kenosha County's shoreland-wetland zoning ordinance as it pertains to the definition of a sewer service area plan for the study area. The environmental impact statement was determined to be necessary because of the sensitive and unique environmental resources found in the Chiwaukee Prairie-Carol Beach area and the conflicting urban development and open space preservation objectives within the area.

Chapter NR 150 of the Wisconsin Administrative Code prescribes the contents of an environmental impact statement and related procedural requirements. Final Department action on an areawide water quality management plan amendment for the study area cannot be taken until the environmental impact statement process, as prescribed in Chapter NR 150 of the Wisconsin Administrative Code, has been completed. To avoid unnecessary delay and duplication of effort, the Department has determined that the environmental impact statement would be prepared concurrently with the Chiwaukee Prairie-Carol Beach planning program. This approach enabled the Department to proceed with analysis of alternative plan proposals and their environmental consequences under the environmental impact statement process in parallel with the planning work itself.

### COUNTY AND LOCAL LAND USE REGULATION

Two important types of land use regulation adopted and administered by Kenosha County--namely, floodplain regulations and shoreland regulations--were described in the section of this chapter on state policies and regulations. This section describes other county and local land use controls which have a direct bearing on the management of land use in the Chiwaukee Prairie-Carol Beach study area, including general zoning, subdivision control ordinances, and the county sanitary code and private sewerage system ordinances.

## General Zoning Ordinance

Zoning ordinances represent one of the most important means available to county and local units of government for managing land use in the public interest. In Wisconsin, counties may enact a general, or comprehensive, zoning ordinance covering all unincorporated areas of the county. Such a county zoning ordinance, however, becomes effective only in those towns which act to ratify the county ordinance.

Kenosha County adopted a new county zoning ordinance in 1983, replacing a zoning ordinance adopted by the County in 1959. The new county ordinance was subsequently adopted by the Town of Pleasant Prairie in 1984. Existing zoning districts in the Chiwaukee Prairie-Carol Beach area are shown on Map 19.

About 1,082 acres, or about 59 percent of the total study area, have been zoned for residential use. Specifically, about 922 acres have been placed in the R-5 Urban Single-Family Residential District; about 153 acres have been placed in the R-6 Urban Single-Family Residential District; and about 7 acres have been placed in the R-11 Multiple-Family Residential District (see Table 9). It should be noted that some of the areas which have been placed in the R-5 Urban Single-Family Residential District have also been placed in the UHO Urban Land Holding Overlay District. That overlay district indicates that the land is expected to undergo urban development in accordance with the underlying zoning district, but that such development is not permitted at the present time because of one or more deficiencies, such as the lack of essential services or the need to provide access to landlocked areas. New uses are not permitted in such areas until the overlay district is removed. About 179 acres, or about 19 percent of the land in the R-5 Urban Single-Family Residential District, have been placed in the UHO Urban Land Holding Overlay District.

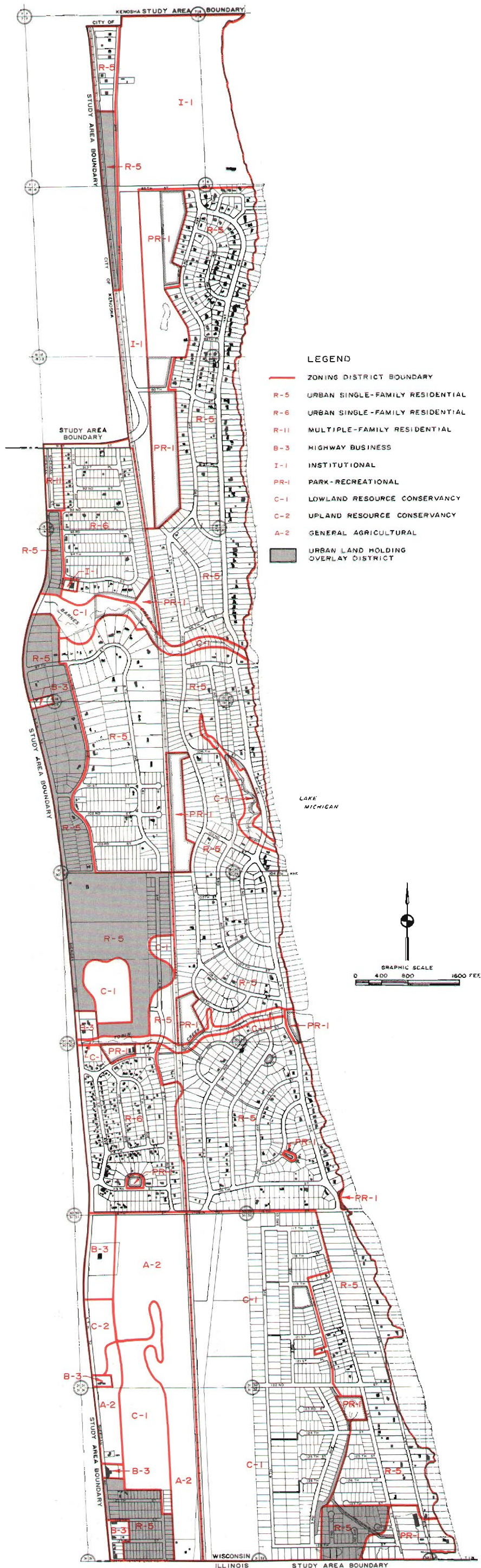
As indicated in Table 9, conservancy zoning districts account for about 359 acres, or about 20 percent of the study area. The C-1 Lowland Resource Conservancy District, which is intended to protect water, wetlands, and other areas that are not naturally drained, has been applied to 348 acres, or about 19 percent of the study area. The C-2 Upland Conservancy District, which is intended to protect significant woodlands, areas of rough topography, and related scenic areas, has been applied to about 11 acres, or less than 1 percent of the study area.

Zoning districts within the balance of the study area include the B-3 Highway Business District, which encompasses about 26 acres, or less than 2 percent of the study area; the I-1 Institutional District, which encompasses about 151 acres, or about 8 percent of the study area; the PR-1 Park-Recreational District, which encompasses about 108 acres, or about 6 percent of the study area; and the A-2 General Agricultural District, which encompasses about 99 acres, or about 5 percent of the study area.

## Subdivision Control Ordinances

Kenosha County approved and adopted a subdivision control ordinance in 1971. This ordinance governs the division of land in all unincorporated areas of the County. The Town of Pleasant Prairie has also adopted a subdivision control ordinance governing the division of land within the Town. Both ordinances set

EXISTING ZONING DISTRICTS IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA: 1984



Source: Kenosha County Department of Planning,  
Zoning and Sanitation; and SEWRPC.

forth procedures to be followed by the owner/developer in the submission of preliminary and final plats. The ordinances regulate the form of proposed urban development through design standards regarding streets and other development features. The division of land within the Town of Pleasant Prairie must be in accord with both the town and county ordinances. Where differences between the ordinances exist, the more stringent regulations shall be met.

### County Sanitary Code and Private Sewerage System Ordinance

A county sanitary code and private sewerage system regulatory ordinance became effective in Kenosha County in July 1980. This ordinance regulates the location, construction, installation, alteration, design, use, and maintenance of private waste disposal and private water systems in the County. Regulations in the ordinance pertaining to private sewerage systems apply throughout the County, including cities and villages as well as unincorporated areas. Sections 59.065 and 145.01(15) of the Wisconsin Statutes require that all Wisconsin counties, except counties with a population of 500,000 or more, adopt and administer an ordinance regulating private sewerage systems within the county.

The county sanitary code establishes site requirements for soil absorption sewage disposal systems, including percolation rates and minimum allowable depth to groundwater and bedrock. Under the ordinance, holding tanks are generally permitted to remedy failing conventional septic tank systems or failing mound systems. Holding tanks are also permitted to serve new construction on lots of record created on or before July 1, 1980. As noted in Chapter II of this report, there are more than 2,000 vacant lots in the study area within subdivisions recorded prior to this date.

### SUMMARY AND CONCLUSIONS

This chapter has described the various local, county, state, and federal regulatory measures which are particularly relevant to, and may have a bearing on, the management of land use within the Chiwaukee Prairie-Carol Beach study area. The most important findings of this chapter are summarized below.

1. The U. S. Army Corps of Engineers administers two regulatory programs for the management of water and adjacent wetlands--the federal Section 404 regulatory program and the federal Section 10 regulatory program. The Section 404 program, in particular, has a direct bearing on the use of wetlands in the Chiwaukee Prairie-Carol Beach area. Section 404 of the Water Pollution Control Act of 1972, as amended, requires the U. S. Army Corps of Engineers to regulate the discharge of dredged and fill materials into waters of the United States, including lakes, rivers, and adjacent wetlands. The Corps of Engineers has determined that most of the wetlands located east of the Chicago & North Western (C&NW) Railway right-of-way in the study area are subject to regulation through individual Section 404 permits. Thus, individual Section 404 permits are required for most activities involving the discharge of dredged or fill materials in these wetlands. Moreover, through an "advanced identification process," the Corps of Engineers has determined that the wetlands located east of the C&NW Railway right-of-way in the study area are generally unsuitable for the discharge of dredged or fill materials.



Table 9

**SUMMARY OF GENERAL ZONING DISTRICTS IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: 1984**

Zoning District	Principal Uses	Minimum Lot Requirements		Portion of Study Area in District	
		Area	Width	Acres	Percent of Study Area
R-5 Urban Single-Family Residential	One single-family dwelling; certain community living arrangements and foster family homes; essential services	10,000 square feet	75 feet	922 <sup>a</sup>	50.5
R-6 Urban Single-Family Residential	One single-family dwelling; certain community living arrangements and foster family homes; essential services	6,000 square feet	60 feet	153	8.4
R-11 Multiple-Family Residential	Multiple-family dwellings; certain community living arrangements and foster homes; essential services	20,000 square feet or 3,000 square feet per unit, whichever is greater	120 feet	7	0.4
B-3 Highway Business	Highway-oriented businesses and other specified business uses	10,000 square feet if sewered; 40,000 square feet if not sewered	75 feet if sewered; 150 feet if not sewered	26	1.4
I-1 Institutional	Churches; hospitals, sanitariums, nursing homes, and clinics; libraries, museums, and art galleries; private youth development organizations; public or private schools, colleges, and universities; public administrative offices and public service buildings; public utility offices	10,000 square feet if sewered; 40,000 square feet if not sewered	75 feet if sewered; 150 feet if not sewered	151	8.3
PR-1 Park-Recreational	Bike trails; boat rental and boat access sites; botanical gardens; cross-country ski trails; fairgrounds; historic monuments or sites; hiking and nature trails and walks; hunting and fishing clubs; neighborhood tot lots; outdoor skating rinks; parks and playgrounds; picnicking areas; playfields and athletic fields; ski hills without facilities; sledding, skiing, or tobogganing; tennis courts	--	--	108	5.9

Table 9 (continued)

Zoning District	Principal Uses	Minimum Lot Requirements		Portion of Study Area in District	
		Area	Width	Acres	Percent of Study Area
C-1 Lowland Resource Conservancy	Fishing; grazing; hunting; preservation of scenic, historic, and scientific areas; public fish hatcheries; public parks where left in a natural, undeveloped, open space use; sustained yield forestry; stream bank and lake-shore protection; water retention and wildlife preserves; agricultural uses, provided they do not involve extension of cultivated areas or extension of or creation of new drainage systems, and provided they do not substantially impair the natural fauna, flora, topography, or water regimen	--	--	348	19.1
C-2 Upland Resource Conservancy	Agricultural uses; hunting and fishing; preservation of scenic, historic, and scientific areas; forest and game management; park and recreation areas; one single-family dwelling	5 acres	300 feet	11	0.6
A-2 General Agricultural	General agricultural uses; one farm dwelling; essential services; animal hospitals, shelters, commercial boarding and riding stables, and veterinary services; certain community living arrangements and foster family homes; equestrian trails; riding academies	10 acres	300 feet	99	5.4

<sup>a</sup> A total of 179 acres, or 19 percent of the area in the R-5 Urban Single-Family Residential District, have also been placed in the UHO Urban Land Holding Overlay District. That Overlay District indicates that the land is expected to undergo further urban development in accordance with the underlying zoning, but that such development is not permitted at the present time because of the existence of one or more deficiencies such as the lack of essential services or the need to provide access to landlocked lands. New uses are not permitted until the overlay district is removed.

Source: Kenosha County Office of Planning and Zoning Administration; and SEWRPC.

While this does not preclude the granting of Section 404 permits, it does provide a preliminary indication that the granting of such a permit would be unlikely.

2. Under Section 10 of the River and Harbor Act of 1899, the U. S. Army Corps of Engineers regulates structures or work in or affecting the navigable waters of the United States, including Lake Michigan. Section 10 regulations apply to commercially navigable waters, and associated wetlands, up to the ordinary high-water mark. Under Section 10 of the River and Harbor Act, permits are required for the placement of structures--including, but not limited to, piers, breakwaters, bulkheads, revetments, permanent mooring structures, and power transmission lines--below the ordinary high-water mark of navigable waters.
3. The Wisconsin Department of Natural Resources administers a variety of regulatory programs that are intended to protect and preserve the natural resource base, including shoreland, floodplain, navigable waters, and sanitary sewer regulatory programs. The shoreland and sanitary sewer regulatory programs have a particularly important bearing on the management of the natural resource base of the study area. Under Section 59.971 of the Wisconsin Statutes, counties of the State are required to regulate shorelands within unincorporated areas. Shorelands are defined as lands within the following distances of the ordinary high-water mark of navigable waters: 1,000 feet from a lake, pond, or flowage; and 300 feet from a river or stream, or to the landward side of a floodplain, whichever distance is greater. Under Chapter NR 115 of the Wisconsin Administrative Code, county shoreland regulations must include restrictions on lot sizes, building setbacks, and filling and grading. Moreover, under Chapter NR 115, wetlands five acres or more in size located within the statutory shoreland zoning jurisdiction area must be placed in a shoreland-wetland zoning district. Kenosha County has adopted shoreland regulations governing shorelands in the unincorporated area of the County. The County has not, however, placed all of the wetlands located within the shoreland jurisdiction area of the study area in a shoreland-wetland zoning district.
4. Under Chapter 144 of the Wisconsin Statutes, the Wisconsin Department of Natural Resources is required to review and take action to either approve, approve conditionally, or reject plans for proposed sewage treatment plants and sanitary sewer extensions. Under Section NR 110.08(4) of the Wisconsin Administrative Code, all sewerage system plans must be in conformance with an approved areawide wastewater treatment management plan, if such a plan exists. Such a plan has been prepared and adopted for southeastern Wisconsin by the Regional Planning Commission and endorsed by the Wisconsin Department of Natural Resources. The recommendations of the plan are, however, necessarily general and do not reflect detailed local planning considerations. The sanitary sewer service area recommendations of the land use management plan set forth in this report are intended to constitute an amendment to the sewer service area recommendations of the regional plan and to be used by the Department of Natural Resources, as well as by the Regional Planning Commission, in the review of specific sewer extension proposals in the study area.

5. In Wisconsin, counties may enact a general, or comprehensive, zoning ordinance covering all unincorporated areas of the county. Such a county zoning ordinance, however, becomes effective only in those towns which act to ratify the county ordinance. Kenosha County adopted a new county zoning ordinance in 1983, replacing a zoning ordinance adopted by the County in 1959. The new zoning ordinance was ratified by the Town of Pleasant Prairie in 1984. Under that zoning ordinance, about 1,082 acres, or about 59 percent of the study area, have been placed in residential zoning districts, including 922 acres in the R-5 Urban Single-Family Residential District, 153 acres in the R-6 Urban Single-Family Residential District, and 7 acres in the R-11 Multiple-Family Residential District. About 359 acres, or about 20 percent of the study area, have been placed in conservancy zoning districts, including 348 acres in the C-1 Lowland Resource Conservancy District, and 11 acres in the C-2 Upland Resource Conservancy District. Other zoning districts in the study area include the B-3 Highway Business District--26 acres, or less than 2 percent of the study area; the I-1 Institutional District--151 acres, or about 8 percent of the study area; the PR-1 Park-Recreational District--108 acres, or about 6 percent of the study area; and the A-2 General Agricultural District--99 acres, or about 5 percent of the study area.
6. A county sanitary code and private sewerage system regulatory ordinance became effective in Kenosha County in July 1980. This ordinance regulates the location, construction, installation, alteration, design, and use of private waste disposal and private water systems in the County. It should be noted that, under the ordinance, holding tanks are generally permitted to remedy failing septic tank systems and, moreover, are permitted to serve new construction on lots of record created on or before July 1, 1980. As noted in Chapter II of this report, there are more than 2,000 vacant lots in the study area within subdivisions recorded prior to that date.

As indicated above, the use of land within the Chiwaukee Prairie-Carol Beach area--particularly the use of wetlands--is subject to regulation at the local, state, and federal levels of government. Regulations of the U. S. Army Corps of Engineers require individual permits for fill activities within most of the wetland areas located east of the C&NW Railway right-of-way, and the Corps of Engineers has determined, through an advanced identification process, that those wetlands are generally unsuitable for such activities. State law requires that counties act to place wetlands that are located within the statutory shoreland jurisdiction area in a conservancy zoning district, thus potentially prohibiting urban development in many wetland areas in the Chiwaukee Prairie-Carol Beach area. The Kenosha County zoning ordinance precludes urban development in certain wetland areas in the Chiwaukee Prairie-Carol Beach area, and permits urban development in other wetland areas, including many within the statutory shoreland jurisdiction area. One of the primary objectives of this planning program is the achievement of a consensus among the concerned agencies and units of government regarding the significance of the environmental values in the Chiwaukee Prairie-Carol Beach study area, and the need for the preservation in open space use of specific areas, thereby providing a common basis for the administration of the various regulatory authorities.



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## Chapter IV

### ALTERNATIVE LAND USE MANAGEMENT PLANS

#### INTRODUCTION

As noted in Chapter I of this report, the primary purpose of the Chiwaukee Prairie-Carol Beach planning program is to develop a land use management plan which reconciles valid but sometimes conflicting open space preservation and urban development objectives within the study area. Such a plan should, at a minimum, identify areas which may be developed in urban use and areas which should be preserved in an essentially natural, open condition. In addition, such a plan should identify areas which should be provided with public sanitary sewer service.

A series of three basic alternative land use management plans has been developed for the Chiwaukee Prairie-Carol Beach area, each proposing a different development-preservation pattern for the area. The three plans are: 1) a maximum development plan; 2) a maximum preservation plan; and 3) a combination development-preservation plan. While many variations of these basic alternative plans are possible, it is believed that the three alternative plans described in this chapter are representative of the basic, practical options available for the area.

As its name implies, the maximum development plan envisions the highest level of development among the alternatives. Under this plan, the vast majority of platted lots in the area would be developed in residential use, regardless of the natural resource values which they encompass.

Conversely, the maximum preservation plan envisions the most extensive preservation of open space among the alternatives. This plan envisions the preservation of almost all areas of environmental significance in the area, including substantial areas which have been subdivided into residential lots. This plan further envisions the restoration of certain environmentally significant areas which have been partially developed for urban use.

The combination development-preservation plan represents a conscious attempt to accommodate significant urban development within the area, while preserving the most important natural features of the area. The plan stands, in effect, as a middle ground between the maximum development and maximum preservation plans.

#### BASIC PLAN CONCEPTS

Certain basic concepts which apply to each of the plan alternatives warrant explicit presentation.

1. As land use and management plans, the alternative plans identify and set forth proposals for generalized, rather than detailed, categories of land use. Each plan includes proposals regarding the location and extent of areas to be allocated to "urban," "open space preservation," and "rural" uses within the area. Those areas identified in the plans as urban would be devoted primarily to single-family residential use,

but could also encompass limited amounts of other urban uses, including intensive recreational and limited commercial and institutional uses. Those areas identified as open space preservation areas would be maintained in essentially an open, natural condition. Those areas identified in the plans as rural would be devoted primarily to agricultural use.

2. As noted above, each of the alternative plans includes open space preservation areas. These areas contain concentrations of significant natural resources within the study area which serve several important functions. Among these functions are the protection of surface water and groundwater quality, the provision of food and cover for wildlife which live in, or migrate through, the study area, and the provision of opportunities for scientific or educational, as well as recreational, pursuits. The conservation and wise use of the natural resources of the area can contribute to the sound physical, social, and economic development of the area, and provide a healthy and attractive environment in which to live. Thus, to the extent possible under the assumptions of the specific alternatives, the alternatives identify open space preservation areas which contain natural resources that should be preserved.
3. The alternative plans envision that certain lands within the open space preservation areas will be acquired over time at fair market value, assuming a willing buyer and a willing seller. Acquisition provides the greatest assurance that open space areas will be permanently preserved in a natural, open condition. While the emphasis in the alternative plans is on the acquisition of platted lands, unplatted lands could also be acquired depending on the interests of the parties involved in acquiring the land. Estimates of the open space acquisition costs for platted lands have been developed for each alternative plan, based upon assessed property values.<sup>1</sup> The open space acquisition proposals presented in this chapter should be considered preliminary in nature and subject to revision, as plan implementation recommendations are formulated, following the selection of a recommended plan.
4. The maximum development, maximum preservation, and combination development-preservation plan alternatives are all described under ultimate development conditions--that is, assuming development of all residential lots within the areas identified for urban use under each plan. Estimates of the number of housing units within the area under ultimate development conditions for each respective plan were made assuming that all remaining platted lots would be developed as individual home sites.<sup>2</sup> The actual number of housing units under ultimate development conditions could be somewhat lower than projected, however, depending upon the

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<sup>1</sup>Under the countywide assessment program in Kenosha County, the assessed valuation of property is intended to represent full market value, as determined by the county assessor. Property values as indicated on the 1981 assessment roll were used in the estimation of open space acquisition costs.

<sup>2</sup>In estimating the number of housing units under ultimate development conditions, it was assumed that no additional housing units would be constructed on partially eroded lots along the Lake Michigan shoreline where the distance between the street right-of-way and the inland edge of the beach was less than 200 feet.

extent to which property owners, particularly owners of small lots, combine two or more platted lots to create larger home sites. The growth of the area may be expected to be influenced by a number of other factors as well, including the availability and cost of public facilities and services, the physical suitability--including soil suitability--of the area for residential development, the overall quality of the environment of the area, accessibility, and the general demand for housing in the Kenosha area.

Estimates of the resident population levels within the study area under ultimate development conditions under each alternative plan were derived from the anticipated number of housing units. The population estimates assume that all additional housing units constructed within the study area will be intended for year-round occupancy; that those housing units now used on a seasonal basis, which comprised about 10 percent of the housing units in the study area in 1980, will eventually be converted to year-round occupancy; that the vacancy rate will approximate 3 percent; and that, under ultimate development, the average household size in the study area will approximate 3.0 persons per household, a decline from the average household size in the study area of 3.2 persons in 1980 and 3.5 persons in 1970.

5. The maximum development, maximum preservation, and development-preservation plans all envision that public sanitary sewer service and water supply service will be eventually extended to all urban areas identified in the respective plans. The plans also envision that required street improvements and improvements to the stormwater drainage system will be undertaken as needed and as development occurs. The capital costs attendant to these public improvements have been estimated for each alternative plan.

The alternative plans envision that sanitary sewage from the study area will be conveyed to the City of Kenosha sewerage system for treatment and disposal. The sewerage system costs presented in this chapter represent the costs of constructing the sewage collection system required to serve the urban areas identified under the respective plans. The cost of the trunk sewer from the City of Kenosha along 7th Avenue and Sheridan Road, proposed in the Town's long-range sewerage system plan, is not included.<sup>3</sup>

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<sup>3</sup>Under the sanitary sewerage system plans conceptualized for the purpose of estimating public improvement costs for each alternative plan, the proposed trunk sewer along 7th Avenue and Sheridan Road would be used for the conveyance of at least a portion of the sewage from the study area to the Kenosha sewage treatment plant, with the plans differing somewhat in the extent of reliance on that trunk sewer. The cost of the trunk sewer was not included in the cost estimates of the sanitary sewage collection systems for the study area under the respective plans, although the cost of any needed building sewers from the trunk sewer to the lot lines of lots fronting Sheridan Road was included. The Town Engineer has indicated that the trunk sewer along 7th Avenue and Sheridan Road has been proposed and sized primarily to serve portions of the Town lying west of Sheridan Road, and that the design capacity and cost of the trunk sewer would not be substantially affected by the level of development proposed east of Sheridan Road. It has not yet been determined how the cost of the trunk sewer will be borne locally. It is possible that owners of property in the study area could be assessed a portion of that cost.



Public water supply service is presently provided within the residential area north of 90th Street and east of 7th Avenue. Service here is provided by the Pleasant Prairie Water Utility, which obtains water on a wholesale basis from the Kenosha Water Utility. The alternative plans envision that this service will be maintained and that public water supply service will be extended to all other urban areas.

The alternative plans further envision that the study area will be served by all-weather streets with rural cross-sections; that is, with road ditches, culverts, and skeletal storm sewer systems and without curbs and gutters and full storm sewer systems. Roadway conditions within the study area are presently highly varied. Certain roads have an asphalt surface and are in good condition, requiring no improvement at this time. Others are gravel roads, or asphalt or penetration macadam-surfaced roads in poor condition. In addition, certain dedicated road segments have never been constructed or have been overtaken by vegetation subsequent to initial construction. The road improvement costs presented in this chapter represent the costs of constructing or reconstructing required local roads to a good asphalt surface.

The alternative plans envision that stormwater drainage within the study area will be primarily through roadside ditches and open drainage channels. An estimate of the cost of grading or regrading roadside ditches and of drainage channel improvements has been prepared for each alternative plan.

It should be noted that the costs of constructing sanitary sewer and water supply systems and the cost of stormwater drainage improvements under the respective plans have been estimated assuming moderately wet subsurface conditions. Extremely wet subsurface conditions could be expected to result in somewhat higher public improvement costs, while dry subsurface conditions could be expected to result in somewhat lower public improvement costs, with sanitary sewer construction costs likely to be the most significantly affected.<sup>4</sup> More precise estimates of public improvement costs would be developed as preliminary engineering work is undertaken.

6. Although it is a serious problem within the study area, Lake Michigan shoreline erosion was not directly addressed in the alternative plans. Certain shoreland property, including certain public street segments, are particularly susceptible to damage or loss due to shoreline erosion, and further shoreline recession may be expected to occur without adequate shore protection. The projected 50-year nonstructural erosion risk line has been identified on each of the alternative plan maps to illustrate the potential extent of this problem. This line identifies those areas which may be expected to be affected by shoreline erosion during the next 50 years if no additional structural protection is undertaken.

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<sup>4</sup>The sanitary sewer system cost estimates were developed assuming moderately wet and stable-consolidated excavation conditions. The overall sanitary sewer construction costs for the respective plans could be expected to be up to 25 percent higher if excavation conditions are extremely wet and unstable, and up to 10 percent lower if excavation conditions are relatively dry and stable.

In the preparation of the alternative plans, it was assumed that structural shore protection would be provided to prevent any substantial shoreland loss and that the existing Lake Michigan shoreline would remain essentially intact. It is estimated that the cost of installing shore protection structures along shoreline reaches which are not effectively protected by such structures would be \$4.7 million.<sup>5</sup> In addition, substantial costs for the maintenance of shore protection structures may be expected to be incurred. The Town, in conjunction with the property owners concerned, must determine whether structural shore protection is a financially feasible and cost-effective solution to the serious shoreline erosion problems in the area. If, and where, shore protection is found to be an inappropriate solution, existing housing units may ultimately have to be relocated and existing streets realigned. This matter should be studied by the Town before any further major public improvements or private development are undertaken within erosion-threatened areas.

7. As indicated in Chapter II, the 100-year recurrence interval floodplains along streams in the Chiwaukee Prairie-Carol Beach area are generally very narrow. The largest floodplain area is located between 1st Avenue and 3rd Avenue, north of 115th Street, along an unnamed tributary to Lake Michigan (see Map 9 in Chapter II). In the preparation of the alternative plans, it was assumed that this floodplain area will be significantly reduced through the installation of larger culverts and minimal channel improvements, with the result being that most existing platted lots in the area could be developed for residential use.

The following discussions of the alternative land use management plans describe the proposed urban, open space preservation, and rural areas envisioned; estimate the attendant housing unit and population levels; describe the proposed open space acquisition measures; describe the proposed sanitary sewer service areas; and estimate the related public infrastructure costs. For each alternative plan, pertinent data are presented for the five subareas of the study area shown on Map 2 in Chapter II of this report. A comparison of the alternative plans is presented in the final section of this chapter.

## MAXIMUM DEVELOPMENT PLAN

The maximum development plan envisions an extensive area of urban use within the study area, with substantial additional development, primarily single-family residential development, occurring both east and west of the Chicago &

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<sup>5</sup>This cost estimate is based on the application of a unit cost of \$330 per foot--the estimated unit cost of installing shore protection structures with a life expectancy of 25 years or more in this area--to the total shoreline length which is not effectively protected. Based upon aerial photograph inspection and the findings of a field survey of shore protection structures conducted under the Wisconsin Coastal Management Program in 1976, it has been estimated that shoreline reaches totaling 2.7 miles, or 56 percent of the length of the Lake Michigan shoreline within the study area, are not protected by functional structures. It should be noted that the total cost of shore protection could be higher than estimated if a need develops for major improvements to structures along those reaches which were assumed to be effectively protected.

North Western Transportation Company (C&NW) railway right-of-way (see Map 20). The maximum development plan envisions that the vast majority of vacant, platted lots in the study area will be developed for single-family residential use. The notable exceptions to this are the vacant lots within, and adjacent to, the presently defined project area of The Nature Conservancy in Subarea E, and the bulk of the vacant lots within the platted subdivision located in Subarea D,<sup>6</sup> these lots being envisioned to be maintained in open space or rural uses. The maximum development plan also envisions that certain unplatted lands adjacent to Sheridan Road in Subarea D will be converted to urban use, assuming that sanitary sewer service is eventually extended along Sheridan Road (STH 32) to the Wisconsin-Illinois border. In addition, certain unplatted lands located east of Sheridan Road, south of 104th Street, would be converted to urban use, assuming the eventual extension of sanitary sewer service to adjacent platted areas. The urban area proposed under the maximum development plan encompasses about 1,090 acres, or about 60 percent of the study area (see Table 10).

Under the maximum development plan, the open space preservation area would consist primarily of 1) wetland-prairie areas within or adjacent to the presently defined project area of The Nature Conservancy<sup>7</sup>; 2) lands already held by the Town which encompass significant natural resource features; and 3) those privately held lands within the study area which contain significant natural resource features but which have not been platted for residential development.<sup>8</sup> It should be noted with respect to The Nature Conservancy project area that, while the objective of the plan is the preservation of open space lands within that area, if The Nature Conservancy is unable to acquire the lands in question over time, actual development could reflect a different configuration of urban and open space preservation uses in this area.

The open space preservation area proposed under the maximum development plan encompasses about 604 acres, or about 33 percent of the study area. As shown on Map 20, the open space preservation area proposed under the maximum development plan would be somewhat disjointed, and would consist, in effect, of a series of isolated natural areas.

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<sup>6</sup>Platted in 1924, this subdivision remains undeveloped and unimproved except for certain lots adjacent to, or in the immediate vicinity of, Sheridan Road. The portion of this subdivision not included within the urban area proposed under the maximum development plan encompasses 97 lots. Assuming a 3 percent vacancy rate and an average household size of 3.0 persons per household, these lots could accommodate a population of 282 persons upon full development.

<sup>7</sup>The portion of The Nature Conservancy project area located east of 1st Avenue, south of 116th Street--which encompasses 10 platted lots, most of which have been significantly lost to shoreline erosion or developed in residential use--is not included in the proposed open space preservation area.

<sup>8</sup>Within the unplatted portion of the study area, the open space preservation area was identified through an application of the environmental corridor mapping technique described in Chapter II of this report. Within the unplatted areas, the proposed open space preservation area includes those wetlands, woodlands, prairies, and wildlife habitat areas which would ordinarily be included in an environmental corridor or isolated natural area.

Table 10

**PROPOSED GENERALIZED LAND USE IN THE CHIWAUKEE PRAIRIE-  
CAROL BEACH STUDY AREA UNDER THE MAXIMUM DEVELOPMENT PLAN**

Generalized Land Use Category <sup>a</sup>	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Urban Area.....	108	37.5	404	86.5	437	90.3	31	15.8	110	28.2	1,090	59.7
Open Space Preservation Area..	180	62.5	63	13.5	47	9.7	34	17.4	280	71.8	604	33.1
Rural Area.....	--	--	--	--	--	--	131	66.8	--	--	131	7.2
<b>Total</b>	<b>288</b>	<b>100.0</b>	<b>467</b>	<b>100.0</b>	<b>484</b>	<b>100.0</b>	<b>196</b>	<b>100.0</b>	<b>390</b>	<b>100.0</b>	<b>1,825</b>	<b>100.0</b>

<sup>a</sup> Includes street and railroad rights-of-way within the respective areas.

Source: SEWRPC.



Under the maximum development plan, rural areas, devoted primarily to agricultural use, would be confined to Subarea D in the southwestern portion of the study area and would encompass about 131 acres, or about 7 percent of the total study area.

### Population and Housing

Assuming the development of virtually all remaining platted lots within the proposed urban area as individual home sites,<sup>9</sup> the housing stock in the study area would increase from 512 housing units in 1980 to 2,034 housing units upon full development--an increase of 1,522 housing units, or an almost four-fold increase in such units within the study area (see Table 11). Assuming a 3 percent housing vacancy rate and an average household size of 3.0 persons per household, the population of the study area could be expected to increase to about 5,922 persons under ultimate development conditions, an increase of 4,520 persons over the 1980 level (see Table 12).

### Open Space Acquisition

A total of 213 acres, or about 35 percent of the open space preservation area proposed under the maximum development plan, are presently held by the Town of Pleasant Prairie, the University of Wisconsin, or The Nature Conservancy. As indicated in Table 13, the maximum development plan envisions that an additional 98 acres, or about 16 percent of the proposed open space preservation area, will be acquired in the public interest for preservation. The plan further envisions that about 243 acres, or about 40 percent of the proposed open space preservation area, will continue to be held in private ownership. Existing street and railway rights-of-way account for the balance--about 50 acres, or about 8 percent--of the proposed open space preservation area.

As shown on Map 21, open space lands proposed for acquisition under the maximum development plan would all be located within, or adjacent to, the presently defined project area of The Nature Conservancy. Based upon locally assessed property values, the cost of acquiring these lands, which include 177 platted lots and one unsubdivided parcel, would approximate \$172,600.

### Sanitary Sewer Service Area

The maximum development plan envisions that, during the next 20 years, public sanitary sewer service will be extended to all areas designated for urban use under the plan--areas which, as previously noted, encompass about 1,090 acres, or about 60 percent of the study area (see Map 20). The plan further envisions that, as sanitary sewers are installed to serve the identified urban areas, existing housing units within the open space preservation area which are proposed to be retained indefinitely will be connected to the sewerage system. Sanitary sewer service would not be extended to any other portions of the open space preservation area.

### Public Infrastructure Costs

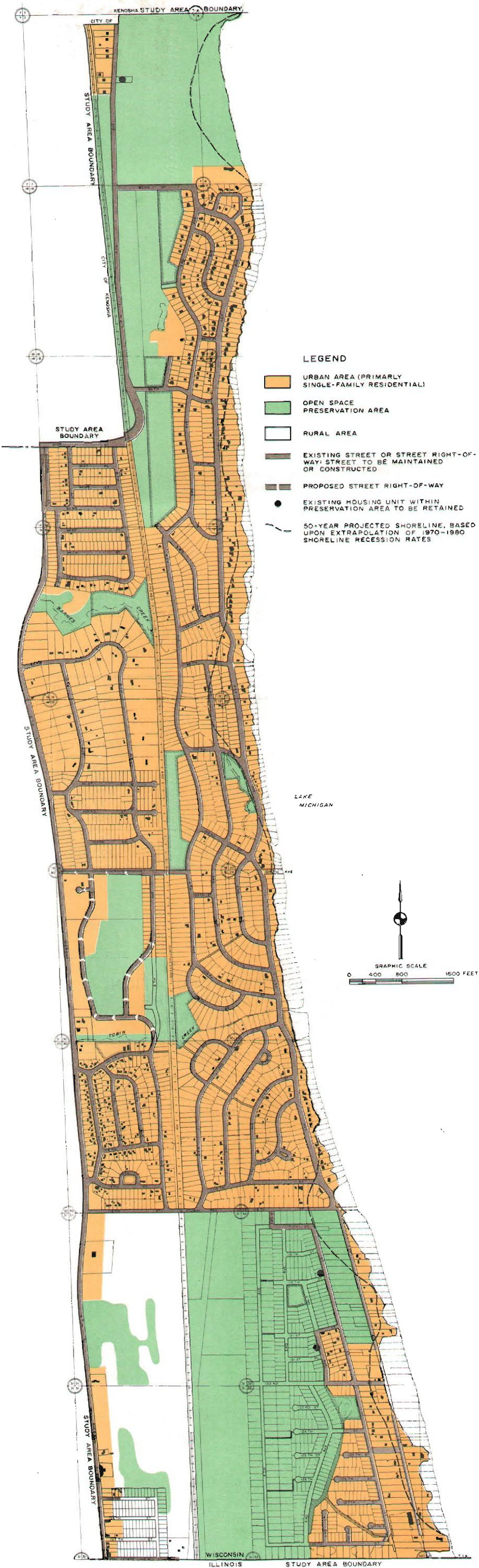
As noted above, the maximum development plan envisions that public sanitary sewer service will be provided within all of the proposed urban areas. The

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<sup>9</sup>It was assumed that nine undeveloped lots adjacent to the Trident Marina would be developed in marina-related, rather than residential, use.

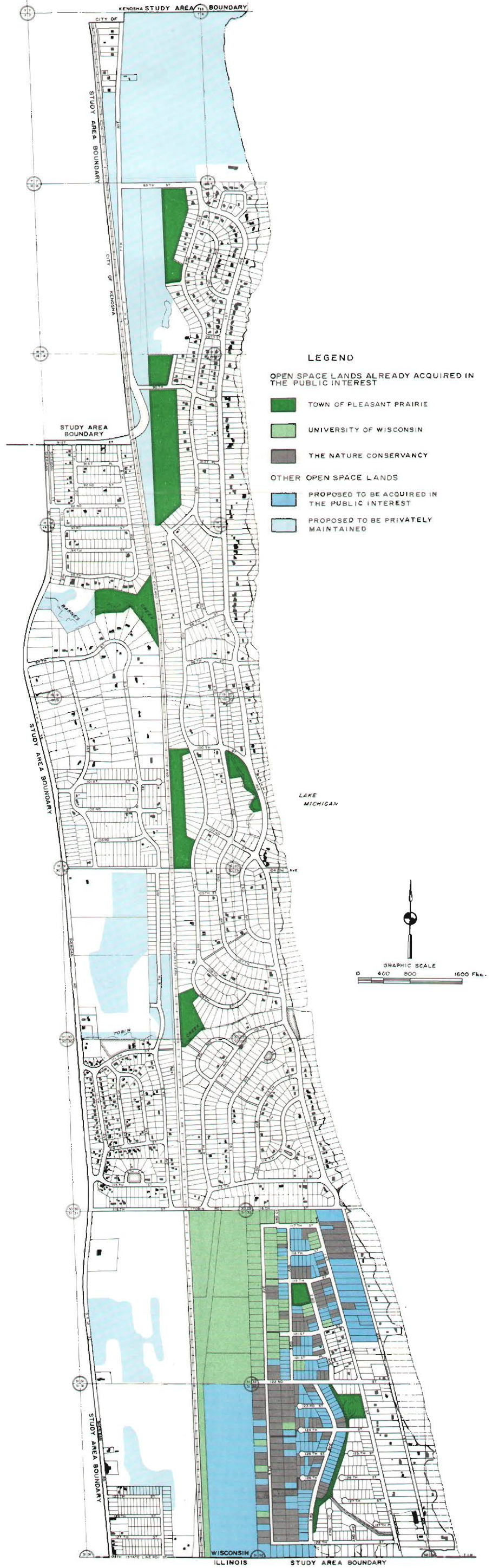


MAXIMUM DEVELOPMENT PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH AREA  
OF THE TOWN OF PLEASANT PRAIRIE



Source: SEWRPC.

PROPOSED OWNERSHIP OF LAND WITHIN  
THE OPEN SPACE PRESERVATION AREA  
UNDER THE MAXIMUM DEVELOPMENT PLAN



Source: SEWRPC.



Table 11

**EXISTING HOUSING UNITS (1980) AND PROPOSED  
HOUSING UNITS UNDER THE MAXIMUM DEVELOPMENT PLAN  
FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Housing Units			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	113	179	66	58.4
B	190	735	545	286.8
C	163	938	775	475.5
D	9	16	7	77.8
E	37	166	129	348.6
Total Study Area	512	2,034	1,522	297.3

Source: SEWRPC.

Table 12

**EXISTING POPULATION (1980) AND PROPOSED POPULATION  
UNDER THE MAXIMUM DEVELOPMENT PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Population			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	324	522	198	61.1
B	607	2,139	1,532	252.4
C	377	2,730	2,353	624.1
D	27	48	21	77.8
E	67	483	416	620.9
Total Study Area	1,402	5,922	4,520	322.4

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

plan also envisions that public water supply service will be provided within all urban areas and that required street and stormwater drainage improvements will be made as the area develops. A rural street cross-section is envisioned; thus, local streets would be asphalt surface without curb and gutter, drainage being primarily through roadside ditches and open drainage channels.

As indicated in Table 14, the capital cost of public improvements envisioned under the maximum development plan would approximate \$14.76 million. Construction of a sanitary sewerage system within the study area could be expected to cost \$7.23 million. Construction of a water distribution system could be

Table 13

**PROPOSED OWNERSHIP OF PROPERTY WITHIN THE OPEN SPACE  
PRESERVATION AREA UNDER THE MAXIMUM DEVELOPMENT PLAN**

Proposed Ownership of Property Within Preservation Area	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Property Presently Held in the Public Interest, Proposed to be Retained:												
Town of Pleasant Prairie.....	14	7.8	8	12.7	36	76.6	--	--	9	3.2	67	11.1
University of Wisconsin.....	--	--	--	--	--	--	--	--	91	32.5	91	15.1
The Nature Conservancy.....	--	--	--	--	--	--	--	--	55	19.7	55	9.1
Subtotal	14	7.8	8	12.7	36	76.6	--	--	155	55.4	213	35.3
Existing Private Property, Proposed to be Acquired in the Public Interest.....	--	--	--	--	--	--	--	--	98	35.0	98	16.2
Existing Private Property, Proposed to be Retained.....	150	83.3	51	81.0	8	17.0	34	100.0	-- <sup>a</sup>	--	243	40.2
Other Property: Existing Street and Railroad Rights-of-Way.....	16	8.9	4	6.3	3	6.4	--	--	27	9.6	50	8.3
Total Open Space Preservation Area	180	100.0	63	100.0	47	100.0	34	100.0	280	100.0	604	100.0

<sup>a</sup> Less than 0.5 acre.

Source: SEWRPC.



Table 14

**COST OF PUBLIC IMPROVEMENTS UNDER  
THE MAXIMUM DEVELOPMENT PLAN**

Subarea	Estimated Public Improvement Costs				
	Sanitary Sewer Collection System	Water Supply Distribution System	Local Street Improvements	Stormwater Drainage Improvements	Total
A	\$1,065,000	\$ 105,000	\$ 5,000	\$ 194,000	\$ 1,369,000
B	2,171,000	2,165,000	298,000	469,000	5,103,000
C	3,267,000	2,192,000	483,000	601,000	6,543,000
D	29,000	179,000	21,000	20,000	249,000
E	694,000	457,000	213,000	131,000	1,495,000
Total	\$7,226,000	\$5,098,000	\$1,020,000	\$1,415,000	\$14,759,000

Source: SEWRPC.

expected to cost \$5.10 million. Construction or reconstruction of local streets within the study area could be expected to cost \$1.02 million. Stormwater drainage improvements could be expected to cost \$1.41 million.

#### MAXIMUM PRESERVATION PLAN

The maximum preservation plan envisions an extensive area devoted to open space preservation, including most of the areas of environmental significance remaining within the study area. In the identification of the areas to be preserved in essentially natural, open uses under this plan, a distinction was made between platted and unplatted lands. Within the unplatted portion of the study area, the open space preservation area was identified through an application of the environmental corridor mapping technique described in Chapter II of this report. Thus, within the unplatted areas, the proposed open space preservation area includes those wetlands, woodlands, prairies, wildlife habitat areas, and other natural features which would ordinarily be included within an environmental corridor or isolated natural area.

Within the platted portion of the study area, the proposed open space preservation area includes all wetlands and high-value upland prairie areas, excluding, however, those areas which are isolated or which encompass larger concentrations of housing units. Within the platted portions of the study area, upland areas classified as low- or medium-value prairie areas<sup>10</sup> were not included in the open space preservation area unless they encompassed other identifiable natural features or provided a link between identified wetlands or high-value upland prairies.

<sup>10</sup>Prairie value ratings reflect the diversity of prairie plants present, the integrity of the plant community, and the extent of human disturbance. Definitions of high-, medium-, and low-value prairies are presented in Chapter II of this report.

The proposed open space preservation area encompasses about 1,044 acres, or about 57 percent of the study area (see Table 15). As shown on Map 22, the proposed preservation area is essentially an elongated corridor connecting the Kenosha Sand Dunes on the north end of the study area with the Chiwaukee Prairie on the south end.

The maximum preservation plan anticipates the development of almost all the platted residential lots located outside the identified open space preservation area. The notable exception is the unimproved subdivision located in Subarea D, where the majority of the platted lots would remain in open space or rural uses. Like the maximum development plan, the maximum preservation plan envisions that certain unplatted lands will be converted to urban use. Specifically, certain unplatted lands adjacent to Sheridan Road in Subarea D would be converted to urban use, assuming that sanitary sewer service is eventually extended along Sheridan Road (STH 32) to the Wisconsin-Illinois border. In addition, certain unplatted lands east of Sheridan Road, south of 104th Street, would be converted to urban use, assuming the eventual extension of sanitary sewer service to adjacent platted areas.

The urban area proposed under the maximum preservation plan encompasses about 650 acres, or about 36 percent of the study area. As shown on Map 22, new urban development would occur primarily on the west side of the C&NW Railway right-of-way, although some additional development would occur east of that right-of-way, particularly in Subarea C.

Under the maximum preservation plan--as under the maximum development plan--a rural area, consisting primarily of agricultural land, would be located in the southwestern portion of the study area and would encompass about 131 acres, or about 7 percent of the total study area.

### Population and Housing

Assuming the development of virtually all remaining platted lots within the proposed urban area as individual home sites,<sup>11</sup> the housing stock in the study area would increase from 512 housing units in 1980 to 989 housing units upon full development--an increase of 477 housing units, or about 93 percent (see Table 16). Assuming a 3 percent housing vacancy rate and an average household size of 3.0 persons per household, the population of the study area could be expected to increase to about 2,880 persons under ultimate development conditions, an increase of 1,478 persons over the 1980 level (see Table 17).

### Open Space Acquisition

A total of 218 acres, or 21 percent of the open space preservation area proposed under the maximum preservation plan, is presently held by the Town of Pleasant Prairie, Kenosha County, the University of Wisconsin, and The Nature Conservancy. As indicated in Table 18, the maximum preservation plan envisions that an additional 444 acres, or about 42 percent of the open space preservation area, will be publicly or privately acquired for preservation. The plan further envisions that about 258 acres, or about 25 percent of the proposed

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<sup>11</sup>It was assumed that nine undeveloped lots adjacent to the Trident Marina would be developed in marina-related, rather than residential, use.

Table 15

**PROPOSED GENERALIZED LAND USE IN THE CHIWAUKEE PRAIRIE-  
CAROL BEACH STUDY AREA UNDER THE MAXIMUM PRESERVATION PLAN**

Generalized Land Use Category <sup>a</sup>	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Urban Area.....	108	37.5	329	70.4	114	23.6	31	15.8	68	17.4	650	35.6
Open Space												
Preservation Area..	180	62.5	138	29.6	370	76.4	34	17.4	322	82.6	1,044	57.2
Rural Area.....	--	--	--	--	--	--	131	66.8	--	--	131	7.2
<b>Total</b>	<b>288</b>	<b>100.0</b>	<b>467</b>	<b>100.0</b>	<b>484</b>	<b>100.0</b>	<b>196</b>	<b>100.0</b>	<b>390</b>	<b>100.0</b>	<b>1,825</b>	<b>100.0</b>

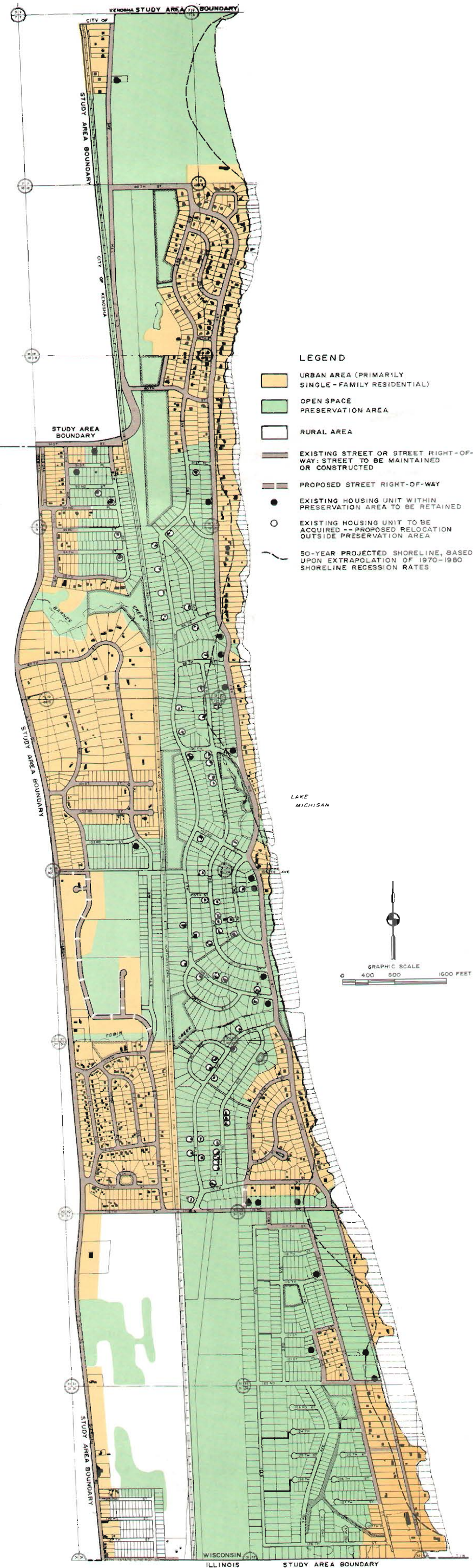
<sup>a</sup> Includes street and railroad rights-of-way within the respective areas.

Source: SEWRPC.



Map 22

MAXIMUM PRESERVATION PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH AREA  
OF THE TOWN OF PLEASANT PRAIRIE



Map 23

PROPOSED OWNERSHIP OF LAND WITHIN  
THE OPEN SPACE PRESERVATION AREA  
UNDER THE MAXIMUM PRESERVATION PLAN

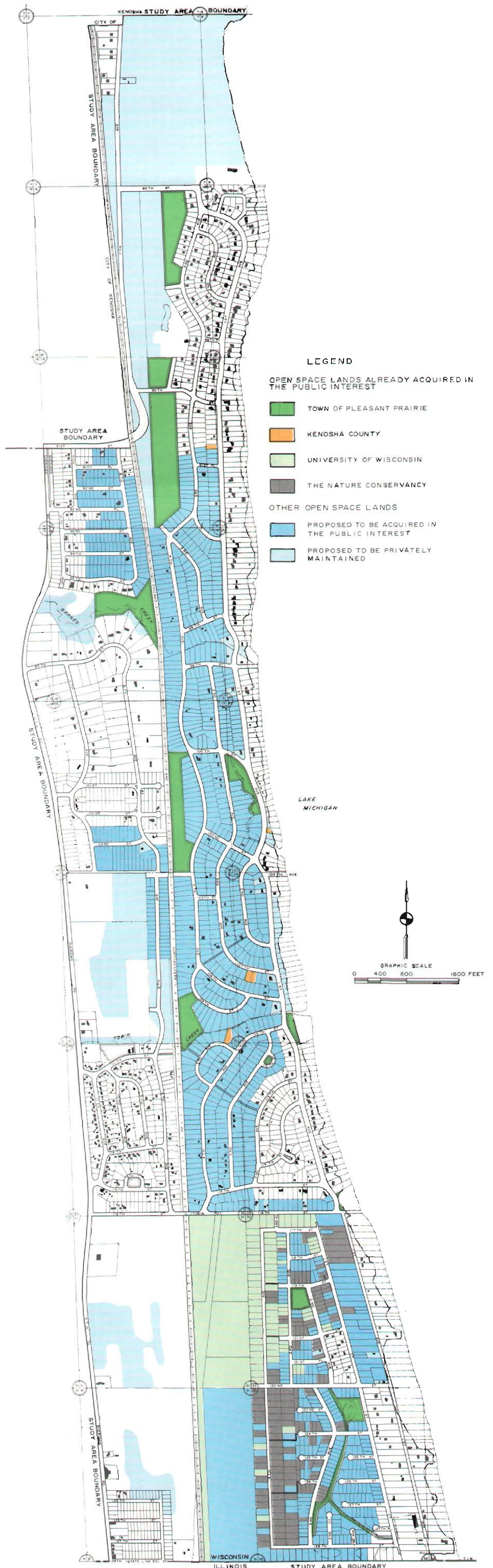




Table 16

**EXISTING HOUSING UNITS (1980) AND PROPOSED HOUSING  
UNITS UNDER THE MAXIMUM PRESERVATION PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Housing Units			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	113	179	66	58.4
B	190	513	323	170.0
C	163	223	60	36.8
D	9	16	7	77.8
E	37	58	21	56.8
Total Study Area	512	989	477	93.2

Source: SEWRPC.

Table 17

**EXISTING POPULATION (1980) AND PROPOSED POPULATION  
UNDER THE MAXIMUM PRESERVATION PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Population			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	324	522	198	61.1
B	607	1,494	887	146.1
C	377	648	271	71.9
D	27	48	21	77.8
E	67	168	101	150.7
Total Study Area	1,402	2,880	1,478	105.4

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

open space preservation area, will continue to be held in private ownership. Existing street and railway rights-of-way account for the balance--about 124 acres, or about 12 percent--of the proposed open space preservation area.

The maximum preservation plan envisions that almost all privately held, unimproved platted lots within the proposed open space preservation area will be acquired for preservation in essentially natural, open use. Conversely, as shown on Map 23, portions of the proposed open space preservation area which have not been divided into residential lots would generally not be acquired. The only notable exception is the unsubdivided parcel of land east of the C&NW Railway right-of-way, south of 122nd Street, which is recommended for public or private acquisition because of its location within the presently defined project area of The Nature Conservancy.

Table 18

**PROPOSED OWNERSHIP OF PROPERTY WITHIN THE OPEN SPACE  
PRESERVATION AREA UNDER THE MAXIMUM PRESERVATION PLAN**

Proposed Ownership of Property Within Preservation Area	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Property Presently Held in the Public Interest, Proposed to be Retained:												
Town of Pleasant Prairie.....	14	7.8	8	5.8	38	10.3	--	--	10	3.1	70	6.7
Kenosha County.....	--	--	--	--	2	0.5	--	--	--	--	2	0.2
University of Wisconsin.....	--	--	--	--	--	--	--	--	91	28.3	91	8.7
The Nature Conservancy.....	--	--	--	--	--	--	--	--	55	17.1	55	5.3
Subtotal	14	7.8	8	5.8	40	10.8	--	--	156	48.5	218	20.9
Existing Private Property, Proposed to be Acquired in the Public Interest.....	--	--	52	37.7	259	70.0	--	--	133	41.3	444	42.5
Existing Private Property, Proposed to be Retained.....	150	83.3	55	39.8	18	4.9	34	100.0	1	0.3	258	24.7
Other Property: Existing Street and Railroad Rights-of-Way.....	16	8.9	23	16.7	53	14.3	--	--	32	9.9	124	11.9
Total Open Space Preservation Area	180	100.0	138	100.0	370	100.0	34	100.0	322	100.0	1,044	100.0

Source: SEWRPC.

Table 19

**VALUE OF REAL PROPERTY TO BE ACQUIRED  
UNDER THE MAXIMUM PRESERVATION PLAN**

Subarea	Real Property to be Acquired						
	Unimproved <sup>a</sup>		Improved <sup>b</sup>				Total Assessed Value
	Number of Lots	Assessed Value	Number of Lots	Assessed Value			
				Land	Improvements	Total	
A	--	\$ --	--	\$ --	\$ --	\$ --	\$ --
B	222	367,400	6	49,200	195,500 <sup>d</sup>	244,700	612,100
C	660	1,749,400	62	550,100	2,035,000 <sup>e</sup>	2,585,100	4,334,500
D	--	--	--	--	--	--	--
E	290 <sup>c</sup>	266,800	--	--	--	--	266,800
Total Study Area	1,172 <sup>c</sup>	\$2,383,600	68	\$599,300	\$2,230,500	\$2,829,800	\$5,213,400

<sup>a</sup> Property having no assessed improvement value.

<sup>b</sup> Property having an assessed improvement value.

<sup>c</sup> Includes one unsubdivided parcel.

<sup>d</sup> Includes four housing units.

<sup>e</sup> Includes 58 housing units.

Source: Kenosha County Assessor's Office and SEWRPC.

The maximum preservation plan also proposes that certain partially developed portions of the open space preservation area be restored, insofar as possible, to natural, open uses. In this regard, the plan envisions that a total of 62 housing units within the identified open space preservation area will be acquired and relocated outside that area and that the streets which presently provide access to the sites concerned will be vacated. Such relocation would enhance the natural values of the preservation area and eliminate the need to maintain, at a high public cost, access roads to sparsely developed areas. Any such relocation would occur over time and only with the voluntary cooperation of the property owners concerned.

As indicated in Table 19, the total assessed value of real property to be acquired under the maximum preservation plan is about \$5.21 million. The unimproved land proposed for acquisition--consisting of a total of 1,171 platted lots and one unsubdivided parcel--has a combined assessed valuation of \$2.38 million. The land value of the improved lots proposed for acquisition totals \$599,300. The value of the improvements, including 62 housing units, totals \$2.23 million. It is envisioned that an attempt will be made to sell these houses to a third party for relocation outside the study area. Experience indicates that only a nominal amount--typically no more than 5 percent of the original house acquisition cost--could be realized through such a sale. Thus, only about \$112,000 of the original acquisition cost of \$2.23 million could be expected to be recovered through resale of the houses.

## Sanitary Sewer Service Area

The maximum preservation plan envisions that, during the next 20 years, public sanitary sewer service will be extended to all areas designated for urban use under the plan--areas which, as previously noted, encompass about 650 acres, or about 36 percent of the study area (see Map 22). The plan further envisions that, as sanitary sewers are installed to serve the identified urban areas, existing housing units within the open space preservation area which are proposed to be retained indefinitely will be connected to the sewerage system. Sanitary sewer service would not be extended to any other portions of the open space preservation area.

## Infrastructure Costs

As noted above, the maximum preservation plan envisions that eventually public sanitary sewer service will be provided within all of the proposed urban areas. The plan also envisions that public water supply service will be provided within all urban areas and that required street and stormwater drainage improvements will be made as the area develops. A rural street cross-section is envisioned; thus, local streets would be asphalt surface without curb and gutter, drainage being primarily through roadside ditches.

As indicated in Table 20, the capital cost of public improvements envisioned under the maximum preservation plan would approximate \$8.51 million. Construction of a sanitary sewerage system within the study area could be expected to cost \$4.05 million. Construction of a water distribution system could be expected to cost \$3.13 million. Construction or reconstruction of local streets within the study area could be expected to cost \$383,000. Stormwater drainage improvements could be expected to cost \$954,000.

## DEVELOPMENT-PRESERVATION PLAN

The development-preservation plan represents a conscious attempt to accommodate significant additional urban development within the study area, while at the same time preserving the most important natural features of the area. The plan thus represents, in effect, a middle ground between the maximum development and maximum preservation plans, embodying some features of both.

The development-preservation plan emphasizes the preservation of those wetlands which are of special significance because of their effects on water quality and on streamflows within the study area, or because of the plant and animal life which they support. The plan places less emphasis upon the preservation of those wetlands with no identified special natural values. In order to establish a hierarchy among the wetlands in the study area, the development-preservation plan drew upon the findings of an analysis, described in Appendix A of this report, involving the application of the wetland "rezoning" criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code to the study area wetlands. These criteria, along with a summary of the analysis findings, are set forth in Table 21. Wetlands determined to be significant in terms of the Chapter NR 115 rezoning criteria are identified on Map 24.



Table 20

**COST OF PUBLIC IMPROVEMENTS UNDER  
THE MAXIMUM PRESERVATION PLAN**

Subarea	Estimated Public Improvement Costs				
	Sanitary Sewer Collection System	Water Supply Distribution System	Local Street Improvements	Stormwater Drainage Improvements	Total
A	\$ 732,000	\$ 87,000	\$ 5,000	\$194,000	\$1,018,000
B	1,801,000	1,784,000	178,000	341,000	4,104,000
C	1,067,000	798,000	65,000	268,000	2,198,000
D	29,000	179,000	21,000	20,000	249,000
E	417,000	283,000	114,000	131,000	945,000
Total	\$4,046,000	\$3,131,000	\$383,000	\$954,000	\$8,514,000

Source: SEWRPC.

As indicated in Table 21, wetland areas encompassing about 160 acres, or about 20 percent of the study area wetlands, have been identified as particularly important to the maintenance of low streamflows, to the maintenance of water quality, and to the maintenance of the identified fish populations in the study area; wetland areas encompassing about 611 acres, or about 75 percent of the study area wetlands, have been identified as having wildlife habitat value; wetland areas encompassing about 540 acres, or about 66 percent of the study area wetlands, have been identified as having critical plant habitat value; wetland areas encompassing 62 acres, or about 8 percent of the study area wetlands, have been identified as fens; and wetland areas encompassing about 418 acres, or about 51 percent of the study area wetlands, have been identified as having natural area value. Many of these areas are overlapping and not mutually exclusive. It should be noted that of the 818 acres of wetlands within the study area, about 717 acres, or about 88 percent, have been identified as having at least one of the above-noted values.

In the identification of an open space preservation area under the development-preservation plan, a distinction was made between platted and unplatted areas. Within those portions of the study area which have been platted for residential development, the open space preservation area generally includes those wetlands which have been identified as having special significance because of their effects on water quality and streamflows, or because of the wildlife habitat areas, critical plant habitat areas, or areas of scientific value which they encompass. Certain wetlands for which special natural values have been identified were not included in the preservation area, however, inasmuch as they were isolated from similar areas or were located in areas of logical extension of the proposed urban area. Wetlands for which no special natural values have been identified were not included in the open space preservation area, except in those cases where such wetland areas were believed to significantly enhance the integrity of the preservation area.

Within the unplatted portion of the study area, the open space preservation area was identified through an application of the environmental corridor mapping technique described in Chapter II of this report. Thus, within the

WETLANDS DETERMINED TO BE  
SIGNIFICANT IN TERMS OF THE  
WETLAND REZONING CRITERIA  
OF CHAPTER NR 115 OF THE  
WISCONSIN ADMINISTRATIVE CODE

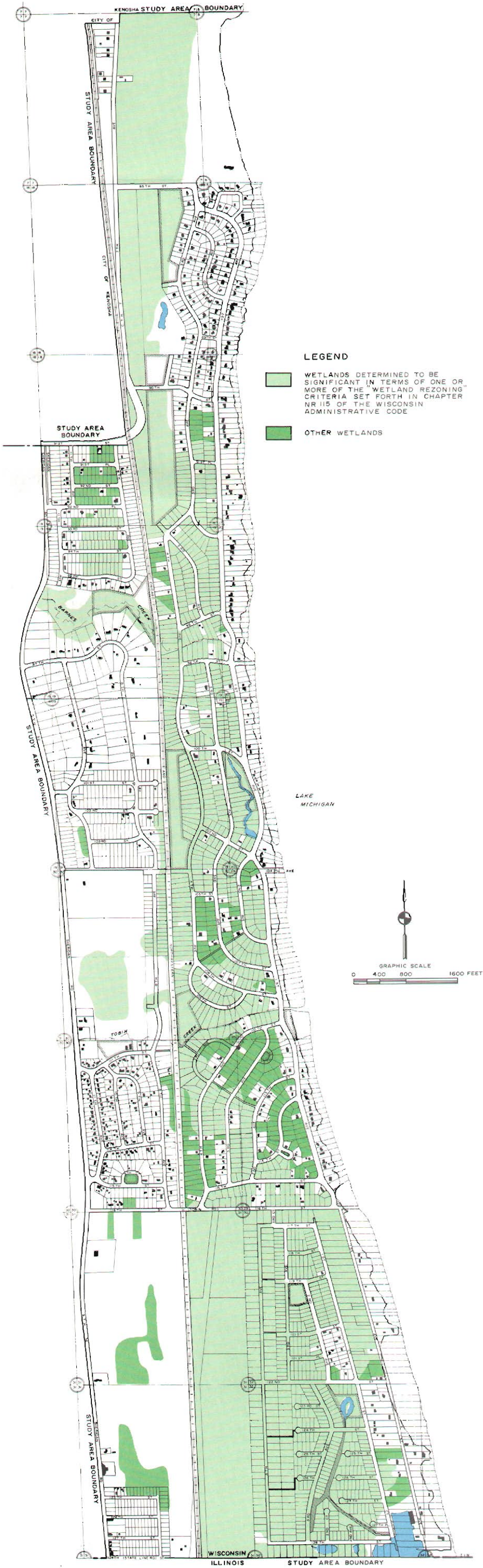


Table 21

**SUMMARY OF THE FINDINGS OF THE ANALYSIS OF  
WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA  
IN TERMS OF THE WETLAND REZONING CRITERIA OF  
CHAPTER NR 115 OF THE WISCONSIN ADMINISTRATIVE CODE**

Criterion <sup>a</sup>	Findings
Storm- and floodwater storage capacity	No wetlands of significance were identified.
Maintenance of dry season streamflow, or the discharge of groundwater to a wetland, the recharge of groundwater from a wetland to another area, or the flow of groundwater through a wetland	The wetlands in the subbasins drained by Barnes Creek and Tobin Creek were identified as important to the maintenance of the flow of those streams under dry weather conditions. The wetland areas so identified encompass 160 acres, or 20 percent of all wetlands in the study area. In addition, several fen areas have been identified in the study area. A fen is a very rare type of wetland which is dominated by sedges and grasses growing on sandy peat soils and which generally develops in groundwater discharge areas. Fen areas encompass 62 acres, or 8 percent of all wetlands in the study area.
Filtering or storage of sediments, nutrients, heavy metals, or organic compounds that would otherwise drain into navigable waters	Wetlands in the subbasins drained by Barnes Creek and Tobin Creek were identified as having particularly important water quality benefits. The wetland areas so identified encompass 160 acres, or 20 percent of all wetlands in the study area.
Shoreline protection against soil erosion	No wetlands of significance were identified.
Fish spawning, breeding, nursery, or feeding grounds	Barnes Creek and Tobin Creek both support diverse and balanced forage fisheries. The wetlands identified as having an important bearing on water quality or low streamflows are considered to be important to the maintenance of the identified fish populations.
Wildlife habitat	Wetlands comprising significant wildlife habitat have been identified within the Kenosha Sand Dunes on the north end of the study area, within Chiwaukee Prairie on the south end, and within many of the intervening wetlands. These wetlands encompass 611 acres, or 75 percent of all wetlands in the study area.
Areas of special recreational, scenic, or scientific interest, including scarce wetland types	Areas of special scientific interest include critical plant habitat areas where rare, threatened, or endangered species in Wisconsin have been identified; and natural areas containing intact plant community assemblages which closely resemble the pre-European settlement landscape. Wetlands identified as critical plant habitat areas encompass 540 acres, or 66 percent of all wetlands in the study area. Wetlands identified as natural areas encompass 418 acres, or 51 percent of all wetlands in the study area. In addition, a total of nine archaeological sites, consisting of early American Indian campsites and villages, have been identified within the study area, five of these being partially or entirely located within wetland areas.

<sup>a</sup> Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code.

Source: Wisconsin Department of Natural Resources and SEWRPC.

unplatted areas, the proposed open space preservation area includes those wetlands, woodlands, prairies, wildlife habitat areas, and other natural features which would ordinarily be included within an environmental corridor or isolated natural area.

The open space preservation area proposed under the development-preservation plan is shown on Map 25. This area encompasses about 853 acres, or about 47 percent of the total study area (see Table 22). The open space preservation area consists essentially of a continuous corridor--somewhat narrower than the corridor proposed under the maximum preservation plan--connecting the Kenosha Sand Dunes on the north end of the study area with the Chiwaukee Prairie on the south end. The maintenance of at least a narrow corridor is considered important to the movement of plant seeds and wildlife throughout the study area.

The development-preservation plan envisions the development of most of the platted residential lots outside the identified open space preservation area. The notable exception is the unimproved subdivision located in Subarea D, where the majority of the platted lots would remain undeveloped. Like the two previously described plans, the development-preservation plan anticipates the eventual development of certain presently unplatted lands. Specifically, certain unplatted lands adjacent to Sheridan Road (STH 32) in Subarea D would be converted to urban use, assuming that sanitary sewer service is eventually extended along Sheridan Road to the Wisconsin-Illinois border. In addition, certain unplatted lands east of Sheridan Road, south of 104th Street, would be converted to urban use, assuming the eventual extension of sanitary sewer service to adjacent platted areas. The proposed urban area shown on Map 25 encompasses about 841 acres, or about 46 percent of the study area.

### Population and Housing

Assuming the development of virtually all remaining platted lots within the planned urban area as individual home sites,<sup>12</sup> the housing stock in the study area would increase from 512 housing units in 1980 to 1,479 housing units upon full development--an increase of 967 housing units, or about triple the 1980 level (see Table 23). Assuming a 3 percent housing vacancy rate and an average household size of 3.0 persons per household, the population of the study area could be expected to increase to about 4,305 persons, an increase of 2,903 persons over the 1980 level (see Table 24).

### Open Space Acquisition

A total of 217 acres, or 25 percent of the open space preservation area proposed under the development-preservation plan, is presently held by the Town of Pleasant Prairie, Kenosha County, the University of Wisconsin, and The Nature Conservancy. As indicated in Table 25, the development-preservation plan envisions that an additional 295 acres, or about 35 percent of the proposed open space preservation area, will be publicly or privately acquired. The plan further envisions that about 254 acres, or about 30 percent of the open space preservation area, will continue to be held in private ownership. Existing street and railway rights-of-way account for the balance--about 87 acres, or about 10 percent--of the proposed open space preservation area.

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<sup>12</sup>It was assumed that nine undeveloped lots adjacent to the Trident Marina would be developed in marina-related, rather than residential, use.



Table 22

**PROPOSED GENERALIZED LAND USE IN THE CHIWAUKEE PRAIRIE-  
CAROL BEACH STUDY AREA UNDER THE DEVELOPMENT-PRESERVATION PLAN**

Generalized Land Use Category <sup>a</sup>	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Urban Area.....	108	37.5	386	82.7	245	50.6	31	15.8	71	18.2	841	46.1
Open Space												
Preservation Area..	180	62.5	81	17.3	239	49.4	34	17.4	319	81.8	853	46.7
Rural Area.....	--	--	--	--	--	--	131	66.8	--	--	131	7.2
<b>Total</b>	<b>288</b>	<b>100.0</b>	<b>467</b>	<b>100.0</b>	<b>484</b>	<b>100.0</b>	<b>196</b>	<b>100.0</b>	<b>390</b>	<b>100.0</b>	<b>1,825</b>	<b>100.0</b>

<sup>a</sup> Includes street and railroad rights-of-way within the respective areas.

Source: SEWRPC.

Table 23

**EXISTING HOUSING UNITS (1980) AND PROPOSED HOUSING  
UNITS UNDER THE DEVELOPMENT-PRESERVATION PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Housing Units			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	113	179	66	58.4
B	190	698	508	267.4
C	163	524	361	221.5
D	9	16	7	77.8
E	37	62	25	67.6
<b>Total Study Area</b>	<b>512</b>	<b>1,479</b>	<b>967</b>	<b>188.9</b>

Source: SEWRPC.

Table 24

**EXISTING POPULATION (1980) AND PROPOSED POPULATION  
UNDER THE DEVELOPMENT-PRESERVATION PLAN FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subarea	Population			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
A	324	522	198	61.1
B	607	2,031	1,424	234.6
C	377	1,524	1,147	304.2
D	27	48	21	77.8
E	67	180	113	168.7
<b>Total Study Area</b>	<b>1,402</b>	<b>4,305</b>	<b>2,903</b>	<b>207.1</b>

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

The development-preservation plan envisions that almost all privately held, unimproved platted lots within the proposed open space preservation area will be publicly or privately acquired for preservation. Conversely, portions of the proposed open space preservation area which have not been divided into residential lots would generally not be acquired (see Map 26). The only notable exception is the unsubdivided parcel of land located east of the C&NW Railway right-of-way, south of 122nd Street, which is proposed for acquisition because of its location within the presently defined project area of The Nature Conservancy.

The development-preservation plan also envisions that certain partially developed portions of the open space preservation area will be eventually restored, insofar as possible, to natural, open uses. In this regard, the plan envisions that 14 housing units within the identified open space preservation area will

Table 25

**PROPOSED OWNERSHIP OF PROPERTY WITHIN THE OPEN SPACE  
PRESERVATION AREA UNDER THE DEVELOPMENT-PRESERVATION PLAN**

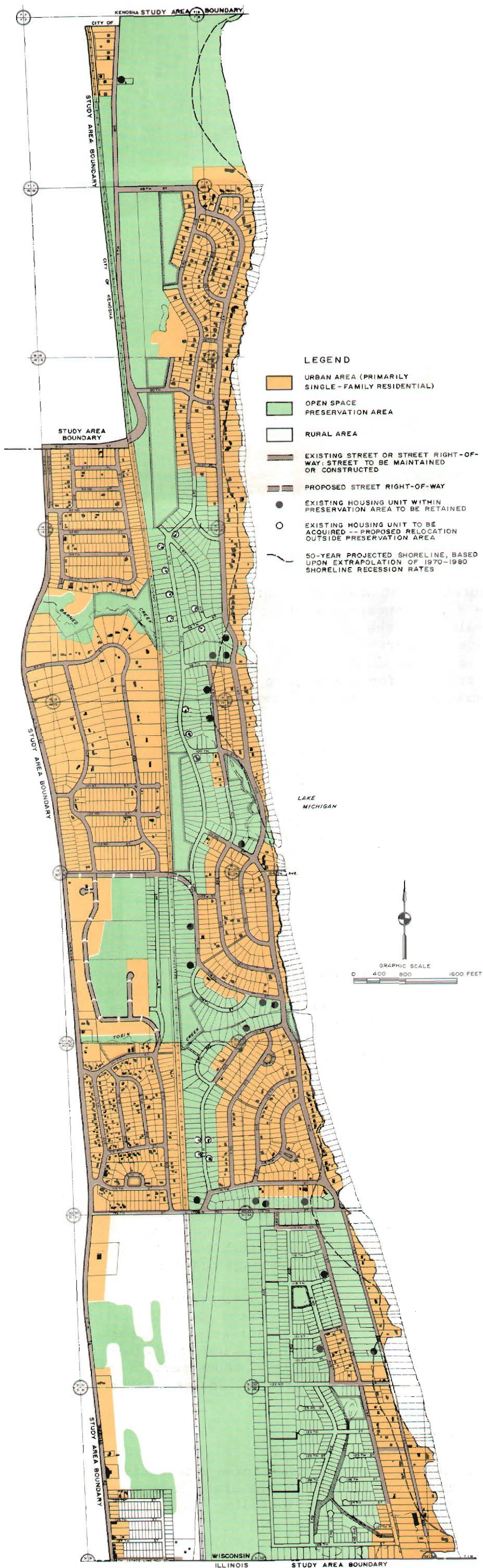
Proposed Ownership of Property Within Preservation Area	Subarea A		Subarea B		Subarea C		Subarea D		Subarea E		Total Study Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Property Presently Held in the Public Interest, Proposed to be Retained:												
Town of Pleasant Prairie....	14	7.8	8	9.9	38	15.9	--	--	10	3.1	70	8.2
Kenosha County.....	--	--	--	--	1	0.4	--	--	--	--	1	0.1
University of Wisconsin.....	--	--	--	--	--	--	--	--	91	28.5	91	10.7
The Nature Conservancy.....	--	--	--	--	--	--	--	--	55	17.3	55	6.4
Subtotal	14	7.8	8	9.9	39	16.3	--	--	156	48.9	217	25.4
Existing Private Property, Proposed to be Acquired in the Public Interest.....	--	--	8	9.9	156	65.3	--	--	131	41.1	295	34.6
Existing Private Property, Proposed to be Retained.....	150	83.3	54	66.6	16	6.7	34	100.0	-- <sup>a</sup>	--	254	29.8
Other Property: Existing Street and Railroad Rights-of-Way.....	16	8.9	11	13.6	28	11.7	--	--	32	10.0	87	10.2
Total Open Space Preservation Area	180	100.0	81	100.0	239	100.0	34	100.0	319	100.0	853	100.0

<sup>a</sup> Less than 0.5 acre.

Source: SEWRPC.

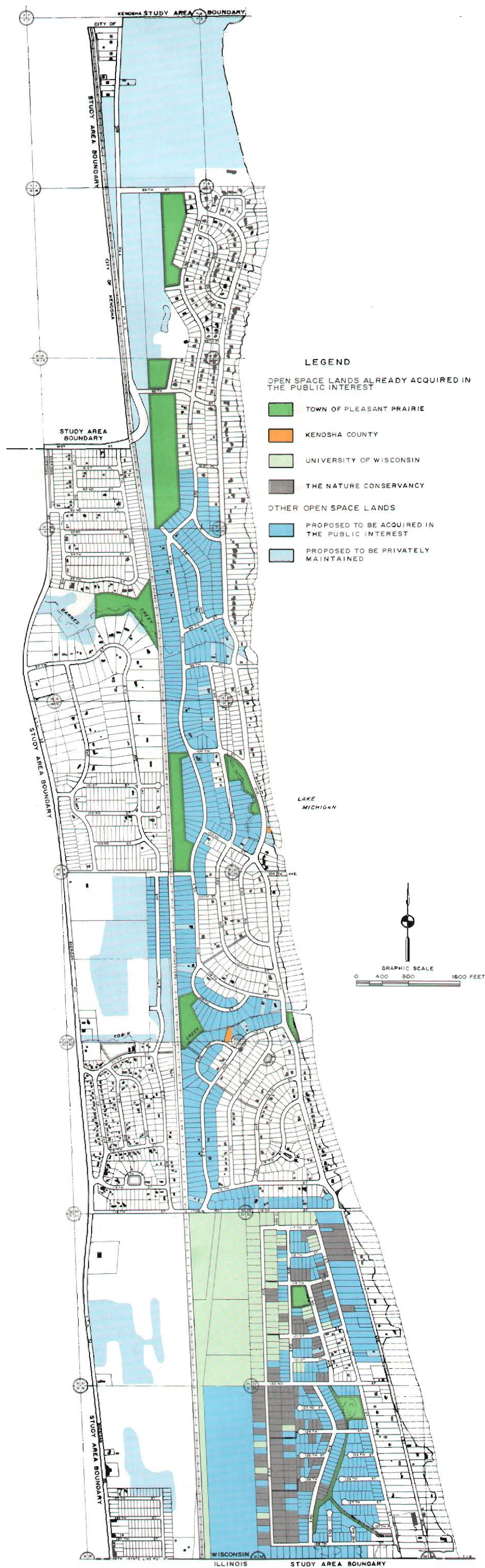


# DEVELOPMENT-PRESERVATION PLAN FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA OF THE TOWN OF PLEASANT PRAIRIE



Source: SEWRPC.

# PROPOSED OWNERSHIP OF LAND WITHIN THE OPEN SPACE PRESERVATION AREA UNDER THE DEVELOPMENT-PRESERVATION PLAN



Source: SEWRPC.



be acquired and relocated outside that area and that the streets which presently provide access to the sites concerned will be vacated. Such relocation would enhance the natural values of the preservation area and eliminate the need to maintain access roads to sparsely developed areas. Existing occupants would have the option to remain in their present location as long as they desire. Any acquisition of property for the purpose of relocation would occur only with the voluntary cooperation of the property owners concerned.

As indicated in Table 26, the total assessed value of real property to be acquired under the development-preservation plan is \$1.84 million. The unimproved land proposed for acquisition--consisting of 723 platted lots and one unsubdivided parcel--has a combined assessed value of \$1.24 million. The land value of improved lots proposed for acquisition totals \$143,900. The value of improvements, including 14 housing units, proposed for acquisition totals \$453,000. It is envisioned that an attempt will be made to sell these houses to a third party for relocation outside the study area. It is estimated that \$23,000--5 percent of the original acquisition cost--would be realized through the resale of these houses.

### Sanitary Sewer Service Area

The development-preservation plan envisions that, during the next 20 years, public sanitary sewer service will be extended to all areas designated for urban use under the plan--areas which, as previously noted, encompass about 841 acres, or about 46 percent of the study area (see Map 25). The plan further envisions that, as sanitary sewers are installed to serve the identified urban areas, existing housing units within the open space preservation area which are proposed to be retained indefinitely will be connected to the sewerage system. Sanitary sewer service would not be extended to any other portions of the open space preservation area.

### Public Infrastructure Costs

As noted above, the development-preservation plan envisions that public sanitary sewer service will be provided within all of the proposed urban areas. The plan also envisions that public water supply service will be provided within all urban areas and that required street and stormwater drainage improvements will be made as the area develops. A rural street cross-section is envisioned; thus, local streets would be asphalt surface without curb and gutter, drainage being primarily through roadside ditches and open drainage channels.

As indicated in Table 27, the capital cost of public improvements under the development-preservation plan may be expected to total \$11.65 million. Of this total, the construction of sanitary sewerage facilities within the study area may be expected to cost \$5.65 million; the construction of a water distribution system \$4.02 million; the construction or reconstruction of local streets \$686,000; and the construction of stormwater drainage improvements \$1.29 million.

## COMPARISON OF ALTERNATIVE PLANS

The previous sections of this chapter have described three alternative land use management plans for the Chiwaukee Prairie-Carol Beach area. This section compares the major features of those three plans, including the amounts of land

Table 26

**VALUE OF REAL PROPERTY TO BE ACQUIRED  
UNDER THE DEVELOPMENT-PRESERVATION PLAN**

Subarea	Real Property to be Acquired						
	Unimproved <sup>a</sup>		Improved <sup>b</sup>				Total Assessed Value
	Number of Lots	Assessed Value	Number of Lots	Assessed Value			
				Land	Improvements	Total	
A	--	\$ --	--	\$ --	\$ --	\$ --	\$ --
B	40	32,700	--	--	--	--	32,700
C	398	957,600	15	143,900	453,000 <sup>d</sup>	596,900	1,554,500
D	--	--	--	--	--	--	--
E	286 <sup>c</sup>	247,800	--	--	--	--	247,800
Total Study Area	724 <sup>c</sup>	\$1,238,100	15	\$143,900	\$453,000	\$596,900	\$1,835,000

<sup>a</sup> Property having no assessed improvement value.

<sup>b</sup> Property having an assessed improvement value.

<sup>c</sup> Includes one unsubdivided parcel.

<sup>d</sup> Includes 14 housing units.

Source: Kenosha County Assessor's Office and SEWRPC.

Table 27

**COST OF PUBLIC IMPROVEMENTS UNDER  
THE DEVELOPMENT-PRESERVATION PLAN**

Subarea	Estimated Public Improvement Costs				
	Sanitary Sewer Collection System	Water Supply Distribution System	Local Street Improvements	Stormwater Drainage Improvements	Total
A	\$ 947,000	\$ 87,000	\$ 5,000	\$ 194,000	\$1,233,000
B	2,086,000	2,083,000	262,000	469,000	4,900,000
C	2,164,000	1,389,000	284,000	480,000	4,317,000
D	29,000	179,000	21,000	20,000	249,000
E	421,000	285,000	114,000	131,000	951,000
Total	\$5,647,000	\$4,023,000	\$686,000	\$1,294,000	\$11,650,000

Source: SEWRPC.

proposed to be allocated to urban, open space preservation, and rural uses; the attendant housing unit and population levels; the attendant public improvement costs; and the proposed open space preservation measures and attendant costs.

### Land Use

Table 28 compares the amount of land proposed to be allocated to urban, open space preservation, and rural areas under the three alternative plans under ultimate development conditions. As indicated in this table, the maximum

Table 28

**GENERALIZED LAND USE IN THE CHIWAUKEE PRAIRIE-  
CAROL BEACH STUDY AREA UNDER THE ALTERNATIVE LAND USE  
MANAGEMENT PLANS FOR ULTIMATE DEVELOPMENT CONDITIONS**

Plan Alternative	Urban Area		Open Space Preservation Area		Rural Area		Total Area	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Maximum Development....	1,090	59.7	604	33.1	131	7.2	1,825	100.0
Maximum Preservation...	650	35.6	1,044	57.2	131	7.2	1,825	100.0
Development- Preservation...	841	46.1	853	46.7	131	7.2	1,825	100.0

Source: SEWRPC.

development plan envisions the most extensive urban area of the alternative plans. Under the maximum development plan, 60 percent of the study area would be devoted to urban uses, in comparison with 36 percent under the maximum preservation plan and 46 percent under the development-preservation plan. Conversely, the maximum preservation plan envisions the most extensive preservation of open space of the alternative plans. The maximum preservation plan envisions an open space preservation area encompassing 57 percent of the study area, in comparison with 33 percent under the maximum development plan and 47 percent under the development-preservation plan. The maximum development, maximum preservation, and development-preservation plans each envision that rural areas would encompass about 7 percent of the study area.

### Housing Units and Population

Table 29 indicates change in the number of housing units anticipated in the study area under the three ultimate development plans. Under the maximum development plan, housing units in the study area would increase from 512 in 1980 to about 2,034 under full development conditions, about a four-fold increase. Under the maximum preservation plan, the housing stock would increase to about 989 housing units upon full development, almost double the 1980 level. Under the development-preservation plan, the housing stock would increase to about 1,479 housing units upon full development, almost triple the 1980 level.

As indicated in Table 30, the maximum development plan envisions a population of about 5,922 persons under full development conditions, an increase of 4,520 over the 1980 population of 1,402. The maximum preservation plan envisions a population of about 2,880 under full development conditions, an increase of 1,478 over the 1980 level. The development-preservation plan envisions a population of about 4,305 under full development conditions, an increase of 2,903 persons over the 1980 level.

### Public Improvements

The maximum development, maximum preservation, and development-preservation plans envision urban areas encompassing 1,090 acres, 650 acres, and 841 acres, respectively. Each of these plans envisions that public sanitary sewer and

Table 29

**EXISTING HOUSING UNITS (1980) AND PROPOSED HOUSING  
UNITS UNDER THE ALTERNATIVE LAND USE MANAGEMENT  
PLANS FOR ULTIMATE DEVELOPMENT CONDITIONS**

Plan Alternative	Housing Units			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
Maximum Development.....	512	2,034	1,522	297.3
Maximum Preservation.....	512	989	477	93.2
Development- Preservation.....	512	1,479	967	188.9

Source: SEWRPC.

Table 30

**EXISTING POPULATION (1980) AND PROPOSED POPULATION  
UNDER THE ALTERNATIVE LAND USE MANAGEMENT PLANS  
FOR ULTIMATE DEVELOPMENT CONDITIONS**

Plan Alternative	Population			
	Existing 1980	Upon Full Development	Change	
			Number	Percent
Maximum Development.....	1,402	5,922	4,520	322.4
Maximum Preservation.....	1,402	2,880	1,478	105.4
Development- Preservation.....	1,402	4,305	2,903	207.1

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

water supply service will be eventually extended to all of the proposed urban areas. The plans also envision that required street improvements and improvements to the stormwater drainage system will be undertaken as the area develops. In this regard, the plans envision a rural street cross-section, consisting of asphalt surface streets without curb and gutter.

Table 31 sets forth the costs of public improvements envisioned under the maximum development, maximum preservation, and development-preservation plans. As indicated in this table, the total cost of public improvements--including the construction of a sanitary sewer collection system, the construction of a water supply distribution system, the construction or reconstruction of local streets, and stormwater drainage improvements--is estimated at \$14.8 million under the maximum development plan, \$8.5 million under the maximum preservation plan, and \$11.7 million under the development-preservation plan.

The average costs of public improvements per housing unit under the alternative plans are set forth in Table 32. As indicated in this table, public



Table 31

**COST OF PUBLIC IMPROVEMENTS UNDER THE  
ALTERNATIVE LAND USE MANAGEMENT PLANS**

Plan Alternative	Estimated Public Improvement Costs				
	Sanitary Sewer Collection System	Water Supply Distribution System	Local Street Improvements	Stormwater Drainage Improvements	Total
Maximum Development....	\$7,226,000	\$5,098,000	\$1,020,000	\$1,415,000	\$14,759,000
Maximum Preservation...	4,046,000	3,131,000	383,000	954,000	8,514,000
Development- Preservation...	5,647,000	4,023,000	686,000	1,294,000	11,650,000

Source: SEWRPC.

Table 32

**COST OF PUBLIC IMPROVEMENTS PER HOUSING UNIT  
UNDER THE ALTERNATIVE LAND USE MANAGEMENT PLANS**

Plan Alternative	Estimated Public Improvement Costs per Housing Unit				
	Sanitary Sewer Collection System <sup>a</sup>	Water Supply Distribution System <sup>b</sup>	Local Street Improvements <sup>a</sup>	Stormwater Drainage Improvements <sup>a</sup>	Total
Maximum Development....	\$3,553	\$2,736	\$501	\$696	\$7,486
Maximum Preservation...	4,091	3,828	387	965	9,271
Development- Preservation...	3,818	3,076	464	875	8,233

<sup>a</sup> Calculated by dividing the improvement costs set forth in Table 31 by the total number of housing units anticipated under ultimate development conditions under the respective plans.

<sup>b</sup> Calculated by dividing the cost of the water distribution system under the respective plans as set forth in Table 31 by the total number of housing units anticipated under ultimate development conditions, excluding those existing and proposed housing units within the portion of the study area already being provided with public water supply service.

Source: SEWRPC.

improvement costs are estimated at \$7,486 per housing unit under the maximum development plan; \$9,271 per housing unit under the maximum preservation plan; and \$8,233 per housing unit under the development-preservation plan.

### Open Space Preservation

The open space preservation proposals of the alternative plans differ significantly, both in terms of the amount and location of lands to be preserved and in terms of the level of supporting public or private outlay required for the acquisition of property.

Table 33

**VALUE OF REAL PROPERTY TO BE ACQUIRED UNDER  
THE ALTERNATIVE LAND USE MANAGEMENT PLANS**

Plan Alternative	Real Property to be Acquired						Total Assessed Value
	Unimproved <sup>a</sup>		Improved <sup>b</sup>				
	Number of Lots	Assessed Value	Number of Lots	Assessed Value			
				Land	Improvements	Total	
Maximum Development....	178 <sup>c</sup>	\$ 172,600	--	\$ --	\$ --	\$ --	\$ 172,600
Maximum Preservation...	1,172 <sup>c</sup>	2,383,600	68	599,300	2,230,500 <sup>d</sup>	2,829,800	5,213,400
Development- Preservation...	724 <sup>c</sup>	1,238,100	15	143,900	453,000 <sup>e</sup>	596,900	1,835,000

<sup>a</sup> Property having no assessed improvement value.

<sup>b</sup> Property having an assessed improvement value.

<sup>c</sup> Includes one unsubdivided parcel.

<sup>d</sup> Includes 62 housing units.

<sup>e</sup> Includes 14 housing units.

Source: Kenosha County Assessor's Office and SEWRPC.

The maximum preservation plan envisions an open space preservation area encompassing 1,044 acres, or 57 percent of the study area. The plan envisions that 444 acres, or 43 percent of this area, will be publicly or privately acquired for preservation. As indicated in Table 33, open space acquisition costs under the maximum preservation plan would total \$5.21 million. This total includes \$2.38 million for the acquisition of unimproved property and \$2.83 million for the acquisition of improved property. The plan envisions that 62 housing units will be acquired and relocated outside the proposed open space preservation area, thereby restoring natural conditions within the area insofar as possible and eliminating the need to maintain access roads to sparsely developed areas.

The development-preservation plan envisions an open space preservation area encompassing 853 acres, or 47 percent of the total study area. This plan envisions that 295 acres, or 35 percent of the proposed open space area, will be publicly or privately acquired for preservation. As indicated in Table 33, property acquisition costs under the development-preservation plan would total about \$1.84 million, including \$1.24 million for unimproved and \$596,900 for improved property. The development-preservation plan envisions that 14 housing units will be acquired and relocated outside the proposed open space preservation area.

The maximum development plan envisions an open space preservation area encompassing 604 acres, or 33 percent of the study area. The plan envisions that 98 acres, or 16 percent of the proposed open space preservation area--consisting of privately held land within or immediately adjacent to the presently defined project area of The Nature Conservancy--will be acquired in the public interest at an estimated cost of \$172,600 (see Table 33).

A comparison of the open space preservation proposals of the three alternative plans should consider the degree to which the plans may be expected to preserve key elements of the natural resource base. Of primary importance is the preservation of those wetlands which have been identified as being particularly significant because of their effects on water quality and streamflows, or because of the wildlife habitat areas, critical plant habitat areas, or areas of scientific value which they encompass.<sup>13</sup> Table 34 compares the degree to which the alternative plans would preserve these wetlands and related upland areas.

As indicated in Table 34, the maximum preservation plan would result in the highest level of preservation of the identified natural resource base elements. The development-preservation plan would result in a slightly lower, but still substantial, degree of preservation. The maximum development plan would result in a significantly lower degree of preservation of many of the identified natural resource base elements.

Finally, it should be noted that the maximum preservation plan and the development-preservation plan envision the maintenance of an open space corridor linking the Kenosha Sand Dunes at the north end of the study area with the Chiwaukee Prairie at the south end. As already noted, such a continuous corridor is considered to be important to the movement of plant seeds and wildlife within the area. In contrast, the open space preservation areas envisioned under the maximum development plan are relatively disjointed, consisting, in essence, of a series of isolated natural areas.

## PROPERTY TAX IMPACTS

Each of the three alternative plans described in this chapter envisions the acquisition of real property within the proposed open space preservation areas. Such acquisition would likely take place over an extended period of time on a voluntary basis as each particular parcel comes onto the real estate market. The eventual acquisition of those properties by a unit of government would result in a direct reduction in the property tax base. Accordingly, impacts on the property tax base should be considered in the comparison and evaluation of the alternative plans.

Property tax data for 1983 for the four taxing jurisdictions in the Chiwaukee Prairie-Carol Beach area--the Town of Pleasant Prairie, the Kenosha Unified School District, Kenosha County, and the Gateway Technical Institute District--are set forth in Table 35. Tables 36, 37, and 38 indicate the estimated impact of the maximum preservation, development-preservation, and maximum development plans, respectively, on the property tax bases and gross property tax rates of each of these four taxing jurisdictions. Table 39 summarizes the impact of the lost tax base under each of the three alternative plans as reflected in the assumed increase in the annual property tax on a \$50,000 home.

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<sup>13</sup>These wetlands were identified in the analysis, described in Appendix A of this report, involving the application of the wetland rezoning criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code to the study area wetlands. Those criteria, along with a summary of the analysis findings, are set forth in Table 21.

Table 34

**PRESERVATION OF SELECTED NATURAL RESOURCE ELEMENTS  
UNDER THE ALTERNATIVE LAND USE MANAGEMENT PLANS**

Natural Resource Element <sup>a</sup>	Percent of Natural Resource Element Preserved Under the Alternative Land Use Management Plans		
	Maximum Development	Maximum Preservation	Development-Preservation
<b>Wetland Areas</b>			
Total Wetlands (818 acres in study area).....	58	95	83
Wetlands Particularly Important to the Maintenance of Water Quality Low Stream Flows, and Identified Fish Populations (160 acres in study area).....	27	99	85
Wetlands Comprising Critical Plant Habitat (540 acres in study area)...	77	99	91
Wetlands Comprising Wildlife Habitat (611 acres in study area)...	73	99	97
Wetlands Having Natural Area Value (418 acres in study area).....	81	100	96
Wetland Fen Area (62 acres in study area).....	65	100	92
Wetlands Having at Least One of the Above-Listed Values (717 acres in study area).....	63	98	90
<b>Upland Areas</b>			
Upland Area Comprising Critical Plant Habitat (68 acres in study area).....	75	87	79
Upland Area Comprising Wildlife Habitat (87 acres in study area)....	78	85	84
Upland Area Having Natural Area Value (56 acres in study area).....	86	91	89
Upland Woodlands of At Least Five Acres in Area (15 acres in study area).....	100	100	100

<sup>a</sup> Many of these elements are overlapping and not mutually exclusive.

Source: SEWRPC.

Under the maximum preservation plan, real property having a combined assessed value of about \$5.21 million would be acquired. This represents 1.58 percent of the current equalized value of the Town of Pleasant Prairie, 0.27 percent of the equalized value of the Kenosha Unified School District, 0.19 percent of the equalized value of Kenosha County, and 0.06 percent of the equalized value of the Gateway Technical Institute District. If the open space acquisition proposals of the maximum preservation plan were to be fully implemented, a property owner with a \$50,000 home in the Town of Pleasant Prairie would pay \$3.20 more in local property taxes because of the loss of the tax base, given the 1983 tax levies of the four taxing jurisdictions. Similarly, a property owner in the Kenosha Unified School District but outside the Town of Pleasant Prairie with a \$50,000 home would pay \$2.03 more; in Kenosha County outside the Kenosha Unified School District, \$0.40 more; and in the Racine and Walworth County portions of the Gateway Technical Institute District, \$0.03 more.



Table 35

**EQUALIZED VALUE OF PROPERTY AND PROPERTY TAX RATES  
FOR THE TOWN OF PLEASANT PRAIRIE, KENOSHA COUNTY,  
THE KENOSHA UNIFIED SCHOOL DISTRICT, AND THE  
GATEWAY TECHNICAL INSTITUTE DISTRICT: 1983**

Taxing Jurisdiction	Equalized Value of Property (real and personal)	Property Tax Levy	Gross Property Tax Rate (dollars of tax per \$1,000 equalized value) <sup>a</sup>	Gross Tax on \$50,000 House
Town of Pleasant Prairie.....	\$ 329,660,720	\$ 479,510	1.4546	\$ 72.73
Kenosha County.....	2,807,783,110 <sup>b</sup>	11,076,835	3.9450	197.25
Kenosha Unified School District.....	1,961,586,510 <sup>b</sup>	23,941,811	12.2053	610.27
Gateway Technical Institute District.....	9,477,083,425 <sup>b</sup>	11,678,789	1.2323	61.62

<sup>a</sup>The gross tax rate was calculated as the property tax levy divided by the equalized value of property. State property tax relief is not reflected in this rate.

<sup>b</sup>Excludes tax incremental finance district value increment.

Source: SEWRPC.

Table 36

**HYPOTHETICAL EQUALIZED VALUE OF PROPERTY AND PROPERTY  
TAX RATES FOR 1983 ASSUMING OPEN SPACE ACQUISITION  
AS PROPOSED IN THE MAXIMUM PRESERVATION PLAN**

Taxing Jurisdiction	Equalized Value of Property Less Value of Property to be Acquired <sup>a</sup>	Property Tax Levy	Gross Property Tax Rate (dollars of tax per \$1,000 equalized value) <sup>b</sup>	Gross Tax on \$50,000 House	Increase in Tax on \$50,000 Home as a Result of Open Space Acquisition	
					Absolute	Percent
Town of Pleasant Prairie...	\$ 324,447,320	\$ 479,510	1.4779	\$ 73.90	\$1.17	1.6
Kenosha County.....	2,802,569,710	11,076,835	3.9524	197.62	0.37	0.2
Kenosha Unified School District....	1,956,373,110	23,941,811	12.2379	611.90	1.63	0.3
Gateway Technical Institute District.....	9,471,870,025	11,678,789	1.2330	61.65	0.03	-- <sup>c</sup>

<sup>a</sup>The value of property to be acquired under the maximum preservation plan is \$5,213,400.

<sup>b</sup>This rate was calculated by dividing the property tax levy by the equalized value of property less the value of property to be acquired. Property tax relief is not reflected in this rate.

<sup>c</sup>Less than 0.1 percent.

Source: SEWRPC.

Under the development-preservation plan, real property having a combined assessed value of about \$1.84 million would be acquired. This represents 0.56 percent of the current equalized value of the Town of Pleasant Prairie, 0.09 percent of the equalized value of the Kenosha Unified School District, 0.07 percent of the equalized value of Kenosha County, and 0.02 percent of the equalized value of the Gateway Technical Institute District. If the open space acquisition proposals of the development-preservation plan were to be fully

Table 37

**HYPOTHETICAL EQUALIZED VALUE OF PROPERTY AND PROPERTY  
TAX RATES FOR 1983 ASSUMING OPEN SPACE ACQUISITION  
AS PROPOSED IN THE DEVELOPMENT-PRESERVATION PLAN**

Taxing Jurisdiction	Equalized Value of Property Less Value of Property to be Acquired <sup>a</sup>	Property Tax Levy	Gross Property Tax Rate (dollars of tax per \$1,000 equalized value) <sup>b</sup>	Gross Tax on \$50,000 House	Increase in Tax on \$50,000 Home as a Result of Open Space Acquisition	
					Absolute	Percent
Town of Pleasant Prairie...	\$ 327,825,720	\$ 479,510	1.4627	\$ 73.14	\$0.41	0.6
Kenosha County.....	2,805,948,110	11,076,835	3.9476	197.38	0.13	0.1
Kenosha Unified School District....	1,959,751,510	23,941,811	12.2168	610.84	0.57	0.1
Gateway Technical District.....	9,475,248,425	11,678,789	1.2326	61.63	0.01	-- <sup>c</sup>

<sup>a</sup>The value of property to be acquired under the development-preservation plan is \$1,835,000.

<sup>b</sup>This rate was calculated by dividing the property tax levy by the equalized value of property less the value of property to be acquired. Property tax relief is not reflected in this rate.

<sup>c</sup>Less than 0.1 percent.

Source: SEWRPC.

Table 38

**HYPOTHETICAL EQUALIZED VALUE OF PROPERTY AND PROPERTY  
TAX RATES FOR 1983 ASSUMING OPEN SPACE ACQUISITION  
AS PROPOSED IN THE MAXIMUM DEVELOPMENT PLAN**

Taxing Jurisdiction	Equalized Value of Property Less Value of Property to be Acquired <sup>a</sup>	Property Tax Levy	Gross Property Tax Rate (dollars of tax per \$1,000 equalized value) <sup>b</sup>	Gross Tax on \$50,000 House	Increase in Tax on \$50,000 Home as a Result of Open Space Acquisition	
					Absolute	Percent
Town of Pleasant Prairie...	\$ 329,488,120	\$ 479,510	1.4553	\$ 72.77	\$0.04	0.1
Kenosha County.....	2,807,610,510	11,076,835	3.9453	197.27	0.02	-- <sup>c</sup>
Kenosha Unified School District....	1,961,413,910	23,941,811	12.2064	610.32	0.05	-- <sup>c</sup>
Gateway Technical District.....	9,476,910,825	11,678,789	1.2323	61.62	-- <sup>d</sup>	-- <sup>c</sup>

<sup>a</sup>The value of property to be acquired under the maximum development plan is \$172,600.

<sup>b</sup>This rate was calculated by dividing the property tax levy by the equalized value of property less the value of property to be acquired. Property tax relief is not reflected in this rate.

<sup>c</sup>Less than 0.1 percent.

<sup>d</sup>Less than \$0.01.

Source: SEWRPC.

implemented, a property owner with a \$50,000 home in the Town of Pleasant Prairie would pay \$1.12 more in local property taxes because of the loss of the tax base, given the 1983 tax levies of the four taxing jurisdictions. Similarly, a property owner in the Kenosha Unified School District but outside the Town of Pleasant Prairie with a \$50,000 home would pay \$0.71 more; in Kenosha County outside the Kenosha Unified School District, \$0.14 more; and in the Racine and Walworth County portions of the Gateway Technical Institute District, \$0.01 more.

Table 39

**SUMMARY OF IMPACT OF PROPERTY TAX REVENUE LOSS  
ASSUMING IMPLEMENTATION OF ALTERNATIVE DEVELOPMENT  
PLANS FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA**

House Location	Increase in Annual Property Tax on a \$50,000 House <sup>a</sup>		
	Maximum Development Plan	Maximum Preservation Plan	Development- Preservation Plan
Town of Pleasant Prairie..... Kenosha Unified School District Outside	\$0.11	\$3.20	\$1.12
Town of Pleasant Prairie.... Kenosha County Outside	0.07	2.03	0.71
Kenosha Unified School District.....	0.02	0.40	0.14
Racine and Walworth Counties Within Gateway Technical Institute District.....	--b	0.03	0.01

<sup>a</sup>Using the 1983 equalized value and tax levies as a basis for computation.

<sup>b</sup>Less than \$0.01.

Source: SEWRPC.

Under the maximum development plan, real property having a combined assessed value of \$172,600 would be acquired. This represents 0.05 percent of the current equalized value of the Town of Pleasant Prairie, about 0.01 percent of the equalized value of the Kenosha Unified School District, less than 0.01 percent of the equalized value of Kenosha County, and less than 0.01 percent of the equalized value of the Gateway Technical Institute District. If the open space acquisition proposals of the maximum development plan were to be fully implemented, a property owner with a \$50,000 home in the Town of Pleasant Prairie would pay \$0.11 more in local property taxes because of the loss of the tax base, given the 1983 tax levies of the four taxing jurisdictions. Similarly, a property owner in the Kenosha Unified School District but outside the Town of Pleasant Prairie with a \$50,000 home would pay \$0.07 more; in Kenosha County outside the Kenosha Unified School District, \$0.02 more; and in the Racine and Walworth County portions of the Gateway Technical Institute District, less than \$0.01 more.

## CONCLUDING REMARKS

This chapter has presented three alternative plans--a maximum development plan, a maximum preservation plan, and a development-preservation plan--believed to be representative of the basic options available for development-preservation in the Chiwaukee Prairie-Carol Beach area.

Of the three alternative plans, the maximum development plan envisions the highest level of development--1,090 acres, or 60 percent of the study area developed for urban purposes; the highest population level--about 5,922 persons under full development conditions; and the highest public improvement costs--about \$14.8 million for sanitary sewer, water supply, storm drainage, and street improvements. The extensive development envisioned under this alterna-

tive, however, would result in a substantial loss of natural resource values within the study area. Of the 717 acres of special value wetlands in the study area, about 37 percent would be destroyed under this alternative. About 98 acres of land would be acquired in the public interest and be permanently preserved. The cost of acquiring this land is estimated at \$172,600. This acquisition would reduce the equalized value of the Town of Pleasant Prairie by about 0.05 percent and add \$0.11 to the tax bill of the owner of a \$50,000 home in the Town.

Of the three alternative plans, the maximum preservation plan envisions the lowest level of development--650 acres, or 36 percent of the study area developed for urban purposes; the lowest population level--about 2,880 persons under full development conditions; and the lowest public improvement costs--about \$8.5 million for sanitary sewers, water supply, stormwater drainage, and street improvements. The maximum preservation plan envisions the most extensive preservation of open space among the alternative plans, thereby affording the greatest level of protection to the identified natural resource values of the area. Nearly all of the 717 acres of special value wetlands in the study area would be preserved under this alternative. About 444 acres of land would be acquired in the public interest for preservation. The cost of acquiring this property--including 62 housing units within the open space preservation area--is estimated at \$5.2 million. This acquisition would reduce the equalized value of the Town of Pleasant Prairie by about 1.6 percent and add \$3.20 to the tax bill of the owner of a \$50,000 home in the Town.

The development-preservation plan stands as a middle ground between the maximum development plan and the maximum preservation plan. This plan envisions that 841 acres, or 46 percent of the study area, will be allocated to urban use. In addition, this plan envisions a population level of 4,305 persons under full development conditions; and public improvement costs of about \$11.7 million for sanitary sewers, water supply, stormwater drainage, and street improvements. The plan represents a conscious attempt to accommodate significant additional urban development within the area, while preserving the most important natural features of the area. The plan would preserve about 90 percent of the special value wetlands in the study area. Under this alternative, 295 acres of land would be acquired in the public interest for preservation. The cost of acquiring this property--including 14 housing units within the open space preservation area--is estimated at \$1.8 million. This acquisition would reduce the equalized value of the Town of Pleasant Prairie by about 0.6 percent and add \$1.12 to the tax bill of the owner of a \$50,000 home in the Town.



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## Chapter V

### RECOMMENDED LAND USE MANAGEMENT PLAN

#### INTRODUCTION

The previous chapter of this report presented three alternative land use management plans for the Chiwaukee Prairie-Carol Beach area--a maximum development plan, a maximum preservation plan, and a combination development-preservation plan--each plan proposing a different development-preservation pattern for the area. After considering these alternative plans, the study Technical and Citizen Advisory Committee selected the development-preservation alternative as the basis for the preparation of a recommended plan for the area.

In taking that action, the Committee specified a number of changes to the development-preservation alternative which were to be incorporated into the recommended plan. Specifically, the Committee directed that the following considerations be accommodated in the plan: 1) expansion of the Kenosha sewage treatment plant in the northernmost portion of the study area; 2) expansion of the Trident Marina in the southernmost portion of the study area; 3) provision of a corridor along 85th Street to accommodate the servicing of the water intake and discharge lines which run between Lake Michigan and the Wisconsin Electric Power Company's Pleasant Prairie electric power generation plant; 4) provision of a corridor for the extension of utilities along 7th Avenue; and 5) to the maximum extent practicable, provision for development along both sides of public streets in which sanitary sewers are to be laid within the proposed urban areas. The Committee also directed that, to the maximum extent practicable, lots with houses be excluded from open space preservation areas; that the wetland inventory map be revised based upon additional field surveys, and that to the maximum extent practicable, privately held lots not found to be in a wetland be excluded from the preservation area; and that lots included in the open space preservation area be acquired for such use at fair market value.

As noted in Chapter II of this report, the preliminary state wetland inventory map, prepared by the Regional Planning Commission for the Wisconsin Department of Natural Resources under the Wisconsin Wetland Mapping Program, was used initially to identify wetlands in the Chiwaukee Prairie-Carol Beach area under this planning program. Subsequent to the May 3, 1984, meeting of the Technical and Citizen Advisory Committee, wetland inventory comment forms--forms intended for use by concerned property owners to request a revision to the boundaries shown on the preliminary state wetland inventory map--were submitted for more than 290 parcels of land in the Chiwaukee Prairie-Carol Beach area. As part of the additional wetland inventory field survey work requested by the Committee at its May 3, 1984, meeting, all of the parcels for which comment forms were submitted were field inspected by the Commission staff.

A number of changes to the wetland inventory map were made as a result of these field inspections. For the most part, the changes represent a more precise mapping of the wetland swales and larger upland ridges which are part of the dune ridge and swale complex which characterizes the area. It should be noted

that while the primary objective of the additional field survey work was a more precise wetland inventory map, refinements to the delineation of other natural resource base features were also made as appropriate.

The first section of this chapter summarizes the results of the additional field surveys requested by the Committee. The second section describes the recommended land use management plan for the Chiwaukee Prairie-Carol Beach area.<sup>1</sup>

## REVISED NATURAL RESOURCE BASE INVENTORY INFORMATION

The field inspections conducted by the Commission staff subsequent to the May 3, 1984, meeting of the Technical and Citizen Advisory Committee resulted in the refined delineation of wetlands in the Chiwaukee Prairie-Carol Beach area shown on Map 27. As a result of the additional field inspections, areas encompassing about 35 acres, or about 4 percent of the initially delineated wetland area, were added to the configuration of wetlands in the study area, while areas encompassing about 106 acres, or about 13 percent of the initially delineated wetland area, were deleted from the wetland configuration, a net decrease of 71 acres, or about 9 percent of the initially delineated wetland area. The revised configuration of wetlands in the study area encompasses 747 acres, or 41 percent of the study area, compared to 818 acres, or 45 percent of the study area, as reported in previous chapters.

Also shown on Map 27 are those wetlands which have been determined to be significant in terms of one or more of the wetland rezoning criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code. Under the refined delineation, such wetlands encompass 654 acres, or about 36 percent of the study area, compared to 717 acres, or 39 percent of the study area, as initially delineated and previously reported.

As already noted, while the additional field surveys conducted subsequent to the May 3, 1984, Committee meeting were undertaken primarily to develop a more precise wetland inventory map, refinements to the delineation of other natural resource base features, based upon the field observations, were also made as appropriate. Table 40 presents the initially reported area and the revised area for the selected natural resource base elements affected.

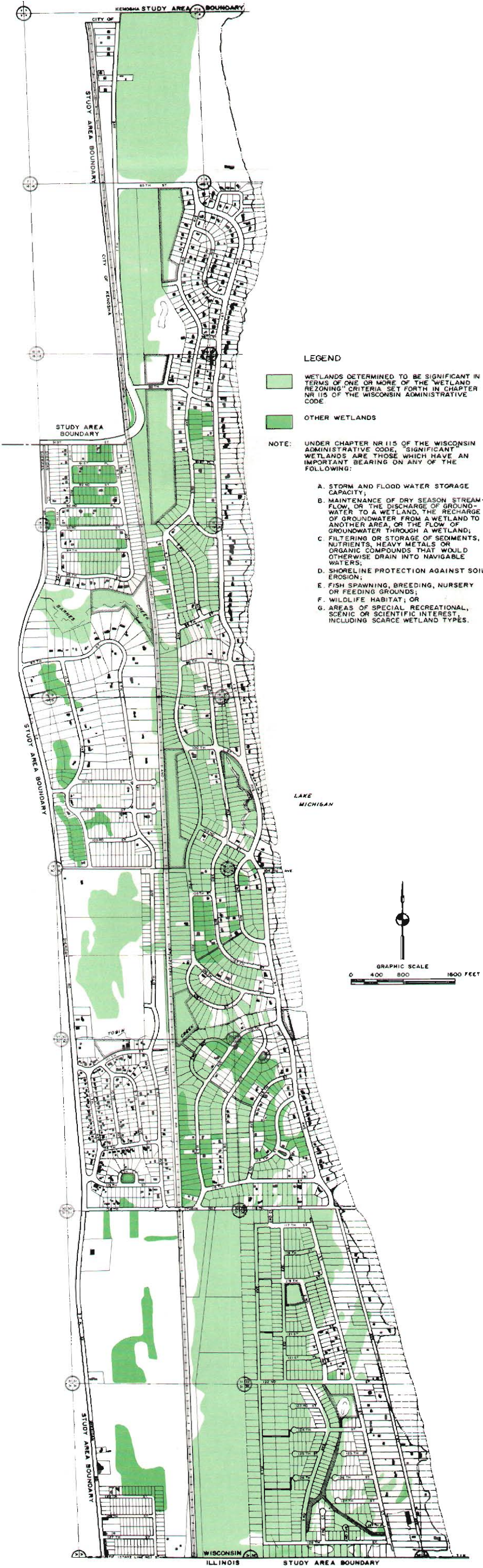
Application of the Regional Planning Commission environmental corridor mapping criteria to the revised natural resource base data resulted in the slightly revised delineation of primary environmental corridor shown on Map 28. The primary environmental corridor shown on Map 28 encompasses 1,256 acres, or 68.8 percent of the study area, compared to 1,264 acres, or 69.3 percent, as initially reported. The configuration of the secondary environmental corridor and isolated natural areas in the study area did not change appreciably as a result of the additional field survey work. The secondary environmental corridor encompasses four acres, or less than 1 percent of the study area, and the isolated natural areas encompass 34 acres, or 2 percent of the study area, as initially reported.

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<sup>1</sup>It should be noted that this chapter presents the recommended land use management plan as presented for public review at a public hearing held on October 23, 1984. A discussion of the public reaction to the plan expressed at that hearing is presented in Chapter VII of this report.

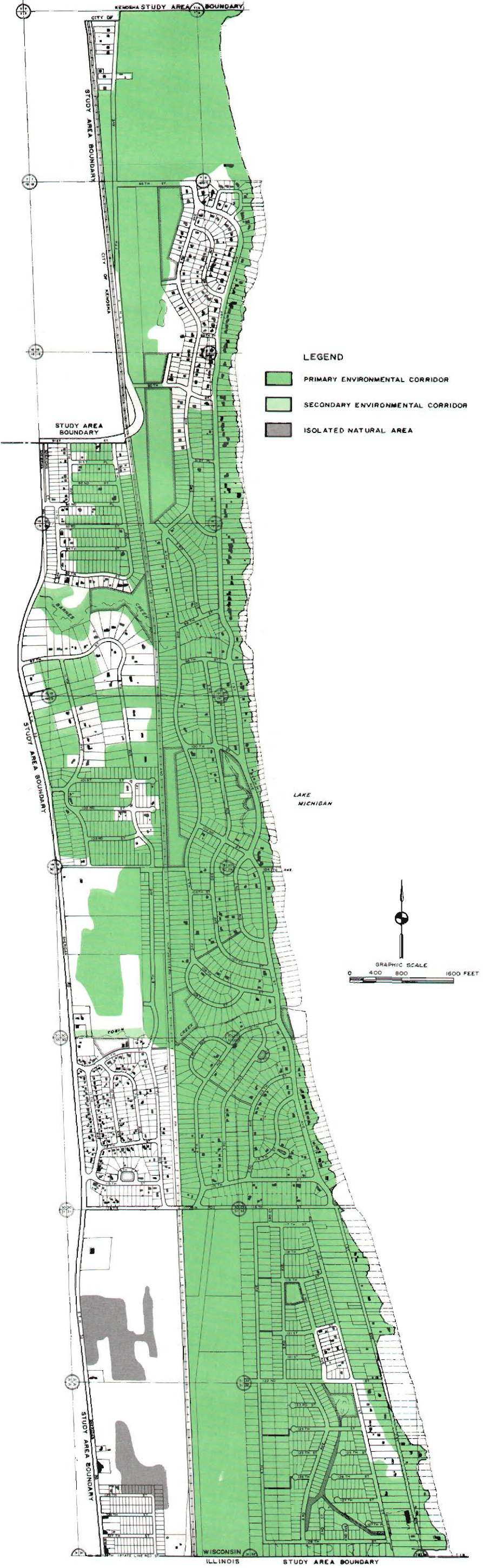


WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA--REVISED  
BASED UPON FIELD SURVEYS IN JULY 1984



Source: Wisconsin Department of Natural Resources and SEWRPC.

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL AREAS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA BASED UPON REVISED NATURAL RESOURCE BASE INVENTORY DATA: 1984



Source: SEWRPC.



Table 40

**INITIALLY REPORTED AND REVISED AREAS FOR  
SELECTED NATURAL RESOURCE FEATURES IN  
THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA**

Area	Initially Reported Area (acres)	Revised Area (acres)	Difference	
			Acres	Percent
<b>Critical Plant Habitat Areas</b>				
Wetland.....	540	505	-35	-6.5
Upland.....	68	90	22	32.4
Total	608	595	-13	-2.1
<b>Wildlife Habitat Areas</b>				
Wetland.....	611	566	-45	-7.4
Upland.....	87	131	44	50.6
Water.....	4	5	1	25.0
Total	702	702 <sup>a</sup>	--	--
<b>Natural Area</b>				
Wetland.....	418	394	-24	-5.7
Upland.....	56	78	22	39.3
Water.....	2	2	--	--
Other (streets, railway).....	17	17	--	--
Total	493	491	-2	-0.4
<b>Wetlands</b>	818	747	-71	-8.7
<b>Wetlands Particularly Important to the Maintenance of Water Quality, Low Streamflows, and Fish Populations</b>	160	159	-1	-0.6
<b>Fens</b>	62	60	-2	-3.2
<b>Wetlands Determined to be Significant In Terms of One or More of the Wetland Rezoning Criteria of Chapter NR 115 of the Wisconsin Administrative Code</b>	717	654	-63	-8.8
<b>Prairies</b>				
High Value.....	368	358	-10	-2.7
Medium Value.....	343	333	-10	-2.9
Low Value.....	149	137	-12	-8.1
Total	860	828	-32	-3.7

<sup>a</sup>The total of 702 acres of wildlife habitat includes 324 acres of high-value habitat and 378 acres of medium-value habitat.

Source: Wisconsin Department of Natural Resources and SEWRPC.

## RECOMMENDED LAND USE MANAGEMENT PLAN

The recommended land use management plan represents a refinement of the development-preservation alternative, adjusted to incorporate the revised natural resource base inventory information, as well as to accommodate the considerations directed by the Technical and Citizen Advisory Committee. The plan attempts to accommodate significant additional urban development within the area, while at the same time preserving the most important natural features of the area.

The recommended plan is presented on Map 29 and in Table 41. Under the recommended plan, an open space preservation area--consisting of lands to be maintained in an essentially open, natural condition--would encompass 803 acres, or about 44.0 percent of the Chiwaukee Prairie-Carol Beach area. Urban areas--



Table 41

**PROPOSED GENERALIZED LAND USE IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH AREA UNDER  
THE RECOMMENDED LAND USE MANAGEMENT PLAN**

Land Use Category <sup>a</sup>	Acres	Percent of Total
Urban Area.....	860	47.1
Open Space Preservation Area.....	803	44.0
Rural Area.....	116	6.4
Railway Right-of-Way.....	46	2.5
<b>Total</b>	<b>1,825</b>	<b>100.0</b>

<sup>a</sup> Includes existing streets within the respective categories.

Source: SEWRPC.

consisting primarily of single-family residential development, but also including intensive recreational and limited commercial and institutional use--would encompass 860 acres, or about 47.1 percent of the area. Rural lands--consisting of lands devoted primarily to agricultural use--would encompass 116 acres, or 6.4 percent of the area. The railway right-of-way of the Chicago & North Western Transportation Company accounts for the balance--46 acres, or 2.5 percent of the area. The proposed open space preservation areas, urban areas, and rural areas are further described below.

### Open Space Preservation Area

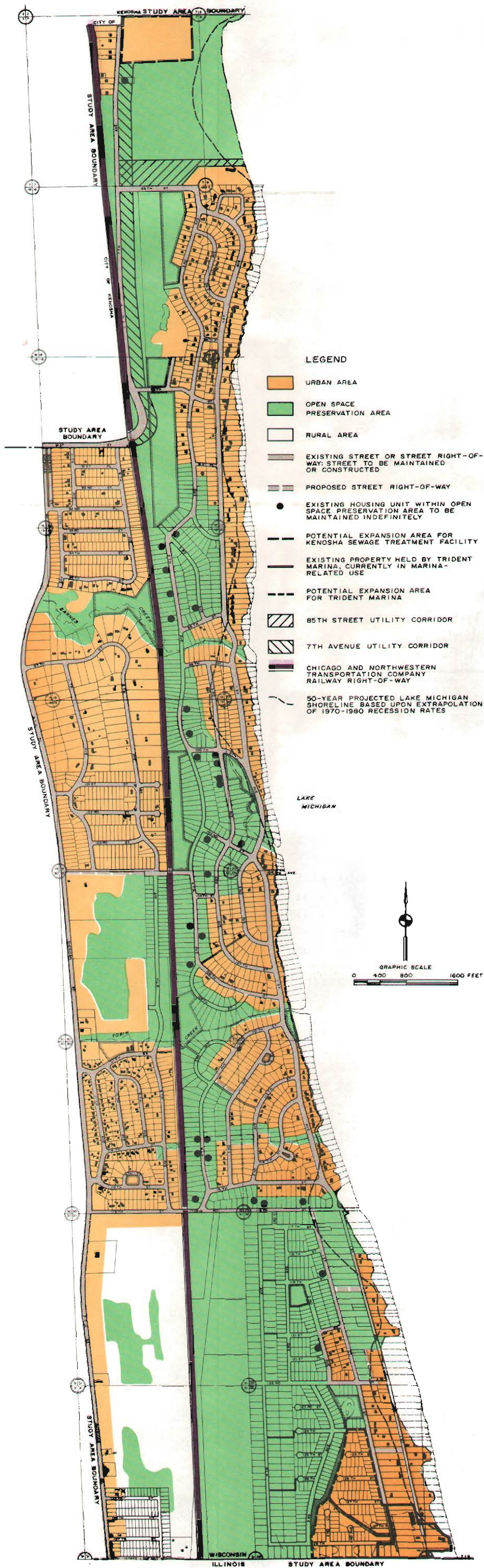
The proposed open space preservation area would consist of a continuous corridor connecting the Kenosha Sand Dunes on the north end of the study area with the Chiwaukee Prairie on the south end, along with small isolated natural areas in the southwestern portion of the study area.<sup>2</sup> Of the 803-acre open space preservation area, 604 acres, or about 75.2 percent, would consist of existing wetlands; 135 acres, or about 16.8 percent, would consist of existing upland open space lands; 4 acres, or 0.5 percent, would consist of existing surface water; 13 acres, or 1.6 percent, would consist of existing roadways proposed to be vacated and restored to a natural condition; and 47 acres, or about 5.9 percent, would consist of existing streets proposed to be maintained, proposed new roads, and developed lots (see Map 30). It should be noted that most of the upland open space proposed for preservation possesses important

<sup>2</sup>Within the context of the regional land use and water quality management plans, the various segments of the proposed open space preservation area would be classified as follows. The proposed preservation areas west of the C&NW railway right-of-way, south of 116th Street, would be classified as isolated natural areas. The segment of the proposed preservation area along the northern mouth of Barnes Creek between Lake Michigan and a point approximately 800 feet upstream; the segment along Tobin Creek between Lake Michigan and a point approximately 500 feet upstream; the segment along Tobin Creek west of 8th Avenue; the segment along the unnamed stream north of 115th Street between Lake Michigan and 3rd Avenue; and the segment near the intersection of 114th Street and 8th Avenue, west of the C&NW railway right-of-way, would all be classified as secondary environmental corridors. The balance of the proposed preservation area would be classified as a primary environmental corridor.



Map 29

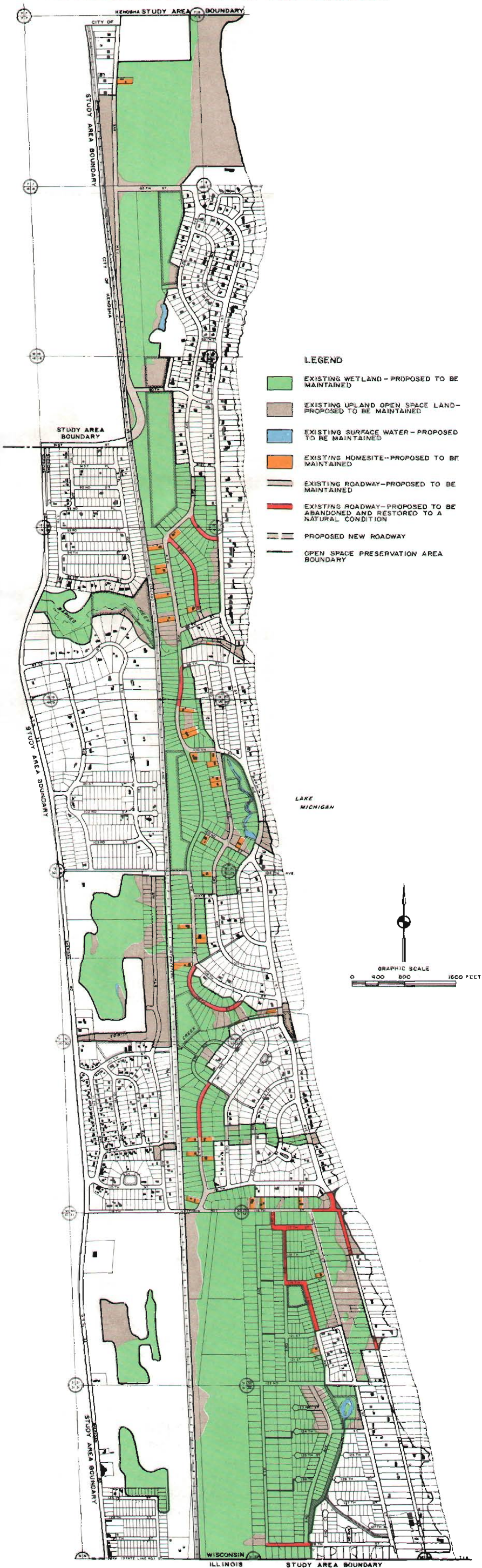
RECOMMENDED LAND USE MANAGEMENT PLAN  
FOR THE CHIAWKEE PRAIRIE-CAROL BEACH AREA



Source: SEWRPC.

Map 30

LAND USE WITHIN THE PROPOSED OPEN SPACE  
PRESERVATION AREA IDENTIFIED  
IN THE RECOMMENDED LAND USE MANAGEMENT PLAN



Source: SEWRPC.



plant habitat, wildlife habitat, or natural area value.<sup>3</sup> In some cases, small upland open space areas which are intermittently mowed or otherwise disturbed have been included in the open space preservation area to maintain the integrity of that area, and it is envisioned that such areas will eventually be restored to a natural condition.

Table 42 presents a summary of the degree to which the recommended plan would preserve wetlands in general, as well as "special value" wetlands--that is, wetlands determined to be significant in terms of one or more of the wetland rezoning criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code. As indicated in Table 42, the plan would preserve about 604 acres, or about 81 percent, of all wetlands in the study area. Importantly, the plan would preserve 565 acres of special value wetlands, or just over 86 percent of all special value wetlands.

The recommended plan would also preserve certain upland areas possessing important natural resource features. Specifically, the plan would preserve 76 acres, or about 84 percent, of the upland critical plant habitat in the study area; 101 acres, or about 77 percent, of the upland wildlife habitat; and 74 acres, or about 95 percent, of the upland areas having natural area value. The recommended plan would also preserve 584 acres of prairie lands, both wetland and upland, within the study area, or about 71 percent of the 828 acres of prairie lands which have been identified in the area.

As already noted, the recommended plan would preserve a substantial portion--about 86 percent--of all special value wetlands in the Chiwaukee Prairie-Carol Beach area. The remaining special value wetlands, which would not be preserved under the recommended plan, are shown on Map 31. The special value wetlands which would not be preserved are typically isolated from, or located on the periphery of, other special value wetland areas. In most cases, these wetlands occupy areas that are a logical extension of areas which are already wholly or partly committed to urban use. It should be recognized in this respect that resource management is not only more effectively accomplished in large contiguous tracts of open space land, but in some cases may be possible only in such tracts. The recommended plan attempts to avoid the creation of biological islands which may be genetically isolated and which are difficult to manage effectively and efficiently, if at all.

As shown on Map 29, there are 30 existing housing units within the proposed open space preservation area. Under the plan, these homesites would be permitted to be maintained indefinitely. However, the plan does not preclude the possibility of acquisition and relocation of such housing units outside the preservation area in the future, should such acquisition be mutually agreeable to the acquiring agencies and the owners of the property concerned.

Two utility corridors are shown within the proposed open space preservation area in the recommended plan. One of these corridors, along the east side of 7th Avenue north of 91st Street, is intended to accommodate the installation and servicing of utility lines which may be necessary to provide sanitary

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<sup>3</sup>As used here, natural area value implies designation as an "NA-1"--a natural area of statewide or greater significance--or "NA-2"--a natural area of county or regional significance.

Table 42

**PRESERVATION OF SPECIAL VALUE WETLANDS<sup>a</sup> IN  
THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA  
UNDER THE RECOMMENDED LAND USE MANAGEMENT PLAN**

Wetland Classification	Total in Study Area (acres)	Portion Preserved	
		Acres	Percent of Total
Wetlands Particularly Important to the Maintenance of Water Quality, Low Streamflows, and Identified Fish Populations.....	159	143	89.9
Wetlands Comprising Critical Plant Habitat.....	505	454	89.9
Wetlands Comprising Wildlife Habitat.....	566	518	91.5
Wetlands Having Natural Area Value.....	394	363	92.1
Wetland Fen Area.....	60	55	91.7
Wetlands Having at Least One of the Above-Listed Values.....	654	565	86.4
All Wetlands .....	747	604	80.9

<sup>a</sup>Special value wetlands are those which have been determined to be significant in terms of one or more of the wetland rezoning criteria of Chapter NR 115 of the Wisconsin Administrative Code.

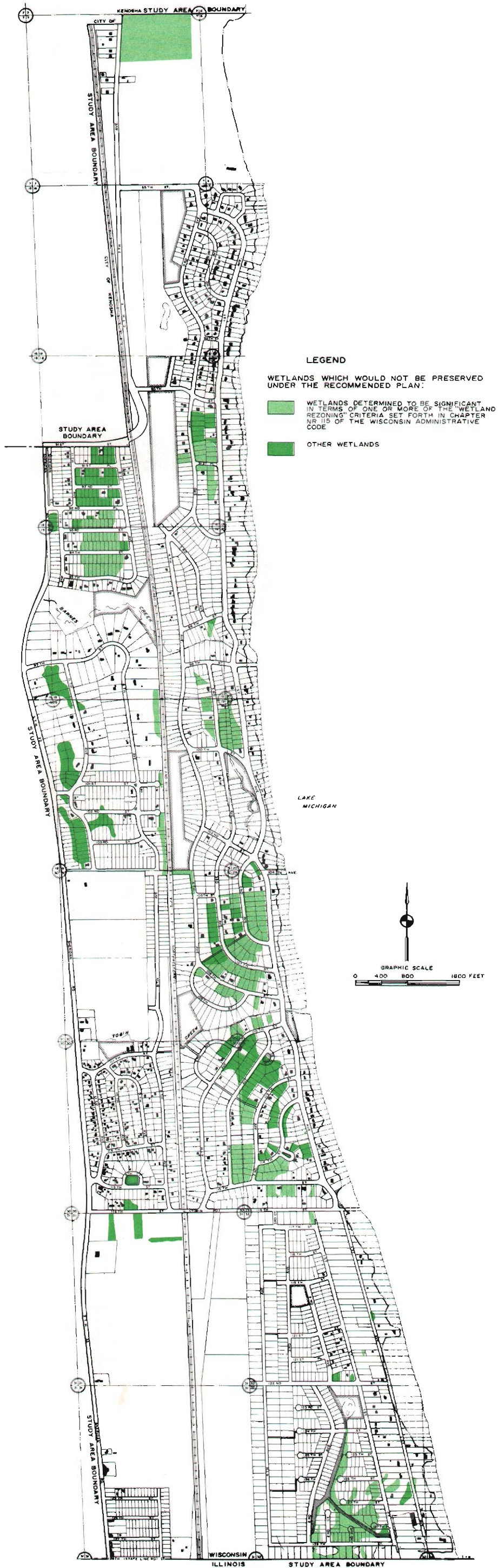
Source: SEWRPC.

sewer, public water supply, electric power, or natural gas service to the Chiwaukee Prairie-Carol Beach area or to other portions of the southeastern area of the Town of Pleasant Prairie. A corridor on the north side of 85th Street between Lake Michigan and 7th Avenue is intended to accommodate the servicing of existing water intake and discharge lines which run between Lake Michigan and the Wisconsin Electric Power Company's Pleasant Prairie electric power generation plant, as well as the installation of additional lines as required. Any work involving the construction and maintenance of utility lines should be done in a manner which is sensitive to the natural values in those areas and should include restoration to natural conditions after construction and maintenance insofar as practicable.

As indicated in Chapter II of this report, 100-year recurrence interval flood hazard areas have been delineated along Barnes Creek, including both its northern and southern outlets; Tobin Creek; the unnamed stream tributary to Lake Michigan, north of 115th Street; and the unnamed stream which drains into the Trident Marina (see Map 9 in Chapter II of this report). Nearly all of the identified flood hazard areas along Barnes Creek and Tobin Creek are contained within the proposed open space preservation area. Along some segments of Barnes Creek and Tobin Creek, narrow drainageways, typically following drainage easements recorded on original subdivision plats, have been incorporated into the open space preservation area to ensure the preservation of the flood hazard areas in open use.

The proposed open space preservation area also includes a drainageway along the unnamed stream north of 115th Street between 3rd Avenue and Lake Michigan. This drainageway encompasses some, but not all, of the existing flood hazard area east of 3rd Avenue. It is envisioned that the area of the floodplain east

WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA WHICH WOULD NOT BE PRESERVED UNDER THE RECOMMENDED LAND USE MANAGEMENT PLAN





of 3rd Avenue would be reduced in size through the installation of larger culverts under 1st Avenue, 2nd Avenue, and 114th Street and through certain minor channel improvements. The alignment of the proposed drainageway along this reach should be considered preliminary and subject to modification following detailed engineering analysis of alternative drainage improvements.

### Urban Area

The recommended plan envisions that the area devoted to urban development would encompass 860 acres, or about 47 percent of the Chiwaukee Prairie-Carol Beach area. Most of the urban area would be devoted to single-family residential use, together with limited commercial and institutional uses. The proposed urban area also includes lands specifically reserved for the possible expansion of the Kenosha sewage treatment plant, and for the possible expansion of the Trident Marina.

The recommended plan envisions the development for urban use of most of the platted lots outside the proposed open space preservation area. The notable exception is the unimproved subdivision located east of Sheridan Road, north of the Illinois-Wisconsin state line, where the majority of lots, being held in a single ownership and being substandard, would remain undeveloped.

The recommended plan also envisions the eventual development of certain presently unplatted lands. Specifically, unplatted lands outside the open space preservation area in an area located east of Sheridan Road, south of 104th Street, and adjacent to 116th Street between Sheridan Road and the C&NW railway right-of-way would be converted to urban use, assuming the eventual extension of sanitary sewer service to adjacent platted lands. In addition, certain unplatted lands adjacent to Sheridan Road, south of 116th Street, would be converted to urban use assuming that sanitary sewer service is eventually extended along Sheridan Road to the Wisconsin-Illinois border (see Map 29).

As noted above, the proposed urban area includes lands reserved for two special uses--namely, expansion of the Trident Marina and of the Kenosha sewage treatment plant. The owner of the Trident Marina has proposed, and the Technical and Citizen Advisory Committee has concurred, that land adjacent to the Trident Marina be reserved for possible expansion of that facility. Under the recommended plan, an undeveloped area encompassing about 36 acres located west of 1st Court and north of the Wisconsin-Illinois border is reserved for possible expansion of the marina. It is important to note that the existing plans for the expansion of the marina are preliminary in nature and that precise site boundaries would be determined, to a large extent, by the ability of the marina owner to acquire the additional lands needed. In this regard, the plan does not preclude the expansion of the marina into the urban area east of 1st Court, north of the present marina facility, which includes a number of developed lots. In any case, however, the marina facility should not be expanded into the proposed open space preservation area. If the marina expansion is not underway within 10 years, the plan should be amended to delete the marina expansion element and to re-designate the land concerned as part of the open space preservation area.

As shown on Map 29, the recommended plan reserves land in the northernmost portion of the study area for the expansion of the Kenosha sewage treatment plant. The Kenosha sewage treatment plant is presently located on a 23-acre

site just north of 80th Street in the City of Kenosha. The most recent expansion of that site was designed to accommodate the need for sewage treatment in the Kenosha area through the year 2000. That expansion has, however, essentially fully utilized all of the existing area of the present site and has left no area for future expansion of the plant. The site is surrounded on two sides by existing residential development, on a third side by Southport Park, and on the fourth side by property held by the Wisconsin Electric Power Company. Deed restrictions attendant to Southport Park essentially prohibit its use for anything but a public park.

The area proposed in the plan to be reserved for expansion of the sewage treatment plant is located just south of the existing plant on property owned by the Wisconsin Electric Power Company. The reserved area would encompass 18 acres, about equal to the intensively developed area at the present sewage treatment plant site. The reserved area is located outside the upland dune area adjacent to Lake Michigan, but is a wetland and part of the Kenosha Sand Dunes natural area. It has been identified as a medium-value wildlife habitat area and as an area which provides important plant habitat. It should be noted that in 1975 the Kenosha Water Utility sought to acquire at least 15 acres of Wisconsin Electric Power Company property for the purpose of accommodating the expansion of the Kenosha sewage treatment plant. However, at that time the Wisconsin Department of Natural Resources opposed such expansion because of the nature of the plant communities found on much of the WEPCo property.

### Rural Area

Under the recommended plan, certain lands located north of the Wisconsin-Illinois border, west of the C&NW railway right-of-way, would remain in rural--primarily agricultural--use. Such lands would encompass 116 acres, or about 6 percent of the study area.

### Population and Housing

Under the recommended plan, the housing stock in the Chiwaukee Prairie-Carol Beach area would increase from 512 housing units in 1980 to about 1,460 units upon full development--an increase of about 950 housing units, or almost three times the existing stock. This estimate assumes the development of most of the remaining platted lots within the proposed urban area as individual single-family homesites.<sup>4</sup>

Under the recommended plan, the population in the study area would increase from 1,402 persons in 1980 to about 4,250 persons upon full development--an increase of about 2,850 persons--or to about three times the existing population. This estimate assumes a housing vacancy rate of 3 percent and an average household size of 3.0 persons per household. It also assumes that those

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<sup>4</sup>In estimating the number of housing units under ultimate development conditions, it was assumed that lots in the area reserved for the expansion of the Trident Marina will be developed in marina-related, rather than residential, use. It was also assumed that no additional housing units will be constructed on partially eroded lots along the Lake Michigan shoreline where the distance between the street right-of-way and the inland edge of the beach is less than 200 feet.

housing units now used on a seasonal basis, which comprised about 10 percent of the housing units in the area in 1980, will eventually be converted to year-round occupancy.

## Public Improvements

Sanitary Sewer Service: The recommended plan envisions that, during the next 20 years, public sanitary sewer service will be extended to all areas designated for urban use under the plan--areas which, as previously noted, encompass about 860 acres, or about 47 percent of the study area.

In accordance with the directive of the Technical and Citizen Advisory Committee, the recommended plan proposes that where sanitary sewers are provided, development along both sides of the streets be permitted insofar as practicable. In some cases, however, the plan proposes that sewer service be provided to urban development on one side of the street only, with the opposite side being held in open space use because of the importance of the natural resource values present. Those street segments along which sanitary sewer service is proposed on one side only are listed below.

1. 1st Avenue from a point south of 91st Place to 96th Street;  
and 96th Street from 1st Avenue to a point east of 4th Avenue  
Under the recommended plan, the land west of 1st Avenue, north of 96th Street--with the exception of the existing homesite just north of 96th Street--would be held in open space use. This land consists primarily of wetlands, with small upland areas present. It has been identified as a natural area of statewide or greater significance and has important plant habitat and wildlife habitat value.
2. A portion of 1st Avenue north of its intersection with 102nd Street,  
and a portion of 2nd Avenue south of its intersection with 102nd Street  
Under the recommended plan, the land west of 1st and 2nd Avenues--with the exception of the existing homesite on 102nd Street, just west of 1st Avenue--would be held in open use. Most of this land consists of wetlands. The land west of 2nd Avenue, south of 102nd Street, has been identified as having important plant habitat value and is part of a natural area of county or regional significance.
3. A portion of 3rd Avenue, beginning at  
a point about 0.2 mile north of its intersection with 115th Street  
Under the recommended plan, the land west of 3rd Avenue would be held in open space use. This area is a wetland having important plant habitat value.
4. 115th Street between 2nd Avenue and a point east of 4th Avenue  
Under the recommended plan, the area south of 116th Street would be held in open space use. This area is a wetland having important plant habitat and wildlife habitat value. A portion of the area has been identified as a natural area of statewide or greater significance.
5. 1st Avenue from a point about 700 feet  
south of 116th Street to approximately 121st Street extended  
Under the recommended plan, the land west of 1st Avenue would be held in open space use. This land includes both wetland and upland areas. The

land has been designated a natural area of statewide or greater significance and has important plant habitat and wildlife habitat value.

6. 1st Court between 121st Street and 122nd Street; and a proposed road east of 1st Court between 121st Place extended and 122nd Street  
Under the recommended plan, the land between 1st Court and the proposed road would be held in open space use. This land includes both wetland and upland areas. The land has important wildlife habitat value; a portion of the area has important plant habitat value.
7. 2nd Avenue between 121st Street and 122nd Street; and 122nd Street between 1st Court and 2nd Avenue  
Under the recommended plan, the area west of 2nd Avenue, with the exception of a single existing homesite, would be held in open space use. This area is primarily a wetland, having important plant habitat and wildlife habitat value. The area is part of a natural area of statewide or greater significance. The area south of 122nd Street would also be preserved in open space use under the recommended plan. This area is also a wetland and has important wildlife habitat value.

As already noted, 30 housing units within the proposed open space preservation area would be permitted to be maintained indefinitely under the plan. The plan does not specifically recommend the provision of sanitary sewer service to these homesites. However, as a sewer system is installed to serve the identified urban areas, some of these units may be connected to that system. The determination of which, if any, of these units would be served would be made when a detailed sewerage system is designed for the proposed urban areas. This determination would be based upon the layout of the proposed system and the attendant costs and environmental impacts of the required connections.

Water Supply Service: As previously noted, public water supply service is presently provided within the residential area north of 90th Street. The recommended plan envisions that this service will be maintained and that public water supply service will be extended to all other urban areas.

Street Improvements: The recommended plan envisions that the study area will be served by all-weather streets with rural cross-sections; that is, with road ditches, culverts, and skeletal storm sewer systems and without curbs and gutters and full storm sewer systems. As noted earlier, roadway conditions within the study area are presently varied. Certain roads have a bituminous concrete surface and are in good condition, requiring no improvement at this time. Others are gravel roads, or are bituminous concrete or penetration macadam-surfaced roads in poor condition. Other than the exceptions noted later in this section, roads included in the recommended plan, as shown on Map 29, would be improved, as necessary, to a good bituminous concrete surface.

The plan envisions a total of 20.3 linear miles of local streets, including 20.0 miles over existing street rights-of-way and slightly more than 0.3 linear mile over proposed new rights-of-way. As shown on Map 29, proposed new street rights-of-way include: 1) a proposed new street right-of-way east of 1st Court, north of 122nd Street; 2) a proposed new right-of-way connecting 3rd Avenue and 4th Avenue, about one-quarter mile north of 115th Street; 3) a widened right-of-way along a segment of 104th Street, from Sheridan Road to a point just west of 8th Avenue; 4) a proposed new right-of-way consisting of an



extension of 1st Court, between 116th Street and 117th Street; and 5) a proposed new right-of-way between 1st Avenue and 1st Court, just south of 119th Street. In addition, the plan proposes the extension of 104th Street across the C&NW railway right-of-way. This would provide more direct access to the proposed urban areas east of the railway, which must otherwise rely on 90th Street or 116th Street for access. Such access is important for the provision of fire and rescue services, the closest town fire station being that located in the municipal building on 39th Avenue, just north of CTH Q (104th Street).

It should be noted that the proposed new street right-of-way between 1st Avenue and 1st Court would permit an approximately 1,000-foot-long segment of 1st Avenue to be vacated--extending from a point about 300 feet north of its intersection with 116th Street to a point about 700 feet south of that intersection. This segment is seriously threatened by Lake Michigan shoreline erosion. The cost of providing the street connection between 1st Avenue and 1st Court would approximate \$14,000. In comparison, the installation of effective shore protection along the erosion-threatened segment of 1st Avenue may be expected to cost more than \$300,000. The vegetation on the lot proposed for the east-west access route between 1st Court and 1st Avenue is already significantly disturbed.

Under the recommended plan, road access to the Trident Marina and residential development in the southeastern portion of the Chiwaukee Prairie-Carol Beach area would be provided from the north via 116th Street and 1st Court extended. It is anticipated that a standard two-lane rural section roadway would be able to accommodate existing traffic volumes, as well as any additional traffic volume attendant to the development of the marina and the infilling of residential lots in the southeastern portion of the study area. If the expansion and additional development of the Trident Marine proceeds, the traffic volume along 116th Street and 1st Court may be expected to increase significantly. In this regard, under ultimate development conditions, the number of vehicle trips on an average weekday along 116th Street and 1st Court may be expected to triple over the present level.<sup>5</sup> While a standard two-lane rural section roadway along 1st Court and 116th Street may be expected to be able to accommodate the increased traffic volume, this roadway would tend to function as an arterial street rather than a local street, with attendant impacts on adjacent residential property.

In considering this matter, two alternatives were evaluated: an east-west access route from Sheridan Road to 1st Court, along 122nd Street extended, and a direct east-west access route from Sheridan Road to the Trident Marina along the Illinois-Wisconsin border. Either route would require an additional at-grade crossing of the C&NW railway right-of-way. These alternative routes were not proposed because they would disrupt existing natural features east of the

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<sup>5</sup>This assumes the expansion of the marina to provide 500 boat slips and the development of a related hotel-conference center with 225 hotel rooms. It also assumes the development as single-family homesites of all vacant platted lots within the proposed urban area--outside the marina expansion area--in the southeastern portion of the study area.

railway right-of-way and because, as noted above, 1st Court and 116th Street would be able to accommodate the increased traffic flow. In its review of this matter, the Town of Pleasant Prairie expressed concern about relying solely on 1st Court and 116th Street for access to an expanded marina facility. The Town expressed concern that much of the traffic to the marina could be expected to emanate from Illinois and would use Russell Road and 128th Street as an approach route to the area from IH 94; and that the increased traffic along 1st Court and 116th Street would have severe impacts on adjacent residential areas. The Town was also concerned about the potential need for a utility corridor for the extension of sanitary sewer service from Sheridan Road to the marina area. The Town expressed support for a roadway and utility corridor along the state line.

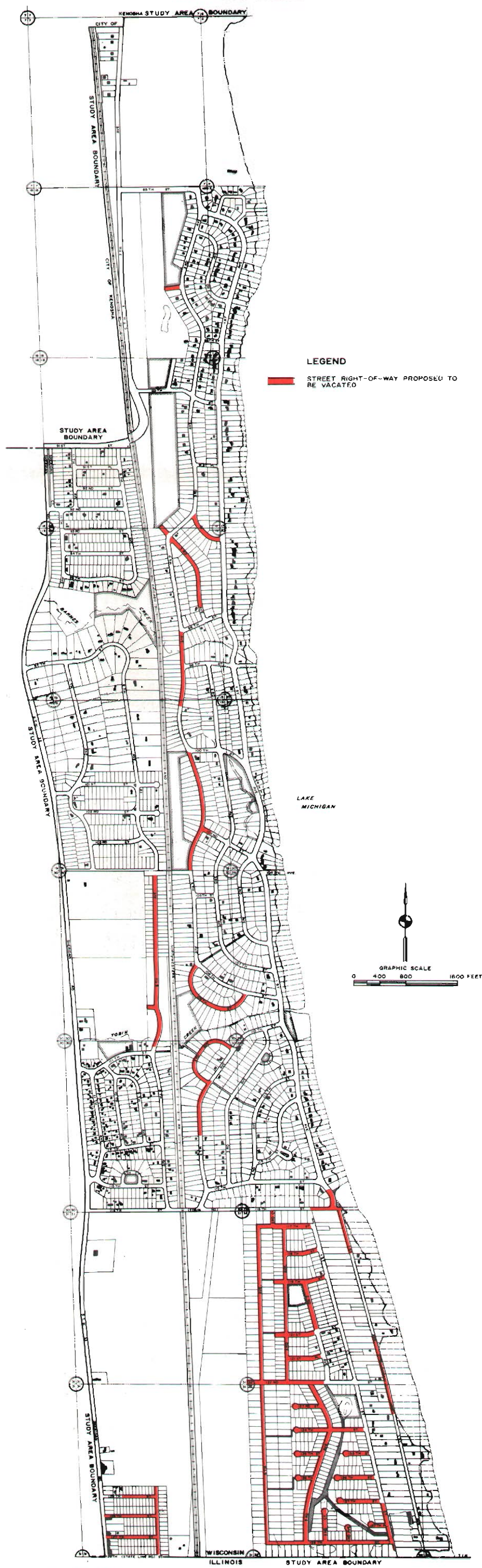
The need for, and location of, a new roadway and utility corridor will have to be decided if, and when, the marina expansion proceeds and the actual scale of development is determined. If the marina expansion does proceed and it is determined that an alternate to 1st Court and 116th Street is required for access, alternative east-west routes along 122nd Street and 128th Street (the state line) should be evaluated. Proposals for the construction of a roadway and for the installation of public utilities should be evaluated separately. It should be noted that an east-west roadway and utility corridor along 122nd Street would be preferable to a corridor along 128th Street because it would have fewer attendant environmental impacts.

Certain dedicated street rights-of-way would not be retained and used as local streets under the recommended plan. Such streets would be vacated following the procedures provided for such vacation set forth in Chapter 236 of the Wisconsin Statutes. The street rights-of-way recommended to be vacated are shown on Map 32. Some of the rights-of-way proposed to be vacated contain existing roadways, and in others roadways were never constructed, or were constructed but are no longer viable, having been overtaken by vegetation or lost to shoreline erosion. The street rights-of-way proposed to be vacated in combination total 7.5 linear miles.

It should be noted that certain east-west street "stub ends" along the Lake Michigan shoreline are not proposed to be developed as roadways under the recommended plan, but should, nevertheless, be maintained in public ownership to provide public access to Lake Michigan.

Several streets shown on the recommended plan serve only to provide access to isolated housing units within the proposed open space preservation area. These street segments--which in combination total about one linear mile and serve a total of 14 housing units--include: 1) 4th Avenue north of its intersection with 115th Street; 2) 102nd Street west of 3rd Avenue; 3) the segment which includes 100th Street west of 3rd Avenue, and 4th Avenue north of 100th Street; 4) 3rd Avenue north of 96th Street; and 5) the segment which includes a portion of 3rd Avenue south of 91st Place, 4th Avenue north of 96th Street, and a small portion of 96th Street east of 4th Avenue. It is envisioned that, in the interim, these road segments will be maintained in their present condition and thereby continue to provide access to the homesites concerned. The

STREET RIGHTS-OF-WAY PROPOSED  
TO BE VACATED UNDER THE RECOMMENDED  
LAND USE MANAGEMENT PLAN



Source: SEWRPC.

Town should determine whether it is in its best interest to continue to maintain the roads in question or whether it instead should acquire the homesites and vacate those roads.<sup>6</sup>

### Shoreline Erosion

As previously noted, shoreline erosion poses a special hazard to certain shoreline property. Average annual recession rates along the Lake Michigan shoreline in the study area are presented in Chapter II of this report. Map 29 shows the projected location of the Lake Michigan shoreline 50 years hence, if the rate of shoreline erosion during that time were to approximate the average annual rate observed between 1970 and 1980 and if no additional structural shore protection measures were undertaken.

As also previously noted, the plan proposes the vacating of a road segment which is presently seriously threatened by Lake Michigan shoreline erosion--namely, an approximately 1,000-foot-long segment of 1st Avenue near its intersection with 116th Street--and the provision of alternative access to the homesites presently served by that segment. Along the rest of the Lake Michigan shoreline, it was assumed that structural shore protection will be installed as necessary to prevent any substantial shoreland loss, and that the Lake Michigan shoreline will remain essentially intact.

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<sup>6</sup>In analyzing this matter, the Town should consider, among other factors, the cost of acquiring the existing homesites, the marginal cost to the Town of maintaining these roads, the amount of state aid received by the Town as an offset to such road maintenance costs, and the property taxes generated by the houses presently served by these segments. The total assessed value of the homesites in question is about \$596,000, and tax levy for town purposes against this property would amount to about \$890 annually. The actual marginal cost to the Town of maintaining the roads in question is unknown at this time. However, it is known that the average annual cost to the Town of maintaining all of its roads--based upon the average of four years of cost information reported by the Town to the Wisconsin Department of Transportation--is \$6,700 per mile. If the Town actually spent \$6,700 to maintain the road segments in question, it would face an annual shortfall of \$4,870--the difference between the maintenance cost of \$6,700 on one hand and the sum of offsetting state aids, estimated at \$940, and property tax for town purposes, about \$890, on the other hand.

It is likely, however, that the actual cost to the Town of maintaining the road segments in question is considerably less because of the fixed nature of certain road maintenance costs. If the Town spent \$2,700 per year--roughly equivalent to the average annual cost of maintaining one mile of rural town road in southeastern Wisconsin--the Town would face a shortfall of \$1,410--the difference between the cost of \$2,700 on one hand and the sum of offsetting state aids, estimated at \$400, and the property tax for town purposes, about \$890, on the other hand.

In making a determination on this matter, the Town would have to weigh any potential road maintenance cost savings attendant to vacating the roads against the cost of acquiring the existing homesites served by the roads in question.



Review of the recommended plan in light of the 50-year projected "nonstructural" shoreline suggests that, while certain housing units would have to be relocated and certain streets vacated, the plan would be viable in a situation in which no additional structural shore protection is installed. With certain modifications to the proposed street system--particularly between 96th Street and 102nd Street, where an alternative to 1st Avenue as the main north-south access route may be required--the plan could be adapted to such a situation.

The Town in conjunction with the property owners concerned must address the shoreline erosion problem and determine whether structural shore protection is a financially feasible and cost-effective solution. It is essential that this matter be studied before any further major public improvements or private development are undertaken in erosion-threatened areas.

It should be recognized that town adoption of the plan would not obligate the Town to install public utilities in erosion-threatened segments of 1st Avenue, or to maintain such segments through structural shore protection. The plan is intended to be flexible regarding a shoreline erosion strategy and thus only presents options. The street pattern attendant to the plan could be readily amended to accommodate whatever course of action the Town chooses.

## SUMMARY

After considering the series of alternative plans documented in Chapter IV of this report, the Technical and Citizen Advisory Committee on May 3, 1984, selected the development-preservation alternative as the basis for the preparation of a recommended plan for the Chiwaukee Prairie-Carol Beach area. In doing so, the Committee directed that certain considerations be incorporated into the refined development-preservation plan, and further directed that additional field inspection work be conducted within the area to provide a more precise delineation of the wetland areas. This chapter has presented the results of the additional field inspection work, along with a recommended land use management plan for the study area.

## Revised Natural Resource Base Inventory Information

As a result of the additional field inspection work requested by the Advisory Committee, areas encompassing about 35 acres were added to the configuration of wetlands in the study area, while areas encompassing about 106 acres were deleted from the wetlands configuration, a net decrease of 71 acres, or about 9 percent of the initially delineated wetland area. The revised configuration of wetlands in the study area encompasses 747 acres, or 41 percent of the study area, compared to 818 acres, or 45 percent of the study area, as reported in previous chapters. The additional field inspection work further indicated that special value wetlands--that is, wetlands which are significant in terms of one or more of the wetland rezoning criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code--encompass 654 acres, or about 36 percent of the study area. While the additional field inspection work conducted subsequent to the May 3, 1984, Advisory Committee meeting was undertaken primarily to develop a more precise wetland inventory map, refinements to the delineation of other natural resource base features, based upon field observations at that time, were also made as appropriate. A summary of the updated natural resource base information is presented in Table 40 of this chapter.

## Recommended Land Use Management Plan

The recommended land use management plan is a refinement of the development-preservation alternative, adjusted to incorporate the revised natural resource base inventory information, as well as the amendments recommended by the Technical and Citizen Advisory Committee. The recommended plan proposes the maintenance of an open space preservation area consisting of a continuous corridor connecting the Kenosha Sand Dunes on the north end of the study area with the Chiwaukee Prairie on the south end, along with small isolated preservation areas in the southwestern portion of the study area. The open space preservation area encompasses 803 acres, or 44 percent of the study area. It encompasses 604 acres of wetlands, or 81 percent of all wetlands in the area, including 565 acres of special value wetlands, or about 86 percent of the special value wetlands.

The recommended plan envisions an urban area encompassing 860 acres, or about 47 percent of the study area. Most of the urban area would be devoted to single-family residential use, as well as limited commercial and institutional use. In addition, the proposed urban area includes lands specifically reserved for possible expansion of the Kenosha sewage treatment plant, as well as for possible expansion of the Trident Marina.

Under the recommended plan, the housing stock in the area would increase from 512 housing units in 1980 to about 1,460 housing units upon full development--an increase of about 950 housing units--or almost triple the existing stock. The population of the study area would increase from 1,402 persons in 1980 to about 4,250 persons upon full development.

The recommended plan envisions that public sanitary sewer and water supply service will be provided throughout the area proposed for urban use. The recommended plan further envisions that the area will be served by all-weather streets, with rural cross-sections; that is, with road ditches, culverts, and skeletal storm sewer systems and without curbs and gutters and full storm sewer systems. The plan envisions a 20.3-linear-mile local street system, including 20.0 linear miles over existing street rights-of-way and slightly more than 0.3 linear mile over proposed rights-of-way. Conversely, street rights-of-way totaling 7.5 linear miles would be vacated under the recommended plan.

Shoreline erosion poses a special hazard to certain property along the Lake Michigan shoreline. The plan proposes that a road segment presently seriously threatened by Lake Michigan shoreline erosion be vacated--namely, an approximately 1,000-foot-long segment of 1st Avenue near its intersection with 116th Street--and that alternative access to the homesites presently served by that road segment be provided. Along the rest of the Lake Michigan shoreline, it was assumed that structural shore protection will be installed as necessary to prevent any substantial shoreland loss and that the Lake Michigan shoreline will remain essentially intact.

It is important to note that, while certain housing units would have to be relocated and certain streets vacated, the plan would be viable in a situation in which no additional structural shore protection is installed. With certain modifications to the proposed street system--particularly between 96th Street and 102nd Street, where an alternative to 1st Avenue as the main north-south access route would be required--the plan could be adapted to such a situation.

The Town in conjunction with the property owners concerned must address the shoreline erosion problem and determine whether structural shore protection is a financially feasible and cost-effective solution. It is essential that this matter be studied before any further major public improvements or private development are undertaken in erosion-threatened areas.

## Chapter VI

### PLAN IMPLEMENTATION

#### INTRODUCTION

The recommended land use management plan presented in Chapter V is intended to serve as a guide to urban development and open space preservation within the Chiwaukee Prairie-Carol Beach area of the Town of Pleasant Prairie. In a practical sense, however, the recommended plan is not complete until the steps required to implement the plan have been specified. This chapter is intended to provide such specification, and thereby serve as a basis for achieving implementation of the recommended land use management plan over time. The first section identifies those agencies and units of government, as well as private interests, whose actions will have an important bearing on plan implementation. The functions and duties of those agencies and units are described in Chapter III of this report. Subsequent sections present specific actions required to implement the plan, setting forth recommendations regarding plan adoption, open space acquisition, natural resource management, and land use regulation. The final section presents public improvement costs attendant to the plan.<sup>1</sup>

#### PLAN IMPLEMENTATION AGENCIES

Successful implementation of the land use management plan depends upon the cooperative actions of a number of government agencies and private interests. Those government agencies and private interests whose actions will have a significant effect, either directly or indirectly, upon successful implementation of the recommended plan, and whose cooperation in implementation will be essential, are listed and described below.

##### Local Level Agencies

Town of Pleasant Prairie: Under town-county zoning in Kenosha County, the Town of Pleasant Prairie has an important role in the adoption and administration of the county zoning ordinance as it pertains to the Town. The Town is, moreover, responsible for the maintenance and improvement of town roads and, through its water utility and various sewer utility districts, is responsible for the provision of water supply and sanitary sewer services in the Town.

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<sup>1</sup>It should be noted that this chapter presents plan implementation recommendations attendant to the recommended land use management plan as presented for public review at a public hearing held on October 23, 1984. A discussion of the public reaction to the plan and plan implementation recommendations expressed at that hearing is presented in Chapter VII of this report.



Kenosha County: Kenosha County's land use regulatory authority and responsibility will have a direct bearing on plan implementation. In conjunction with the Town of Pleasant Prairie, Kenosha County, under the County Planning and Zoning Committee, administers the county zoning ordinance as it pertains to the Town. The County also administers floodplain and shoreland zoning regulations within the Town, as described in Chapter III of this report.

### State Level Agencies

Wisconsin Department of Natural Resources: The Wisconsin Department of Natural Resources administers a variety of regulatory programs that are intended to protect and preserve the natural resource base, including shorelands, floodplains, navigable waters, and sanitary sewer regulatory programs. The Department also has the authority and responsibility to acquire, develop, and manage park and open space areas, including state scientific and wildlife areas. Moreover, all proposed areawide water quality management plan amendments require approval by the Department.

Scientific Areas Preservation Council: The State Scientific Areas Preservation Council has the authority and responsibility to administer, develop, maintain, and protect a scientific areas system in Wisconsin. The Council maintains an official list of scientific areas available for research and the teaching of natural history. The Council also serves in an advisory capacity to the Department of Natural Resources and other agencies on matters related to the acquisition, development, maintenance, and use of scientific areas.

### Federal Level Agencies

U. S. Army Corps of Engineers: The U. S. Army Corps of Engineers administers two regulatory programs for the management of water and adjacent wetlands--the federal Section 404 regulatory program and the federal Section 10 regulatory program. As indicated in Chapter III, the Section 404 program has a direct bearing on the use of wetlands in the Chiwaukee Prairie-Carol Beach area. Section 404 of the federal Water Pollution Control Act of 1972, as amended, requires the Corps of Engineers to regulate the discharge of dredged and fill materials into waters of the United States, including lakes, rivers, and adjacent wetlands. Under Section 10 of the River and Harbor Act of 1899, the Corps of Engineers regulates structures or works in or affecting the commercially navigable waters of the United States.

U. S. Environmental Protection Agency: The U. S. Environmental Protection Agency has authority and responsibility for managing and protecting virtually all aspects of the environment. With respect to wetland protection, the Environmental Protection Agency assists the U. S. Army Corps of Engineers in the administration of the federal Section 404 regulatory program through the review of applications for permits for activities involving the discharge of dredged and fill materials.

U. S. Department of the Interior,  
Fish and Wildlife Service: The U. S. Fish and Wildlife Service is the federal agency responsible for preserving and enhancing fish and wildlife populations throughout the nation. Like the Environmental Protection Agency, the Fish and

Wildlife Service assists in the review of applications for permits under the federal Section 404 regulatory program, paying particular attention to the effects of the proposed work on fish and wildlife resources.

### Private Interests

The Nature Conservancy: The Nature Conservancy is a private, nonprofit organization devoted to the preservation of biologically significant areas throughout the nation. The Nature Conservancy is presently carrying out a land acquisition program in the Chiwaukee Prairie, south of 116th Street, east of the C&NW railway right-of-way in the study area.

Wisconsin Electric Power Company: The Wisconsin Electric Power Company is a major landholder in the Chiwaukee Prairie-Carol Beach area. Almost all of its land holdings in the area have been recommended for preservation in open space use. Its primary plan implementation responsibility is the cooperative management of the resources of the land recommended for preservation.

The Chicago & North Western Transportation Company: The Chicago & North Western Transportation Company owns the railway right-of-way which traverses the Chiwaukee Prairie-Carol Beach area in a generally north-south direction and which, under the plan, would continue to be used as a railway corridor. Primary plan implementation responsibilities of the Transportation Company are cooperative resource management of prairie and wetland areas which lie along the railway, and the granting of an additional street crossing through its right-of-way.

### PLAN ADOPTION AND ENDORSEMENT

Formal adoption, endorsement, or acknowledgement of the land use management plan by concerned agencies and units of government is highly desirable, if not absolutely essential, to ensure a common understanding among those agencies and to enable their staffs to program the necessary plan implementation work. Accordingly, the following plan adoption-endorsement-acknowledgement actions are recommended.

1. The Town Board and Plan Commission of the Town of Pleasant Prairie should adopt the land use management plan as a guide to the regulation of land use and the provision of public services and facilities in the Chiwaukee Prairie-Carol Beach area.
2. The Kenosha County Planning and Zoning Committee and the Kenosha County Board should adopt the land use management plan as a guide to the regulation of land use in the Chiwaukee Prairie-Carol Beach area.
3. The Regional Planning Commission should adopt the plan as an amendment to the regional water quality management plan and the regional land use plan. The Regional Planning Commission should certify the plan as an amendment to the regional water quality management plan

to all parties concerned, including the Wisconsin Department of Natural Resources, the Governor, and the U. S. Environmental Protection Agency.

4. The Wisconsin Department of Natural Resources should endorse the land use management plan and utilize the findings and recommendations of the report in carrying out its various regulatory and land acquisition programs.
5. The State Scientific Areas Preservation Council should endorse the plan and consider the findings and recommendations of the plan in carrying out its responsibilities relating to the maintenance of a scientific area system in the State.
6. The U. S. Army Corps of Engineers should acknowledge the plan and utilize the findings and recommendations of the plan in carrying out its regulatory responsibilities under Section 404 of the federal Water Pollution Control Act of 1972, as amended, and Section 10 of the federal River and Highway Act of 1899.
7. The U. S. Environmental Protection Agency and the U. S. Department of the Interior, Fish and Wildlife Service, should acknowledge the plan and utilize the findings and recommendations of the plan in their review of applications for federal Section 404 permits from within the area.

## OPEN SPACE ACQUISITION

The recommended plan envisions that almost all privately held, unimproved platted lots within the proposed open space preservation area will be publicly or privately acquired for preservation at fair market value.<sup>2</sup> A total of 661 platted lots, having a combined area of 222 acres and a combined assessed value of \$1.13 million, are recommended for acquisition. While the plan specifically calls for the acquisition of platted lots, unplatted lands within the open space preservation area could also be acquired, depending upon the interests of the owners of the land concerned and of the acquiring agencies.

A summary of the proposed ownership of land within the open space preservation area is presented on Map 33 and in Table 43. Under the recommended plan, The Nature Conservancy, the Wisconsin Department of Natural Resources, and the Town of Pleasant Prairie would be responsible for open space acquisition within the Chiwaukee Prairie-Carol Beach area. As shown on Map 33, the plan envisions that The Nature Conservancy would acquire privately held, unimproved platted lots within the open space preservation area located south of 116th Street, east of the railway right-of-way. A total of 192 lots, having a combined area of about 59 acres and a combined assessed value of \$149,500, are

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<sup>2</sup>The following privately held, unimproved platted lots within the proposed open space preservation area would not be acquired: lots within the unimproved subdivision located in the southwestern portion of the study area; significantly eroded lots adjacent to Lake Michigan; and the backlot areas of lots along proposed drainageways.

recommended for acquisition by The Nature Conservancy.<sup>3</sup> While the plan specifically recommends continued land acquisition by The Nature Conservancy south of 116th Street, the plan does not preclude acquisition by The Nature Conservancy in areas to the north.

The plan further recommends that the Wisconsin Department of Natural Resources assume primary responsibility for land acquisition north of 116th Street. A total of 449 lots, having a combined area of about 157 acres and a combined assessed value of \$950,000, are recommended for acquisition by the Department of Natural Resources.

The plan recommends that the Town of Pleasant Prairie acquire a total of 20 lots, having a combined area of 6 acres and a combined assessed value of \$34,500. Nineteen of the lots recommended for town acquisition comprise a drainageway along the unnamed stream north of 115th Street (see Map 33). The remaining lot comprises part of the drainageway along Tobin Creek west of the railway right-of-way.

Under the plan, the recommended open space acquisition would take place over a five-year period, beginning in 1985. The average annual expenditure over the five-year period would approximate \$29,900 for The Nature Conservancy, \$190,000 for the Wisconsin Department of Natural Resources, and \$6,900 for the Town of Pleasant Prairie.

As noted above, The Nature Conservancy would be primarily responsible for open space acquisition south of 116th Street. If toward the end of the five-year period The Nature Conservancy, because of financial limitations, has not made substantial progress toward the recommended land acquisition, the Department of Natural Resources should assume responsibility for land acquisition in this area.

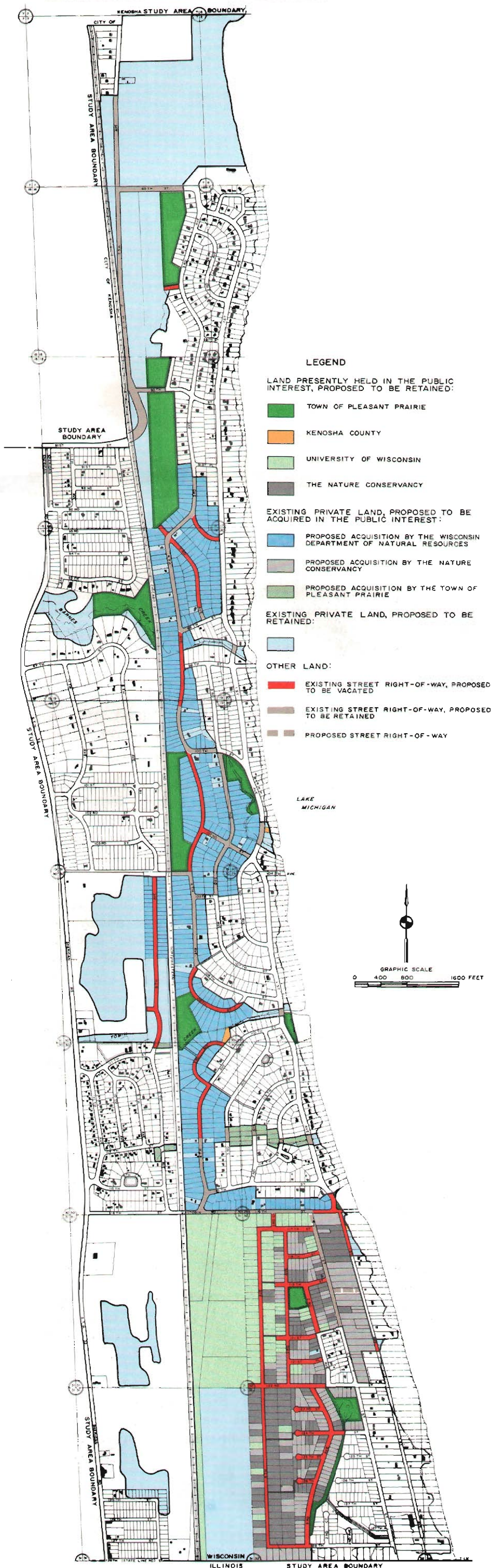
As indicated in Table 43, 68 acres, or more than 8 percent of the proposed open space preservation area, are already in town ownership, having been dedicated to the Town as parklands. It is recommended that the Town of Pleasant Prairie explore the feasibility of conveying some of the dedicated areas to The Nature Conservancy or the Wisconsin Department of Natural Resources. Specifically, the Town should consider conveying town-held lands within the open space preservation area located south of 116th Street and east of the railway right-of-way to The Nature Conservancy. The Town should further consider conveying to the Wisconsin Department of Natural Resources town-held lands within the open space preservation area located east of the railway right-of-way, between 90th Street and 116th Street. Should the Town choose to retain those lands, it should enter into cooperative resource management agreements with the Wisconsin Department of Natural Resources or The Nature Conservancy, as appropriate.

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<sup>3</sup>All assessed value data presented in this chapter are from the 1981 assessment roll. As noted in Chapter IV, under the countywide assessment program in Kenosha County, the assessed valuation of property is intended to represent full market value, as determined by the County Assessor.



PROPOSED OWNERSHIP OF LAND WITHIN THE  
OPEN SPACE PRESERVATION AREA UNDER  
THE RECOMMENDED LAND USE MANAGEMENT PLAN



Source: SEWRPC.

Table 43

**PROPOSED OWNERSHIP OF LAND WITHIN THE  
OPEN SPACE PRESERVATION AREA UNDER  
THE RECOMMENDED LAND USE MANAGEMENT PLAN**

Proposed Ownership of Property Within Preservation Area	Acres	Percent of Total
Property Presently Held in the Public Interest, Proposed to be Retained		
Town of Pleasant Prairie.....	68	8.5
Kenosha County.....	1	0.1
University of Wisconsin.....	91	11.3
The Nature Conservancy.....	55	6.8
Subtotal	215	26.7
Existing Private Property, Proposed to be Acquired in the Public Interest		
Proposed Acquisition by The Nature Conservancy.....	59	7.4
Proposed Acquisition by the Wisconsin Department of Natural Resources.....	157	19.6
Proposed Acquisition by the Town of Pleasant Prairie.....	6	0.8
Subtotal	222	27.8
Existing Private Property Proposed to be Retained.....	289	36.0
Other Property		
Existing Street Right-of- Way Proposed to be Vacated.....	42	5.2
Existing Street Right-of- Way Proposed to be Retained.....	34	4.2
Proposed Street Right-of-Way.....	1	0.1
Subtotal	77	9.5
<b>Total Open Space Preservation Area</b>	<b>803</b>	<b>100.0</b>

Source: SEWRPC.

Kenosha County holds title to three lots within the open space preservation area as a result of tax delinquency.<sup>4</sup> The County should consider conveying these lots, and any other lots within the open space preservation area which it acquires, to The Nature Conservancy or to the Wisconsin Department of Natural Resources, as appropriate.<sup>5</sup>

As the acquisition of open space land proceeds, streets within the open space preservation area should be vacated, as indicated on Map 33, and the area conveyed to The Nature Conservancy or the Wisconsin Department of Natural Resources, as appropriate.

<sup>4</sup>Based upon the 1981 assessment roll.

<sup>5</sup>Any land which is located along the Lake Michigan shoreline, but outside the proposed open space preservation area, and which is acquired by Kenosha County as a result of tax delinquency should be considered for maintenance by the County in open space use. Moreover, the County should consider the acquisition for open space use of any other Lake Michigan shoreline property which may become available.

As indicated in Chapter V, under the recommended plan, existing homesites within the proposed open space preservation area would be permitted to be maintained indefinitely. While the recommended plan specifically proposes the acquisition of privately held, unimproved platted lots within the open space preservation area, it does not preclude eventual acquisition of existing homesites within the preservation area should such acquisition be agreeable to the acquiring agencies and the owners of the property concerned.

As noted above, under the recommended plan, real property having a combined assessed value of about \$1.13 million would be acquired over a five-year period. This represents 0.34 percent of the current equalized value of the Town of Pleasant Prairie, 0.06 percent of the equalized value of the Kenosha Unified School District, 0.04 percent of the equalized value of Kenosha County, and 0.01 percent of the equalized value of the Gateway Technical Institute District. If the open space acquisition proposals of the plan were to be fully implemented, a property owner with a \$50,000 home in the Town of Pleasant Prairie would pay \$0.69 more in local property taxes as a result of the loss of this tax base, given the 1983 tax levies of the four taxing jurisdictions. Similarly, a property owner in the Kenosha Unified School District, but outside the Town of Pleasant Prairie, with a \$50,000 home would pay \$0.44 more; in Kenosha County outside the Kenosha Unified School District, \$0.09 more; and in the Racine and Walworth County portions of the Gateway Technical Institute District, \$0.01 more.<sup>6</sup>

During plan implementation, care must be taken to ensure the payment of a fair price to owners of land which is to be acquired in the public interest. It must be recognized that the plan, and attendant zoning enacted under the police power to implement the plan, may have the effect of depressing the market value of land recommended for acquisition prior to the time of sale, thereby complicating the determination of a fair price. The sale price of land acquired for preservation should accordingly be determined on the basis of market transactions between willing buyers and sellers involving comparable properties in the area not proposed for public acquisition in the plan.

## OPEN SPACE MANAGEMENT

The plan envisions that the proposed open space preservation area will be managed as a natural area-wildlife area. Accordingly, the lands within the proposed open space preservation area would be managed to maintain existing plant and animal communities, and restore disturbed areas to a natural condition, insofar as practical. Facility development within the open space preservation area would be limited to small automobile parking areas, nature trails, and such other facilities as may be required to provide opportunities for scientific and educational activities, as well as casual enjoyment of the wetland prairie environment by the public. Such facilities should be designed and installed in a manner which causes the least possible disturbance of the natural resource base.

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<sup>6</sup>This analysis assumes that all open space land recommended for acquisition will be exempt from the property tax. It should be noted that property tax exemption for open space lands held by nonprofit organizations, such as The Nature Conservancy, requires specific approval by the County Board.

The plan envisions that the Wisconsin Department of Natural Resources and The Nature Conservancy will be the agencies primarily responsible for management of the open space preservation area. The Wisconsin Department of Natural Resources would be primarily responsible for the management of lands within the open space preservation area located north of 116th Street, while The Nature Conservancy would be responsible for management of lands south of 116th Street. The Nature Conservancy and the Wisconsin Department of Natural Resources should seek cooperative resource management agreements with the owners of major landholdings which are recommended for preservation but not specifically recommended for public acquisition, such as the Wisconsin Electric Power Company.

The Wisconsin Department of Natural Resources and The Nature Conservancy may find it useful to share certain management functions. For example, The Nature Conservancy already retains a resident manager for its landholdings located south of 116th Street. This manager may be able to provide routine surveillance and monitoring services for lands recommended for acquisition by the Department of Natural Resources north of 116th Street. Conversely, the Wisconsin Department of Natural Resources may assist The Nature Conservancy in management activities, such as burn management, within the open space preservation area located south of 116th Street.

## LAND USE REGULATION

Police power regulatory measures available to the Town of Pleasant Prairie and Kenosha County may be used to guide urban development and protect open space lands within the Chiwaukee Prairie-Carol Beach area. Police power regulatory measures include official mapping and zoning--particularly as related to the preservation of open space lands.

### Official Mapping

Cities and villages have clearly expressed official mapping powers under Section 62.23(6) of the Wisconsin Statutes. Towns with village powers--including the Town of Pleasant Prairie--have the same official mapping powers as do cities and villages. Section 62.23(6) permits not only the mapping of streets and highways, but also of playgrounds, parks, parkways, and drainageways.

The Town of Pleasant Prairie could use official mapping powers to ensure the protection of land within the proposed open space preservation area. All or portions of the proposed open space preservation area could be considered a park or parkway, and portions could be considered drainageways, and so designated by the Town on an official map. Such a designation would protect the area concerned from urban development, giving the public sector, in effect, the first option to purchase lands which are proposed for development. A major drawback to this use of official mapping powers as a plan implementation measure is the length of time required--at least several years--to prepare such a map, assuming that the map will be prepared for the entire area of the Town. Accordingly, the use of official mapping powers as a plan implementation measure is not recommended.

### Zoning

As noted in Chapter III, zoning is one of the most effective means available to local units of government for regulating land use in the public interest. In order to successfully implement the open space preservation recommendations



of the land use management plan, zoning regulations will be required that protect both wetland and upland areas--including platted lots--from urban development and, in addition, assign conforming use status, rather than nonconforming use status, to existing homesites within the open space preservation area.

As reported in Chapter III, Kenosha County adopted a new county zoning ordinance in 1983, replacing a zoning ordinance adopted by the County in 1959. The new zoning ordinance was subsequently adopted by the Town of Pleasant Prairie in 1984.

The new ordinance establishes several basic zoning districts which have potential application within the proposed open space preservation area, including a C-1 Lowland Resource Conservancy District, a C-2 Upland Resource Conservancy District, and a PR-1 Park-Recreational District. The C-1 Lowland Resource Conservancy District is intended to be used to protect water, wetlands, and other areas that are not naturally well drained. The district prohibits virtually all forms of urban development. The C-2 Upland Resource Conservancy District is intended to be used to protect significant woodlands, areas of rough topography, and related scenic areas. The district allows single-family dwellings on lots having a minimum area of five acres. The PR-1 Park-Recreational District is intended to provide areas for public and private outdoor recreation sites. This district permits, among other uses, recreation trails, botanical gardens, parks and playgrounds, athletic fields, and tennis courts.

Several options were considered for the application of these districts within the open space preservation area, as indicated below.

1. Application of the C-1 Lowland Resource Conservancy District to Wetland Areas and the C-2 Upland Resource Conservancy District to Upland Areas Within the Proposed Open Space Preservation Area. The application of the C-1 Lowland Resource Conservancy District to wetlands within the open space preservation area would effectively protect those wetlands from urban development. The application of the C-2 Upland Resource Conservancy District to upland areas would not, however, protect those areas. If placed in the C-2 Upland Resource Conservancy District, presently unplatted upland open space lands having important natural resource value, such as the eastern portion of the Kenosha Sand Dunes area, could be developed for residential use with lots having a minimum area of five acres. On the other hand, open space lands which have been divided into residential lots could be developed for residential use as platted, under the substandard lot provisions of the existing zoning ordinance. The failure to protect upland open space areas from urban development is thus the major limitation of this approach to zoning.
2. Application of the C-1 Lowland Resource Conservancy District to Wetland Areas and the PR-1 Park-Recreational District to Upland Areas Within the Proposed Open Space Preservation Area. The application of the C-1 Lowland Resource Conservancy District to wetland areas within the open space preservation area would effectively protect wetlands from urban development. The application of the PR-1 Park-Recreational District to upland areas would, in addition, prohibit most forms of urban development in such upland open space areas. However, use of the PR-1 Park-Recreational District in this manner would permit public and private development of the area for active, as well as passive, recreational use, and such use may be contrary to the protection of the resource base concerned.



3. Application of the C-1 Lowland Resource Conservancy District Throughout the Open Space Preservation Area. Application of the C-1 Lowland Conservancy District to the entire open space preservation area would protect that area from urban development. However, the placement of upland areas within the C-1 Lowland Resource Conservancy District would be inconsistent with the stated intent of that district, which, of course, is the preservation of lowland areas.

Because of the limitations inherent in each of the foregoing approaches, it is recommended that a new conservancy district be established in the Kenosha County zoning ordinance and applied as appropriate to the Chiwaukee Prairie-Carol Beach area. Recommended principal, accessory, and conditional uses for the proposed district--hereafter referred to as the C-3 Natural and Scientific Area Resource Conservancy District--are set forth in Table 44. As indicated in Table 44, the proposed district regulations would serve to restrict uses to those consistent with the preservation and enhancement of existing natural features. The district would, however, permit the maintenance, repair, and replacement of, and addition to, residential dwellings existing on or before the date of the ordinance amendment.

A recommended zoning district map for the Chiwaukee Prairie-Carol Beach area is shown on Map 34. As indicated on this map, it is envisioned that a total of 10 zoning districts will be applied within the area: the R-2 Suburban Single-Family Residential, R-5 Urban Single-Family Residential, R-6 Urban Single-Family Residential, R-11 Multiple-Family Residential, B-3 Highway Business, I-1 Institutional, PR-1 Park Recreational, C-2 Upland Resource Conservancy, C-3 Natural and Scientific Area Resource Conservancy, and A-2 General Agricultural Districts.<sup>7</sup> Below is a summary of the recommended application of the various zoning districts within the Chiwaukee Prairie-Carol Beach area:

1. The C-3 Natural and Scientific Area Resource Conservancy District would be applied throughout the proposed open space preservation area, with the exception of an upland woodland area located west of 7th Avenue in the northern portion of the study area which would be placed in the C-2 Upland Resource Conservancy District. It should be noted that the area reserved for the expansion of the Kenosha sewage treatment plant would be placed in the C-3 Natural and Scientific Area Resource Conservancy District and remain in that district until such time as the expansion of that facility is required.
2. The PR-1 Park Recreational District would be applied to the existing Trident Marina area; the area proposed for the expansion of the Trident Marina; the portion of the Towne Club property located outside the open space preservation area; the subdivision park located north

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<sup>7</sup>A summary of the permitted uses and minimum lot area requirements of the zoning districts presently applied in the area, the R-5, R-6, R-11, B-3, I-1, PR-1, C-1, C-2, and A-2 zoning districts, is presented in Table 9 in Chapter III of this report. The R-2 Suburban Single-Family Residential District, which is not presently applied in this area but which would be applied under the recommended zoning, specifies as principal uses one single-family dwelling, essential services, and certain foster family homes and community living arrangements and, in addition, specifies a minimum lot size of 40,000 square feet and a minimum lot width of 150 feet.

Table 44

**SUGGESTED C-3 NATURAL AND SCIENTIFIC AREA  
RESOURCE CONSERVANCY DISTRICT TO BE APPLIED IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

12.25-3

**C-3 NATURAL AND SCIENTIFIC AREA RESOURCE CONSERVANCY DISTRICT****(a) Primary Purpose and Characteristics**

The C-3 Natural and Scientific Area Resource Conservancy District is intended to be used to prevent the destruction of valuable natural, scenic, and scientific resources, including wetlands, shorelands of navigable waters, prairies, meadows, sand dunes, woodlands, wildlife habitat, and areas with high erosion hazard. Incompatible development in these areas may result in hazards to the public health and safety, may deplete or destroy invaluable and irreplaceable natural resources, or may be otherwise detrimental to public welfare.

**(b) Principal Uses**

1. The preservation of scenic, historic, and scientific areas and associated plant and animal communities.
2. The preservation of natural flora and fauna.
3. The harvesting of wild crops, such as marsh hay, ferns, moss, wild rice, berries, tree fruits, and tree seeds, in a manner that is not injurious to the natural reproduction of such crops.
4. The practice of silviculture, including the planting, thinning, and harvesting of timber.
5. The construction and maintenance of fences.
6. The maintenance, repair, replacement, and construction of existing roads and bridges.
7. The maintenance, repair, and replacement of, and addition to, residential dwellings existing on January 1, 1985, provided that any addition or modification meets the yard requirements of the R-5 Urban Single-Family Residential District.

**(c) Accessory Uses**

1. Structures accessory to principal uses, not intended for human habitation or the confined housing of livestock.

**(d) Conditional Uses**

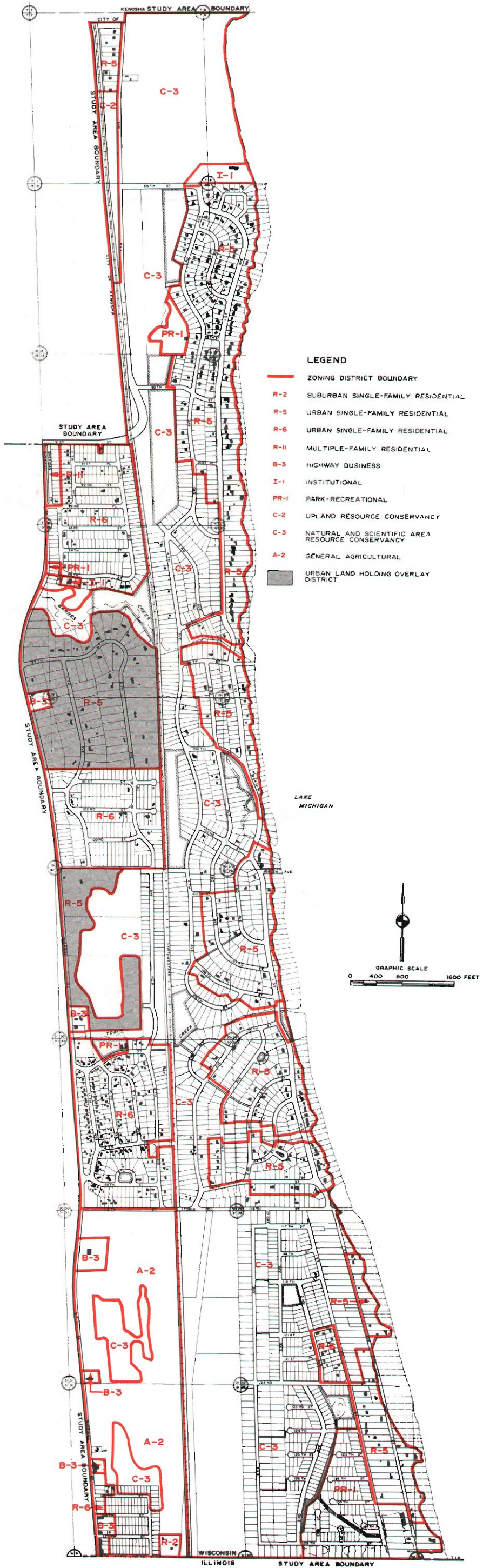
1. The development of public and private parks and recreation areas, marinas and boat access sites, natural and outdoor education areas, historic and scientific areas, wildlife refuges, game preserves, and private wildlife habitat areas provided that:
  - a. Any private recreation or wildlife habitat area is used exclusively for that purpose.

Table 44 (continued)

- b. No filling of wetland or floodland areas is to be done.
  - c. Ditching, excavating, dredging, and dike and dam construction may be done in wildlife refuges, game preserves, and private wildlife habitat areas, but only for the purpose of improving wildlife habitat or to otherwise enhance wetland values.
  - 2. The establishment of roadways and trails for access to scenic, historic, and scientific areas, provided that:
    - a. The roadway or trail cannot, as a practical matter, be located outside the natural or scientific resource area.
    - b. The roadway or trail is located, designed, and constructed to minimize the adverse impact upon the natural functions of the area and meets the following standards:
      - The roadway or trail shall be designed and constructed with the minimum cross-section practical to serve the intended use;
      - Roadway and trail construction activities are to be carried out in the immediate area of the roadbed only; and
      - Any filling, flooding, draining, dredging, ditching, tiling, or excavating that is to be done must be necessary for the construction or maintenance of the roadway.
  - 3. The construction and maintenance of electric, gas, telephone, water, and sewer transmission and distribution lines, and related facilities, by public utilities and cooperative associations organized for the purpose of producing or furnishing heat, light, power, water, or sanitary sewer service to members, provided that:
    - a. The transmission and distribution lines and related facilities cannot, as a practical matter, be located outside a natural or scientific resource area.
    - b. Any filling, excavating, ditching, or drainage that is to be done is necessary for such construction or maintenance and is done in a manner designed to minimize flooding and other adverse impacts upon the natural functions of the area.
  - 4. The construction and maintenance of railway lines, provided that:
    - a. The railway lines cannot, as a practical matter, be located outside a natural or scientific resource area.
    - b. Any filling, excavating, ditching, or draining that is to be done is necessary for such construction or maintenance and is done in a manner designed to minimize flooding and other adverse impacts upon the natural functions of the area.
- (e) Prohibited Uses
- 1. Any use not listed as a principal, accessory, or conditional use under paragraphs 12.25-3(b), (c), or (d) is prohibited and shall not be permitted unless the C-3 District is amended to another district.

Source: SEWRPC.

# PROPOSED ZONING FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA



Source: SEWRPC.

of 111th Street near its intersection with 10th Avenue; and a designated historic site located east of Sheridan Road, north of Barnes Creek.

3. The I-1 Institutional District would be applied to the church property located near the intersection of 95th Street and 11th Avenue, as well as to the land occupied by the Wisconsin Electric Power Company pumphouse north of 85th Street.
4. The B-3 Highway Business District would be applied to certain areas adjacent to Sheridan Road, in substantial conformance with the existing zoning district map.
5. The R-11 Multiple-Family Residential District would be applied to an area south of 91st Street, east of Sheridan Road, in conformance with the existing zoning district map.
6. The R-5 and R-6 Urban Single-Family Residential Districts would be applied to other platted lots within the proposed urban area.
7. Most of the existing agricultural and rural lands in the southwestern portion of the study area would be placed in the A-2 General Agricultural District. Certain lands recommended to be placed in the A-2 Agricultural District along Sheridan Road and 116th Street would be expected to be placed in an appropriate urban district at some future date, in conformance with the plan.
8. It should be noted that two of the areas which have been placed in the R-5 Urban Single-Family Residential District have also been placed in the UHO Urban Land Holding Overlay District. As indicated in Chapter III, that district indicates that the land is expected to undergo urban development in accordance with the underlying zoning district, but that such development is not permitted at the present time. One of the areas which would be placed in the UHO Urban Land Holding Overlay District is the presently unsubdivided area located east of Sheridan Road, south of 104th Street, which is proposed for urban development under the plan. The other is the area platted as Carol Beach Estates-Unit A, located east of Sheridan Road, south of Barnes Creek. Lots within that subdivision are generally about one acre or larger in size. The Urban Land Holding Overlay District should be retained in this area until it is determined whether or not it is desirable to re-subdivide portions of the area into smaller lots for sewer residential development.

The zoning map for the Chiwaukee Prairie-Carol Beach area should also be revised to ensure that all floodplain areas shown on Map 9 in Chapter II of this report are placed in the FPO Floodplain Overlay District of the county zoning ordinance and thereby preserved in open use. As noted in Chapter V, future culvert enlargements and channel improvements may result in the modification of certain floodplain areas, thereby permitting a modification of the floodplain zoning district boundaries.



## Section 404 Regulatory Authority

As previously noted, the U. S. Army Corps of Engineers has important regulatory authority under Section 404 of the federal Water Pollution Control Act of 1972, as amended, regarding the discharge of dredged or fill materials into rivers, lakes, and adjacent wetlands. Section 404 permit requirements for activities involving such discharges were described in Chapter III. As also indicated in Chapter III, to streamline the regulatory process, federal regulations provide for the advanced identification of the suitability of areas for activities involving the discharge of dredged and fill materials. Under the advanced identification process, the wetlands within the Chiwaukee Prairie-Carol Beach area east of the C&NW railway right-of-way have been designated generally unsuitable for such activities. While this does not preclude the granting of a Section 404 permit in this area, it does provide a preliminary indication that the granting of a permit would be unlikely.

Implementation of the recommended plan would involve the filling and development of certain wetland areas which are regulated by the Corps of Engineers. Accordingly, it is recommended that, upon adoption of the plan, the Town of Pleasant Prairie submit to the Corps of Engineers a collective application seeking permission to fill and develop for appropriate uses all wetland lots located in the proposed urban area. The Corps of Engineers has expressed a willingness to accept and review such a collective permit application. The Corps of Engineers' response to such an application would serve to substantially clarify the manner in which Section 404 regulations may affect plan implementation.

## **PUBLIC IMPROVEMENT COSTS**

The public improvements envisioned under the recommended plan were described in Chapter V. As indicated in Chapter V, the plan envisions that public sanitary sewer and water supply service will be provided throughout the area proposed for urban use and envisions, further, that the area will be served by all-weather streets, with rural cross-sections--that is, with road ditches, culverts, and skeletal storm sewer systems, and without curbs and gutters and full storm sewer systems. The Town of Pleasant Prairie would be primarily responsible for the provision of the required public improvements. It is anticipated that the improvements would be made over a 20-year time period. The costs of the required public improvements are presented in Table 45.

The total cost of the recommended public improvements would approximate \$14.6 million, including \$11.2 million for construction and \$3.4 million for engineering, administrative, and legal costs. Component costs--including construction costs and engineering, administrative, and legal costs--would be as follows: sanitary sewer collection system--\$7.0 million, or 48.0 percent of the total; water supply distribution system--\$5.0 million, or 34.0 percent; local street improvements--\$0.9 million, or 6.2 percent; and stormwater improvements--\$1.7 million, or 11.8 percent. The average costs of public improvements per household under the recommended plan would be as follows: sanitary sewer collection system--about \$4,800 per housing unit; water supply distribution system--about \$3,910 per housing unit; local street improve-

Table 45

**COST OF PUBLIC  
IMPROVEMENTS UNDER THE RECOMMENDED  
LAND USE MANAGEMENT PLAN**

Cost Component	Construction Cost	Engineering, Administrative, and Legal Costs <sup>a</sup>	Total	
			Dollars	Percent of Total
Sanitary Sewer Collection System.....	\$ 5,385,000	\$1,616,000	\$ 7,001,000	48.0
Water Supply Distribution System.....	3,820,000	1,146,000	4,966,000	34.0
Local Street Improvements.....	698,000	209,000	907,000	6.2
Stormwater Drainage Improvements....	1,330,000	399,000	1,729,000	11.8
<b>Total</b>	<b>\$11,233,000</b>	<b>\$3,370,000</b>	<b>\$14,603,000</b>	<b>100.0</b>

<sup>a</sup> Estimated as 30 percent of the construction cost.

Source: SEWRPC.

ments--about \$620 per housing unit; and stormwater drainage improvements--about \$1,180 per housing unit.<sup>8</sup>

The Town of Pleasant Prairie must recognize that Lake Michigan shoreline erosion poses a continuing threat to certain shoreline property. As indicated in Chapter V, the plan recommends that an approximately 1,000-foot-long erosion-threatened segment of 1st Avenue near its intersection with 116th Street be vacated and alternative access provided to the area presently served by this road. Along other shoreline reaches, it was assumed that structural shore protection would be provided to prevent any substantial shoreland loss and that the Lake Michigan shoreline would remain essentially intact. It is important to note, however, that while certain housing units would have to be relocated and certain streets vacated, the plan would be viable in a situation in which no additional structural shore protection is installed. With certain modifications to the proposed street system, the plan could be adapted to such a situation.

The Town, in conjunction with the property owners concerned, must address the shoreline erosion problem and determine whether structural shore protection is a financially feasible and cost-effective solution to the problem. It is estimated that the cost of installing shore protection structures along shoreline reaches which are not currently effectively protected by such structures--excluding the shoreline reach along the portion of 1st Avenue which is pro-

<sup>8</sup> Public improvement costs under the recommended plan as presented herein include construction costs as well as engineering, administrative, and legal costs, estimated as 30 percent of the construction cost. It should be noted that the public improvement costs for the alternative plans presented in Chapter IV of this report represent construction costs only.

posed to be vacated--would be \$4.4 million. It is essential that this matter be studied by the Town before any further major public improvements or private development are undertaken within erosion-threatened areas.

## SUMMARY

This chapter has recommended the specific actions which should be taken by various agencies of government as well as private interests to implement the Chiwaukee Prairie-Carol Beach land use management plan. The most important recommendations are summarized by agency. A summary of the total public cost of implementing the plan is also presented.

### Local Level

Town of Pleasant Prairie: It is recommended that the Town Board of the Town of Pleasant Prairie:

1. Adopt the land use management plan as a guide to the regulation of land use and the provision of public services and facilities in the Chiwaukee Prairie-Carol Beach area.
2. In conjunction with Kenosha County, amend the zoning district map for the Chiwaukee Prairie-Carol Beach area in accordance with the open space preservation and urban development recommendations of the land use management plan and the specific zoning district recommendations presented on Map 34.
3. Acquire a total of 20 lots--having a combined area of about six acres and a combined assessed area value of about \$34,500--as part of the proposed drainageways along streams in the study area as shown on Map 33.
4. Explore the feasibility of conveying to the Wisconsin Department of Natural Resources and The Nature Conservancy those open space lands which have been dedicated to the Town as parkland and which would be logical extensions of the open space areas recommended for acquisition and management by the Department of Natural Resources and The Nature Conservancy.
5. Submit to the U. S. Army Corps of Engineers a collective application seeking permission to fill and develop for appropriate uses all wetland lots located within the proposed urban area.
6. Provide public improvements--including sanitary sewer, water supply, local street, and storm drainage improvements--as proposed in the recommended plan.
7. In conjunction with the property owners concerned, study Lake Michigan shoreline erosion problems and determine whether structural shore protection is a financially feasible and cost-effective solution. This matter should be studied before any further major public improvements or private development are undertaken within erosion-threatened areas.

Kenosha County: It is recommended that the Kenosha County Board of Supervisors:

1. Adopt the land use management plan as a guide to the regulation of land use in the Chiwaukee Prairie-Carol Beach area.
2. Amend the county zoning ordinance by establishing a new C-3 Natural and Scientific Area Resource Conservancy District and, in conjunction with the Town, amend the zoning district map for the Chiwaukee Prairie-Carol Beach area through the application of the proposed new conservancy district and other zoning districts in accordance with the open space preservation and urban development recommendations of the land use management plan and the specific zoning district recommendations presented on Map 34.
3. Consider conveying to the Wisconsin Department of Natural Resources or The Nature Conservancy, as appropriate, lands within the proposed open space preservation area which it may acquire as a result of tax delinquency.

### Areawide Agencies

Regional Planning Commission: It is recommended that the Regional Planning Commission adopt the plan as an amendment to the regional water quality management plan and the regional land use plan. The Regional Planning Commission should certify the plan as an amendment to the regional water quality management plan to all parties concerned, including the Wisconsin Department of Natural Resources, the Governor, and the U. S. Environmental Protection Agency.

### State Level Agencies

Wisconsin Department of Natural Resources: It is recommended that the Wisconsin Department of Natural Resources:

1. Endorse the land use management plan and utilize the findings and recommendations of the report in carrying out its various regulatory and land acquisition programs.
2. Acquire open space lands recommended for acquisition in the proposed open space preservation area north of 116th Street as shown on Map 33. A total of 449 lots, having a combined area of about 157 acres and a combined assessed value of about \$950,000, are recommended for acquisition by the Department over a recommended five-year implementation period.
3. Manage lands within the proposed open space preservation areas north of 116th Street as a natural area-wildlife area, and, in so doing, seek cooperative management agreements with the owners of major land holdings recommended for preservation but not specifically recommended for public acquisition, such as the Wisconsin Electric Power Company.

Wisconsin Scientific Areas Preservation Council: It is recommended that the Wisconsin Scientific Areas Preservation Council endorse the plan and consider the findings and recommendations of the plan in carrying out its responsibilities relating to the maintenance of a scientific area system in the State.

## Federal Level Agencies

U. S. Army Corps of Engineers: It is recommended that the U. S. Army Corps of Engineers acknowledge the plan and utilize the findings and recommendations of the plan in carrying out its regulatory responsibilities under Section 404 of the federal Water Pollution Control Act of 1972, as amended, and Section 10 of the federal River and Harbor Act of 1899.

U. S. Environmental Protection Agency and U. S. Department of the Interior, Fish and Wildlife Service: It is recommended that the U. S. Environmental Protection Agency and the U. S. Department of the Interior, Fish and Wildlife Service, acknowledge the plan and utilize the findings and recommendations of the plan in the review of applications for federal Section 404 permits from within the Chiwaukee Prairie-Carol Beach area.

## Private Interests

The Nature Conservancy: It is recommended that The Nature Conservancy:

1. Acquire lands recommended for acquisition within the open space preservation area south 116th Street, east of the C&NW railway right-of-way, as shown on Map 33. A total of 192 lots, having a combined area of about 59 acres and a combined assessed value of about \$149,500, are recommended for acquisition by The Nature Conservancy over a five-year implementation period.
2. Manage the lands within the open space preservation area south of 116th Street, east of the railway right-of-way, as a natural area-wildlife area, and cooperate with the Department of Natural Resources in resource management matters of mutual concern.

Other Major Private Landholders: Other major private landholders in the area--including, most importantly, the Wisconsin Electric Power Company--should consider entering into cooperative resource management agreements with the Wisconsin Department of Natural Resources, or The Nature Conservancy, as appropriate, with regard to their lands which are recommended for preservation but not specifically recommended for public acquisition.

## Plan Costs

The total open space acquisition and public improvement costs attendant to implementation of the recommended land use management plan would approximate \$15.7 million (see Table 46). Land acquisition costs would approximate \$1.1 million, or 7 percent of the total, while public improvement costs would approximate \$14.6 million, or 93 percent of the total.

Under the recommended plan, open space acquisition costs would be borne as follows: Wisconsin Department of Natural Resources--\$950,000, or 84 percent of the total; The Nature Conservancy--\$149,500, or 13 percent; and the Town of Pleasant Prairie--\$34,500, or 3 percent. The open space acquisition would occur over a five-year period. The average annual expenditure over the five-year period would approximate \$190,000 for the Department of Natural Resources, \$29,900 for The Nature Conservancy, and \$6,900 for the Town of Pleasant Prairie.



Table 46

**SUMMARY OF LAND ACQUISITION COSTS AND  
PUBLIC IMPROVEMENT COSTS UNDER  
THE RECOMMENDED LAND USE MANAGEMENT PLAN**

Plan Element	Estimated Cost
Open Space Acquisition Costs:	
Wisconsin Department of Natural Resources.....	\$ 950,000
Town of Pleasant Prairie.....	34,500
The Nature Conservancy.....	149,500
Total	\$ 1,134,000
Public Improvement Costs <sup>a</sup> --	
Town of Pleasant Prairie:	
Sanitary Sewer Collection System.....	\$ 7,001,000
Water Supply Distribution System.....	4,966,000
Local Street Improvements.....	907,000
Stormwater Drainage Improvements.....	1,729,000
Total	\$14,603,000
Total Open Space Acquisition and Public Improvement Costs	\$15,737,000

<sup>a</sup> Includes construction costs and engineering, administrative, and legal costs.

Source: SEWRPC.

The total cost of the recommended public improvements would approximate \$14.6 million. Component costs--including construction costs and engineering, administrative, and legal costs--would be as follows: sanitary sewer collection system--\$7.0 million, or 48 percent of the total; water supply distribution system--\$5.0 million, or 34 percent; local street improvements--\$0.9 million, or 6 percent; and stormwater drainage improvements--\$1.7 million, or 12 percent. The improvements would be installed over a 20-year period. The average annual public improvement cost over the 20-year period would approximate \$730,000.

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## Chapter VII

### SUMMARY AND CONCLUSION

#### INTRODUCTION

That portion of the Town of Pleasant Prairie, Kenosha County, lying along the Lake Michigan shoreline east of Sheridan Road (STH 32) represents one of the outstanding natural resource areas in southeastern Wisconsin. This area is characterized by a beach dune ridge and swale complex. High-quality upland prairies and wetlands are associated with the ridges and swales. The preservation and protection of the natural resources in this area is complicated by the fact that a large portion of the area has been platted for urban development. Despite past construction activities, wetland and prairie features have persisted in many areas, and the natural resource values of much of this area remain intact.

The future of the Chiwaukee Prairie-Carol Beach area has been uncertain for some time because of the divergent natural resource preservation and urban development objectives attendant to the area, and because of the relatively large number of public agencies and private interests which are concerned with, or which may have a bearing on, future land use within the area. Recognizing both the important natural resource values of the area and the inroads of urban development in the area, the Town of Pleasant Prairie and Kenosha County in 1981 proposed a planning program which would bring together the concerned public agencies and private interests in an effort to reconcile conflicting urban development and open space preservation objectives. Such a planning program was initiated in 1982, with primary staff work undertaken by the Regional Planning Commission and with support provided by the Wisconsin Department of Natural Resources, Kenosha County, and the Town of Pleasant Prairie. The planning program was conducted under the guidance of an advisory committee consisting of representatives of the Town of Pleasant Prairie; Kenosha County; the Wisconsin Department of Natural Resources; the U. S. Department of the Army, Corps of Engineers; major affected landowners, including the Wisconsin Electric Power Company and The Nature Conservancy; and citizen members.

This report documents the findings and recommendations of the Chiwaukee Prairie-Carol Beach land use management planning program. This chapter presents a summary of the findings of the planning program, the alternative plans considered, and the preliminary recommended land use management plan for the area as presented for public review at a formal public hearing on October 23, 1984. In addition, this chapter presents a summary of the testimony of that hearing, a post-public hearing recommended land use management plan, and the Advisory Committee action on that plan.

## INVENTORY FINDINGS

### General Description of the Chiwaukee Prairie-Carol Beach Area

The Chiwaukee Prairie-Carol Beach area is located in the eastern portion of the Town of Pleasant Prairie, Kenosha County, and is bounded by Lake Michigan on the east; by the Wisconsin-Illinois state line on the south; by STH 32 and the Chicago & North Western Transportation Company (C&NW) railway right-of-way on the west; and by 80th Street on the north. The study area encompasses about 1,825 acres, or about 8 percent of the total area of the Town of Pleasant Prairie.

The resident population of the study area stood at 1,402 persons in 1980. Between 1970 and 1980, the study area population increased by 286 persons, or 26 percent, over the 1970 population of 1,116.

About 1,246 acres, or 68 percent of the study area, have been subdivided for urban residential use. Plats for certain portions of the study area were recorded during the 1920's. Most of the platting activity, however, occurred between 1947 and 1956. By 1983, a total of 2,746 lots had been created through this platting activity, and 643 lots, or 23 percent of the total, were actually developed. Some of the originally platted lots are now partially or entirely submerged as a result of shoreline erosion along Lake Michigan.

### Existing Land Use

In 1983, urban land uses accounted for 517 acres, or 28 percent of the study area, while open lands--including wetlands, upland prairies, agricultural lands, and unused lands--along with surface water still occupied a total of 1,308 acres, or 72 percent of the area. Residential lands--encompassing 237 acres, or 13 percent of the area--and transportation and utility lands--encompassing 257 acres, or 14 percent of the area--accounted for most of the urban uses. Concentrations of residential land were located along the Lake Michigan shoreline, as well as in Carol Beach Estates-Unit No. 1 and Carol Beach Estates-Unit W; elsewhere, residential development was comparatively sparse and scattered.

### Existing Natural Resource Base

The Chiwaukee Prairie-Carol Beach area contains some of the outstanding natural resource features found within the Southeastern Wisconsin Region. Despite the inroads of urban development within the area, much of the natural resource base remains essentially intact. Although described on an individual, element-by-element basis in this report, the various features of the natural resource base, including wetlands, prairies, wildlife habitat areas, and critical plant habitat areas, are not mutually exclusive, and there is considerable overlap among them. Wetlands cover a total of about 747 acres, or 41 percent of the study area. Prairies cover about 828 acres, or 45 percent of the study area. Portions of the study area encompassing a total of about 702 acres, have been identified as wildlife habitat. Both Barnes Creek and Tobin Creek in the study area support a diverse and balanced population of forage minnows and other fish species. Portions of the study area, encompassing about 595 acres, or 33 percent of the study area, have been identified as critical plant habitat. A total of seven natural areas have also been identified in the study area, with

four of these--the Chiwaukee Prairie, the Kenosha Sand Dunes, the Carol Beach Low Prairie and Panne, and the Tobin Road prairie--being ranked as natural areas of statewide significance, and three of these--the Carol Beach Estates prairie, the Barnes Creek Dunes and Panne, and the Carol Beach Prairie--being ranked as natural areas of regional significance. Part of the Chiwaukee Prairie area south of 116th Street, east of the Chicago & North Western Railway right-of-way, has been designated a state scientific area and a national natural landmark.

### Shoreline Erosion

The Lake Michigan shoreline along the Chiwaukee Prairie-Carol Beach area has been identified as the most critical reach of the entire Lake Michigan coast in Wisconsin in terms of shore damage and recession rates. Long-term recession rates from 1835 to 1980 ranged between 1.5 feet per year and 8.8 feet per year at 19 measurement locations. Recession rates from 1970 to 1980 were generally lower than the 1835 to 1980 rates. However, recent recession rates of 10 feet or more per year were measured at three locations along the Lake Michigan shoreline in the study area.

### Existing Land Use Regulatory Programs

A number of local, state, and federal regulatory programs have a direct bearing on the use of land in the Chiwaukee Prairie-Carol Beach area. The most important of these are described below.

Federal Level: Section 404 of the federal Water Pollution Control Act of 1972, as amended, requires the U. S. Army Corps of Engineers to regulate the discharge of dredged and fill materials into the waters of the United States, including lakes, rivers, and adjacent wetlands. The Corps of Engineers has determined that most of the wetlands located east of the Chicago & North Western railway right-of-way in the study area are subject to regulation through individual Section 404 permits. Thus, such permits are required for activities involving the discharge of dredged or fill materials into these wetlands. Moreover, through an "advanced identification process," the Corps of Engineers has determined that the wetlands located east of the railway right-of-way through the study area are generally unsuitable for the discharge of dredged or fill material. While this does not preclude the granting of Section 404 permits, it does provide a preliminary indication that the granting of such permit would be unlikely.

State Level: The Wisconsin Department of Natural Resources administers a variety of regulatory programs, including shoreland, floodplain, navigable waters, and sanitary sewer regulatory programs, that are intended to protect and preserve the natural resource base. The shoreland and sanitary sewer regulatory programs have a particularly important bearing on the management of the natural resource base of the study area. Under Section 59.971 of the Wisconsin Statutes, counties are required to regulate shorelands within unincorporated areas. Shorelands are defined as lands within the following distances of the ordinary high-water mark of navigable waters: 1,000 feet from a lake, pond, or flowage, and 300 feet from a river or stream, or to the landward side of a floodplain, whichever distance is greater. Under Chapter NR 115 of the Wisconsin Administrative Code, county shoreland regulations must include restrictions on lot sizes, building setbacks, and filling and grading. Moreover,



under Chapter NR 115, wetlands five acres or more in size located within the statutory shoreland zoning jurisdiction area must be placed within a shoreland-wetland zoning district.

Under Chapter 144 of the Wisconsin Statutes, the Wisconsin Department of Natural Resources is required to review and take action to either approve, approve conditionally, or reject plans for proposed sewage treatment plants and sanitary sewer extensions. Under Section NR 110.08(4) of the Wisconsin Administrative Code, all sewerage facility development plans must be in conformance with an approved areawide water quality management plan. Such a plan has been prepared and adopted for southeastern Wisconsin by the Regional Planning Commission and endorsed by the Wisconsin Department of Natural Resources, the Governor, and the U. S. Environmental Protection Agency. The recommendations of this areawide, systems level plan are, however, necessarily general and do not reflect detailed local planning considerations. The sanitary sewer service area recommendations of this plan are accordingly intended to constitute an amendment to the sanitary sewer service area recommendations of that regional plan.

Local Level: Zoning is one of the most effective means available to local units of government for regulating land use in the public interest. In Wisconsin, counties may enact a general, or comprehensive, zoning ordinance covering all unincorporated areas of the county. Such a county zoning ordinance, however, becomes effective only in those towns which act to ratify the county ordinance. Kenosha County adopted a new county ordinance in 1983, replacing a zoning ordinance adopted by the County in 1959. The new zoning ordinance was ratified by the Town of Pleasant Prairie in 1984. Under that zoning ordinance, about 1,082 acres, or about 59 percent of the study area, have been placed in residential zoning districts. About 359 acres, or 20 percent of the study area, have been placed in conservancy zoning districts, including 348 acres in the C-1 Lowland Resource Conservancy District, and 11 acres in the C-2 Upland Resource Conservancy District. Other zoning districts applied in the study area include the B-3 Highway Business District--26 acres, or less than 2 percent of the study area; the I-1 Institutional District--151 acres, or about 8 percent of the study area; the PR-1 Park-Recreational District--108 acres, or about 6 percent of the study area; and the A-2 General Agricultural District--99 acres, or about 5 percent of the study area.

## ALTERNATIVE PLANS

Three basic alternative land use management plans were developed for the Chiwaukee Prairie-Carol Beach area, each proposing a different development-preservation pattern for the area. The three plans were: 1) a maximum development plan; 2) a maximum preservation plan; and 3) a combination development-preservation plan. While many variations of these basic alternative plans are possible, it is believed that the three alternative plans are representative of the basic, practical options available for the area.

### Maximum Development Plan

Of the three alternative plans, the maximum development plan envisions the highest level of development--with a total of 1,090 acres, or 60 percent of

the study area, proposed for urban use<sup>1</sup>--and the highest population level--about 5,900 persons under full development conditions. The extensive development envisioned under this alternative, however, would result in a substantial loss of natural resource values within the area. In this regard, a total of 42 percent of all wetlands in the area, and 37 percent of all of the identified "special value" wetlands--that is, wetlands determined to be significant in terms of one or more of the wetland rezoning criteria of Chapter NR 115 of the Wisconsin Administrative Code--would be lost to urban development under this alternative. About 98 acres of land would be acquired in the public interest for permanent preservation. The cost of acquiring this land is estimated at \$172,600. This represents 0.05 percent of the equalized value of the Town of Pleasant Prairie, about 0.01 percent of the equalized value of the Kenosha Unified School District, less than 0.01 percent of the equalized value of Kenosha County, and less than 0.01 percent of the equalized value of the Gateway Technical Institute District. Such acquisition would add about \$0.11 to the annual property tax bill of the owner of a \$50,000 home in the Town; about \$0.07 to the tax bill of the owner of such a home in the Kenosha Unified School District, but outside the Town; about \$0.02 to the tax bill of the owner of such a home located in Kenosha County, but outside the Kenosha Unified School District; and less than \$0.01 to the tax bill of the owner of such a home in the Racine and Walworth County portions of the Gateway Technical Institute District.

#### Maximum Preservation Plan

Of the three alternative plans, the maximum preservation plan envisions the lowest level of development--650 acres, or 36 percent of the study area, proposed for urban use<sup>2</sup>--and the lowest population level--about 2,900 persons under full development conditions. The maximum preservation plan envisions the most extensive preservation of open space among the alternative plans, thereby affording the greatest level of protection to the identified natural resource values of the area. About 95 percent of all wetlands and 98 percent of all special value wetlands would be preserved under this alternative. About 444 acres of land would be acquired in the public interest for preservation. The cost of acquiring this property--including 62 housing units within the proposed open space preservation area--is estimated at \$5.2 million. This represents 1.58 percent of the equalized value of the Town of Pleasant Prairie, 0.27 percent of the equalized value of the Kenosha Unified School District, 0.19 percent of the equalized value of Kenosha County, and 0.06 percent of the

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<sup>1</sup>Under the maximum development alternative, the identified urban areas would encompass 1,090 acres. The land actually in urban use would include the 1,090 acres within the identified urban areas, plus 42 acres consisting of segments of the railway right-of-way, existing streets proposed to be retained, proposed new streets, and existing homesites proposed to be retained within the identified open space preservation and rural areas.

<sup>2</sup>Under the maximum preservation alternative, the identified urban areas would encompass 650 acres. The land actually in urban use would include the 650 acres within the identified urban areas, plus 61 acres consisting of segments of the railway right-of-way, existing streets proposed to be retained, proposed new streets, and existing homesites proposed to be retained within the identified open space preservation and rural areas.

equalized value of the Gateway Technical Institute District. Such acquisition would add about \$3.20 to the annual property tax bill of the owner of a \$50,000 home in the Town; about \$2.03 to the tax bill of the owner of such a home in the Kenosha Unified School District, but outside the Town; about \$0.40 to the tax bill of the owner of such a home in Kenosha County, but outside the Kenosha Unified School District; and about \$0.03 to the tax bill of the owner of such a home in the Racine and Walworth County portions of the Gateway Technical Institute District.

### Development-Preservation Plan

The development-preservation plan represents a middle ground between the maximum development and the maximum preservation plans. It represents a conscious attempt to accommodate a significant amount of new urban development within the area, while preserving the most important natural features of the area. The plan envisions an urban area encompassing about 841 acres, or 46 percent of the study area,<sup>3</sup> and a population level of about 4,300 persons under full development conditions. The plan would preserve 83 percent of all wetlands in the study area --including 90 percent of the special value wetland areas. Under this alternative, 295 acres of land would be acquired in the public interest for preservation. The cost of acquiring this property--including 14 housing units within the open space preservation area--is estimated at \$1.8 million. This represents 0.56 percent of the equalized value of the Town of Pleasant Prairie, 0.09 percent of the equalized value of the Kenosha Unified School District, 0.07 percent of the equalized value of Kenosha County, and 0.02 percent of the equalized value of the Gateway Technical Institute District. Such acquisition would add about \$1.12 to the annual property tax bill of the owner of a \$50,000 home in the Town; about \$0.71 to the tax bill of the owner of such a home in the Kenosha Unified School District, but outside the Town; about \$0.14 to the tax bill of the owner of such a home located in Kenosha County, but outside the Kenosha Unified School District; and about \$0.01 to the tax bill of the owner of such a home located in the Racine and Walworth County portions of the Gateway Technical Institute District.

### PRELIMINARY RECOMMENDED LAND USE MANAGEMENT PLAN<sup>4</sup>

After carefully considering the series of alternative plans described above, the Technical and Citizen Advisory Committee on May 3, 1984, selected one of the alternatives--namely, the development-preservation alternative--as the basis for the preparation of a recommended plan for the Chiwaukee Prairie-

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<sup>3</sup>Under the development-preservation alternative, the identified urban areas would encompass 841 acres. The land actually in urban use would include the 841 acres within the identified urban areas, plus 61 acres consisting of segments of the railway right-of-way, existing streets proposed to be retained, proposed new streets, and existing homesites proposed to be retained within the identified open space preservation and rural areas.

<sup>4</sup>This section presents a description of the recommended plan as presented for review at a public hearing held on October 23, 1984. A final recommended plan, revised to take into account the major concerns expressed at the public hearing, is presented in a later section of this chapter.

Carol Beach area. The recommended plan represents a refinement of the development-preservation alternative, adjusted to reflect specific amendments recommended by the Technical and Citizen Advisory Committee at its May 3, 1984, meeting.

The recommended plan proposes the maintenance of an open space preservation area consisting of a continuous corridor connecting the Kenosha Sand Dunes on the north end of the study area with the Chiwaukee Prairie on the south end, along with small isolated preservation areas in the southwestern portion of the study area. The open space preservation area encompasses 803 acres, or 44 percent of the study area. It encompasses 604 acres, or 81 percent of all wetlands in the area, including 565 acres of special value wetlands, or about 86 percent of all special value wetlands.

The recommended plan envisions an urban area encompassing 860 acres, or 47 percent of the study area.<sup>5</sup> Most of the urban area would be devoted to single-family residential use, and to limited commercial and institutional uses. In addition, the proposed urban area includes land specifically preserved for the possible future expansion of the Kenosha sewage treatment plant and of the Trident Marina.

Under the recommended plan, certain lands located north of the Wisconsin-Illinois border, west of the Chicago & North Western Railway right-of-way, would remain in rural--primarily agricultural--use. Such lands would encompass 116 acres, or about 6 percent of the study area.

Under the recommended plan, the housing stock in the area would increase from 512 housing units in 1980 to about 1,460 housing units upon full development--an increase of about 950 units--or to almost triple the existing stock. The population of the study area would increase from 1,402 persons in 1980 to about 4,250 persons upon full development.

The recommended plan envisions that public sanitary sewer and water supply service will eventually be provided throughout the area proposed for urban use. The recommended plan further envisions that the area will be served by all-weather streets with rural cross-sections; that is, with road ditches, culverts, and skeletal storm sewer systems and without curbs and gutters and full storm sewer systems. The plan envisions a 20.3-linear-mile local roadway system, including 20.0 linear miles over existing street rights-of-way and slightly more than 0.3 linear mile over proposed new rights-of-way. Conversely, street rights-of-way totaling 7.5 linear miles would be vacated under the recommended plan.

Shoreline erosion poses a special hazard to certain lands along the Lake Michigan shoreline. The plan proposes the vacating of a segment of roadway which is presently seriously threatened by Lake Michigan shoreline erosion--

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<sup>5</sup>Under the recommended plan, the identified urban areas would encompass 860 acres. The land actually in urban use would include 860 acres within the identified urban areas, plus 97 acres consisting of existing streets proposed to be retained, proposed new streets, and existing homesites proposed to be retained within the identified open space preservation and rural areas and the railway right-of-way throughout the study area.

namely, an approximately 1,000-foot-long segment of 1st Avenue near its intersection with 116th Street--and the provision of alternative access to homesites presently served by that segment. Along the rest of the Lake Michigan shoreline, it was assumed that structural shore protection would be installed as necessary to prevent any substantial shoreland loss, and that the Lake Michigan shoreline would thereby remain essentially intact. It is important to note that, while certain housing units would have to be relocated and certain streets vacated, the plan would be viable under a situation in which no additional structural shore protection measures were installed. With certain modifications to the proposed street system, the plan could be readily adapted to such a situation.

The Town in conjunction with the property owners concerned should address the shoreline erosion problem and determine whether structural shore protection is a financially feasible and cost-effective solution. It is essential that this matter be studied and the issues concerned resolved before any further major public improvements or private development are undertaken in erosion-threatened shoreline areas.

### Plan Implementation

Successful implementation of the land use management plan depends upon the cooperative actions of a number of government agencies and private interests. The most important plan implementation actions--those pertaining to open space acquisition, natural resource base management, and land use regulation--are described herein.

Open Space Acquisition: The recommended plan envisions that almost all privately held, unimproved, platted lots within the proposed open space preservation area will be publicly or privately acquired for preservation at fair market value. A total of 661 platted lots, having a combined area of 222 acres and a combined assessed value of \$1.13 million, are recommended for acquisition. While the plan specifically calls for the acquisition of platted lots, unplatted lands within the open space preservation area could also be acquired, depending upon the interests of the owners of the land concerned and of the acquiring agencies.

Under the recommended plan, The Nature Conservancy, the Wisconsin Department of Natural Resources, and the Town of Pleasant Prairie would be responsible for open space acquisition in the Chiwaukee Prairie-Carol Beach area. The plan envisions that The Nature Conservancy will acquire privately held, unimproved platted lots within the open space preservation area located south of 116th Street, east of the Chicago & North Western Railway right-of-way. A total of 192 lots having a combined area of 59 acres, and a combined assessed value of \$149,500, are recommended for acquisition by The Nature Conservancy.

The plan further recommends that the Wisconsin Department of Natural Resources assume primary responsibility for land acquisition north of 116th Street. A total of 449 lots, having a combined area of about 157 acres and a combined assessed value of \$950,000, are recommended for acquisition by the Department.

The plan recommends that the Town of Pleasant Prairie acquire a total of 20 lots, having a combined area of six acres and a combined assessed value of \$34,500.



Open Space Management: The plan envisions that the proposed open space preservation area will be managed as a natural area-wildlife area. Accordingly, the lands within the proposed open space preservation area would be managed with emphasis on maintaining existing plant and animal communities, and on restoring disturbed areas to a natural condition, insofar as practical. Facility development in the open space preservation area would be limited to facilities required to provide opportunities for scientific and educational activities, as well as casual enjoyment of the wetland-prairie environment by the public.

The plan envisions that the Wisconsin Department of Natural Resources and The Nature Conservancy will be the agencies primarily responsible for management of the open space preservation area. The Wisconsin Department of Natural Resources would be primarily responsible for management of lands within the open space preservation area located north of 116th Street, while The Nature Conservancy would be responsible for lands located south of 116th Street. The Nature Conservancy and the Department of Natural Resources should seek cooperative resource management agreements with the owners of major landholdings which are recommended for preservation but not specifically recommended for public acquisition, such as the Wisconsin Electric Power Company.

#### Land Use Regulations:

Zoning--The plan recommends that Kenosha County amend the county zoning ordinance by establishing a new C-3 Natural and Scientific Area Resource Conservancy District and, in conjunction with the Town of Pleasant Prairie, amend the zoning district map for the Chiwaukee Prairie-Carol Beach area through the application of the proposed new conservancy district and other zoning districts in accordance with the open space preservation and urban development recommendations of the land use management plan. District regulations of the proposed C-3 Conservancy District would serve to restrict uses to those which serve to preserve and enhance existing natural features, and thereby effectively protect from urban encroachment both wetland and upland open space lands to which the regulations are applied. The district would, however, permit the maintenance, repair, and replacement of, and addition to, residential dwellings existing on or before the date of the ordinance amendment. The proposed C-3 Conservancy District would be applied throughout most of the open space preservation area proposed under the recommended plan.

Federal Section 404 Regulatory Program--As noted above, under Section 404 of the federal Water Pollution Control Act of 1972, as amended, the U. S. Army Corps of Engineers has authority to regulate the discharge of dredged and fill materials into lakes, rivers, and adjacent wetlands. Implementation of the plan would involve the filling and development of certain wetland areas which are regulated by the Corps of Engineers. It is envisioned that, upon adoption of the plan, the Town of Pleasant Prairie will submit to the Corps of Engineers a collective application seeking permission to fill and develop for appropriate uses all wetland lots located in the proposed urban area.

Plan Costs: The total open space acquisition and public improvement costs attendant to implementation of the recommended plan would approximate \$15.7 million. Open space land acquisition costs would approximate \$1.1 million, or 7 percent of the total, while public improvement costs would approximate \$14.6 million, or 93 percent of the total.

Under the plan, open space acquisition costs would be borne as follows: Wisconsin Department of Natural Resources--\$950,000, or 84 percent of the total costs; The Nature Conservancy--\$149,500, or 13 percent; and the Town of Pleasant Prairie--\$34,500, or 3 percent. It is proposed that open space acquisition occur over a five-year time period. The average annual expenditure over the five-year period would approximate \$190,000 for the Department of Natural Resources, \$29,900 for The Nature Conservancy, and \$6,900 for the Town of Pleasant Prairie. It should be noted that the proposed acquisition would reduce the equalized value of the Town of Pleasant Prairie by about 0.34 percent, the equalized value of the Kenosha Unified School District by 0.06 percent, the equalized value of Kenosha County by 0.04 percent, and the equalized value of the Gateway Technical Institute District by 0.01 percent. The proposed acquisition would add about \$0.69 to the annual tax bill of the owner of a \$50,000 home in the Town; about \$0.44 to the tax bill of the owner of such a home in the Kenosha Unified School District, but outside the Town; about \$0.09 to the tax bill of the owner of such a home in Kenosha County, but outside the Kenosha Unified School District; and about \$0.01 to the tax bill of the owner of such a home in the Racine and Walworth County portions of the Gateway Technical Institute District.

The total cost of the recommended public improvements would approximate \$14.6 million. Component costs--including construction costs and engineering, administrative, and legal costs--would be as follows: sanitary sewer collection system--\$7.0 million, or 48 percent of the total; water supply distribution system--\$5.0 million, or 34 percent; local street improvements--\$0.9 million, or 6 percent; and stormwater drainage improvements--\$1.7 million, or 12 percent. It is envisioned that the required public improvements will be installed over a 20-year time period. The average annual public improvement cost over the 20-year period would approximate \$730,000. It is envisioned that the public improvement costs would be assessed against the benefited property. The manner in which the cost is assessed would, under state law, be determined by the Town following a public hearing on the matter.

## PUBLIC REACTION TO THE PRELIMINARY RECOMMENDED PLAN AND SUBSEQUENT ACTION OF THE TECHNICAL ADVISORY COMMITTEE

### Summary of Testimony

The preliminary recommended land use management plan for the Chiwaukee Prairie-Carol Beach area of the Town of Pleasant Prairie as described in Chapter V of this report, together with the preliminary plan implementation recommendations set forth in Chapter VI, were the subject of a formal public hearing conducted by the Regional Planning Commission. The purpose of the hearing was to present the preliminary plan recommendations for review and consideration by all parties concerned. The hearing was noticed in the local media and was attended by about 200 individuals. The hearing was held at 7:00 p.m. on October 23, 1984, at Lance Junior High School in the City of Kenosha.

Minutes of the public hearing were published by the Commission and provided to both the Technical Advisory Committee and the Regional Planning Commission for review and consideration prior to the selection and adoption of a final recom-

mended plan.<sup>6</sup> The minutes of the public hearing contain a complete record of all comments made at the hearing. In addition, the document includes written comments submitted before, at, and after the public hearing, and pertinent newspaper articles.

Review of the public hearing record indicates that the positions of the individuals and organizations submitting comments generally can be grouped into three categories. In the first category were those who generally supported the plan as presented at the hearing, perhaps suggesting refinement in some of its details but supporting the proposed compromise embodied in the plan between preservation and development objectives as reasonable and as a sound basis for preparation of a final plan. This opinion was accompanied by concern that the property owners whose lands are zoned conservancy are fairly compensated in future state acquisition of the lands. This position was taken by two town officials, two residents of the area, and a representative of the Trident Marina.

The Town Chairman in particular cited the need to quickly resolve the issues attendant to the future development of the Chiwaukee Prairie-Carol Beach area in order to be fair to the property owners directly affected, and to enable the Town to take action toward resolving the onsite sewage disposal problems of not only the Carol Beach area, but much of the area of the Town west of Sheridan Road as well. The town officials noted that, if steps are not taken soon by the Town to design and construct a sanitary trunk sewer in the Sheridan Road corridor, together with branch sewers both easterly into the Carol Beach Estates-Unit No. 1 Subdivision and westerly into a number of subdivisions in the Town outside of the Carol Beach study area, individuals residing in those subdivisions likely would be subject to enforcement actions by Kenosha County. Such enforcement actions would require substantial investment in holding tanks and/or septic tank rehabilitation measures, expenditures which would be better directed toward the installation of a public sanitary sewerage system. The town officials noted that the key to the design and construction of a sanitary sewerage system in this portion of the Town lies in resolution of the Chiwaukee Prairie-Carol Beach issues through an agreed-upon land use management plan, and delineation of an attendant sanitary sewer service area. Only when such intergovernmental agreement is achieved will the Wisconsin Department of Natural Resources (DNR) be in a position to approve the needed trunk and branch sewers.

The Trident Marina representative generally supported the plan as proposed at the hearing, recognizing the need to undertake--once the system level plan is completed--specific, in-depth analyses of any groundwater and surface water issues that may be attendant to a specific marina development proposal. One of the private property owners supporting the plan indicated that if state monies are not forthcoming to acquire lands within the open space preservation area, then the lands involved--even if wetlands--should revert to a residential zoning category so that the property owners directly affected would be able to develop their lands should they choose to do so. In addition, this landowner questioned the existence of the primary environmental corridor identified in the plan north of 90th Street, noting that certain lands in the vicinity of

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<sup>6</sup>See Minutes of Public Hearing, A Land Use Management Plan for the Chiwaukee Prairie-Carol Beach Area of the Town of Pleasant Prairie.

90th Street had been so altered through filling as to bring into question the continuity of the corridor in this location. This landowner also suggested that any final plan identify any maintenance costs that may be attendant to the establishment of a state open space project in the Carol Beach area.

In the second category were those individuals and organizations whose comments indicate that, while they recognize the existence in the study area of certain natural resources worthy of protection and preservation, they are opposed to any large-scale preservation effort that would encompass the zoning and acquisition of upland resources, as well as wetland resources; those who question the accuracy of the wetland resource data developed to date; and those who remain opposed to any rezoning efforts that would tend to diminish the market value of property. In this category were the Chiwaukee-Carol Beach Citizens Organization, Inc.; relatively large landowners in the study area, including the Kenosha Towne Club, Inc., and the Wisconsin Electric Power Company; and 18 individual property owners, some of whom are also members of the above-noted citizen organization. The points raised by these individuals and organizations may be summarized as follows:

1. The resource data base developed under the study, and in particular the wetland mapping, remains inaccurate, including the data on upland dunes and ridges within mapped wetlands. Accordingly, more effort should be devoted to correcting the inaccuracies in the mapping. In addition, more information should be made available on the location and extent of threatened and rare or endangered species.
2. There is no federal or state mandate to Kenosha County or to the Town of Pleasant Prairie to place significant upland resources in a conservancy zone, similar to the state mandate for the placement of wetlands in shoreland areas in a conservancy zone, or similar to the federal wetland protection program under Section 404 of the Clean Water Act. Accordingly, that part of the preliminary recommended plan that calls for the placement of significant uplands in a preservation area and, more importantly, that would subject such uplands to restrictive conservancy zoning is not warranted, and would unnecessarily restrict use of those lands and thereby have a negative impact upon property values. Furthermore, the legality of placing such uplands that occur in already platted subdivisions within a restrictive conservancy zone is questionable and subject to inverse condemnation challenges.
3. Much of the land within the proposed open space preservation area identified in the preliminary plan is buildable with conventional septic tank systems, or with holding tanks. Accordingly, the plan should not include the provision of centralized public sanitary sewer service to such lands, particularly those lands lying east of the Chicago & North Western Transportation Company railway right-of-way.
4. The costs of implementing the open space land acquisition portion of the preliminary recommended plan have been underestimated. The assessed values used in the plan for cost estimating purposes reflect depressed market prices because of the notoriety given to the area in the planning effort, and the plan does not recommend the purchase of the unplatted lands proposed to be placed in a conservancy zone. Accordingly, if the plan is to include an open space preservation area, it should include

the cost of acquiring all currently privately held lands within that area at a fair price that has not been artificially deflated by plan recommendations and attendant conservancy zoning. Some individuals suggested that in order to ensure just compensation in any purchase arrangement, the plan recommend the use of condemnation proceedings. In addition, some suggested that if any homes were to be purchased as a part of a project, the homeowners be fully compensated for their losses, including relocation payments and interest subsidies attendant to any replacement mortgages which presumably would have higher interest rates than the current mortgages.

5. Some landowners indicated that the maps should reflect unique situations that would bear upon the acquisition of lands within a designated open space preservation area. One specific example cited in this report involves a mortgage arrangement whereby, in an area subject to shoreline erosion, a home and a lot on one side of a street are grouped with a lot across the street. Another example cited involves the ownership of multiple adjacent lots, with a home being located on one lot and the supporting well and onsite sewage disposal system on adjacent lots. The suggestions made in this respect were to modify the plan to ensure that such situations are taken into account in the implementation of an open space preservation and public acquisition program.

In the third category were those individuals and organizations whose comments indicated that they believe the plan falls short of adequately protecting the natural environment in the study area, and who generally favor greater efforts to preserve the resource base while fairly compensating the private property owners who might be adversely affected. In this category were a number of conservation and environmental interest groups, including the Wisconsin Wildlife Federation, the Wisconsin Sportsman's Association, the Wisconsin Audubon Council, the Brown County Conservation Alliance, the Kettle Moraine Audubon Society, the John Muir Chapter of the Sierra Club, the Hoy Nature Club, the Waukesha Environmental Action League, the Milwaukee Audubon Society, the Citizens Natural Resources Association, the Wisconsin Metro Audubon Society, the Lakeland Audubon Society, the Wisconsin Wetlands Association, the Wisconsin Garden Club Federation, and the Chiwaukee Prairie Rescue Coalition; the Wisconsin Public Intervenor and academicians testifying on behalf of that office; the Wisconsin Department of Natural Resources; and 128 individual citizens. The points raised by these individuals and organizations are best summarized by examining individually the comments made by or on behalf of the Wisconsin Public Intervenor, by the Chiwaukee Prairie Rescue Coalition, and by the Wisconsin Department of Natural Resources.

The Wisconsin Public Intervenor objected to several aspects of the preliminary land use management plan. In general, the Public Intervenor testified that insufficient data were available on the groundwater hydrology and the archaeological significance of the area, and that such data were essential to the preparation of the plan. The Public Intervenor also had the following specific objections to the preliminary plan:

1. Objections were raised to that aspect of the plan that would potentially accommodate a proposed expansion of the Trident Marina. This objection



was based upon the potential loss of significant wetlands in the expansion area, on the potential increased traffic and attendant water pollutants that would be generated by an expanded marina facility, and on the possible construction through the Chiwaukee Prairie national landmark of a new access road to the marina site. In this respect, the Public Intervenor called for more detailed information on the precise nature of the proposed marina expansion project, as well as more detailed information on groundwater hydrology in the vicinity of the marina before any final decision is made on inclusion of a marina expansion proposal in the plan.

2. Objections were raised to that aspect of the plan setting aside an 18-acre expansion area to meet future wastewater treatment needs at the Kenosha sewage treatment plant. These objections were based upon the loss of significant wetlands and sand dunes in the expansion area, particularly in the absence of any demonstrated need for the expansion of the treatment plant.
3. Objections were raised to the proposed utility corridors on Wisconsin Electric Power Company (WEPCo) lands at the north end of the study area. These objections were based upon a lack of a demonstrated need for additional utility line construction through environmentally significant wetlands on WEPCo property. The Public Intervenor recommended that, if any utility corridor is to be retained in the plan, the plan include recommendations relative to the restoration and management of the disturbed lands.
4. Objections were raised to that aspect of the plan that would provide for the installation of sanitary sewers to portions of existing platted subdivisions, particularly in that portion of the study area east of the Chicago & North Western Transportation Company railway right-of-way and adjacent to the Chiwaukee Prairie national natural landmark south of 116th Street. These objections were based, in part, upon the potential harm to the open space areas that could be caused through the installation of the sewers, and in part upon the perceived high cost to individual landowners of installing public sanitary sewers and making other utility and road improvements within the area. The implication of this latter comment is that the public infrastructure costs on a per-lot basis would be so high as to make the plan fiscally impractical.

The Public Intervenor concluded by recommending that intensive hydrological and archaeological studies be undertaken before the plan is completed; that the local officials involved examine more closely the environmental and fiscal impacts attendant to the plan; and that the Wisconsin Department of Natural Resources review very carefully any final plan in light of its statutory responsibilities concerning wetland preservation in shoreland areas, concerning permits and approvals for the installation of sanitary sewers, and concerning its responsibilities in complying with the Wisconsin endangered species law. The Public Intervenor also suggested that greater weight be given in the making of the final plan to decisions already made by the U. S. Army Corps of Engineers concerning the probable denial of Section 404 wetland filling permits in the Chiwaukee Prairie-Carol Beach study area.

The Chiwaukee Prairie Rescue Coalition also objected to the preliminary land use management plan. The major points made by the Coalition on behalf of various environmental organizations and concerned individuals may be summarized as follows:

1. The plan would accommodate substantial amounts of urban development in an environmentally sensitive area and fails to give due weight to the larger public interest in preserving and protecting the entire area. In this respect, the plan has been held out erroneously as a compromise between development and preservation; instead, any compromise should take as given the federal and state legislation that already protects the wetlands in the area, with the compromise taking the form of compensation to private landowners for preserving not only the wetlands but also the important uplands in this environmentally complex area.
2. No new development should be accommodated in the study area if it would have any potential adverse impacts on the wetland/upland complex found to be significant in the area. In this respect, the Coalition called for further hydrological studies as may be necessary to determine whether or not the plan should encompass development proposals.
3. To remedy the inadequacies which the Coalition believes exist in the preliminary plan, the Coalition suggested that the plan be revised as follows:
  - a. The 18-acre land reservation for the potential expansion of the Kenosha sewage treatment plant should be eliminated from the plan.
  - b. The expansion proposal for the Trident Marina should be eliminated from the plan.
  - c. Any sanitary sewer service east of the Chicago & North Western Transportation Company railway right-of-way should be eliminated from the plan.
  - d. The utility corridors on the Wisconsin Electric Power Company lands should be retained in the plan with the provisions that no permanent buildings be placed in the corridors and no herbicides be used in connection with any activities in the corridors.
  - e. A preservation area greater than that currently included in the plan should be identified, and the plan should recommend that the Wisconsin Department of Natural Resources and/or private organizations guarantee that monies will be available to purchase all lands at fair market value within such a preservation area if property owners wish to sell.
  - f. All lands not currently occupied by buildings within the Chiwaukee Prairie-Carol Beach study area should be recommended for placement in a conservancy zoning district that would prohibit new development.

In summary, the Coalition recommended that the final plan take the form of a maximum preservation plan which would go beyond even the alternative plan herein identified as a maximum preservation plan.

The comments of the Wisconsin Department of Natural Resources indicated that the Department would not be able to approve the preliminary recommended land use management plan. The Department indicated that the following points concerning the plan would have to be reflected in the plan before it could be approved:

1. All wetlands within the statutorily defined shoreland area that have been identified as being significant in terms of providing the functions listed in Chapter NR 115 of the Wisconsin Administrative Code--i.e., those wetlands identified in the plan as "special value" wetlands--must be placed in a preservation area.
2. No need exists for the north-south utility corridor identified on Wisconsin Electric Power Company lands in the preliminary plan. Any utilities required in this respect can be accommodated within the 7th Avenue right-of-way.
3. The east-west utility corridor identified in the plan on Wisconsin Electric Power Company lands should reflect the existing corridor established for the water intake and discharge lines of the Pleasant Prairie power plant, and should be widened only if a need is demonstrated within the 20-year framework of the plan. Such a corridor will be subject to shoreland zoning regulations in accordance with Chapter NR 115 of the Wisconsin Administrative Code.
4. With respect to the drainageway between 3rd Avenue and Lake Michigan north of 115th Street, the Department would not approve redelineation of the flood hazard area along the drainageway as might be attendant to the replacement of the existing culverts under streets. Accordingly, the plan should simply include the existing flood hazard area along this drainageway in the open space preservation area.
5. Almost one-half of the 36-acre area identified in the plan for the possible expansion of the Trident Marina is comprised of "special value" wetlands as discussed above. Expansion of the marina into any of these wetlands would be unacceptable to the Department. Furthermore, portions of the proposed marina expansion area contain habitat for endangered and threatened species. The loss of this habitat area would be significant and would have the effect of prohibiting expansion of the marina into this particular area. The Department suggested that this aspect of the plan be reconsidered, and that any marina expansion area be redefined to exclude any significant wetlands or any plant habitat areas that contain endangered or threatened species. Furthermore, the Department suggested that any lands proposed for the marina expansion be included in a preservation area rather than an urban area.
6. The entire 18-acre area set aside in the preliminary plan for the potential expansion of the Kenosha sewage treatment plant should be eliminated from the plan. The 18-acre area in question is a very significant area in terms of its natural value, and there is no need for any further expansion of the Kenosha treatment plant within the 20-year planning period. If at some future date a need to expand the Kenosha plant materializes, an amendment to the plan could be considered at that time after carefully considering all the alternatives for plant expansion.

7. Consideration should be given in the final plan to identifying phased sanitary sewer service areas as permitted in Chapter NR 121 of the Wisconsin Administrative Code.
8. No consideration should be given to the provision of sanitary sewer service to homes within the open space preservation area. Since, under Chapter NR 121 of the Wisconsin Administrative Code, the open space preservation area would be considered to be a primary environmental corridor, no sewer service can be provided to lands in that area. Furthermore, the extension of sanitary sewers through the open space preservation area could induce additional development in the form of unregulated private building sewer connections to existing lots.
9. More attention should be given in the final plan to the high public costs needed to control shoreline erosion and protect any existing roads and planned sanitary sewer lines along 1st Avenue.
10. With respect to the open space acquisition program, the Department's experience has shown that it would be unrealistic to set a five-year horizon in the plan. Because of the willing-buyer/willing-seller premise of the plan, a 20-year acquisition period is not unreasonable. In addition, the plan should provide the estimated cost of acquiring existing homes in the open space area.

In total, then, 171 individuals, agencies, or organizations commented on the preliminary plan. Of that total, only five generally supported the plan as presented at the public hearing. Of the remaining 166 comments, 21 indicated a general preference for accommodating more development in the area, while 145 indicated a general preference for greater resource preservation efforts coupled with fair compensation to affected landowners. Of particular importance in this latter category are the comments made by the Wisconsin Department of Natural Resources. These comments have the practical effect of requiring substantial changes to the plan if it is to be approved and implemented by that Department.

#### Response to Comments Pertaining to Data

A number of comments were made on the data on which the preliminary recommended land use plan was based. The following directly responds to those comments:

1. Inaccuracy of Wetland Mapping

A number of individuals and organizations testifying at the public hearing asked that additional work be done to refine and detail the inventory of wetlands conducted jointly by the Commission and the Wisconsin Department of Natural Resources under the state wetland mapping program. These comments were made despite an intensive effort by the Commission and the Department to respond by field inspection to several hundred individual landowner requests for review of the wetland maps. As pointed out during the public hearing by the attorney for the Chiwaukee-Carol Beach Citizens Organization, Inc., any wetland zoning in the shoreland area undertaken by Kenosha County will have to meet the procedural requirements set forth in Chapter NR 115 of the Wisconsin Administrative Code. This involves a formal public hearing by Kenosha County on the

completeness and accuracy of the wetland inventory maps. That hearing has not yet been held. All of the refinement work on the wetland inventory maps to date had been done informally in a good faith effort by the Commission and the Wisconsin Department of Natural Resources to develop as accurate a set of wetland maps as is possible for the land use planning effort.

It is believed by the Commission, the Wisconsin Department of Natural Resources, the U. S. Army Corps of Engineers, and the U. S. Department of the Interior, Fish and Wildlife Service, that the wetland maps utilized as a basis for the plan are as accurate as is possible and fully adequate for systems level land use planning purposes. Accordingly, it is unnecessary for any additional informal wetland inventory map review and refinement to be undertaken prior to completion of the systems level land use management plan for the study area. Any needed additional review and refinement of the wetland maps should be undertaken through the formal map review and approval process set forth in the Wisconsin Administrative Code. The Commission is not a direct party to that process. That process will, however, have to be completed before Kenosha County adopts any wetland zoning in the shoreland area under the terms of that Code. In addition, it is important to note that the land use management plan is not focused solely on wetland protection and preservation, but more broadly on natural resource protection and preservation, and encompasses significant uplands as well as wetlands. Accordingly, the accuracy of the wetland maps, particularly where there is a recognized complex pattern of interwoven wetlands and uplands, is not of critical importance to the identification of a needed system of resource protection areas.

2. More Information Pertaining to Rare, Threatened, and Endangered Plant Species

One individual testifying at the public hearing asked that more detailed information be included in the plan document on the location and extent of rare, threatened, and endangered plant species in the study area. The plan document contains a list of the rare, threatened, and endangered plant species that have been identified in a number of locations throughout the Chiwaukee Prairie-Carol Beach study area. In addition, the plan document contains a map delineating the location and extent of the critical plant habitat areas, both wetland and upland, within which the rare, threatened, and endangered plant species have been found (see Map A-8 in Appendix A-7). The members of the scientific community that have identified the rare, threatened, and endangered plant species are reluctant to divulge for publication purposes any more detailed information than has already been included in the planning report. This reluctance stems from a concern that even well-intentioned individuals not particularly knowledgeable about plant species may unintentionally destroy such species in field investigations. The information already documented in the report is sufficient and adequate for systems level land use planning purposes. Accordingly, and in recognition of the reluctance of the scientific community to publish more detailed information concerning this matter, no additional information is included in this report. Interested individuals who wish to observe in the field



specimens of rare, threatened, and endangered plant species are advised to contact the Wisconsin Scientific Areas Preservation Council for assistance in this matter.

3. More Information Pertaining to Groundwater Hydrology

The Wisconsin Public Intervenor and a number of individuals testifying at the public hearing asked that more detailed information be collected on the groundwater hydrology in the study area prior to the completion of a land use plan. This request was made based upon conclusions reached by academicians that more detailed hydrologic information was needed before final commitments are made to permit such projects as the expansion of the Trident Marina or the installation of sanitary sewers in portions of the study area. The academicians called for more detailed information on how the Trident Marina would be expanded, on how sanitary sewers would be installed, and on how buildings and roadways would be constructed so that such information, together with more site-specific hydrologic information, could form the basis for determining the impacts of such development projects on the groundwater hydrology.

These requests for additional information reflect a lack of understanding of, and appreciation for, the planning process and its iterative nature. Good planning practice, as well as budgetary constraints, dictate that, at the initial long-range systems planning stage, prior to any development projects being imminent, a plan should be prepared using the information adequate for that purpose, although not necessarily adequate for later facilities, or project, planning purposes. In the case of the Chiwaukee Prairie-Carol Beach study area, there is adequate groundwater information available on which to base such initial long-range systems planning, including information from detailed operational soil surveys, groundwater data assembled by the U. S. Geological Survey, and logs for 137 wells in the study area. That information is more than adequate to enable a sound systems level land use plan to be prepared. As the planning then moves forward into a second phase--the facilities planning phase--when specific development projects are being proposed, more detailed inventories and analyses of the groundwater may be warranted. It makes little sense, however, to expend the resources to collect such detailed hydrologic data if it is determined in a final systems level plan that, for example, and for reasons that may be unrelated to groundwater, the Trident Marina expansion projects or the projects involving the installation of sanitary sewers in portions of the study area should be eliminated from the final plan. If such development proposals remain in the final systems level plan, then additional information can be collected as the projects move into the facilities planning phase. If detailed studies at that time indicate an unacceptable level of impacts on the hydrology of the area to be preserved, then the projects can be disapproved at that time and the systems plan revised.

4. More Information Pertaining to the  
Archaeological Significance of the Study Area

The Wisconsin Public Intervenor also requested that further archaeological investigations be undertaken before any systems level plan decisions are made. Again, this request reflects a lack of understanding of, and appreciation for, the various stages of the planning process. All available archaeological data were collated for, and reported in, the

draft planning report, and used in the making of the preliminary land use plan for the study area. These data are more than adequate for systems level planning. In particular, the Barnes Creek archaeological site, which has been the subject of formal archaeological study and which is listed on the National Register of Historic Places, was specifically identified and included in the open space preservation area. Thus, implementation of the preliminary plan as presented would preserve the Barnes Creek site for future archaeological investigations.

The remaining sites of potential archaeological significance have, to date, been only generally and vaguely defined. The proper time to commit the limited resources available to additional archaeological investigations is not at the systems level planning phase but at that point in the development process when a particular project--such as a sanitary sewer installation project--becomes imminent so that the archaeological investigations can be focused on those areas proposed to be disturbed, and any necessary changes in the site-specific plans made.

5. Existence of Primary Environmental Corridor at 90th Street

One individual testifying at the public hearing questioned the existence of a primary environmental corridor along the east side of 7th Avenue and north of 90th Street. This individual noted that some of the land included within the corridor identified in the preliminary plan was owned by the Town of Pleasant Prairie and was at one time a wetland, but had been filled. Given this filling, the individual concerned questioned the continuing existence of the primary environmental corridor in this location.

The inventories conducted under the study did not identify the site in question as a wetland. The inventories indicated that the site had indeed been filled, but that the site, being a town park site, did possess some value for wildlife habitat and as a park site and, accordingly, did possess the requisite resources necessary to continue being included within a primary environmental corridor.

Response to Comments Pertaining to Preliminary Plan Recommendations

The following directly responds to those comments made concerning the land use recommendations contained in the preliminary plan:

1. "Special Value" Wetlands

The Wisconsin Department of Natural Resources indicated that it could not approve a land use plan that did not include within a preservation area, and that did not recommend placing in a protective conservancy zoning district, all wetlands identified as having a "special value" under the criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code that lie within the statutorily defined shoreland area. Since the Department indicated that this particular comment was founded in the state law governing the protection and preservation of shoreland-wetland areas, the final land use management plan will have to demonstrate that all of these "special value" wetlands within shoreland areas are placed within the recommended open space preservation area and are recommended for conservancy zoning.

2. Land Reservation for Kenosha Sewage Treatment Plant Expansion

The Wisconsin Public Intervenor, the Wisconsin Department of Natural Resources, and a number of individuals recommended that the 18-acre area set aside for possible expansion of the Kenosha sewage treatment plant be eliminated from the plan because that area is located in a highly significant natural area; because no documented need for a plant expansion exists at this time, or is likely to exist within the 20-year planning period; and because, in any event, if expansion is required at the Kenosha sewage treatment plant, the City of Kenosha will have to go through a site selection process that would comprehensively examine all alternatives that are available. No specific testimony was offered at the hearing in support of the inclusion in the plan of this land reservation. Accordingly, and since the Department of Natural Resources is the approving authority for sewage treatment plant expansion projects, this 18-acre expansion area should be eliminated from the final plan.

3. Trident Marina

The Wisconsin Public Intervenor, the Wisconsin Department of Natural Resources, and a number of individuals recommended that the proposal contained in the preliminary plan to accommodate an expansion of the Trident Marina on a 36-acre site either be eliminated from the plan, or be significantly revised. The Trident Marina site is directly affected by the "special value" wetlands problem resolution noted above. Indeed, almost one-half of the Trident Marina expansion site contains "special value" wetlands, and these wetlands occur in such a manner and location as to render the entire 36-acre site unusable for marina expansion purposes. Furthermore, the nonwetland portion of the expansion site is known to contain at least one endangered plant species. As a practical matter, then, there is no potential area for expansion of the Trident Marina site to the west, and provision for such westerly expansion should be eliminated from the final plan. If the marina is to be expanded, it will have to be expanded to the east and north of the existing site.

4. Utility Corridors

A significant amount of testimony at the hearing questioned the need for the broad utility corridors proposed to be extended in the preliminary plan through the proposed open space area north of 85th Street and along 7th Avenue. Suggestions were made to accommodate any future utility needs wherever possible within existing road rights-of-way. Accordingly, it is proposed that the final plan eliminate any broad utility corridor adjacent to 7th Avenue extending from the Kenosha city limits south to 91st Street. Any additional utility installations required in the way of public sanitary sewer or water supply lines should be accommodated within the right-of-way of 7th Avenue along this location. Indeed, there is already a sanitary sewer in 7th Avenue extending south from the Kenosha city limits to 85th Street.

The other utility corridor of significance is that attendant to the Wisconsin Electric Power Company water intake and discharge lines serving the Pleasant Prairie electric power generation plant. At the present time, WEPCo has laid those lines along an alignment approximately 75 feet north of 85th Street and approximately 250 feet east of 7th Avenue extending south to about 88th Street extended. At that point, the water

intake and discharge lines extend west outside the study area. It is proposed that these and any future water intake and discharge lines be accommodated in a 150-foot utility corridor within the open space preservation area, and that this corridor be included within the conservancy zoning district under the Kenosha County zoning ordinance. As such, it would be regulated as a conditional use, and any necessary construction and maintenance activities in this corridor, including restrictions on herbicide applications, can be regulated through the normal Kenosha County zoning process.

5. Floodlands Adjacent to Drainage Course North of 115th Street

The Wisconsin Department of Natural Resources testified that it could not approve a plan that called for undertaking drainage improvements to reduce the extent of the natural floodplain along a minor drainage course located north of 115th Street. Accordingly, the plan should be revised to encompass in the open space preservation area all lots lying partially or wholly within the floodplain attendant to that drainage course.

6. Elimination of Sanitary Sewers/Reliance on Onsite Sewage Disposal Systems and Holding Tanks

There is considerable testimony in the record, both from residents in the study area and from those concerned about protecting the natural resources found in the study area, concerning that portion of the preliminary plan which calls for the installation of sanitary sewerage systems in the study area, and particularly in that portion of the study area lying east of the Chicago & North Western Transportation Company railway right-of-way. Additional objection to this proposed extension was based on the perceived excessive costs entailed. Suggestions were made that any existing and proposed urban development in this area continue to rely on onsite sewage disposal systems and, if such systems are not possible, on holding tanks. In addition, the Wisconsin Department of Natural Resources specifically commented that it would not approve any sanitary sewer extensions through the open space preservation area, since they might result in building sewer connections. The Department specifically objected to that portion of the plan which recognized the potential for sewerage some of the homes that lie within the open space preservation area. The Department also suggested that phasing the installation of sanitary sewer service into the study area be considered.

In response to these comments and in recognition of the comments relating to the "special value" wetlands and the Trident Marina expansion area, it is proposed that the final plan not recommend the installation of a centralized sanitary sewerage system to serve any urban development in the study area east of the railway tracks and south of 85th Street except the Carol Beach-Estates Unit W Subdivision and those portions of the Carol Beach Estates-Unit Nos. 5 and 5A Subdivisions not included in the final open space preservation area. Generally, this includes all urban development in the study area east of the railway tracks north of 91st Place and those homes in the study area lying along the Lake Michigan shoreline on 1st Avenue south of 91st Place to a point just north of Barnes Creek. Any urban development areas south of Barnes Creek and east of the railway tracks that remain in the plan are to be designated for

development without sanitary sewerage systems. The plan would, however, continue to recommend the installation of sanitary sewerage systems to all subdivisions and lands identified for development in that portion of the study area west of the railway tracks. Accordingly, it would not be necessary to address the phasing of the installation of sanitary sewers in the plan. It should be recognized that, as a practical matter, the Town of Pleasant Prairie would probably extend sanitary sewer service first to the existing development in the Carol Beach Estates-Unit No. 1 Subdivision because of the severe problems that currently exist in that subdivision, and last to the Unit W and Unit No. 5 Subdivisions. The timing of the installation of this sanitary sewer service is a local responsibility and should be determined by the Town Board.

7. Unique Homesite Situations

At least two individuals submitted testimony at the public hearing that identified unique situations attendant to existing homes that lie within, or adjacent to, a proposed open space preservation area. These unique situations include mortgage arrangements affecting, and the placement of wells or septic tanks systems on, adjacent lots. Since the Commission is not aware of all such unique situations, it is not possible within the context of the systems level land use plan to identify and graphically show on the plan map the precise nature of such situations. The Commission recognizes, however, the legitimacy of such situations, and recommends that any such situations be taken into account in the implementation of the acquisition program proposed to be carried out by the Wisconsin Department of Natural Resources. In this respect, the final plan map should show all homes within the open space preservation area by symbol, it being the intent of the plan that the home, the lot that the home is on, and any adjacent lots which constitute the homesite and which may contain a well or a septic tank system, or simply be part of the yard of the home, be excluded from the acquisition project. Furthermore, any homeowner whose mortgage situation encompasses a lot other than the lot on which the house is located should make that fact known to the Wisconsin Department of Natural Resources at such time as an acquisition program is begun, and the Department should exclude from acquisition any such lots.

8. Compensation/Condemnation/Relocation

The public hearing record contains a number of comments which express concern over the compensation due those landowners whose lands might be within an open space preservation area. Some individuals suggested using condemnation authority to ensure just compensation. Other individuals suggested that, if any homes are to be purchased, appropriate relocation benefits, including mortgage interest subsidies, be provided. In response to these comments, it should be noted that the preliminary plan did not recommend the acquisition of any existing homes within the open space preservation area. Consequently, such homes could continue to be maintained, enlarged, reconstructed, and sold and bought on the private real estate market. The plan would not prohibit the State from acquiring such homes should the Wisconsin Department of Natural Resources and the homeowner agree on such an acquisition on a willing-seller/willing-buyer basis.



The preliminary plan specifically recommended that any land to be acquired for resource preservation and protection purposes be acquired on a willing-seller/willing-buyer basis, with the buyer paying fair market price for the lands. The plan recommended that appraisals that would be attendant to any acquisition process involve comparable properties in the general area not proposed for public acquisition in order to help ensure fair compensation. The condemnation process would not improve on this approach.

## Response to Comments Pertaining to Preliminary Plan Implementation Recommendations

The following directly responds to those comments made pertaining to implementation actions set forth in the preliminary plan:

### 1. Plan Costs

Several individuals commenting at the hearing suggested that the costs of the plan include the cost of acquiring not only the platted lands within the open space preservation area, but also the unplatted lands. Furthermore, the plan should include costs attendant to the maintenance of the open space preservation area over time. In response to these comments, separate costs for acquisition of the open space preservation area for both platted and unplatted areas, and a cost attendant to the maintenance of the open space preservation area, will be included in the final plan.

### 2. Reversion of Lands to Residential Zoning

One individual commenting at the hearing suggested that if the Wisconsin Department of Natural Resources is unable to obtain sufficient funds to purchase all the lands included in the open space preservation area within the five-year implementation period, then procedures should be taken to rezone at that time all lands, including shoreland-wetlands, back into a residential zoning category. Such a contingency recommendation would not be acceptable to the Wisconsin Department of Natural Resources. While the Department has indicated a willingness to support a program of purchasing significant natural resource lands in the Chiwaukee Prairie-Carol Beach area, the Department has consistently maintained the position--as reiterated in its comments filed for the public hearing--that it has no legal obligation to purchase wetlands in a shoreland zone. Accordingly, while one of the major objectives of the Chiwaukee Prairie-Carol Beach planning effort is to achieve an intergovernmental consensus on a program that would purchase valuable wetlands in the Carol Beach area, the shoreland-wetland zoning required under Chapter NR 115 of the Wisconsin Administrative Code will move forward with or without a purchase program. Consequently, the type of contingency rezoning recommendation sought by this individual would be inappropriate.

### 3. Conservancy Zoning of Uplands

Several individuals commenting on the plan noted that there is no federal or state mandate requiring Kenosha County or the Town of Pleasant Prairie to place uplands in a conservancy zone. These individuals suggested that the plan implementation recommendations accordingly should not include uplands in conservancy zoning. While there is no mandate at

a federal or state level requiring Kenosha County or the Town of Pleasant Prairie to place environmentally significant uplands in a conservancy zone, there is clearly permissive authority in the State Statutes for the County and the Town to do so under the comprehensive zoning enabling act. In this particular case, the complex, interrelated nature of the wetlands and uplands dictates from a technical viewpoint that all the lands included within the open space preservation area in the plan be recommended for conservancy zoning, comprising, as they do, an integrated corridor. The timing of the necessary rezoning, however, could be deferred--for all lands except those affected by the state-mandated shoreland-wetland zoning requirements--while a public land acquisition program is carried out.

4. Placement of All Undeveloped Lands in the Study Area In a Conservancy District

The Chiwaukee Prairie Rescue Coalition recommended that all undeveloped lands within the entire study area be placed into the proposed C-3 Conservancy Zoning District. Presumably, this recommendation was made on the assumption that the entire area would be designated for open space preservation and that ultimately the Wisconsin Department of Natural Resources would acquire all undeveloped lands within the study area. This recommendation cannot be supported technically because there are large areas within the study area which are neither wetlands nor significant uplands, and which do not need to be preserved and protected from development. This is particularly true with respect to lands lying west of the Chicago & North Western Transportation Company railway right-of-way.

5. 20-Year Acquisition Period

The Wisconsin Department of Natural Resources testified that a five-year implementation period for acquisition of the open space lands is unrealistic, given the willing-seller/willing-buyer concept in the program. It recommended instead that a 20-year program be envisioned since it is likely that it will take that long for all of the land to be acquired. Given, however, the concerns of the local property owners, the plan should recommend that the State Legislature provide the Department with sufficient monies to acquire all of the land at fair market value during a five-to-10-year period so that the Department will be in a position to acquire all of the lands should the landowners all be willing to sell at the fair market value prices.

## POST-PUBLIC HEARING RECOMMENDED LAND USE MANAGEMENT PLAN

Given the citizen and public agency reaction to the preliminary land use management plan, and the responses to the salient comments noted above, a final, post-public hearing recommended land use management plan was prepared and submitted to the Technical and Citizen Advisory Committee for consideration. This final recommended plan is shown on Map 35. In general, this plan represents a refinement of the preliminary plan, changing that plan to reduce the amount of urban development proposed in the area, in particular, sewer urban development, and to increase the area to be allocated to natural resource base preservation and protection. The referenced plan shall fully meet the requirements of the Wisconsin Department of Natural Resources as those requirements are

defined in Chapters NR 115 (shoreland-wetland zoning) and NR 121 (sanitary sewer service areas) of the Wisconsin Administrative Code. The key recommendations of the final recommended land use management plan for the Chiwaukee Prairie-Carol Beach area may be summarized as follows:

1. Extent of Open Space Preservation Area

The recommended area allocated to natural resource base preservation and protection would encompass a total of 950 acres (see Table 47). This is an increase of 147 acres, or 18 percent, over the 803 acres proposed for preservation and protection in the preliminary recommended plan. This increase is the result of the elimination of the previously delineated urban land reservations for the Kenosha sewage treatment plant and the Trident Marina expansion projects; the addition of open lands to ensure that all "special value"--that is, environmentally significant--wetlands within the state-defined shoreland area are included in the natural resource base preservation and protection area; the addition to the open space areas of all lands encompassed within the natural floodplains of the study area; and the inclusion in the open space area of additional Lake Michigan shoreline where existing lots have eroded to the point where, as a practical matter, they cannot be used for building development. These additional areas are shown on Map 36. Implementation of the final plan as proposed would ensure that 1.7 miles of shoreline, or about 35 percent of the 4.9 miles of Lake Michigan shoreline in the study area, are in public ownership and use.

2. Acquisition of Open Space Preservation Area

As shown in Table 48, of the 950 acres that constitute the proposed natural resource base preservation and protection area, 217 acres, or almost 23 percent, were, in 1984, already held in public or quasi-public ownership by the Town of Pleasant Prairie, Kenosha County, the University of Wisconsin, or The Nature Conservancy, and are proposed to be retained in such ownership. An additional 481 acres, or almost 51 percent, were privately held in 1984, but are proposed to be acquired in the public interest. Of this total, 347 acres lie north of 116th Street and are proposed to be acquired by the Wisconsin Department of Natural Resources, and 134 acres lie south of 116th Street and are proposed to be acquired by The Nature Conservancy. In the event, however, that The Nature Conservancy is unable to acquire those lands in a timely manner, it is recommended that they also be acquired by the Wisconsin Department of Natural Resources.

Of the remaining 252 acres recommended to be kept in open space, 47 acres consist of existing street rights-of-way proposed to be vacated, with the lands returned to natural open uses; 50 acres represent existing street rights-of-way proposed to be maintained for access to existing homes in the open space preservation area; one acre represents lands proposed to be used for minor street rights-of-way; and the remaining 154 acres, or about 16 percent of the total natural resource base preservation and protection area, constitute privately held lands proposed to be kept in private ownership, but to be zoned conservancy (see Map 37). These lands include lands owned by the Wisconsin Electric Power Company and used for utility purposes; all or portions of existing lots proposed to be maintained in urban use; 15 lots within an unimproved

subdivision which are part of an isolated natural area in the southwestern portion of the study area; two floodplain lots in Carol Beach Estates-Unit No. 1; and certain unplatted lands lying west of the rail way right-of-way. Other than the lots currently used as homesites for the existing homes lying in the open space preservation area, the 15 lots within the unimproved subdivision in the southwestern portion of the study area, and the two floodplain lots in Carol Beach Estates-Unit No. 1, there are no platted subdivision lots fully encompassed within this private ownership area.

3. Homes Within Open Space Preservation Area

As shown on Map 35, there are a total of 72 homes within the proposed natural resource base preservation and protection area.<sup>7</sup> The plan recommends that these homes, together with the attendant homesites, which would include any adjacent lots owned by the homeowner and maintained for yards, gardens, and water supply and onsite sewage disposal purposes, be maintained indefinitely and not rendered nonconforming uses under the Kenosha County zoning ordinance. As such, they could be bought and sold on the private land market, be expanded, and be rebuilt if necessary. The plan would not preclude, however, the acquisition of these homes by the Wisconsin Department of Natural Resources or The Nature Conservancy should the homeowners wish to sell their homes to either the Department or the Conservancy, and should there be sufficient funds available to the Department or to the Conservancy for such acquisition.

4. Cost of Acquiring Land in the Open Space Preservation Area

As shown in Table 49, the plan recommends the acquisition of 989 platted lots totaling 310 acres within the proposed natural resource base preservation and protection area that are not presently used as homesites. The cost of acquiring these lots would approximate \$1.98 million. In addition, there are about 171 acres of unplatted lands recommended for acquisition within the proposed natural resource base preservation and protection area. The cost of acquiring these lands would approximate \$402,000. Thus, in total, it would cost about \$2.38 million to acquire a total of 481 acres of land for natural resource base preservation and protection. The estimated cost of maintaining this area over time, once it is fully acquired, is about \$60,000 annually.<sup>8</sup>

As already noted, there are 72 homes within the open space preservation area. If the Wisconsin Department of Natural Resources and The Nature Conservancy were to acquire all these homes, assuming the owners wished to sell, the additional estimated cost would be \$3.3 million.

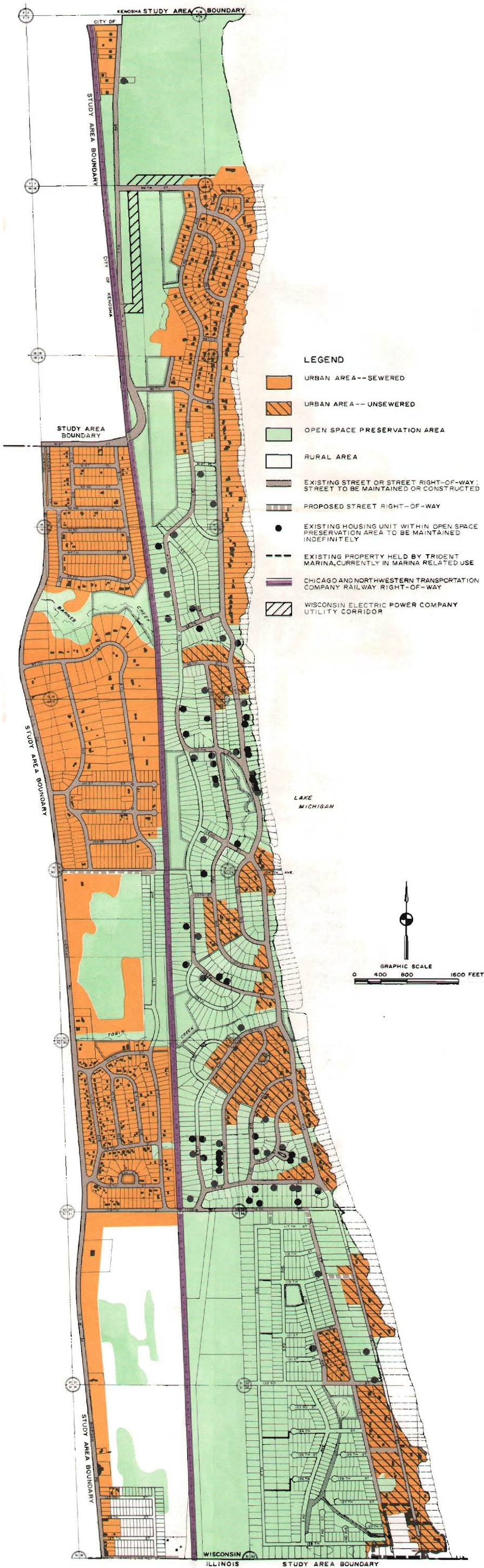
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<sup>7</sup>This total does not include a house owned by The Nature Conservancy in the Chiwaukee Prairie area which is used as a site manager's residence.

<sup>8</sup>Cost estimate includes the cost of habitat management and the cost of an area manager-naturalist, interpretive center, and vehicle cost. The actual cost may vary depending upon the level of services ultimately determined to be necessary by the Department of Natural Resources, The Nature Conservancy, and the University of Wisconsin-Parkside.

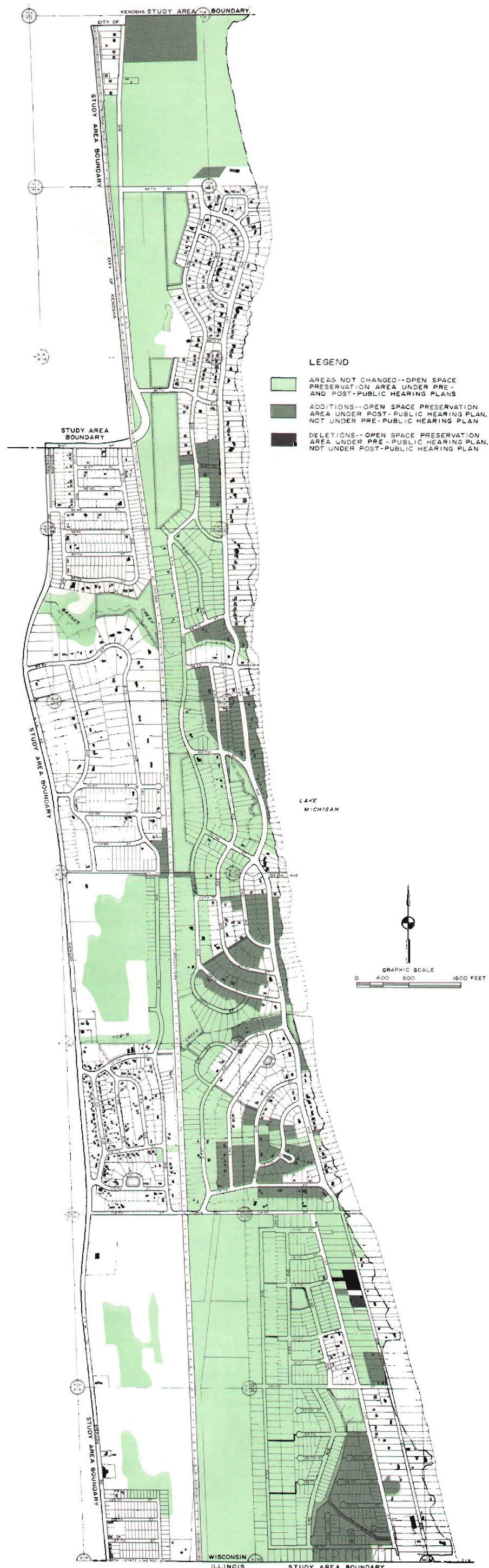


POST-PUBLIC HEARING RECOMMENDED  
LAND USE MANAGEMENT PLAN



Source: SEWRPC.

COMPARISON OF OPEN SPACE PRESERVATION  
AREA--PRE- AND POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLANS



Source: SEWRPC.



Table 47

**PROPOSED GENERALIZED LAND USE IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH AREA  
UNDER THE POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLAN**

Generalized Land Use Category	Acres	Percent of Total
Urban Area <sup>a</sup>		
Proposed to be Sewered.....	558	30.6
Proposed to be Served by Septic Tanks and Holding Tanks.....	155	8.5
Subtotal	713	39.1
Open Space Preservation Area <sup>a</sup>		
Proposed to be Publicly Acquired....	796 <sup>b</sup>	43.6
Proposed to be Privately Owned and Zoned Conservancy.....	154	8.4
Subtotal	950	52.0
Rural Area <sup>a</sup> .....	116	6.4
Railroad Right-of-Way.....	46	2.5
Total	1,825	100.0

<sup>a</sup> Includes attendant existing street rights-of-way.

<sup>b</sup> Of this total, 314 acres, including 97 acres of existing street rights-of-way, is already publicly owned or owned by The Nature Conservancy.

Source: SEWRPC.

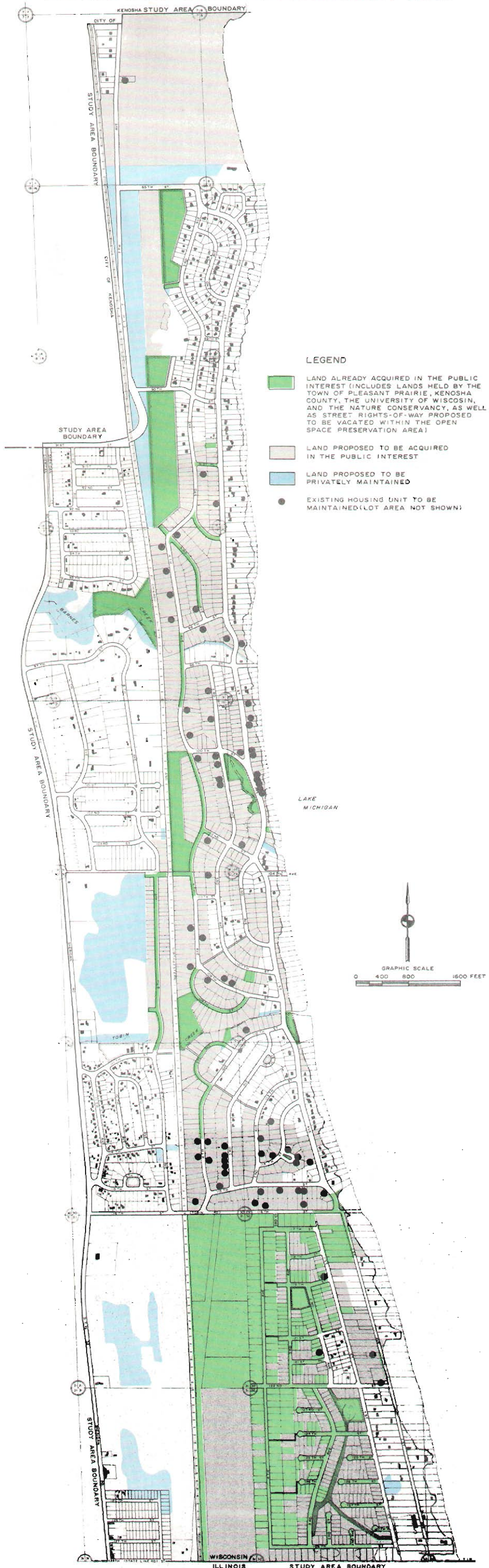
Table 48

**PROPOSED OWNERSHIP IN THE OPEN SPACE  
PRESERVATION AREA: POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLAN**

Proposed Open Space Preservation Area Land Ownership	Acres	Percent of Total
Lands Presently Held in the Public Interest and Proposed to be Retained		
Town of Pleasant Prairie.....	69	7.3
Kenosha County.....	2	0.2
University of Wisconsin.....	91	9.6
The Nature Conservancy.....	55	5.8
Subtotal	217	22.9
Lands Presently Privately Held and Proposed to be Acquired in the Public Interest		
Lands South of 116th Street--Acquisition by The Nature Conservancy.....	134	14.1
Lands North of 116th Street--Acquisition by the Wisconsin Department of Natural Resources.....	347	36.5
Subtotal	481	50.6
Other Lands		
Privately Held Lands to be Kept in Private Ownership and to be Zoned Conservancy.....	154	16.2
Existing Street Rights-of-Way to be Vacated.....	47	4.9
Existing Street Rights- of-Way to be Maintained.....	50	5.3
Proposed Street Rights-of-Way.....	1	0.1
Subtotal	252	26.5
Total	950	100.0

Source: SEWRPC.

PROPOSED LAND OWNERSHIP IN THE OPEN SPACE  
PRESERVATION AREA: POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLAN



Source: SEWRPC.

Table 49

**ESTIMATED COST OF ACQUIRING LAND IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH OPEN SPACE  
PRESERVATION AREA UNDER THE POST-PUBLIC  
HEARING RECOMMENDED LAND USE MANAGEMENT PLAN**

Area	Lands Proposed to be Acquired							Homes Within the Open Space Preservation Area <sup>a</sup>			
	Platted Lots			Unplatted Lands		Total		Estimated Cost			
	Number	Acres	Estimated Cost	Acres	Estimated Cost	Acres	Estimated Cost	Number	Land	Improvements	Total
North of 116th Street--Wisconsin Department of Natural Resources	686	222	\$1,748,200	125	\$357,000	347	\$2,105,200	69	\$801,900	\$2,408,200	\$3,210,100
South of 116th Street--The Nature Conservancy	303	88	231,800	46	45,000	134	276,800	3 <sup>b</sup>	36,600	58,800	95,400
Total	989	310	\$1,980,000	171	\$402,000	481	\$2,382,000	72	\$838,500	\$2,467,000	\$3,305,500

<sup>a</sup> The plan recommends that these homes remain indefinitely. However, the plan would not preclude their purchase over time by the Wisconsin Department of Natural Resources if homeowners wished to sell to the Department and if the Department was provided with sufficient funds for such purposes.

<sup>b</sup> Excludes house owned by The Nature Conservancy within the Chiwaukee Prairie area.

Source: SEWRPC.

5. Preservation of Resources Within the Study Area

As shown in Table 50, under the final recommended land use management plan, substantial areas of important natural resources in the Chiwaukee Prairie-Carol Beach area would be preserved. A total of about 654 acres of wetlands within the study area were found to have one or more of the "special value" criteria set forth in Chapter NR 115 of the Wisconsin Administrative Code. The plan would preserve about 640 of these acres, or nearly 98 percent, including areas lying outside the statutory shoreland area. Within the shoreland area, all of the 408 acres of "special value" wetlands would be preserved except four acres. These four acres occur in scattered locations and fall below the five-acre minimum size specified for preservation in the Code. If implemented, the plan would preserve 684 of the 747 acres of all wetlands in the study area, or nearly 92 percent.

In addition to preserving wetlands, the plan would preserve substantial amounts of the significant uplands that provide critical plant and wildlife habitat. Of the 159 acres of significant uplands identified in the study area, the plan would preserve 134 acres, or about 84 percent. Finally, of the 828 acres of prairies identified within the study area, which include both uplands and wetlands, the plan would preserve about 95 percent of the high-quality prairies and about 81 percent of all prairies.

6. Sewered Urban Area

The final recommended plan proposes that sanitary sewer service be provided to all existing and proposed urban development in that portion of the study area lying west of the railway tracks, and to existing and proposed urban development in that portion of the study area lying east of the railway tracks and north of Barnes Creek (see Map 35). The latter represents the intensively developed Carol Beach Estates-Unit W and Unit Nos. 5 and 5A Subdivisions. In addition, these areas would ultimately receive public water supply service. In connection with these utility installation projects, the plan envisions that the Town will undertake some local street improvements and stormwater drainage improvements. The total estimated costs of these public improvements are set forth in Table 51. Over a 20-year period, it is estimated that these costs would average nearly \$400,000 annually. The average cost per household for all of the proposed improvements would be about \$9,100. It is not viewed as necessary or desirable to institute a phased approach to the installation of sanitary sewers within the planned sewered urban area. Rather, the timing of the extension of sanitary sewers into these areas should properly be decided by the Town Board and the landowners concerned.

7. Unsewered Urban Area

As shown on Map 35, in that portion of the study area lying east of the railway tracks and south of Barnes Creek, there are a number of clusters of developed and related vacant platted lots that are proposed for urban development without public utility services. These lands, which total about 155 acres, are proposed to be retained in private ownership and to be developed for residential uses with onsite sewage disposal by septic tank or holding tank systems.

Table 50

**PRESERVATION OF NATURAL RESOURCES IN  
THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA UNDER  
THE POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLAN**

Key Natural Resource Feature	Total in Study Area (acres)	Portion Preserved	
		Acres	Percent of Total
Wetlands			
Wetlands Particularly Important for Maintaining Water Quality, Low Streamflows, and Fish Populations.....	159	157	98.7
Wetlands Providing Critical Plant Habitat.....	505	493	97.6
Wetlands Providing Quality Wildlife Habitat.....	566	564	99.6
Wetlands Having Special Natural Area Value.....	394	383	97.2
Wetland Fen Area .....	60	60	100.0
Wetlands Having at Least One of the Above-Listed Values.....	654	640	97.9
Shoreland-Wetlands Having at Least One of the Above-Listed Values.....	408	404	99.0
All Shoreland-Wetlands.....	453	421	92.9
All Wetlands.....	747	684	91.6
Uplands			
Uplands Providing Critical Plant Habitat.....	90	81	90.0
Uplands Providing Quality Wildlife Habitat.....	131	118	90.1
Uplands Having Special Natural Area Value.....	78	74	94.9
Upland Woodlands of at Least Five Acres in Area.....	15	9	60.0
Uplands Having at Least One of the Above-Listed Values.....	159	134	84.3
Prairies			
High-Quality Prairies.....	358	341	95.3
All Prairies.....	828	674	81.4

Source: SEWRPC.

Table 51

**ESTIMATED COST OF PUBLIC  
IMPROVEMENTS IN THE CHIWAUKEE PRAIRIE-CAROL  
BEACH AREA UNDER THE POST-PUBLIC HEARING  
RECOMMENDED LAND USE MANAGEMENT PLAN**

Public Improvements	Estimated Total Cost	Average Cost per Household	Average Annual Cost Over 20 Years
Sanitary Sewer Collection System.....	\$3,935,000	\$4,130 <sup>a</sup>	\$196,800
Water Supply Distribution System.....	2,799,000	3,660 <sup>b</sup>	140,000
Local Street Improvements.....	286,000	300 <sup>a</sup>	14,300
Stormwater Drainage Improvements.....	958,000	1,010 <sup>b</sup>	47,900
Total	\$7,978,000	\$9,100	\$399,000

<sup>a</sup> Based on a total of 953 housing units in the sewered urban area, an increment of 601 housing units to the 1984 stock of 352 housing units.

<sup>b</sup> Based on a total of 764 housing units. This number was determined by subtracting 189 residential lots which currently have water supply available from the estimated total of 953 housing units.

Source: SEWRPC.



The Trident Marina site lies within the southernmost of these urban clusters of land. The final plan makes no specific recommendation for the Trident Marina site. If, however, the owners of the Trident Marina desire to expand the marina, that expansion would have to occur on lands to the north and east of the present basin area. Furthermore, any sewage disposal needs for the development would have to be accommodated through an onsite sewage disposal system, a holding tank system, or a pumping station and force main connection to the nearest available gravity flow sewer. Access to the marina site would continue via 116th Street and 1st Court.

While the plan recognizes that the unsewered urban clusters of development within the open space preservation area could represent desirable locations for homes, it is also recognized that there may be some owners of vacant lots within these clusters who would prefer to sell their lots to either the Wisconsin Department of Natural Resources or The Nature Conservancy. Accordingly, the plan would not preclude the Department or the Conservancy from acquiring lands within these unsewered clusters of urban development. In this respect, there are a total of 163 vacant platted lots within these clusters. The estimated cost of acquiring all of these additional lots is \$514,000.

8. Local Streets

New streets proposed to be constructed in the final recommended plan would be limited to the following:

- a. The widening from 40 to 60 feet of the existing right-of-way of 104th Street from Sheridan Road to 8th Avenue.
- b. The extension of 119th Street from 1st Court to 1st Avenue in order to permit the elimination of a portion of 1st Avenue that is at high risk to loss from lakeshore erosion.
- c. The extension of 1st Court from 116th Street to 117th Street in order to permit the vacation of 3rd Court south of 116th Street and of 117th Street from 3rd Court to 1st Court.

The final recommended plan envisions that street rights-of-way totaling 7.7 linear miles will be vacated, in comparison to 7.5 linear miles under the preliminary recommended plan. The street right-of-way segments proposed to be vacated under the final recommended plan include all those recommended to be vacated under the preliminary plan, as shown on Map 32 in Chapter V, except that an approximately 500-foot-long segment of 1st Avenue north of 122nd Street--rather than an approximately 700-foot-long segment--would be vacated. In addition, the following segments, not proposed to be vacated under the preliminary plan, would be vacated under the final recommended plan: 91st Place between 1st Avenue and 3rd Avenue; 104th Street between 8th Avenue and the C&NW Railway right-of-way; 104th Street between the C&NW Railway right-of-way and 4th Avenue; and 4th Avenue between 104th Street and 105th Street.

9. Utility Corridors

The only special utility corridor recommended in the final land use management plan is that attendant to the existing water intake and discharge lines serving the Wisconsin Electric Power Company's Pleasant Prairie power plant. As shown on Map 35, this corridor extends from the pumping station on the Lake Michigan shoreline along 85th Street and 7th Avenue. The corridor would be 150 feet wide. Any installation of additional utility lines within that corridor would be regulated under the Kenosha County zoning ordinance.

10. Population and Housing

Under the final recommended plan, the housing stock in the Chiwaukee Prairie-Carol Beach area could increase from 512 housing units in 1980 to about 1,269 units upon full development. This estimate assumes the development of the remaining platted lots within the entire urban area for individual, single-family dwelling units. In fact, some lots may be combined, which would reduce the ultimate total number of housing units that could be accommodated in the area. Assuming a housing vacancy rate of about 3 percent and an average household size of 3.0 persons per household, the population in the study area could increase from about 1,400 in 1980 to about 3,700 upon full development.

11. Plan Implementation Period

It is recognized that it will be a number of years before all the land within the open space preservation area proposed to be acquired can, in fact, be acquired by the Wisconsin Department of Natural Resources and/or The Nature Conservancy. While there may be many landowners willing to sell in the near future, other landowners may prefer to keep their lands in private ownership, even though federal, state, and/or local regulations might prohibit them from building on the lands. The Department of Natural Resources has estimated that an acquisition program of this type would take about two decades to complete.

What is important in terms of preserving the natural resource base and in terms of treating the landowners concerned fairly and equitably is not the particular length of time over which the acquisition program would be conducted, but the ability of the Wisconsin Department of Natural Resources and The Nature Conservancy to respond quickly to offers to sell by individual landowners within the open space preservation area. Accordingly, it is recommended that the Department of Natural Resources and The Nature Conservancy work with the State Legislature and the Governor to establish a Chiwaukee Prairie-Carol Beach open space land acquisition program, with that program scheduled to begin on July 1, 1985. Initially, it is recommended that that program contain sufficient funds in the two-year 1985-1987 biennium so that the Department would be able to acquire all of the vacant lands within the proposed open space preservation area. This would ensure that all landowners within that area who wish to sell within the next two years could do so. Furthermore, during the next two years, those homeowners within the open space preservation area and those landowners within the clusters of unsewered urban development in the study area could make their preferences regarding selling their homes or lots known to the Department and The Nature

Conservancy. Based upon the reaction of these individuals during the next two years, the Department and The Nature Conservancy could request additional funds from the State Legislature and the Governor in the 1987-1989 biennium to expand and continue the project. Any funds provided by the Legislature and the Governor should be nonlapsing in nature so that the monies set aside for the project would be available to complete the acquisition program over a period of two decades.

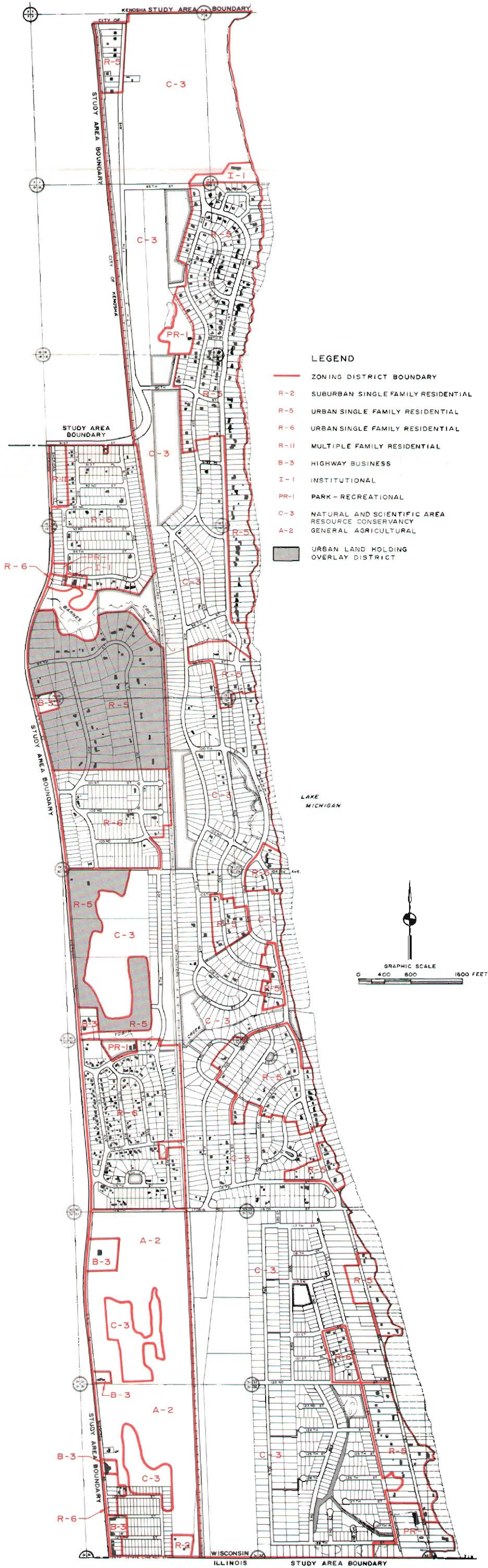
12. Zoning Map and Procedures

The proposed revised zoning map attendant to the final recommended land use management plan is shown on Map 38. Like the initially proposed zoning map set forth in Chapter VI of this report, the revised zoning map would seek to place all land uses within the proposed study area into appropriate zoning districts. Importantly, all of the designated natural resource base preservation and protection area is proposed to be placed in the recommended new C-3 Natural and Scientific Area Resource Conservancy District. This would be a district created explicitly for the Chiwaukee Prairie-Carol Beach area, but which could be applicable in other portions of Kenosha County. While it is recommended that ultimately all lands within the open space preservation area be included within the C-3 District, it is recognized that there is concern by the landowners in the area that the application of the C-3 District prior to purchase of the lands could have a chilling effect on the appraisal process that will be required to establish market land values prior to acquisition. Accordingly, it is recommended that Kenosha County and the Town of Pleasant Prairie proceed on an incremental basis to apply the C-3 District to the open space preservation area in the following manner:

- a. Initially, it is recommended that Kenosha County proceed with the legally mandated rezoning of wetlands within the shoreland area. This would involve completion of the procedural requirements set forth in Chapter NR 115 of the Wisconsin Administrative Code, including the holding of a public hearing--either by Kenosha County or by the Wisconsin Department of Natural Resources--on the state wetland inventory maps that are to serve as the basis for the delineation of wetlands within the shoreland area. After that hearing, the Department of Natural Resources would be responsible for reviewing all comments submitted and for making findings and determinations as to the accuracy and completeness of the wetland maps. Once the wetland maps have been declared final by the Department, then Kenosha County would have six months to complete the required shoreland-wetland zoning, or, in the alternative, default at the end of the six months and let the Wisconsin Department of Natural Resources impose the shoreland-wetland zoning.

As a practical matter, these procedural requirements will delay the effective imposition of shoreland-wetland zoning in the Carol Beach area until late 1985 at the earliest. By then, given local support and necessary leadership in the Legislative and Executive branches of state government, the land acquisition program in the Carol Beach program could be well underway.

PROPOSED ZONING IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH AREA UNDER THE  
POST-PUBLIC HEARING RECOMMENDED  
LAND USE MANAGEMENT PLAN



- b. The remaining lands within the proposed open space preservation area consist either of wetlands beyond the shoreland zone or of significant uplands. It is recommended that such lands remain in their current zoning category until acquisition takes place, and that Kenosha County and the Town of Pleasant Prairie annually review the status of land acquisition in the area and rezone all lands that have been acquired in the public interest into the C-3 District. It is recognized that it could be possible for an individual landowner to subvert the intent of the plan by building a home on an upland lot where federal, state, or local regulations would not prohibit the issuance of a building permit. It is believed, however, that such instances would be few, if any. Nevertheless, it is further recommended that once it is determined that 50 percent of the land within the natural resource base preservation and protection area has been acquired in the public interest, all remaining lands in the area be rezoned into the C-3 District.

13. Section 404 Permit

It is recommended that, upon adoption of the plan by both parties concerned, the Town of Pleasant Prairie submit to the U. S. Army Corps of Engineers a collective application seeking permission to fill and develop for residential uses all wetlands located within the proposed urban areas shown on the final plan. It is further recommended that the Wisconsin Department of Natural Resources, the U. S. Fish and Wildlife Service, and the U. S. Environmental Protection Agency support that application.

Advisory Committee Action

The Technical and Citizen Advisory Committee met on January 15, 1985, to consider the testimony of the October 23, 1984, public hearing on the land use management plan, and to review a revised land use management plan prepared by the Commission staff and intended to respond to the major concerns expressed at that hearing. After carefully reviewing the revised plan in light of the public hearing testimony, the Advisory Committee approved the revised plan as presented above with three modifications. These modifications pertain to: 1) the timing of the recommended state land acquisition program, the level of funding which should be made available to that program during the 1985-1987 biennium, and the use of the revised plan by the Wisconsin Department of Natural Resources as a master plan for state acquisition; 2) the zoning of proposed upland and wetland conservancy areas located beyond the state-defined shoreland zone; and 3) priorities for the use of state monies which are made available for open space acquisition within the area. The specific modifications are described below.

As presented to the Advisory Committee, the post-public hearing plan called for the recommended Department of Natural Resources land acquisition program to begin on July 1, 1985, and further recommended the provision of sufficient state funds in the two-year 1985-1987 biennium to enable the Department to acquire all of the vacant lands within the proposed open space preservation area. The Committee determined that the plan should explicitly recommend that the state land acquisition program begin as soon as possible in 1985, following provision of necessary state funding. The Committee further determined



that the plan should explicitly recommend that the acquisition program contain sufficient funds in the two-year 1985-1987 biennium to enable the Department to make substantial progress toward acquisition of all of the vacant lands within the proposed state open space preservation area. The Committee also recommended that the Department adopt the revised plan as a master plan for state acquisition, thereby rendering unnecessary a time-consuming effort by the Department itself to prepare a master plan.

As presented to the Advisory Committee, the post-public hearing plan recommended that all lands within the open space preservation area be placed in the recommended new C-3 Conservancy Zoning District when it had been determined that 50 percent of the land within the open space preservation area had been acquired in the public interest. The Committee determined that this recommendation should be deleted from the plan. Thus, under the final plan, upland and wetland conservancy areas located beyond the state-defined shoreland areas which are recommended for public acquisition would remain in the current zoning category until public interest acquisition takes place.

In its deliberation on the record of the public hearing and the post-public hearing plan, the Advisory Committee determined that the plan should recommend priorities for the use of state funds made available for land acquisition within the area. The Committee determined that the plan should recommend that state funds be used first to ensure that owners of wetlands which are regulated at the town, county, state, or federal levels are given an opportunity to sell their lands to the State. Thus, the purchase of unregulated lands within the open space preservation area would be assigned a lower priority under the state land acquisition program.

In addition to the foregoing changes to the post-public hearing plan, the Committee determined that recent changes in the U. S. Army Corps of Engineers' regulations affecting wetlands in the study area should be documented in the study report. Chapter III of this report indicated that individual Corps of Engineers' permits are required for the filling of most wetlands located east of the Chicago & North Western Railway right-of-way in the study area, while most wetlands located west of that right-of-way are governed by a nationwide permit which provides, in effect, a blanket authorization for the filling of wetlands. Changes to Corps of Engineers' regulations implemented in October 1984 may require individual permits for certain wetland areas previously classified as being governed by the nationwide permit. The revised regulations specify that projects which would fill or adversely modify 10 or more acres of an isolated or headwaters wetland are excluded from the nationwide permit. Moreover, any project which would fill or adversely modify one to 10 acres of an isolated or headwaters wetland would receive an interagency review to determine whether the project should be allowed to proceed under a nationwide permit or be subject to individual permit requirements. It should be noted that the Corps of Engineers has supported the concept of a collective permit application for the Chiwaukee Prairie-Carol Beach area--that is, a permit seeking permission to fill and develop for residential use all wetlands located within proposed urban areas--in order to facilitate the conduct of the regulatory process in accordance with the adopted plan recommendations.

## CONCLUDING REMARKS

The primary purpose of the Chiwaukee Prairie-Carol Beach planning program was the development of a plan which would identify those open space lands which should be protected and preserved in the public interest and those areas within which urban growth should be accommodated. The planning process attempted to achieve a sound balance between open space preservation objectives and urban development objectives attendant to the area. The resulting plan attempts to accommodate significant urban development within the area, while preserving its most important natural features. The plan is intended to guide local, state, and federal agencies and units of government in the exercise of their respective land use regulatory responsibilities; to guide the concerned local units of government in the provision of basic urban services; to guide public agencies and private interests in the acquisition of environmentally significant open space land; and to provide a framework within which private interests can formulate plans for additional development within the area.

Adoption and implementation of the plan would ensure the preservation of existing plant and animal communities, as well as the unique heritage of the Chiwaukee Prairie-Carol Beach area. At the same time, implementation of the plan would enhance the potential for urban development in the area and foster the establishment of neighborhoods which offer a unique opportunity for living in proximity to a natural prairie environment.

## **APPENDICES**

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## Appendix A

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA IN TERMS OF THE SHORELAND-WETLAND REZONING CRITERIA OF CHAPTER NR 115 OF THE WISCONSIN ADMINISTRATIVE CODE

Under the provisions of Chapter NR 115 of the Wisconsin Administrative Code, all counties in the State must place wetlands five acres or more in size and located within the statutory shoreline zoning jurisdiction area in a shoreland-wetland zoning district to ensure their preservation. Once such zoning is in effect, the wetland areas may not be rezoned if such rezoning would result in a significant adverse impact upon any of the following, as specified in Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code:

- a. Stormwater and floodwater storage capacity;
- b. Maintenance of dry season streamflow, or the discharge of groundwater to a wetland, the recharge of groundwater from a wetland to another area, or the flow of groundwater through a wetland;
- c. Filtering or storage of sediments, nutrients, heavy metals, or organic compounds that would otherwise drain into navigable waters;
- d. Shoreline protection against soil erosion;
- e. Fish spawning, breeding, nursery, or feeding grounds;
- f. Wildlife habitat; and
- g. Areas of special recreational, scenic, or scientific interest, including scarce wetland types.

Under the Chiwaukee Prairie-Carol Beach planning program, wetlands within the study area were accordingly analyzed in terms of the impacts their filling and development may be expected to have on these seven considerations. This appendix summarizes the methodology used in, and the findings of, those analyses.



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## Appendix A-1

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION A-- STORMWATER AND FLOODWATER STORAGE CAPACITY

#### INTRODUCTION

Wetlands can help regulate high rates of runoff from storm events and spring snowmelt by temporarily storing the excess runoff and slowly releasing the stored runoff to stream channels or groundwater reservoirs, or to the atmosphere through evapotranspiration. The U. S. Geological Survey reported that within Wisconsin, flood flows are 80 percent lower in drainage basins with 40 percent of their area covered by wetlands than in drainage basins with no wetland areas.<sup>1</sup> An analysis of four watersheds indicated that the wetlands reduced peak flows by as much as 40 to 50 percent for relatively short duration storms.<sup>2</sup>

Studies have indicated that the drainage or filling of wetlands can substantially increase flood flows. Larson<sup>3</sup> used a mathematical hydraulic simulation model to evaluate annual runoff amounts, storm runoff amounts, and peak discharges for two watersheds with substantial wetland areas. The watersheds were evaluated under existing conditions and under alternative conditions, which included either partial or complete drainage of the wetlands. The study results indicated that:

1. The drainage of wetlands within the watersheds significantly increased annual runoff volume, storm runoff volumes, and peak discharges.
2. The enlarging or straightening of stream channels to improve drainage significantly increased peak discharges.
3. The subsurface tile drainage of wetlands significantly increased annual runoff, as well as the duration of higher flows.
4. Wetland drainage had a lesser effect on peak discharges from short duration, high-intensity storms than from long duration, low-intensity storms and snowmelt.

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<sup>1</sup>R. P. Novitzki, "Hydrologic Characteristics of Wisconsin's Wetlands and Their Influence on Floods, Streamflow, and Sediment," Selected Proceedings of the Midwest Conference on Wetland Values and Management, June 17-19, 1981, ed. B. Richardson, 1981, p. 111.

<sup>2</sup>U. S. Army Corps of Engineers, The Effects of Wetlands on Flood Intensities, Technical Report, September 1981.

<sup>3</sup>C. L. Larson, "Effects of Wetland Drainage on Surface Runoff," in Richardson, 1981, pp. 117-120.

## ANALYSIS

Wetlands encompass about 747 acres, or 41 percent of the Chiwaukee Prairie-Carol Beach area (see Map 27 in Chapter V of this report). It is estimated that during a 100-year recurrence interval storm event, 570 acre-feet of runoff would be directed to the existing wetland areas. At least a portion of this runoff would be temporarily stored by the existing wetlands. A reduction in the wetland area would result in a reduction in the stormwater storage capacity of the study area.

The significance of a reduction in stormwater and floodwater storage capacity can best be evaluated in terms of the attendant changes in peak discharges and stages, and in the extent of flood hazard areas. Accordingly, the balance of this analysis addresses the changes in peak flow discharges and stages of, and in the extent of the flood hazard areas along, major streams in the study area that could be expected to result from the filling and development of wetlands, and the related loss of stormwater and floodwater storage capacity.

Flood flows under various recurrence interval storm events were evaluated for identified streams or drainage channels in the Chiwaukee Prairie-Carol Beach study area. The analyses were applied to the seven subbasins shown on Map A-1. Three of those subbasins--A1, B1, and C1--are located upstream of the study area and drain into subbasins A2, B2, and C2, respectively. Subbasins B2 and C2 are located entirely within the study area. Subbasins A2 and D are located primarily within the study area. Existing land uses were assumed for the tributary drainage areas located upstream of the study area. The four subbasins located within the study area would be developed under the future conditions analyzed. To evaluate the most severe impacts possible, hydrologic analyses were conducted, assuming existing channel conditions and assuming that all the platted lots in the study area lying outside the 100-year recurrence interval flood hazard areas, both wetland and upland, will be developed. Moreover, it was assumed that unplatted upland areas outside the floodplain in subbasins A2 and B2 will be developed. The latter assumption reflects the expectation that at least a portion of the unplatted upland areas in these subbasins would be developed as sanitary sewer service is extended to adjacent areas which have been platted for residential use. The flood hazard areas were delineated under both existing conditions and future development conditions. The physical characteristics of the subbasins are set forth in Table A-1.

The peak discharges under existing and future development conditions were determined using the U. S. Soil Conservation Service TR-55 method, which analyzes the effects of urbanization in a watershed.<sup>4</sup> Runoff curve numbers, which are determined from the hydrologic soil group, land use, and type of vegetative cover in the subbasins, were developed for existing and future conditions. The curve numbers were used to determine the amount of runoff for a specified recurrence interval storm event, as well as the peak discharges. These peak discharges were adjusted to account for the amount of wetland and ponding areas in the subbasin.

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<sup>4</sup>U. S. Soil Conservation Service, Urban Hydrology for Small Watersheds, Technical Release No. 55, January 1975.

## SUBBASINS TRIBUTARY TO STREAMS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA

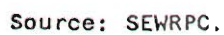


Table A-1

**SELECTED CHARACTERISTICS OF THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA SUBBASINS**

Subbasin	Areal Extent (acres)	Stream Channel Length (miles)	Existing Land Use (percent)			Assumed Future Land Use <sup>a</sup> (percent)		
			Urban	Wetland and Open Water	Other Rural	Urban	Wetland and Open Water	Other Rural
A1	2,218	5.3	30	10	60	30	10	60
A2	370	1.7	30	35	35	90	10	0
B1	1,165	4.0	25	5	70	25	5	70
B2	120	0.7	20	40	40	90	5	5
C1	153	0.5	5	10	85	5	10	85
C2	138	0.7	45	30	25	95	5	0
D	462	0.2	10	55	35	40	25	35

<sup>a</sup> Assumed future land use for the hydraulic and water quality analyses.

Source: SEWRPC.

Peak discharges under various recurrence interval storm events are set forth in Table A-2 for subbasins A2, B2, C2, and D, which discharge to Lake Michigan. The discharges from subbasins A2, B2, and C2 include discharges from the upstream subbasins A1, B1, and C1, respectively. The peak discharges are estimated for existing conditions and for fully developed conditions.

The table indicates that, generally, the proportionate increase in peak discharges expected to result from future development of the study area decreases as the recurrence interval of the storm event increases. Within subbasin A2, which is drained by Barnes Creek, future development could be expected to increase peak discharges by from 9 to 17 percent. Development of subbasin B2 could be expected to result in an 8 to 13 percent increase in peak discharges. The largest increases in peak discharges would be expected in subbasin C2--43 to 65 percent--and subbasin D--31 to 57 percent. It should be noted that the increases in peak discharges would be attributable not only to the development of platted wetland lots but also to the development of platted upland lots and certain unplatted upland areas.

Flood stages under existing and assumed future development conditions were determined using the U. S. Army Corps of Engineers HEC-2 step backwater model. The 100-year recurrence interval flood stages are set forth for a total of 43 channel cross-section locations in Table A-3. The channel cross-section locations are shown on Map A-2. The analyses indicate that within subbasin A2, future development may be expected to increase flood stages by from 0.1 foot to 0.4 foot. Within subbasin B2, future development may be expected to increase flood stages by from 0.1 foot to 0.3 foot. Within subbasin C2, future development may be expected to increase flood stages by from 0.1 to 1.3 feet. Within subbasin D, future development may be expected to increase flood stages by 0.2 foot. The flood stages under future development conditions represent those stages which may be anticipated if all the platted portions of the subbasin concerned, except the flood hazard areas, are fully developed for urban use and if unplatted upland areas in subbasins A2 and B2, except the flood hazard areas, are also developed.



Table A-2

**PEAK STREAMFLOW DISCHARGES FOR THE CHIWAUKEE PRAIRIE-CAROL BEACH  
STUDY AREA UNDER EXISTING AND FUTURE DEVELOPMENT CONDITIONS**

24-Hour Storm Event Recurrence Interval (years)	Peak Streamflow Discharge (cfs)											
	Subbasin A2 <sup>a</sup>			Subbasin B2			Subbasin C2			Subbasin D		
	Existing	Future Development	Percent Increase	Existing	Future Development	Percent Increase	Existing	Future Development	Percent Increase	Existing	Future Development	Percent Increase
2	94	110	17	67	76	13	26	43	65	21	33	57
5	174	200	15	125	140	12	46	74	61	41	61	49
10	248	282	14	179	201	12	65	102	57	62	88	42
50	452	508	12	328	355	8	122	179	47	121	162	34
100	547	595	9	398	435	9	149	213	43	154	202	31

<sup>a</sup> Data pertain to the northern branch of Barnes Creek in subbasin A2.

Source: SEWRPC.

Table A-3

**100-YEAR RECURRENCE INTERVAL FLOOD STAGES FOR THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA UNDER  
EXISTING AND FUTURE DEVELOPMENT CONDITIONS**

Subbasin	Channel Cross-Section Location <sup>a</sup>	Existing 100-Year Flood Stage (feet NGVD)	Future Development 100-Year Flood Stage (feet NGVD)	Change in Flood Stage (feet)
A2	A	585.7	585.8	0.1
	B	588.1	588.4	0.3
	C	588.2	588.6	0.4
	D	588.5	588.8	0.3
	E	589.7	590.0	0.3
	F	590.4	590.7	0.3
	G	591.0	591.2	0.2
	H	594.7	594.8	0.1
	I	599.2	599.3	0.1
	J	584.1	584.2	0.1
	K	584.1	584.2	0.1
	L	584.1	584.2	0.1
	M	584.4	584.5	0.1
	N	584.5	584.6	0.1
B2	A	585.5	585.8	0.3
	B	586.6	586.9	0.3
	C	588.7	588.9	0.2
	D	591.8	591.9	0.1
	E	593.9	594.0	0.1
	F	599.7	600.0	0.3
	G	603.3	603.4	0.1
	H	607.8	607.9	0.1
	I	613.7	613.8	0.1
C2	A	584.6	584.9	0.3
	B	586.5	586.6	0.1
	C	586.6	586.7	0.1
	D	588.0	588.1	0.1
	E	588.0	588.1	0.1
	F	588.2	588.3	0.1
	G	589.4	589.5	0.1
	H	589.4	589.5	0.1
	I	590.8	590.9	0.1
	J	592.5	592.6	0.1
	K	594.5	594.6	0.1
	L	596.7	596.8	0.1
	M	600.7	600.9	0.2
	N	604.0	605.3	1.3
	O	604.2	605.3	1.1
	P	610.8	611.6	0.8
	Q	611.6	612.0	0.4
	R	616.4	616.6	0.2
D	A	584.6	584.8	0.2
	B	585.3	585.5	0.2

NOTE: NGVD = National Geodetic Vertical Datum.

<sup>a</sup>As shown on Map A-2.

Source: SEWRPC.

Map A-2

FLOODPLAINS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA UNDER EXISTING AND FUTURE DEVELOPMENT CONDITIONS

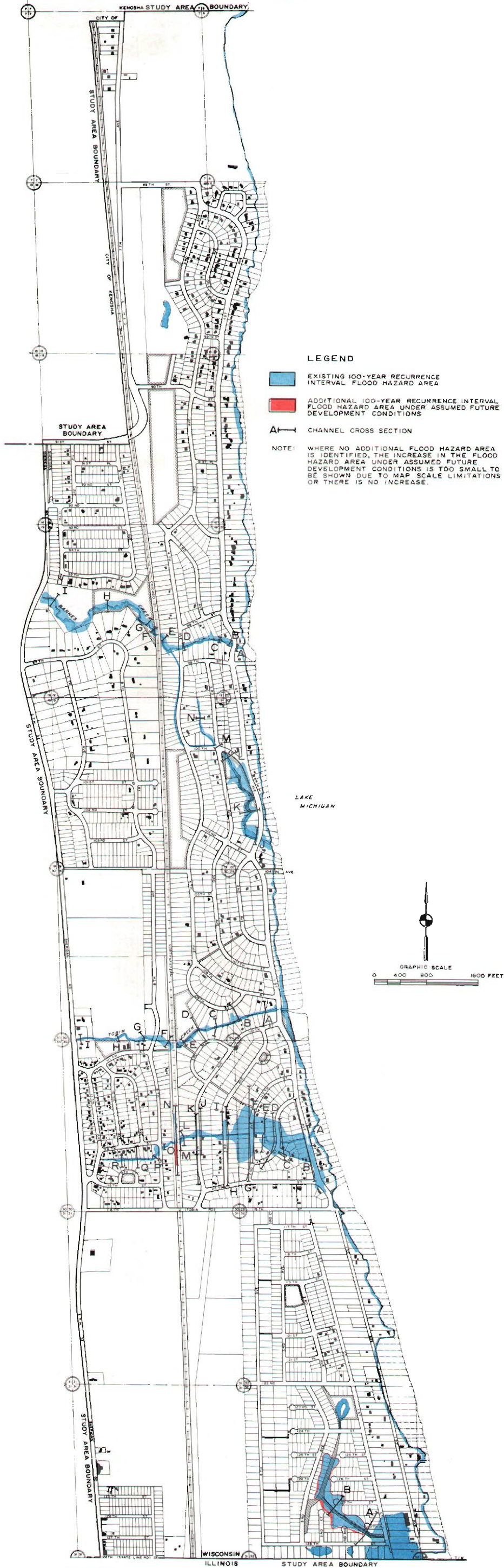


Table A-4

**AREAL EXTENT OF 100-YEAR RECURRENCE  
INTERVAL FLOOD HAZARD AREAS WITHIN  
THE CHIWAUKEE PRAIRIE-CAROL BEACH  
STUDY AREA UNDER EXISTING  
AND FUTURE DEVELOPMENT CONDITIONS**

Subbasin	Existing Flood Hazard Area (acres)	Future Development Flood Hazard Area (acres)	Change in Flood Hazard Area (acres)	Percent Increase
A2	13.6	13.8	0.2	1.5
B2	3.7	4.0	0.3	8.1
C2	19.4	20.5	1.1	5.7
D	6.1	7.6	1.5	24.6
Stream Subtotal	42.8	45.9	3.1	7.2
Lake Michigan	17.7	17.7	0.0	0.0
Total	60.5	63.6	3.1	5.1

Source: SEWRPC.

The 100-year recurrence interval flood hazard areas were delineated on one inch equals 200 feet scale, two-foot contour interval topographic maps prepared to Commission specifications, and are delineated on Map A-2 under both existing and future development conditions. Data on the areal extent of these flood hazard areas are set forth in Table A-4. The existing flood hazard area within the study area encompasses a total of 60.5 acres, of which 42.8 acres, or 71 percent, represent the flood hazard areas along the streams flowing through the area; and 17.7 acres, or 29 percent, represent the flood hazard area along the Lake Michigan shoreline. Under future development conditions, the flood hazard areas along the streams may be expected to increase by about 3.1 acres, or by about 7.2 percent. The smallest relative increase in flood hazard area may be expected to occur in subbasin A2, with a 1.5 percent increase. The largest relative increase may be expected to occur in subbasin D, with a 24.6 percent increase. However, the latter represents an absolute increase of only 1.5 acres. The flood hazard area along Lake Michigan would not be expected to be affected by changes in development within the study area.

## CONCLUSIONS

Criterion a of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the proposed rezoning may have a significant adverse impact upon stormwater and floodwater storage capacity. It is estimated that, during a 24-hour 100-year recurrence interval storm event, 570 acre-feet of water could be directed to the existing wetlands in the study area. At least a portion of this runoff would be temporarily stored by the existing wetlands. A reduction in the wetland area would result in a reduction in the stormwater and floodwater storage capacity of the study area.

The significance of a reduction in stormwater and floodwater storage capacity can probably best be evaluated in terms of the attendant changes in peak discharges and stages, and in the extent of the flood hazard areas. The analyses indicate that full development of the Chiwaukee Prairie-Carol Beach study area lying outside the future flood hazard areas would result in increases--ranging from 8 to 65 percent--in peak discharges, depending upon the subbasin and storm event considered. These increased peak flows may be expected to result in flood stage increases during a 100-year recurrence interval storm event ranging up to 1.3 feet. At just over one-half of the channel cross-sections evaluated, however, the expected increase in flood stages would be only 0.1 foot. These increases in flood stages may be expected to result in an increase of approximately 3.1 acres in the 100-year recurrence interval flood hazard area within the study area, representing a 7.2 percent increase in the flood hazard area along the streams flowing through the study area. However, as can be seen on Map A-2, the increase in the flood hazard areas would probably be very small.

Based on these analyses, it may be concluded that, in some cases, increases in flood stages of greater than 0.1 foot may be associated with the increases in flood flows due to further development of the study area. However, this impact is not considered to be significant because the areal extent of the flood hazard areas is not significantly affected, and because any adverse impacts of such increases could be readily avoided by retaining the flood hazard area as delineated for future development conditions in open uses, and by certain relatively simple and minor drainage improvements.



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## Appendix A-2

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION B-- MAINTENANCE OF DRY SEASON STREAMFLOW, OR THE DISCHARGE OF GROUNDWATER TO A WETLAND, THE RECHARGE OF GROUNDWATER FROM A WETLAND TO ANOTHER AREA, OR THE FLOW OF GROUNDWATER THROUGH A WETLAND

#### INTRODUCTION

Prairie wetlands can have important and diverse impacts on the low flow characteristics of streams draining the wetlands. The interaction of the wetland with the groundwater is of particular concern because it is the least understood component of the hydrologic system of a prairie wetland.<sup>1</sup> The hydrologic regimen of a wetland affects biotic conditions such as species composition and diversity, primary productivity, and organic deposition. The hydrologic regimen may also directly influence or modify a range of secondary abiotic parameters--such as substrate type, nutrient release, dissolved oxygen availability, and sediment trapping efficiency.

Within the Chiwaukee Prairie-Carol Beach study area, the water present in the wetlands and low-lying areas originates primarily from groundwater discharge and from onsite runoff.<sup>2</sup> Drainage from the upland areas west of the study area is confined to stream channels. The study area is underlain by a complex groundwater system, and both recharge areas and discharge areas exist. The flow of groundwater in the subject area is generally from west to east toward Lake Michigan. Particularly within the eastern portion of the study area near the Lake Michigan shoreline, groundwater levels are influenced by Lake Michigan water levels. In addition, the level and flow rates of groundwater at the western border of the study area, as well as local groundwater recharge, affect groundwater levels within the study area. The elevation of the groundwater is generally several feet higher than the elevation of Lake Michigan throughout the study area. Although the surface soils are permeable, the study area is underlain by a less permeable clay layer.

The sand and gravel aquifer lies nearest the surface. Within the sand and gravel aquifer lies a layer of clay, the top of which, based on well boring data, varies from 0 to 60 feet beneath the land surface. Below the sand and gravel aquifer, and separated by a layer of glacial till, lies the Silurian Age Niagara dolomite aquifer. The Niagara aquifer, within which water flows

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<sup>1</sup>T. C. Winter, "The Hydrology of Prairie Lakes and Wetlands," Selected Proceedings of the Midwest Conference on Wetland Values and Management, June 17-19, 1981, ed. B. Richardson, pp. 113-115.

<sup>2</sup>R. Henderson, "Stewardship Master Plan for the Chiwaukee Prairie," The Nature Conservancy, Draft, 1981.

through fractures in the dolomite, is often hydraulically connected to the sand and gravel aquifer. The sand and gravel aquifer and the Niagara aquifer are recharged from precipitation that falls on and seeps downward through overlying glacial drift. Some recharge may also be induced from Lake Michigan. Generally, however, the groundwater in these aquifers flows from west to east, discharging to Lake Michigan.<sup>3</sup>

Lying beneath the Niagara aquifer and separated by a semi-permeable layer of shale is the deep sandstone aquifer, consisting of a series of sandstones, dolomites, and shales of Cambrian and Ordovician Age which act hydraulically as a single unit. About 80 percent of the sandstone aquifer in Kenosha County is recharged from outcrop areas in western Walworth County; the remaining recharge is from downward percolation through the overlying semi-permeable Maquoketa shale and through well leakage.<sup>4</sup> The sandstone aquifer is an independent system having no known effect on the hydrology of the Chiwaukee Prairie study area.

## ANALYSIS

Wetlands in the Chiwaukee Prairie-Carol Beach study area affect the groundwater and low streamflows by serving as groundwater recharge or discharge areas, and by either increasing or decreasing low streamflows as they pass through the prairie area. The hydraulic impacts of the wetlands vary by season as well as by spatial area.

### Groundwater

Wetland areas within the study area act primarily as groundwater discharge areas, but some wetland areas within the western portion of the study area may act as groundwater recharge areas. The seasonal minimum depth-to-groundwater within the study area, based on soil characteristics, is shown on Map A-3. The map thus presents the highest groundwater elevations expected on a seasonal basis; groundwater elevations will also fluctuate in response to weather conditions on a short-term basis. The areas closest to Lake Michigan may have a lesser variation in groundwater elevations.

The actual extent of Lake Michigan effects on groundwater elevations in the study area cannot be precisely determined on the basis of the data available. Although the groundwater hydrology of the study area is complex, it may be assumed that Lake Michigan will limit the amount that water levels can be drawn down. The lake shoreline consists of permeable sandy soils and, as already noted, a clay layer which lies 0 to 60 feet below the lake level. This would indicate that the level of Lake Michigan may be expected to moderate, although not necessarily preclude, any reductions in groundwater elevations within the eastern portion of the study area.

Much of the western portion of the study area is believed to act as a groundwater recharge area, supplying the discharge from the eastern wetlands to the

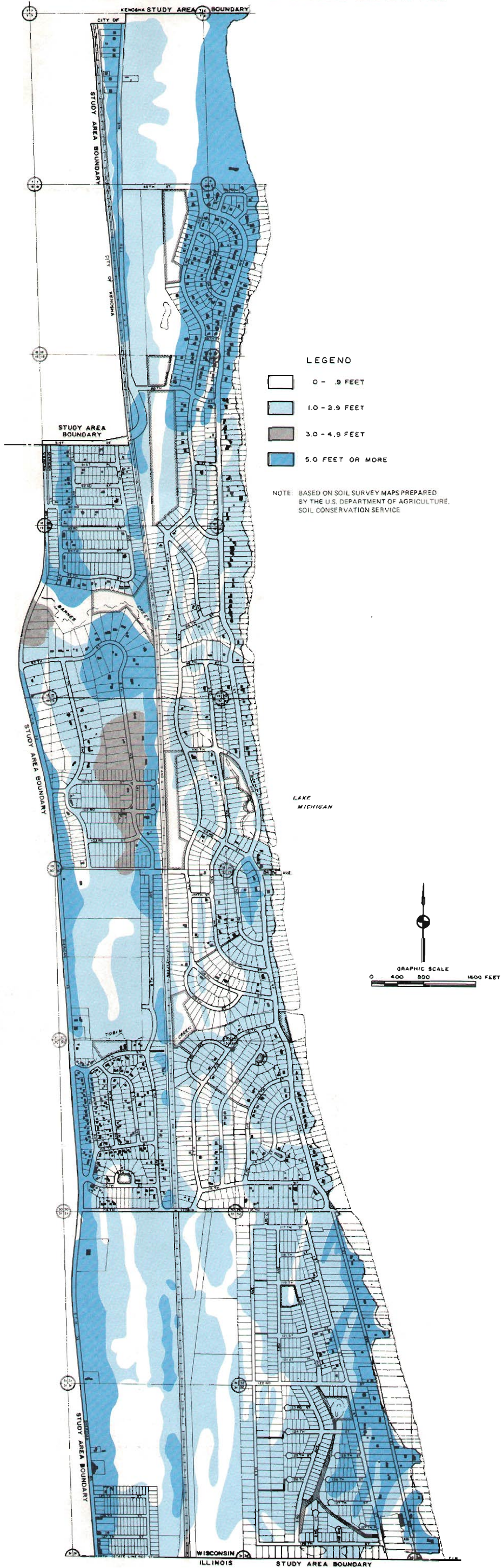
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<sup>3</sup>M. G. Sherrill and J. J. Schiller, Water Table Map of Kenosha County, Wisconsin, U. S. Geological Survey, Water Resources Investigations 79-39, 1979.

<sup>4</sup>R. D. Hutchinson, Water Resources of Racine and Kenosha Counties, South-eastern Wisconsin, Geological Survey Water-Supply Paper 1878, 1970.

Map A-3

SEASONAL MINIMUM DEPTH-TO-GROUNDWATER  
IN THE CHIWAUKEE PRAIRIE-CAROL BEACH AREA



Source: SEWRPC.

surface streams and to the lake. Water levels in the permeable sand layer are primarily affected by the flows in the groundwater system, by the locations of recharge and discharge areas, and by the hydraulic conductivity of the soil. In some cases, areas may act as either discharge or recharge areas depending on seasonal and other short-term fluctuations in the groundwater level.

Approximately 60 acres of fens are known to exist within the study area.<sup>5</sup> Fens, which are dominated by sedges and grasses growing on sandy peat soils, develop in wetlands which are generally groundwater discharge areas. Fens may be indicative of the discharge of groundwaters rich in calcium and magnesium bicarbonate ions.<sup>6</sup> Two permanent springs or seeps have also been identified on the west side of the study area.<sup>7</sup>

Development of wetlands within the eastern portion of the study area would probably occur primarily through filling. Filling on the water-saturated sands will likely produce some compaction of the sands, thereby resulting in a decrease in hydraulic conductivity. Thus, the compacted zone could constrict groundwater flow, increasing upflow water levels and decreasing downflow water levels.

Development of wetlands within the western portion of the study area could occur through either filling or groundwater drainage. If groundwater drainage is used to accommodate development, the elevation of the groundwater would be lowered, which could reduce low streamflows, affect adjacent wetlands, and reduce groundwater recharge. It is more likely, however, that development would be accommodated through filling. If the fill is as permeable as are the existing soils or is graded such that water will flow to infiltration areas, groundwater recharge should not be significantly affected. If, however, the fill is less permeable and adequate infiltration is not retained, then groundwater recharge will be reduced. A decrease in groundwater recharge could reduce water levels in the wetlands in the eastern portion of the study area. The creation of impervious areas could also reduce the localized recharge of groundwater.

The filling of existing groundwater discharge areas with relatively impervious materials and the placement of impervious surfaces during urban development may alter the existing pattern of groundwater flows and tend to direct groundwater flows toward the stream channels, Lake Michigan, and remaining

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<sup>5</sup>Fens in the Chiwaukee Prairie-Carol Beach area were identified on a preliminary basis on Map 7 in Chapter II of this report. Subsequent field inspection work conducted in July 1984 indicated that this map should be modified as follows: The fen area of approximately one acre in size located between 96th Street and 98th Street east of 4th Avenue should be deleted; and an area less than one acre in size consisting of the southerly portions of lots 9, 10, and 11 of Carol Beach Estates-Unit No. 3 should be deleted.

<sup>6</sup>C. J. Richardson, D. L. Tilton, et al., "Nutrient Dynamics of Northern Wetland Ecosystems," Freshwater Wetlands, Ecological Processes and Management Potential, ed. R. E. Good, D. F. Whigham, and R. L. Simpson, 1978, pp. 217-241.

<sup>7</sup>Henderson, op. cit.



wetland areas. The groundwater seepage from exposed stream banks and the Lake Michigan shoreline may reduce the frictional resistance of the soil material to stress forces, thereby reducing the stability of the stream bank and lake shoreline slopes. Because the height of the stream banks is relatively low and the Lake Michigan shoreline in the study area is not marked by bluffs, however, these slope stress forces are relatively minor, and substantially increased stream bank or lake shoreline erosion is not expected.

Based upon the groundwater data currently available, it is not possible to precisely delineate groundwater recharge areas. It may be concluded, based on the available data, together with certain reasonable assumptions concerning the relative importance of groundwater recharge from the study area in comparison to the importance of total recharge to the groundwater system flowing through the study area, and the effects of Lake Michigan, that development of wetlands through groundwater drainage could affect groundwater elevations and recharge areas in the study area. Dry weather water levels in the streams and wetlands could be expected to be reduced by the loss of wetlands in some areas. Furthermore, the filling or the covering of existing groundwater recharge areas with relatively impervious surfaces could increase surface runoff discharges to the stream channels and remaining wetland areas, and alter groundwater flow elevations and patterns. The filling of the western recharge areas could reduce groundwater levels downflow, or east, of the recharge areas. The filling of the eastern discharge areas could increase groundwater elevations upflow, and decrease groundwater elevations downflow, of the discharge areas.

### Low Streamflow

Low streamflow may be the critical factor limiting the distribution and occurrence of various types of fish and aquatic life in some of the streams of the area. If low flows are reduced, or periods of dry streambeds extended, fish and other forms of aquatic life may be adversely affected in that the organisms may either die or need to migrate to other areas. Furthermore, significant changes in low flow conditions may affect the aquatic vegetation in the stream; this vegetation may provide habitat for fish and other forms of aquatic life. Finally, under extreme low flow conditions, certain adverse water quality conditions such as low dissolved oxygen levels and high temperatures may become more severely limiting for fish and other forms of aquatic life.

Dry weather streamflow characteristics were evaluated by applying the equations developed by the U. S. Geological Survey sites for which limited base flow discharge measurements are available.<sup>8</sup> The dry weather streamflow characteristics are determined for the minimum seven-day mean flow below which the flow may be expected to fall on an average of once every two years ( $Q_{7,2}$ ), and once every 10 years ( $Q_{7,10}$ ). These equations were determined from multiple regression analyses that related the low flow characteristics at continuous record gaging stations and partial record stations to drainage basin characteristics. Low flow characteristics were evaluated for the seven subbasins shown on Map A-2. Table A-5 sets forth the existing  $Q_{7,2}$  and  $Q_{7,10}$  low flows for the streams draining the seven subbasins evaluated.

<sup>8</sup>B.K. Holmstrom, Low-Flow Characteristics of Streams in the Lake Michigan Basin, Wisconsin, U. S. Geological Survey Water Resources Investigations Open-File Report 81-1193, 1982.

Table A-5

**EXISTING LOW FLOW CHARACTERISTICS  
OF STREAMS IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA**

Outlet of Subbasin (see Map A-1)	Seven-Day Two-Year Low Flow-- $Q_{7,2}$ (cfs)	Seven-Day 10-Year Low Flow-- $Q_{7,10}$ (cfs)
A1	0.014	0.003
A2 <sup>a</sup>	0.030	0.006
B1	0	0
B2	0.020	0.005
C1	0	0
C2	0	0
D	0	0

<sup>a</sup> Data pertain to the northern branch of Barnes Creek in subbasin A2.

Source: SEWRPC.

The low flow estimates indicate that both the  $Q_{7,2}$  and  $Q_{7,10}$  low flows of Barnes Creek, which drains subbasins A1 and A2, approximately double as the creek flows through the study area. The wetland areas within subbasin A2 are thus indicated to be significant contributors to the low flow of Barnes Creek. The only exceptions are the isolated wetlands encompassing 14 acres located west of 8th Avenue between 97th Street and 104th Street, which are not indicated as significant contributors to the low flow of Barnes Creek because of their small size and isolated location. If subbasin A2, located within the study area, were to be developed and low flow contributions to the stream from groundwater inflow and wetland discharge were reduced to the level occurring upstream of the study area, the  $Q_{7,2}$  low flow at the outlet of subbasin A2 may be expected to decrease from 0.030 cubic feet per second (cfs) to 0.016 cfs, and the  $Q_{7,10}$  low flow may be expected to decrease from 0.006 cfs to 0.003 cfs.

The  $Q_{7,2}$  and  $Q_{7,10}$  low flows from the outlet of subbasin B1 upstream of the study area are zero. Within the study area, the  $Q_{7,2}$  and  $Q_{7,10}$  low flows for subbasin B2 are 0.020 cfs and 0.005 cfs, respectively. The prairie wetlands which are located in subbasin B2 thus contribute to the low flow of the stream which drains subbasins B1 and B2. If subbasin B2 were to be developed and low flow contributions to the stream from groundwater inflow and wetland discharge were reduced to the level occurring upstream of the study area, the  $Q_{7,2}$  and  $Q_{7,10}$  low flows may be expected to be reduced to zero.

The existing  $Q_{7,2}$  and  $Q_{7,10}$  low flows at the outlets of subbasins C1, C2, and D are all zero. Development of subbasins C2 and D within the study area would therefore have no significant impact on the  $Q_{7,2}$  or  $Q_{7,10}$  low flows. However, development of subbasins C2 and D may be expected to reduce streamflows when the streams draining these subbasins do contain base flow; that is, flow which is not stormwater runoff.

In addition to having impacts on low streamflows, the loss of wetland groundwater discharge areas through filling and development could have an impact on the type and diversity of vegetation and wildlife in adjacent wetlands which might receive flow from those discharge areas which are lost.

## CONCLUSIONS

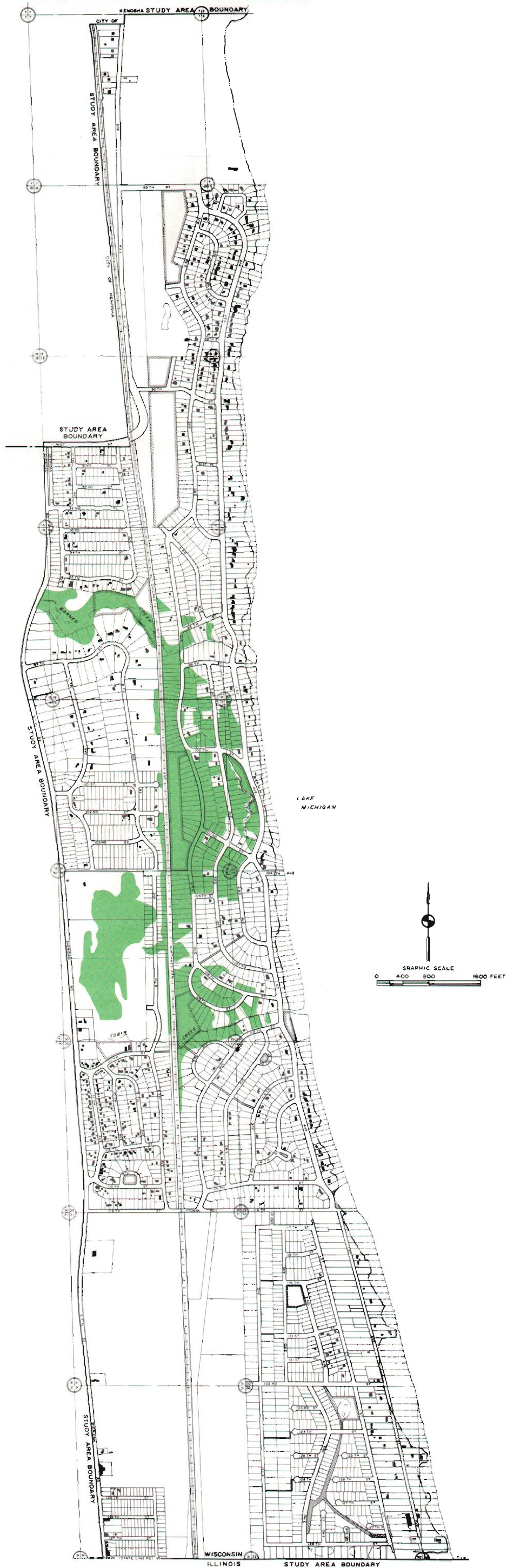
Criterion b of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the proposed rezoning may result in a significant adverse impact on the maintenance of dry season streamflow; the discharge of groundwater to a wetland; the recharge of groundwater from a wetland to another area; or the flow of groundwater through a wetland.

The streams which drain the study area currently have very low streamflows under dry weather conditions. Filling and development of the wetlands in the stream subbasins may be expected to further reduce dry weather flows. The wetland areas in subbasin A2--with the exception of the isolated wetlands located west of 8th Avenue between 97th Street and 104th Street--and in subbasin B2 are significant contributors to the low flow of the perennial streams which drain these subbasins. In combination, these wetlands encompass 159 acres, or 9 percent of the study area (see Map A-4). Most seriously affected would be the stream draining subbasin B2, which may be expected to dry up under dry weather conditions, assuming full development of the wetlands within the subbasin. In addition to having impacts on low streamflows, the loss of wetland discharge areas through filling could have an impact on the type and diversity of vegetation and wildlife in adjacent wetland areas which might receive flow from the discharge areas.

The filling and development of wetland areas could affect groundwater elevations within the eastern portions of the study area, although the elevation of Lake Michigan may be expected to moderate any significant reductions in groundwater levels. The covering of groundwater discharge areas with relatively impervious fill could increase groundwater elevations upflow, and reduce groundwater elevations downflow, of the discharge areas, thereby reducing the extent of downflow land areas which receive and accumulate groundwater discharge and which contribute flow to the stream channels. Dry season streamflows are affected by factors other than the elevation of the groundwater, including the number of discharge areas.

Within the western portions of the study area, the development of wetlands through groundwater drainage could result in a significant reduction in groundwater elevations and recharge areas. Development of the wetlands through filling could, if adequate permeability and infiltration are not retained, reduce groundwater recharge, as well as groundwater elevations, in the eastern portions of the study area.

WETLANDS WHICH HAVE A SIGNIFICANT  
BEARING ON LOW STREAMFLOWS, WATER  
QUALITY, AND FISH POPULATIONS IN THE  
CHIAWKEE PRAIRIE-CAROL BEACH STUDY AREA



## Appendix A-3

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE- CAROL BEACH STUDY AREA: CRITERION C-- FILTERING OR STORAGE OF SEDIMENTS, NUTRIENTS, HEAVY METALS, OR ORGANIC COMPOUNDS THAT WOULD OTHERWISE DRAIN INTO NAVIGABLE WATERS

#### INTRODUCTION

Wetlands can have both positive and negative impacts on the quality of water flowing through the system. Water pollutants such as suspended sediment, nutrients, metals, toxic organic substances, and pathogenic bacteria can be removed by physical entrapment, microbial utilization, plant uptake, and adsorption to sediment particles. Sedimentation occurs as the water filters through the organic soils and the vegetation. Flooded anaerobic soils promote losses of elements to the atmosphere due to denitrification within the anaerobic soil and to aerobic decomposition of the thin oxidized surface layer of the soil.

Negative impacts on water quality can occur as a result of nutrient leaching from vegetative matter, flushing of accumulated sediments, and dissolved oxygen depletion. Nitrogen, phosphorus, and other nutrients can be released by leaching from dead vegetation, fragmented plant parts, and fallen litter. Most leaching occurs in spring and in fall; Perry et. al.<sup>1</sup> found that 60 percent of the annual phosphorus removal by leaching in a Wisconsin marsh occurred in the spring, with 24 percent of the annual removal occurring in fall. Accumulated sediments may be flushed from wetlands, particularly during large spring runoff events when the soils may be frozen and the vegetative cover at a minimum. Dissolved oxygen levels may be depleted as the water flows through and over the anaerobic soils, although this effect may be offset by the oxygen production provided by the wetland vegetation. A wetland can also serve as a source of nutrients to the groundwater. Perry et. al.<sup>2</sup> found that phosphorus concentrations in groundwater leaving a wetland were twice as high as phosphorus concentrations in groundwater entering the wetland.

The net water quality impacts of a wetland are dependent upon the type of wetland, the season, the water level, and other physical, biological, and hydraulic characteristics of the system. Most wetlands act as a sediment and nutrient sink in summer and to a lesser extent in fall, and as a sediment and

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<sup>1</sup>J. J. Perry, D. E. Armstrong, and D. D. Huff, "Phosphorus Fluxes in an Urban Marsh During Runoff," Selected Proceedings of the Midwest Conference on Wetland Values and Management, June 17-19, 1981, ed. B. Richardson. 1981, pp. 199-211.

<sup>2</sup>Ibid.



nutrient source in spring.<sup>3</sup>, <sup>4</sup>, <sup>5</sup> In Lake Wingra Marsh, Wisconsin, 83 percent of the inflowing phosphorus was retained during summer, but only 10 percent of the annual inflowing phosphorus load was retained.<sup>6</sup> Table A-6 summarizes selected studies which have evaluated the water quality impacts of wetlands.

Other vegetative communities in the study area, including the upland prairies and dunes, generate relatively low pollutant loadings in storm runoff. Studies of native prairies in Minnesota indicated that the nutrient loadings contributed by precipitation were significantly higher than the nutrient losses from native prairies, indicating that the prairies acted as nutrient sinks.<sup>7</sup> The dunes probably generate little runoff because of the high permeability of sandy substrate. The scattered residential development which has occurred in the study area may contribute higher pollutant loadings than are contributed by the surrounding wetlands and prairies because of increased runoff from impervious areas, disturbance of the vegetative cover, and possible malfunctioning septic tank systems.

## ANALYSIS

The amount of filtering and storage of pollutants by the wetlands in the study area can be estimated by assuming that a portion of the pollutant loadings from upland areas which flow through the wetlands during the summer months is at least temporarily stored. Based on the studies summarized in Table A-6, it can be assumed that approximately 80 percent of the pollutant loadings which are discharged to a wetland during the summer are at least temporarily stored by the wetland. The wetlands thus provide their greatest water quality benefits during the summer when certain water quality problems, such as excessive algal growths and subsequent dissolved oxygen depletions, may be the most severe in surface waters.

### Wetland Storage of Pollutants

To evaluate the relative importance of the pollutant storage in wetlands during the summer, the Wisconsin Urban Runoff Model, developed under the

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<sup>3</sup>T. M. Burton, "The Effects of Riverine Marshes on Water Quality," in Richardson, 1981, pp. 139-151.

<sup>4</sup>E. M. Bentley, The Effect of Marshes on Water Quality, Ph.D. Thesis, Water Chemistry Department, University of Wisconsin-Madison, 1969.

<sup>5</sup>W. E. Sloey, F. L. Spangler, and C. W. Fetter, Jr., "Management of Freshwater Wetlands for Nutrient Assimilation," Freshwater Wetlands, Ecological Processes and Management Potential, ed. R. E. Good, D. F. Whigham, and R. L. Simpson, 1978, pp. 321-340.

<sup>6</sup>Ibid.

<sup>7</sup>V. Novotny and G. Chesters, Handbook of Nonpoint Pollution Sources and Management, 1981.

Table A-6

## SUMMARY OF THE WATER QUALITY IMPACTS OF WETLANDS

Wetland Study Description	Impact on Inflowing Water Quality Parameter Loadings	Source
Prairie pothole marsh in Iowa	Marsh removed a substantial amount of inorganic nitrogen--especially nitrate-nitrogen--with an 8 percent removal. Little impact on phosphorus total Kjeldahl nitrogen loadings was noted. The marsh was a net producer of soluble organic carbon	C. B. Davins, J. S. Baker, A. G. VanderValk, and C. E. Beer, "Prairie Pothole Marshes as Traps for Nitrogen and Phosphorus in Agricultural Runoff," <u>Selected Proceedings of the Midwest Conference on Wetland Values and Management</u> , July 17-19, 1981, ed. B. Richardson, 1981.
Lake Wingra Marsh draining primarily residential land in Madison, Wisconsin	Marsh removed 82 percent of the particulate phosphorus and 14 percent of the dissolved phosphorus. The dissolved phosphorus was removed primarily by sorption during infiltration and varied seasonally from 8 percent in spring to 39 percent in summer. Retention of total phosphorus was about 44 percent in spring, 53 percent in autumn and winter, and 64 percent in summer. The marsh can serve as a source of phosphorus to the groundwater: Groundwater flowing into the marsh had a total phosphorus concentration of 29 micrograms per liter ( $\mu\text{g/l}$ ); whereas groundwater flowing out of the marsh had a total phosphorus concentration of 40 $\mu\text{g/l}$	J. J. Perry, D. E. Armstrong, and D. D. Huff, "Phosphorus Fluxes in an Urban Marsh During Runoff," in Richardson, 1981.
Lake Wingra Marsh Madison, Wisconsin	Marsh has an 83 percent phosphorus retention in summer, but only a 10 percent annual average phosphorus retention	W. E. Sloey, F. L. Spangler, and C. W. Fetter, Jr., "Management of Freshwater Wetlands for Nutrient Assimilation," <u>Freshwater Wetlands, Ecological Processes and Management Potential</u> , ed. R. E. Good, D. F. Whigham, and R. L. Simpson, 1978.
Ten urban and suburban watersheds in the Minneapolis-St. Paul (Minnesota) area with 1.5 percent to 16.3 percent of their area covered by wetlands	A statistically significant inverse relationship between pollutant loadings from a watershed and the percent of the watershed covered by wetlands was noted. Reducing the wetland area by 50 percent would increase the suspended solids loadings by up to 75 percent or more	G. L. Oberts, "Impact of Wetlands on Nonpoint Source Pollution," <u>1982 International Symposium on Urban Hydrology, Hydraulics, and Sediment Control</u> , University of Kentucky, Lexington, Kentucky, 1982.
Theresa Marsh, Wisconsin	Marsh removed phosphorus and nitrogen during the summer and released the nutrients during spring and fall. On an annual basis, phosphorus removal exceeded 50 percent	T. M. Burton, "The Effects of Riverine Marshes on Water Quality," in Richardson, 1981.
Wayzata Marsh in Minnesota	Marsh removed 77 percent of the total phosphorus and 94 percent of the total suspended solids	Donohue & Associates, Inc., <u>Oakwood Lake Feasibility Study</u> , 1980.

Table A-6 (continued)

Wetland Study Description	Impact on Inflowing Water Quality Parameter Loadings	Source
Natural marsh at Green Lake, Wisconsin	Marsh removed 17 percent of the total phosphorus	Donohue & Associates, Inc., <u>A Plan for the Protection of Green Lake</u> , 1978.
Four marshes in Wisconsin	Marshes were neither nutrient sources nor sinks on a long-term basis. They accumulated pollutants during the summer and released them in spring	E. M. Bentley, <u>The Effect of Marshes on Water Quality</u> , Ph.D. Thesis, Water Chemistry Department, University of Wisconsin-Madison, 1969.
Laboratory studies	Draining marshes negated most beneficial effects and aggravated adverse effects on water quality. Drained marshes produced phosphorus concentrations in runoff up to 10-20 times higher than the concentrations produced by agricultural lands	R. W. Amundson, <u>Nutrient Availability of a Marsh Soil</u> , M. S. Thesis, Water Chemistry Department, University of Wisconsin-Madison, 1970.
North-central Wisconsin	Sediment yields are 90 percent lower in drainage basins with 40 percent lake and wetland area than in drainage basins with no lake and wetland area	R. P. Novitzki, "Hydrologic Characteristics of Wisconsin's Wetlands and Their Influence on Floods, Stream Flow, and Sediment," in Richardson, 1981.
Brillion Marsh, Wisconsin	Marsh received wastewater treatment plant effluent. The marsh provided parameter concentration reductions of 80 percent for biochemical oxygen demand (BOD), 44 percent for chemical oxygen demand (COD), 13 percent for total phosphorus, 44 percent for turbidity, 8 percent for conductivity, 51 percent for NO <sub>3</sub> , 86 percent for coliforms, and 29 percent for suspended solids	C. W. Fetter, Jr., W. E. Sloey, and F. L. Spangler, "Use of a Natural Marsh for Wastewater Polishing," in Richardson, 1981.
Artificially constructed marsh, Ontario	Marsh reduced BOD and suspended solids by more than 95 percent during passage of raw sewage	G. P. Wile and G. Miller, "Use of Artificial Wetlands for Wastewater Treatment," in Richardson, 1981.
Natural wetlands	Range of parameter removals for wetland treatment systems: BOD <sub>5</sub> - 70-96 percent removal Suspended Solids - 60-90 percent removal Nitrogen - 40-90 percent removal Phosphorus - 10-50 percent removal	R. K. Bastian, "EPA's Role and Interest in Using Wetlands for Wastewater Treatment," in Richardson, 1981.

Source: SEWRPC.

Nationwide Urban Runoff Program in Milwaukee County, was applied.<sup>8</sup> The model was used to estimate seasonal storm event loadings of suspended solids, volatile suspended solids, nitrogen, phosphorus, and lead to surface waters. Groundwater quality interactions and stream channel processes are not simulated by the model. The model was applied to the four subbasins shown on Map A-1 which are located within the study area--A2, B2, C2, and D.

In the analysis of the pollutant storage in wetlands during the summer, it was assumed that 80 percent of the summer pollutant loadings from upland areas--primarily open land and residential land--passes through the wetlands in the study area and is removed by filtration, sedimentation, or biological uptake. It was further assumed that no pollutant removal by wetlands occurred in spring or in fall, that those pollutants stored in summer were not released during the following fall or spring, and that pollutant loadings from upstream subbasins located outside the study area are confined to the stream channels and not filtered by the wetlands in the study area. It should be noted here that, based on the studies summarized in Table A-6, some pollutant storage may occur in wetlands in the spring and fall as well as in the summer, and that some of the pollutants stored in wetlands during the summer may be flushed or released from the wetlands at a later date. These effects, however, were considered to be negligible in the analysis. Pollutant loading effects during the winter were also assumed to be negligible.

Table A-7 sets forth the pollutant reductions expected from the study area subbasins at the assumed level of removal of upland pollutant loadings by wetlands during the summer. The table indicates that removal of 80 percent of the upland loadings by the wetlands may be expected to result in a 50 to 70 percent reduction in total summer pollutant loadings for subbasins A2, B2, and C2. For subbasin D, removal of 80 percent of the upland loadings may be expected to result in less than a 15 percent reduction in total summer loadings because upland areas constitute only a small portion of the subbasin. For subbasins A2, B2, and C2, wetland storage of upland pollutant loadings may be expected to result in a 9 to 14 percent reduction in total annual loadings. For subbasin D, the reduction in annual loadings due to wetland storage would be 3 percent or less.

### Urbanization Impacts

It is important to consider the potential water quality impacts of additional urban development of the study area. Development of the study area could result in groundwater contamination and the discharge of pollutants to surface waters, and the construction associated with the development could have impacts as well. The type and magnitude of impacts would depend upon the type of development and upon whether mitigative measures were utilized.

Urbanization may have other, secondary impacts as well. Secondary impacts may include erosion and the compaction of stream banks as a result of the loss of

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<sup>8</sup>Southeastern Wisconsin Regional Planning Commission and Wisconsin Department of Natural Resources, Evaluation of Urban Nonpoint Source Pollution Management in Milwaukee County, Wisconsin, Volume II, Feasibility and Application of Urban Nonpoint Source Water Pollution Abatement Measures, Draft Final Report, September 1983.

Table A-7

**POLLUTANT REMOVAL BY WETLANDS WITHIN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA  
ASSUMING AN 80 PERCENT STORAGE OF POLLUTANT  
LOADINGS FROM UPLAND AREAS<sup>a</sup> DURING THE SUMMER**

Subbasin	Pollutant	Percent Reduction in Total Summer Loadings <sup>b</sup>	Percent Reduction in Total Annual Loadings <sup>b</sup>
A2	Suspended Solids.....	71	13
	Volatile		
	Suspended Solids.....	65	11
	Nitrogen.....	64	14
	Phosphorus.....	71	14
B2	Lead.....	64	12
	Suspended Solids.....	64	12
	Volatile		
	Suspended Solids.....	56	9
	Nitrogen.....	55	11
C2	Phosphorus.....	67	13
	Lead.....	50	10
	Suspended Solids.....	72	14
	Volatile		
	Suspended Solids.....	65	12
D	Nitrogen.....	64	14
	Phosphorus.....	69	14
	Lead.....	60	10
	Suspended Solids.....	12	2
	Volatile		
	Suspended Solids.....	7	3
	Nitrogen.....	6	2
	Phosphorus.....	14	2
	Lead.....	0	0

<sup>a</sup> Includes pollutant loadings from open land and from residential and commercial land uses which pass through, and are filtered by, the wetlands. Pollutant loadings from the wetlands themselves were not reduced by 80 percent.

<sup>b</sup> Includes loadings from all land uses.

Source: SEWRPC.

vegetative cover due to increased human activity along stream banks, and stream bank erosion and vegetation damage as a result of increased stormwater discharges.

**Construction Impacts:** Urban construction activities generally involve soil disturbance and destruction of stable vegetative cover; changes in the physical, chemical, and biological properties of the land surface; and attendant changes in the hydrologic and water quality characteristics of the site. Construction practices which may significantly contribute to the degradation of water quality in the study area include site clearing and grubbing, grading, and site restoration. The sediment and pollutant loadings from construction activities are highly variable, depending upon the period and extent of the construction, the distance from the site to a waterway, the soils and land surface slopes, the construction methods utilized, and the mitigative measures



used to control erosion. The U. S. Environmental Protection Agency has estimated that up to 75 tons of sediment per acre per year may be eroded from land undergoing construction activity.<sup>9</sup>

The most severe impacts on the prairie and wetland environments would thus occur during the development process. These impacts could include high loadings of sediment and associated pollutants to surface waters, sedimentation of the surface waterways and wetlands, and the covering of valuable fish and wildlife habitat with sediment. These impacts could affect the health of the biological communities within the study area and interfere with the beneficial use of the surface waters. However, the most severe impacts would likely be short term. Long-term impacts--including effects on the filtering capacity and species composition of the wetlands--could also occur, but would probably be less severe than the short-term impacts.

Groundwater Quality Impacts: Development of the Chiwaukee Prairie-Carol Beach study area could have impacts on the quality of the underlying groundwater resources, primarily within the sand and gravel aquifer. Potential sources of groundwater contamination include septic tank systems, leaks and spills of chemicals and oils, improper fertilizer and pesticide applications, and street deicing salt. Contaminated groundwater could discharge to Lake Michigan and render some local water supply wells unusable. Groundwater contamination could also adversely affect the species composition and health of those wetland plants and other vegetation which utilize the groundwater resources.

Surface Water Quality Impacts: To evaluate the surface water quality impacts of development of the Chiwaukee Prairie-Carol Beach study area, the Wisconsin Urban Runoff Model was again applied. To isolate and evaluate the most severe impacts possible from urbanization, the model was applied under the assumption that wetland storage of pollutants on an annual basis would not occur. This analysis differs from the analysis of wetland storage of pollutants discussed above, in which the wetlands were assumed to remove 80 percent of the inflowing pollutants during the summer. This urbanization analysis also assumes that all of the platted properties which lie outside the 100-year recurrence interval flood hazard area within the Chiwaukee Prairie-Carol Beach study area will be developed. The analysis further assumes the development of unplatted upland areas located outside the floodplain in subbasins A2 and B2. Existing land uses were assumed for the tributary drainage areas located upstream of the study area. The model was applied to the seven subbasins shown on Map A-1. All four of the subbasins located within the study area--A2, B2, C2, and D--would be developed under the future conditions analyzed.

The pollutant loadings simulated by application of the model to each of the seven subbasins are set forth in Table A-8. Pollutant loadings were estimated under existing land use conditions and under full development conditions. Of the total pollutant loadings discharged to Lake Michigan from the four subbasins listed above under future development conditions, the model results indicated that future development areas would contribute about 22 percent of the suspended solids, 43 percent of the volatile suspended solids, 24 percent

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<sup>9</sup>U. S. Environmental Protection Agency, Methods for Identifying and Evaluating the Nature and Extent of Nonpoint Sources of Pollutants, EPA-430/9-73-014, 1973.

Table A-8

**COMPARISON OF EXISTING AND FUTURE DEVELOPMENT  
SIMULATED STORM EVENT POLLUTANT LOADINGS FOR  
SELECTED SUBBASINS LOCATED WITHIN, OR WHICH DRAIN  
INTO, THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA**

Subbasin	Within Study Area	Drainage Area (acres)	Simulated Pollutant Loadings (pounds) <sup>a</sup>														
			Suspended Solids			Volatile Suspended Solids			Nitrogen			Phosphorus			Lead		
			Existing Land Use	Future Development	Percent Change	Existing Land Use	Future Development	Percent Change	Existing Land Use	Future Development	Percent Change	Existing Land Use	Future Development	Percent Change	Existing Land Use	Future Development	Percent Change
A1	No	2,218	187,300	187,300	0	15,370	15,370	0	5,230	5,230	0	290	290	0	50	50	0
A2	Yes	370	9,700	30,300	212	1,650	6,690	305	470	930	98	70	250	10	30	200	33
A Total	--	2,588	197,000	217,600	10	17,020	22,060	30	5,700	6,160	8	310	360	16	60	80	33
B1	No	1,165	66,600	66,600	0	5,950	5,950	0	2,090	2,090	0	110	110	0	20	20	0
B2	Yes	120	2,700	10,200	278	520	2,600	400	150	310	107	10	20	100	5	10	100
B Total	--	1,285	69,300	76,800	11	6,470	8,550	32	2,240	2,400	7	120	130	8	25	30	20
C1	No	153	4,300	4,300	0	510	510	0	180	180	0	10	10	0	10	10	0
C2	Yes	138	4,800	11,700	144	790	3,040	285	220	330	50	10	30	200	5	10	100
C Total	--	291	9,100	16,000	76	1,300	3,550	173	400	510	28	20	40	100	15	20	33
D Total	Yes	462	11,200	22,400	100	1,490	4,130	177	530	780	47	20	40	100	10	20	100

<sup>a</sup>Pollutant loadings are simulated for the period March through December only.

Source: SEWRPC.

of the nitrogen, 28 percent of the phosphorus, and 47 percent of the lead loadings. The remaining pollutant loadings would be contributed by the three subbasins located upstream of the study area.

The future loading estimates indicate that full development of the study area could be expected to substantially increase pollutant loadings to waterways during storm events. Under full development conditions, the loadings of suspended solids to Lake Michigan from the individual waterways--as shown in Table A-8--would increase by 10 to 100 percent. Future development of the study area would increase Lake Michigan loadings of volatile suspended solids by 30 to 177 percent, of nitrogen by 7 to 47 percent, of phosphorus by 8 to 100 percent, and of lead by 20 to 100 percent.

Pollutant loadings from the study area itself--exclusive of loadings from upstream drainage subbasins--would increase under fully developed conditions by up to 278 percent for suspended solids, up to 400 percent for volatile suspended solids, up to 107 percent for nitrogen, up to 250 percent for phosphorus, and up to 200 percent for lead. It is important to note that the increase in pollutant loadings is attributable not only to the development of platted wetland lots, but also to the development of platted upland lots and certain unplatted upland areas.

## ANALYSIS RESULTS

The regional water quality management plan for southeastern Wisconsin indicates that Barnes Creek currently experiences some violations of the dissolved oxygen standard, as well as severe violations of the fecal coliform standard, as established by the Wisconsin Department of Natural Resources.<sup>10</sup> These violations may be expected to become more severe and more frequent as further urban development occurs in the area. Similar water quality impacts may be expected on the other streams which flow through the study area. However, because of the ability of wetlands to filter and store inflowing pollutants, the preservation of wetlands which drain to the most critical and valuable streams should help to protect water quality.

The relative importance of the water quality benefits of wetlands located in different portions of the Chiwaukee Prairie-Carol Beach study area is determined by the type of wetland and by the beneficial uses and aquatic communities supported by the drainage waterways. In general, perennial streams, which flow year-round, will support a greater variety of beneficial uses and contain a more diverse and stable aquatic community than would intermittent streams, which flow during only a portion of the year. As discussed in more detail in Appendix A-5, the perennial streams draining subbasins A2 and B2 (Barnes Creek and Tobin Creek, respectively) support diverse and balanced forage fisheries which are indicative of generally good water quality conditions. Fish surveys could not be conducted for the intermittent streams in the study area because flows were too low during the study period. Although no water quality data were available for the intermittent streams, it may be assumed that, in general, perennial streams which contain base flow fed by relatively high-quality groundwater as well as stormwater runoff will tend to have higher water quality than will intermittent streams fed almost exclusively by stormwater run-

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<sup>10</sup>SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, Volume Two, Alternative Plans, 1979.

off. In this respect, those wetlands which drain to perennial streams may be considered to provide more significant water quality benefits than are provided by wetlands which drain to intermittent streams.

Of the four subbasins shown on Map A-1 located within the study area, subbasins A2 and B2 are drained by perennial waterways; subbasins C2 and D are drained by intermittent waterways. The classification of a stream as perennial or intermittent is based on U. S. Geological Survey topographic map delineations. Those wetlands located within subbasins A2 and B2 can thus be considered to provide more significant water quality benefits than are provided by those wetlands located within subbasins C2 and D and those wetlands located within the study area but not within one of the analyzed subbasins.

Water quality simulation modeling analyses indicated that, if all of the wetlands within subbasins A2 and B2 were preserved, and if future development occurred in all the upland areas in these subbasins, the initial pollutant loading increases for these subbasins expected under future development conditions--as set forth in Table A-8--would be reduced by from 40 to 60 percent. Total future loadings of pollutants transported to Lake Michigan by the two perennial waterways draining subbasins A2 and B2 would range from 3 to 18 percent higher than existing pollutant loadings.

It may be concluded that the wetland areas in subbasins A2 and B2 provide important water quality benefits. The only exceptions are the isolated wetlands encompassing a total of 14 acres located in subbasin A2, west of 8th Avenue between 97th Street and 104th Street, which are not considered to significantly affect water quality because of their small size and isolated location (see Map 27 in Chapter V of this report). The wetlands in subbasins A2 and B2 in the study area which have been identified as providing important water quality benefits are shown on Map A-4. In combination, these wetlands encompass 159 acres, or 9 percent of the study area.

It should be noted that the remaining wetland areas in the study area also provide water quality benefits, although these benefits may be considered to be relatively less important than the benefits provided by those wetlands which drain to perennial streams. These wetlands can reduce pollutant loadings to the intermittent waterways and to the near-shore area of Lake Michigan.

## CONCLUSIONS

Criterion c of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the proposed rezoning may have a significant adverse impact on the filtering or storage of sediments, nutrients, heavy metals, or organic compounds that would otherwise drain into navigable waters.

Water quality simulation analyses indicate that up to 14 percent of the annual pollutant loadings from subbasins within the study area may be at least temporarily stored by wetlands, while during the summer up to 72 percent of the pollutant loadings may be stored by the wetlands. Development of the wetlands would reduce this pollutant storage capacity, and could therefore increase pollutant loadings, particularly during the summer.

In addition to reducing the pollutant storage capacity of the wetlands, urban development of the wetlands could generate construction impacts, groundwater contamination, and higher pollutant loadings to surface waters. An important conclusion of this analysis is that the adverse water quality impacts which would be caused by urbanization of the study area may be expected to be greater than the adverse water quality impacts which would be caused by the reduction in the pollutant storage capacity of the wetlands.

The construction activity associated with the development of the wetland areas would generate high pollutant loadings which could adversely affect wetland plant communities, cover valuable wildlife habitat areas, and degrade surface water quality. The study area, therefore, is particularly vulnerable and sensitive to these high pollutant loadings.

Groundwater contamination by chemicals, oils, fertilizers, pesticides, and salt could adversely affect local water supplies, the near-shore quality of Lake Michigan, and the health of wetland plant species. Even if these pollutants were introduced to the groundwater, however, the contamination may not be severe because the study area generally acts as a groundwater discharge area--as opposed to a groundwater recharge area. Some pollutants contained in the groundwater could be transported to Lake Michigan by the generally eastward flow of the groundwater. In general, however, the development of wetlands in the study area would not have a significant adverse impact on groundwater.

Urbanization of the study area would be expected to increase pollutant loadings from the subbasins within the study area by up to 400 percent. This increase would likely result in increased violations of established water quality standards for the waterways in the study area. Those wetlands which drain to perennial waterways, which cover a total of about 159 acres,<sup>11</sup> can be considered to provide the most significant water quality benefits to surface waters. Preservation of these wetland areas would minimize the increase in pollutant loadings expected under future development conditions. If wetland areas along the perennial streams are preserved, the increase in pollutant loadings would not be expected to have a significant adverse impact on the existing uses and biota supported by the streams. The perennial streams should continue to support diverse and healthy forage fish and aquatic life.

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<sup>11</sup>This excludes those isolated wetlands encompassing a total of 14 acres located west of 8th Avenue, between 97th Street and 104th Street, which are not considered to significantly affect water quality because of their small size and isolated location.



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## Appendix A-4

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION D--SHORELINE PROTECTION AGAINST SOIL EROSION

#### INTRODUCTION

Erosion may occur along the banks of the streams flowing through the Chiwaukee Prairie-Carol Beach study area, and along the shoreline of Lake Michigan. The degree of stream bank erosion is a function of the slope of the bank, the grade of the stream, vegetative cover, the erodibility of the soil, and streamflow velocities. Lake Michigan shoreline erosion is affected by wave action, stormwater runoff, groundwater seepage, lake level elevation, lake ice action, and the type of vegetative cover.

Stream bank erosion may be increased by the clearing of protective vegetative cover from the banks, by channel straightening and realignment measures, and by an increase in streamflow discharges and velocities. Stream bank erosion can result in higher levels of turbidity and suspended solids concentrations in the water and in the increased sedimentation of downstream areas.<sup>1</sup>

Within the study area, the Lake Michigan shoreline is a beach ridge landform complex consisting primarily of low ridges and swales behind small stabilized sand dunes. There are no clearly defined bluffs in the study area. As a result, beach erosion, rather than bluff erosion and recession, is the primary concern within the study area. The features of the shoreline are continuously in a state of flux as a result of the on-shore or off-shore transport of sand and gravel primarily in response to wave action.

There is a constantly changing interplay between the forces that bring sand ashore and those that move it lakeward, with the position and configuration of the main mass of sand at any time serving as an index of the dominant forces. In general, material removed by beach and bluff erosion is transported along the littoral area of Lake Michigan by a long-shore current. The U. S. Army Corps of Engineers has estimated that from 50,000 to 75,000 cubic yards of sediment are annually transported along the littoral area of Lake Michigan at the southern boundary of the State of Wisconsin. In addition to water and ice action, wind erosion and deposition affect the formation and movement of the sand dunes in the study area. Wetlands can reduce shoreline erosion by providing good vegetative cover, by storing stormwater runoff and reducing attendant streamflow velocities, and by protecting against wave action.

#### ANALYSIS

The impacts of the proposed urban development on stream bank erosion and Lake Michigan shoreline erosion can be forecast by examining the existing erosion

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<sup>1</sup>ASCE Task Committee, Sedimentation Engineering, ed. V. A. Vanoni, ASCE Manuals and Reports on Engineering Practice No. 54, 1975.

processes and rates, and by evaluating the mechanisms which may alter the general magnitude of these rates.

### Stream Bank Erosion

The increased flood flows which are expected to result from development of the study area could potentially increase flow velocities and the erosion of the stream banks. However, analysis of the Barnes Creek flow velocities under existing and future development conditions indicates that development of the study area would have minor impact on flood flow velocities. Of the 14 channel cross-sections analyzed for a 100-year recurrence interval storm event, only two would experience increases in flow velocities of more than 25 percent, and the median increase would be only 3 percent. For other streams draining the study area, the new channels and floodways developed by filling the adjacent wetland areas may experience stream bank erosion if the adjoining fill areas are not properly designed, graded, and seeded.

### Lake Michigan Shoreline Erosion

To provide a general assessment of shoreline erosion under historical and existing conditions, historical shoreline recession rates for the Chiwaukee Prairie-Carol Beach study area over the periods of 1970 to 1980 and 1835 to 1980 were measured. The 1970 and 1980 measurements were made at each U. S. Public Land Survey east-west section, quarter section, and quarter-quarter section line within the study area on ratioed and rectified 1 inch equals 400 feet scale aerial photographs. These measurements were corrected for minor variations in map scale and for the angle of the shoreline in order to represent recession perpendicular to the shoreline. The Lake Michigan water levels in April of 1970 and 1980 were different--580.08 feet National Geodetic Vertical Datum (NGVD) and 580.81 feet NGVD, respectively--but based upon measured beach slopes within the study area, any shoreline recession errors due to these water level differences should be less than two feet per year at essentially all sites. The original U. S. Public Land Survey notes were used for the 1835 measurements.

The measured shoreline recession rates over the periods of 1970 to 1980 and 1835 to 1980 are presented on Map 14 in Chapter II of this report. The 1835 to 1980 recession rates are generally higher than the 1970 to 1980 rates. At six of the 19 measurement sites, shoreline accretion was observed from 1970 to 1980. Such accretion may be due to artificial filling or to structural shore protection measures which extend the shoreline. Numerous shore protection structures are currently located along the shoreline. A survey of 128 shore protection structures within the study area indicated that nearly 40 percent were failing or nonfunctional.<sup>2</sup> Although the 1970 to 1980 measurements were based on a relatively short time period, they may be assumed to be more representative of future shoreline recession rates because the impacts of the shore protection structures are reflected to a greater degree than by the long-term 1835 to 1980 rates.

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<sup>2</sup>The survey of shore protection structures was conducted in 1976 as part of the Shore Erosion Study: Technical Report, Shoreline Erosion Bluff Stability Along the Lake Michigan and Lake Superior Shorelines of Wisconsin, Wisconsin Coastal Management Program, 1977.

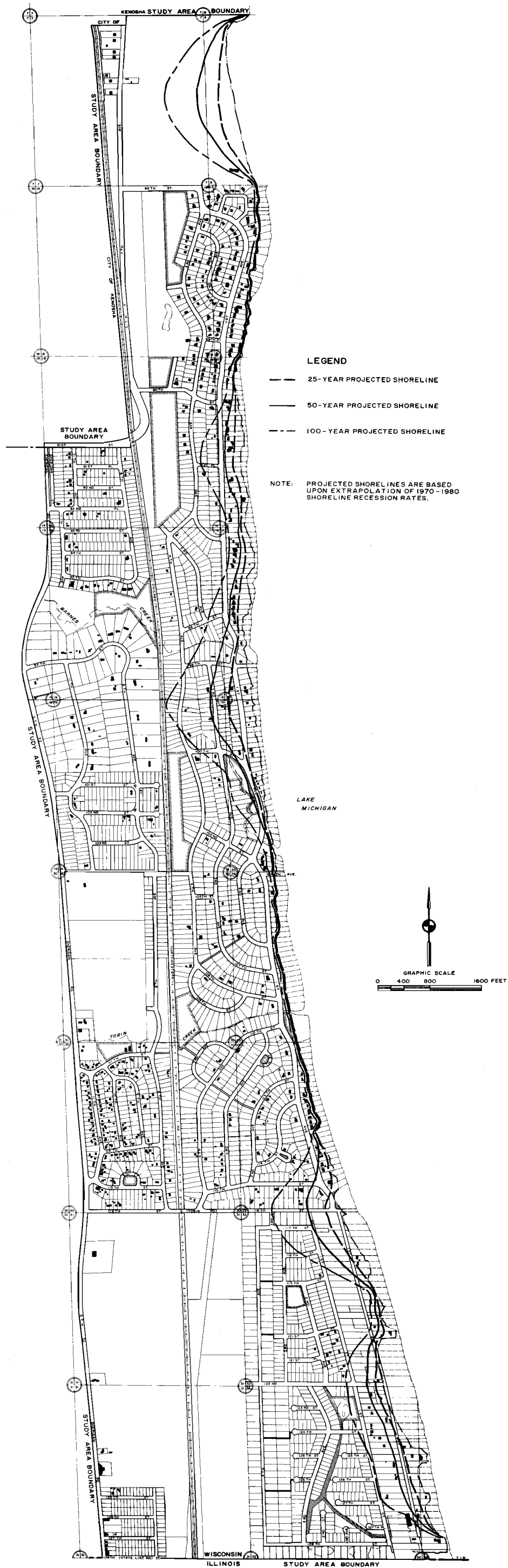
Based on 1970 to 1980 estimated annual recession rates, Map A-5 shows the projected shoreline for a 25-year, 50-year, and 100-year period. The projected shoreline recession lines indicate that over the next 25 years, approximately 52 acres of land could be lost to shoreline erosion in the study area, given continuation of the existing shoreline recession rates determined at the 19 measurement sites. Over 50 years, about 104 acres could be lost to shoreline recession, and over 100 years, approximately 208 acres could be lost. These estimates do not fully reflect the impacts of shore protection structures installed between 1970 and 1980. The extent of the erosion which will occur in these areas is dependent upon the adequacy of the structure design and the extent to which the structures are maintained.

Under existing conditions, wetlands are not located adjacent to the Lake Michigan shoreline; a beach ridge landform borders the shoreline. The filling or draining of the wetlands in the study area, therefore, should not directly affect shoreline recession rates. However, increased surface erosion of the shoreline could result from the higher storm runoff discharges from the proposed development. Furthermore, as shown on Map A-5, continued shoreline recession will begin to affect some wetland areas as soon as within 25 years.

The beach ridge landform contains sand dunes which could be indirectly affected by urban development in the study area. These effects may include increased erosion of the dunes due to increased use of the beach area; loss of stabilizing vegetation and loss of dune-forming and maintaining sand input due to shore protection structures and other structures interrupting the normal on-shore flow of material and wind patterns; and direct loss of dunes resulting from beachfront development.

## CONCLUSION

Criterion d of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the rezoning may result in a significant adverse impact upon shoreline protection against soil erosion. Because of the location of the wetlands, their development is not expected to have a significant impact on the existing rate of Lake Michigan shoreline erosion, all of the wetlands in the area being separated from Lake Michigan by a beach ridge formation. Increased stream bank erosion in Barnes Creek is not expected because only relatively minor increases in flow velocities are anticipated under future development conditions. For other streams draining the study area, the new channels and floodways developed by filling the adjacent wetland areas may experience stream bank erosion if the adjoining fill areas are not properly designed, graded, and seeded.





## Appendix A-5

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION E--FISH SPAWNING, BREEDING, NURSERY, OR FEEDING GROUNDS

#### INTRODUCTION

Wetlands provide several important functions which directly and indirectly support fish populations. As noted in Appendices A-2 and A-3, wetlands serve to maintain streamflows and protect water quality. The wetlands adjacent to surface water bodies often serve as filters and sediment traps which protect fish habitat areas from siltation and sedimentation. Excessive amounts of silt and sediment may cover fish spawning and foraging areas, and may clog the respiratory organs or gills of fish or cause abrasion of the fish scales, fins, and skin, which may result in disease. These factors, as well as increases in turbidity, may also impact fish food sources.

Wetlands adjacent to surface water areas serve as fish habitat by providing cover and shading, which may be used not only by forage fish species, but by panfish and other game species, particularly during the juvenile stages of development. Hence, many such wetland areas provide important nursery areas for many species of fish. In addition, certain wetlands provide spawning habitat. For example, some fish species, such as the northern pike (Esox lucius), ascend small streams immediately after the ice melts in early spring, and spawn in the flooded, grassy wetland margins of these streams.<sup>1</sup>

Finally, certain wetlands provide feeding areas for fish. Many of the food species which fish consume are also dependent on wetlands for feeding, breeding, protective cover, and, as described above, maintenance of streamflows and water quality protection. Juvenile panfish and other game species, as well as forage fish, depend on a sufficient food supply for proper growth and development. The forage fish population may also serve as an important food source for larger fish species and other forms of wildlife.

#### ANALYSIS

To determine the importance of the Chiwaukee Prairie-Carol Beach wetlands to the area fishery, it was necessary to determine the type of fish species utilizing the streams and near-shore waters of Lake Michigan in the study area. Ideally, fish surveys should be conducted at least during each season. However, this is not possible because of time constraints. Therefore, a review of past fish surveys has been conducted and a fish survey conducted during the summer. The results of these surveys are described below.

##### Historic Fish Surveys

The Wisconsin Department of Natural Resources conducted fish surveys at the mouths of Barnes Creek and Tobin Creek on September 3, 1975, as part of a

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<sup>1</sup>Samuel Eddy and James C. Underhill, Northern Fishes (University of Minnesota Press, Minneapolis), 1974.

statewide fish distribution survey. The findings of that survey are summarized in Table A-9. More than 365 fish distributed among 13 species were collected at a single station near the mouth of Barnes Creek. Five of these species were considered to be very tolerant to organic pollution and represent approximately 38 percent of the total population collected at that station.<sup>2</sup> Approximately 61 percent of the total population, representing seven species, was considered to be tolerant to organic pollution. Finally, less than 1 percent of the total population, representing one species, was considered to be intolerant to organic pollution.

More than 301 fish distributed among six species were collected at a single station near the mouth of Tobin Creek. Three of these species were considered to be very tolerant to organic pollution and represent 58 percent of the total population collected at that station. The remaining 42 percent of the total population, representing three species, was considered to be tolerant to organic pollution. No pollution-intolerant species were collected at the Tobin Creek station during the 1975 survey.

### Existing Fishery

Three streams located in the study area were field inspected by the fish management staff of the Wisconsin Department of Natural Resources in 1983 for consideration in the conduct of a fish survey: Barnes Creek, Tobin Creek, and an unnamed tributary located in the southwest one quarter of U. S. Public Land Survey Section 29, Township 1 North, Range 23 East. Water levels in the unnamed tributary were found to be too low for sampling during the proposed

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<sup>2</sup>Fish species may be categorized on the basis of their tolerance to pollution. However, the ranking of fish species on a pollution tolerance scale does not provide a precise species-by-species hierarchy of pollution tolerance and, therefore, an indication of water quality conditions. Rather, such a ranking is intended only to generally group species according to their tolerance to pollution. This pollution tolerance is usually related to dissolved oxygen concentrations, although turbidity, siltation, temperature, pH, and toxic substances such as ammonia and pesticides are also important factors in determining tolerance. Fish classified as very tolerant can withstand large variations in water quality conditions and may, therefore, be expected to be found in both clean and heavily polluted waters. Fish classified as tolerant can withstand smaller variations in water quality conditions than can very tolerant fish, and may, therefore, be expected to be found in clean and moderately polluted waters. Fish classified as intolerant are, relative to other categories, very restricted in the range of water quality conditions in which they can exist and, therefore, may be expected to inhabit only clean waters. Generally, the presence of intolerant fish species indicates good water quality conditions, with high dissolved oxygen levels, low turbidity, pH values within a 6.0 to 9.0 standard units range, water temperatures which do not exceed the natural daily and seasonal fluctuations, and no toxic substances present. Insofar as a stream network is a dynamic system and fish are mobile animals, less tolerant fish species occasionally may find and temporarily reside in localized niches that are of higher quality than the overall quality of a particular reach of a stream system.

Table A-9

**RESULTS OF HISTORICAL FISH SURVEYS CONDUCTED IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: SEPTEMBER 3, 1975**

Station Number (See Map A-6)	Stream	Very Tolerant Species Population							
		Central Mudminnow ( <u>Umbra limi</u> )	Goldfish ( <u>Carassius auratus</u> )	Black Bullhead ( <u>Ictalurus melas</u> )	White Sucker ( <u>Catostomus commersoni</u> )	Fathead Minnow ( <u>Pimephales promelas</u> )	Number of Species	Population	
								Number	Percent of Station Total
1	Barnes Creek north mouth...	23	6	5	99+	7	5	140+	38
4	Tobin Creek mouth...	--	--	1	90	84	3	175	58
Total		23	6	6	189+	91	5	315+	47

Station Number (See Map A-6)	Stream	Tolerant Species Population								Population	
		Bluntnose Minnow ( <u>Pimephales notatus</u> )	Green Sunfish ( <u>Lepomis cyanellus</u> )	Bluegill ( <u>Lepomis macrochirus</u> )	Creek Chub ( <u>Semotilus atromaculatus</u> )	Largemouth Bass ( <u>Micropterus salmoides</u> )	Brook Stickleback ( <u>Culaea inconstans</u> )	Emerald Shiner ( <u>Notropis atherinoides</u> )	Number of Species	Number	Percent of Station Total
1	Barnes Creek north mouth...	99+	15	1	7	99+	2	1	7	224+	61
4	Tobin Creek mouth...	99+	--	--	21	--	6	--	3	126	42
Total		198+	15	1	28	99+	8	1	7	350+	53

Station Number (See Map A-6)	Stream	Intolerant Species Population				Total Number of Species	Total Population
		Northern Redbelly Dace ( <u>Phoxinus eos</u> )	Number of Species	Population			
				Number	Percent of Station Total		
1	Barnes Creek north mouth	1	1	1	1	13	365+
4	Tobin Creek mouth...	--	0	0	0	6	301+
Total		1	1	1	1	13	666+

Source: Wisconsin Department of Natural Resources and SEWRPC.

survey period. However, Barnes Creek and Tobin Creek contained suitable water levels, and were surveyed on August 11, 1983. The results of the survey are summarized in Table A-10.

Three survey stations were established on Barnes Creek. Barnes Creek has two mouths: the north mouth, a man-made channel discharging to Lake Michigan near 1st Avenue between 96th Street and 98th Street extended; and the south mouth, a natural channel discharging to Lake Michigan near 1st Avenue just north of 102nd Street extended. Survey stations--Station Nos. 1 and 2--were thus established on both mouths. The third survey station--Station No. 3--was established on Barnes Creek on the west side of STH 32. The locations of the three survey stations located on Barnes Creek are shown on Map A-6.

A total of 246 fish distributed among 13 species were collected from Barnes Creek. The number of fish collected ranged from a low of 56 fish at Station No. 3 to a high of 108 at Station No. 2. The number of fish species recorded ranged from five species at Station No. 2 to eight species at Station No. 1. Approximately 43 percent of the total population, representing five species, was considered to be very tolerant to organic pollution. Seven species representing approximately 32 percent of the total population were considered to be tolerant to organic pollution. The remaining 25 percent of the total population, represented by a single species, was considered to be intolerant to organic pollution.

A comparison of the September 3, 1975 and August 11, 1983 fish surveys conducted at Station No. 1 in Barnes Creek indicates a decline in both the total number of species and the total population. However, a comparison of total populations collected at all three stations during the August 11, 1983 survey indicates a similar population and diversity of fish species. A rigorous comparison of these data is difficult. The data could suggest a decline in water quality and habitat conditions at Station No. 1 or a simple variation in the population at that site related to the time of day and time of year, particularly because of the proximity of the station to Lake Michigan. For example, the emerald shiner (Notropis atherinoides) migrates into river and stream mouths during the spring and fall.<sup>3,4</sup>

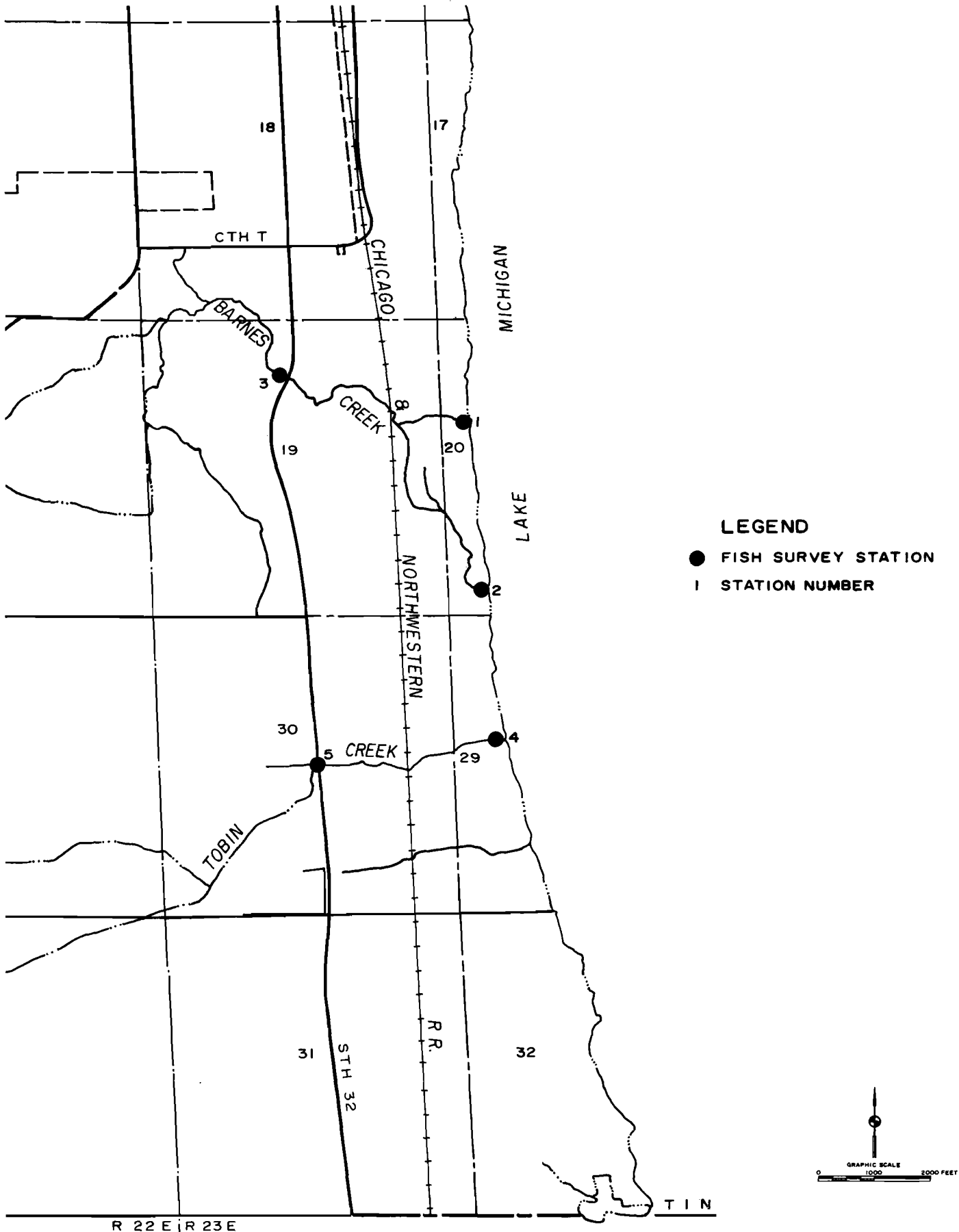
The fish population recorded in Barnes Creek during these two surveys represents an essentially balanced and apparently stable population. The diversity of species present, and the presence of pollution-intolerant species, suggests basically good water quality conditions in the creek. There is a large population of a single game species, largemouth bass (Micropterus salmoides), within the Barnes Creek system. However, the source of these juvenile bass is uncertain. While they may enter Barnes Creek from Lake Michigan, it is also possible that they enter the creek from adjacent ponds located outside the study area.

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<sup>3</sup>Carl L. Hubbs and Karl F. Lagler, Fishes of the Great Lakes Region (The University of Michigan Press, Ann Arbor), 1964.

<sup>4</sup>Samuel Eddy and James C. Underhill, Northern Fishes (University of Minnesota Press, Minneapolis), 1974.

FISH SURVEY STATIONS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA



Source: Wisconsin Department of Natural Resources and SEWRPC.



Table A-10

**RESULTS OF FISH SURVEY CONDUCTED IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA: AUGUST 11, 1983**

Station Number (See Map A-6)	Stream	Very Tolerant Species Population								
		Central Mudminnow ( <u>Umbra limi</u> )	Goldfish ( <u>Carassius auratus</u> )	Carp ( <u>Cyprinus carpio</u> )	Black Bullhead ( <u>Ictalurus melas</u> )	White Sucker ( <u>Catostomus commersonni</u> )	Fathead Minnow ( <u>Pimephales promelas</u> )	Number of Species	Population	
									Number	Percent of Station Total
1	Barnes Creek north mouth....	3	1	25	--	23	--	4	52	63
2	Barnes Creek south mouth....	26	--	--	8	--	--	2	34	32
3	Barnes Creek above STH 32 ..	12	--	--	--	8	--	2	20	36
Subtotal Barnes Creek		41	1	25	8	31	--	5	106	43
4	Tobin Creek mouth....	1	--	1	139+	30	25	5	196+	84
5	Tobin Creek above STH 32...	1	--	--	--	4	5	3	10	26
Subtotal Tobin Creek		2	--	1	139+	34	30	5	206+	76
Total		43	1	26	147+	65	30	6	312	61

Station Number (See Map A-6)	Stream	Tolerant Species Population									
		Bluntnose Minnow ( <u>Pimephales notatus</u> )	Green Sunfish ( <u>Lepomis cyanellus</u> )	Pumpkin-seed ( <u>Lepomis gibbosus</u> )	Creek chub ( <u>Semotilus atromaculatus</u> )	Largemouth Bass ( <u>Micropterus salmoides</u> )	Brook Stickle-back ( <u>Culaea inconstans</u> )	Golden Shiner ( <u>Notemigonus chrysolaucas</u> )	Number of Species	Population	
										Number	Percent of Station Total
1	Barnes Creek north mouth....	4	2	1	--	23	--	--	4	30	37
2	Barnes Creek south mouth....	--	--	--	--	--	6	6	2	12	11
3	Barnes Creek above STH 32...	3	1	--	2	30	--	--	4	36	64
Subtotal Barnes Creek		7	3	1	2	53	6	6	7	78	32
4	Tobin Creek mouth....	--	2	--	12	--	4	2	4	20	9
5	Tobin Creek above STH 32...	--	--	1	2	--	13	--	3	16	42
Subtotal Tobin Creek		--	2	1	14	--	17	2	5	36	13
Total		7	5	2	16	53	23	8	7	114	22

Table 10 (continued)

Station Number (See Map A-6)	Stream	Intolerant Species Population							Total Number of Species	Total Population
		Johnny Darter ( <u>Etheostoma nigrum</u> )	Longnose Dace ( <u>Rhinichthys cataractae</u> )	Blacknose Dace ( <u>Rhinichthys atratulus</u> )	Northern Redbelly Dace ( <u>Phoxinus eos</u> )	Number of Species	Population			
							Number	Percent of Station Total		
1	Barnes Creek north mouth...	--	--	--	--	0	0	0	8	82
2	Barnes Creek south mouth..	--	--	--	62	1	62	57	5	108
3	Barnes Creek above STH 32..	--	--	--	--	0	0	0	6	56
Subtotal Barnes Creek		--	--	--	62	1	62	25	13	246
4	Tobin Creek mouth...	1	2	--	13	3	16	7	12	232+
5	Tobin Creek above STH 32..	--	--	1	11	2	12	32	8	38
Subtotal Tobin Creek		1	2	1	24	4	28	11	14	270+
Total		1	2	1	86	4	90	17	17	516+

Source: Wisconsin Department of Natural Resources and SEWRPC.

No rare, endangered, or threatened fish species were collected during the surveys, although the Lake Michigan population of emerald shiner has declined in recent years as a result of over-predation.<sup>5</sup>

Two survey stations were established on Tobin Creek. One station--Station No. 4--was established at 1st Avenue just north of 110th Street extended, near the creek's confluence with Lake Michigan; and the other station--Station No. 5--was established immediately west of STH 32. The locations of these two stations are shown on Map A-6.

More than 270 fish distributed among 14 species were collected from Tobin Creek. The number of fish collected ranged from a low of 38 fish at Station No. 5 to a high of more than 232 fish at Station No. 4. The number of fish species recorded ranged from eight species at Station No. 5 to 12 species at Station No. 4. As shown in Table A-10, approximately 76 percent of the total population collected, representing five species, was considered to be very tolerant to organic pollution. Five species were considered to be tolerant to organic pollution, representing approximately 13 percent of the total population. The remaining 11 percent of the total population was represented by four species considered to be intolerant to organic pollution.

A comparison of the September 3, 1975 and August 11, 1983 fish surveys conducted at Station No. 4 in Tobin Creek indicates an increase in the total number of species and a decline in the total population. Again, a rigorous comparison of these data is difficult, but the increasing diversity at Station No. 4 would suggest variations in the population by time of day and time of year related to its proximity to Lake Michigan. For example, the longnose dace (Rhinichthys cataractae) prefers torrential waters<sup>6</sup> and, as such, commonly occurs in the surge zones of near-shore areas in the Great Lakes.<sup>7</sup> Because of this habitat preference, the longnose dace could be expected to frequently move in and out of the stream mouth of Tobin Creek, as well as of Barnes Creek.

The fish populations recorded in Tobin Creek during these two surveys indicate that the stream supports a diverse population of forage minnows, with some panfish. No rare, threatened, or endangered species were recorded during the survey.

A copy of the August 11, 1983 fish survey report prepared by the Wisconsin Department of Natural Resources is available in the SEWRPC files.

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<sup>5</sup>George Boronow, Wisconsin Department of Natural Resources Area Fish Manager for Kenosha, Racine, and Walworth Counties, Personal communication, December 1983.

<sup>6</sup>George C. Becker, "Inland Fishes of the Lake Michigan Drainage Basin," Environmental Status of the Lake Michigan Region, Vol. 17, Argonne National Laboratory, September 1976.

<sup>7</sup>Carl L. Hubbs and Karl F. Lagler, Fishes of the Great Lakes Region (The University of Michigan Press, Ann Arbor), 1964.

Although no spawning game species were observed during the 1975 or 1983 fish surveys, largely because both surveys were conducted in the late summer, Mr. George Boronow, Wisconsin Department of Natural Resources area fish manager, reported that a large population of rainbow smelt (*Osmerus mordax*) enter Barnes Creek every spring to spawn. Northern pike are not common in this part of Lake Michigan. However, the wetlands adjacent to these fisheries contain suitable northern pike spawning habitat. Also, the wetlands are accessible to northern pike during periods of high water in the spring, when they may come up from the lake to spawn.

## CONCLUSION

More than 666 fish representing 13 species and more than 516 fish representing 17 species were recorded in fishery surveys made in the Chiwaukee Prairie-Carol Beach study area on September 3, 1975 and on August 11, 1983, respectively. Both surveys indicate that Barnes Creek and Tobin Creek support diverse and balanced forage fisheries, fisheries indicative of generally good water quality conditions. Some juvenile pan and game fishes were found to utilize these two stream systems. In addition, Barnes Creek is a known spawning stream for rainbow smelt, and the wetlands adjacent to it contain spawning habitat for northern pike.

The wetlands adjacent to Barnes Creek and Tobin Creek are important to the area fishery in that they:

1. Provide and/or protect fish spawning areas for rainbow smelt and numerous forage fish species, and contain spawning habitat for northern pike;
2. Provide and/or protect nursery habitat for numerous forage fish, some panfish, and largemouth bass; and
3. Provide feeding grounds for juvenile panfish, largemouth bass, and forage fish, and the aquatic organisms upon which they feed. In addition, these fish and other aquatic organisms provide a food source for the larger game species occupying the near-shore area of Lake Michigan.

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## Appendix A-6

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION F--WILDLIFE HABITAT

#### INTRODUCTION

The wildlife habitat in the Chiwaukee Prairie-Carol Beach study area contributes to the health and diversity of the total environment. Specifically, the presence of wildlife in the study area provides recreational, research, and educational values; supports activities such as hunting, trapping, and fishing; and adds aesthetic value to the community. In providing these values, the study area also contributes to the provision of similar amenities in both adjacent and disjunct wildlife habitat areas by serving as a species reservoir and gene pool which supports or contributes to the population of these other areas, and by serving as a supporting habitat area for migrating species. This latter function is particularly important in maintaining suitable interstate and international bird populations, particularly because of its location in the Mississippi Flyway. The migratory route along the Lake Michigan shoreline is particularly important for water birds, as well as upland birds. Hawks tend to migrate along the Lake Michigan shoreline because of its north-south orientation relative to prevailing westerly winds and the absence of good updrafts for land-soaring birds across the lake, and to take advantage of the thermal updrafts caused by the temperature differences which occur along the water-land interface.<sup>1</sup> The maintenance of suitable habitat areas along the Lake Michigan shoreline in southeastern Wisconsin is particularly important to these migrating species because of the increased urbanization which has occurred in the coastal area.

#### ANALYSIS

##### Wildlife Habitat Area

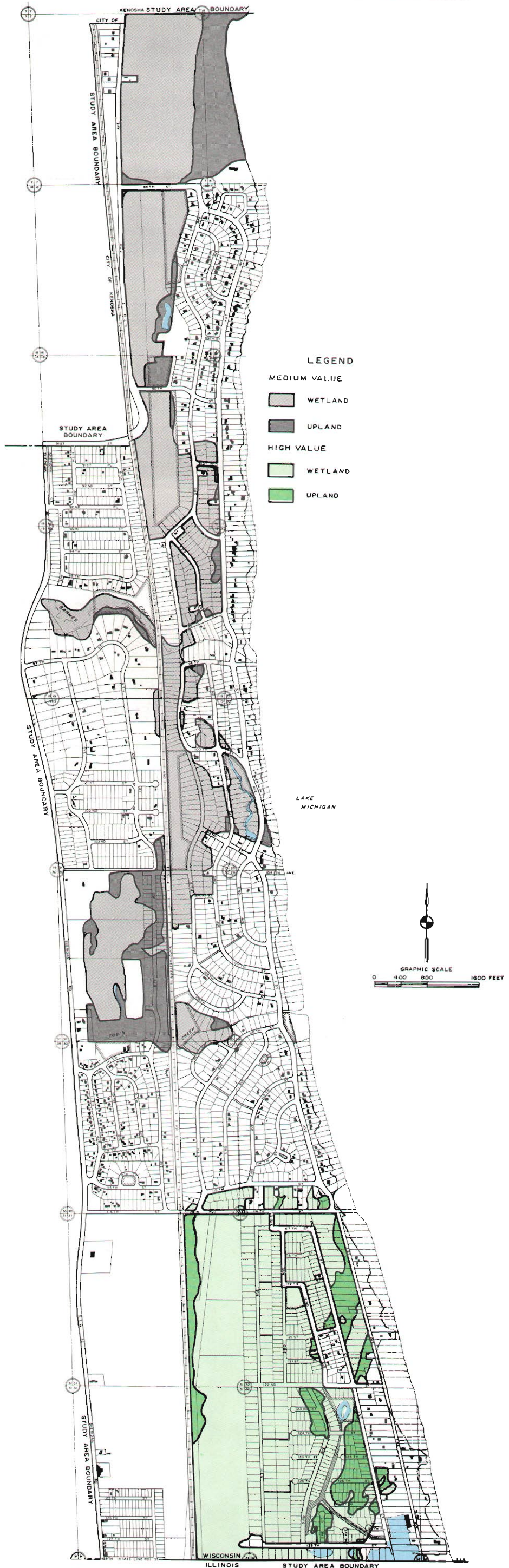
A total of 702 acres of wildlife habitat was identified within the study area and value rated (see Map A-7). Based on current condition, each wildlife habitat area was categorized into one of three value rating categories:

1. High-Value Wildlife Habitat Areas--High-value wildlife habitat areas contain a good diversity of wildlife, are of adequate size to meet all of the habitat requirements for the species concerned, and are generally located in proximity to other wildlife habitat areas.
2. Medium-Value Wildlife Habitat Areas--Medium-value wildlife habitat areas generally lack one of the three criteria for a high-value wildlife habitat. However, they do retain a good plant and animal diversity.

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<sup>1</sup>John E. Bielefeldt, Ornithologist, Personal communication, January 1984.

WILDLIFE HABITAT AREAS IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA:  
REVISED BASED ON FIELD STUDIES IN JULY 1984



3. Low-Value Wildlife Habitat Areas--Low-value wildlife habitat areas are remnant in nature in that they generally lack two or more of the three criteria for a high-value wildlife habitat, but may, nevertheless, be important if located in proximity to medium- and/or high-value wildlife habitat areas, if they provide corridors linking higher value wildlife habitat areas, or if they provide the only available range in the area. No low-value wildlife habitat areas were identified within the study area.

The factors considered in assigning value ratings to wildlife habitat areas were: diversity of animal and plant species, territorial requirements of the species, vegetative composition and structure, proximity to other wildlife habitat areas, and disturbance. In addition to being assigned value ratings, the wildlife habitats in the study area were classified according to the principal wildlife type to which they are suited. The study area contains pheasant, waterfowl, and songbird habitat. These designations were applied to help characterize a particular wildlife habitat area as meeting the requirements of the indicated species. This classification does not, however, imply that the named species is the only, or even the most numerous or most important, species in the habitat. For example, an area designated as a waterfowl habitat may also provide muskrat-mink and songbird habitat as well.

Table A-11 indicates that 324 acres, or about 46 percent, of the wildlife habitat areas remaining in the Chiwaukee Prairie-Carol Beach study area constitute high-value areas. A total of 378 acres, or about 54 percent of the wildlife habitat areas remaining in the study area, constitute medium-value areas. As noted above, there are no low-value wildlife habitat areas in the study area.

Approximately 566 acres of wildlife habitat, or 81 percent of the remaining 702 acres of wildlife habitat in the study area, are identified as wetland. Specifically, 276 acres, or 85 percent of the high-value wildlife habitat, and 290 acres, or 77 percent of the medium-value wildlife habitat, are wetlands.

### Game and Nongame Wildlife Species

The above section described the quantity and quality of the remaining wildlife habitat in the Chiwaukee Prairie-Carol Beach study area. This section describes in detail the remaining wildlife species of the area. The wildlife population of the study area consists of fish, amphibians, reptiles, birds, and mammals. Each of these classes of the animal kingdom as represented in the study area is described below with the exception of fish, which were described in Appendix A-5.

Although a complete field inventory of amphibians, reptiles, birds, and mammals was not conducted as a part of the Chiwaukee Prairie-Carol Beach study, it is possible by using existing information such as the records of the Milwaukee County Public Museum, The Nature Conservancy, the Illinois Nature Preserves Commission, the Wisconsin Department of Natural Resources, and the Commission, and by polling naturalists and wildlife managers familiar with the study area, to prepare a list of the amphibians, reptiles, birds, and mammals which should be found in the study area under existing conditions. To collate the wildlife data, lists were obtained of those amphibians, reptiles, birds, and mammals known to have existed and known to exist in the Chiwaukee Prairie

Table A-11

**WILDLIFE HABITAT IN THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA: 1984**

Value	Wildlife Habitat		
	Acres	Percent of Total Wildlife Habitat	Percent of Study Area
High.....	324	46.2	17.8
Medium.....	378	53.8	20.7
Total	702	100.0	38.5

NOTE: High-value wildlife habitat includes 276 acres of wetlands, 2 acres of open water, and 46 acres of upland area.

Medium-value wildlife habitat includes 290 acres of wetlands, 3 acres of open water, and 85 acres of upland area.

Source: SEWRPC.

area, the eastern portion of Kenosha County, and the northeastern portion of Lake County, Illinois, and these lists were associated with the remaining habitat areas, as inventoried. Then the appropriate amphibian, reptile, bird, and mammal species were projected into the study area. The application of this technique resulted in a better understanding of which species are normally present under existing conditions, and which species could be expected to be lost as urbanization proceeds within the study area. It should be noted that this technique does not account for all of the transient species which would be found in the study area on rare occasions.

**Amphibians and Reptiles:** Although often unseen and unheard, amphibians and reptiles are vital components of the ecologic system of an environmental unit like the Chiwaukee Prairie-Carol Beach study area. Examples of amphibians native to the study area are frogs, toads, and salamanders. Turtles and snakes are examples of reptiles common to the study area. Table A-12 presents a summary of the seven amphibian and 14 reptile species normally present in the study area under present conditions, and identifies those species most sensitive to urbanization.

Most amphibians and reptiles have definite habitat requirements which are adversely affected by advancing urban development. One of the major detriments to the maintenance of amphibians in a changing environment is the destruction of breeding ponds. Frogs and salamanders often return to the same breeding site year after year, even if the pond is not there, in which case they cannot breed. When an area is being filled and developed some ponds must be selectively saved if amphibians are to be maintained. Toads are somewhat of an exception in this respect in that they can better adapt to the changes in environment which normally accompany urbanization than can other species of amphibians.

Another major consideration in the preservation of both amphibians and reptiles is the maintenance of migration routes. Many species annually traverse

Table A-12

**AMPHIBIANS AND REPTILES OF THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA**

Scientific and Common Name	Species Reduced or Dispersed with Full Urbanization of Study Area	Species Lost with Full Urbanization of Study Area
<b>Amphibia</b>		
<u>Ambystoma tigrinum</u> (eastern tiger salamander)....	x	--
<u>Bufo americanus</u> (eastern American toad).....	x	--
<u>Acris crepitans</u> <sup>a</sup> (Blanchard's cricket frog).....	x	--
<u>Pseudacris triseriata</u> (western chorus frog).....	x	--
<u>Hyla crucifer</u> (northern spring peeper).....	--	x
<u>Rana clamitans</u> (green frog).....	x	--
<u>Rana pipiens</u> (northern leopard frog).....	--	x
<b>Reptilia</b>		
<u>Chelydra serpentina</u> (common snapping turtle).....	x	--
<u>Sternotherus odoratus</u> (musk turtle).....	x	--
<u>Emydoidea blandingi</u> <sup>b</sup> (Blanding's turtle).....	--	x
<u>Chrysemys picta</u> (painted turtle).....	x	--
<u>Heterodon platyrhinos</u> <sup>c</sup> (eastern hognose snake)....	--	x
<u>Opheodrys vernalis</u> <sup>c</sup> (smooth green snake).....	--	x
<u>Elaphe vulpina</u> <sup>c</sup> (western fox snake).....	--	x
<u>Lampropeltis triangulum</u> <sup>c</sup> (eastern milk snake)....	--	x
<u>Thamnophis butleri</u> <sup>c</sup> (Butler's garter snake).....	x	--
<u>Thamnophis radix</u> (eastern plains garter snake)....	x	--
<u>Thamnophis sirtalis</u> <sup>c</sup> (eastern garter snake).....	x	--
<u>Storeria dekayi</u> (brown snake).....	x	--
<u>Storeria occipitomaculata</u> <sup>c</sup> (northern red-bellied snake).....	x	--
<u>Nerodia sipedon</u> (northern water snake).....	x	--

NOTE: The Fowler's toad (Bufo woodhousei) has not been identified as occurring in Wisconsin. However, it has been collected at Illinois Beach State Park, just south of the study area, in similar habitats, and therefore could be present in the study area.

<sup>a</sup> Identified as endangered in Wisconsin.

<sup>b</sup> Identified as threatened in Wisconsin.

<sup>c</sup> On watch status in Wisconsin.

Source: The Nature Conservancy; Richard C. Vogt, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 1981; Edwin D. Pentecost and Richard C. Vogt, "Amphibians and Reptiles of the Lake Michigan Drainage Basin," Environmental Status of the Lake Michigan Region, Vol. 16, Argonne National Laboratory, July 1976; and SEWRPC.

distances of a mile or more from wintering sites to breeding sites to summer foraging grounds. The same pathways are used each year, and if species are to be maintained in the watershed, these pathways must be preserved.

Certain amphibians and reptiles are particularly susceptible to changes in food sources brought about by urbanization. The western fox snake (Elaphe vulpina) and eastern milk snake (Lampropeltis triangulum), for example, may be lost over time to the study area because of the reduction of rodents, their potential prey.

A single endangered amphibian species, Blanchard's cricket frog (Acris crepitans), was recorded at the Chiwaukee Prairie by Dr. Richard C. Vogt on July 2, 1976. Populations of Blanchard's cricket frog have drastically declined in



recent years.<sup>2</sup> However, the reasons for this decline are unknown. It has been suggested that the use of pesticides and water pollution may be major factors.<sup>3</sup> Cricket frogs prefer marshes located adjacent to rivers and their floodplains, and low prairies.

Blanding's turtle (Emydoidea blandingi), identified as threatened in Wisconsin, was recorded at the Chiwaukee Prairie by Mr. Robert C. Ahrenhoerster in June 1982. Blanding's turtle populations have declined in Wisconsin as a result of habitat loss, as well as over-collection.<sup>4</sup> This semi-aquatic turtle prefers open grassy marshes, prairie potholes, mesic prairies, back-water sloughs, shallow slow-moving rivers, and shallow lakes.<sup>5</sup>

Fowler's toad (Bufo woodhousei) has not been identified as occurring in Wisconsin. However, it is discussed herein because this species of toad is commonly found at Illinois Beach State Park, just south of the study area, in similar habitats, according to the Illinois Coastal Zone Biological Inventory. Although, Dr. Vogt did look for Fowler's toad at the Chiwaukee Prairie on July 1 and 2, 1970, without finding it,<sup>6</sup> it could be present in the study area. Fowler's toad commonly occurs in sand dunes, oak openings with sandy soils, and dry prairies.

Five species of snakes--smooth green snake (Opheodrys vernalis), western fox snake (Elaphe vulpina), eastern milk snake (Lampropeltis triangulum), eastern garter snake (Thamnophis sirtalis), and the northern red-bellied snake (Storeria occipitomaculata)--which occur in the study area have shown moderate declines in population and distribution within the State.<sup>7</sup> Although not considered to be rare, endangered, or threatened, these five species of snakes have been identified as Wisconsin watch list species because of this decline. Much of the decline is likely due to loss of habitat and/or the use of pesticides.

The eastern hognose snake (Heterodon platyrhinos), which occurs in the study area, has also experienced a significant decline in population and distribution within the State and is presently designated as a Wisconsin watch list

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<sup>2</sup>Richard C. Vogt, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 1981.

<sup>3</sup>Sherman A. Minton, Jr., "Amphibians and Reptiles of Indiana," Indiana Academy of Science Monographs; Edwin D. Pentecost and Richard C. Vogt, "Amphibians and Reptiles of the Lake Michigan Drainage Basin," Environmental Status of the Lake Michigan Region, Vol. 16, Argonne National Laboratory, July 1976; Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979; Richard C. Vogt, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 1981.

<sup>4</sup>Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979.

<sup>5</sup>Richard C. Vogt, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 1981.

<sup>6</sup>Ibid.

<sup>7</sup>Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979.



species. The decline in hognose snake populations has been attributed to over-collection and their extreme sensitivity to pesticides and herbicides.<sup>8</sup>

Finally, good populations of Butler's garter snake still occur in the study area. Butler's garter snake is at the extreme northwest limit of its range in southeastern Wisconsin, and is essentially isolated from other Midwest populations. Because of its limited distribution in Wisconsin and the loss of its habitat, this snake is also on the Wisconsin watch species list.

As noted in Table A-12, five species of amphibians and nine species of reptiles could be expected to be reduced or dispersed with full urbanization of the study area. In addition, it is anticipated that two species of amphibians and five species of reptiles would be lost within the study area as a result of full urbanization. The loss and/or reduction of the one endangered, one threatened, and seven Wisconsin watch list species could significantly affect the statewide status of these species.

Birds: Approximately 161 species of birds have been recorded in the Chiwaukee Prairie and the near-shore area of Lake Michigan adjacent to the study area. Bird species ranging in size from the large sandhill crane (Grus canadensis) to small songbirds such as the sedge wren (Cistothorus platensis) are found in the Chiwaukee Prairie-Carol Beach study area. Table A-13 lists those birds that normally occur in the study area. Each bird is classified as to whether it breeds or occurs in summer within the study area, only visits the study area during the annual migration periods, or only visits the study area during the winter.

Of the 161 species of birds occurring in the study area, 106 species, or 66 percent, are known to form a resident and/or breeding population. With full urbanization, up to 81 species, or 76 percent of the resident breeding bird species, may be reduced in number or lost within the study area.

Three species of birds--peregrine falcon (Falco peregrinus), osprey (Pandion haliaetus), and Forster's tern (Sterna forsteri)--which occur in the study area are on the Wisconsin endangered species list.

The peregrine falcon, which is also listed as a federally endangered species, and the osprey occur in the study area during the spring and fall migration periods. The peregrine falcon has experienced a significant decline in its population due mainly to the use of pesticides. However, human disturbance and loss of habitat--cliffs and rocky ledges--have also contributed to this decline.<sup>9</sup> The osprey has experienced significant declines in population as a result of the use of pesticides, predation, human disturbance, and the loss of suitable nesting habitat--treetops adjacent to water bodies.<sup>10</sup> Since

<sup>8</sup>Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979; Richard C. Vogt, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 1981.

<sup>9</sup>Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979.

<sup>10</sup>Ibid.

Table A-13

**BIRDS OF THE CHIWAUKEE  
PRAIRIE-CAROL BEACH STUDY AREA**

Scientific (family) and Common Name	Resident/ Breeding	Wintering	Migrant
Podicipedidae			
Pied-billed grebe.....	x	--	x
Ardeidae			
Great blue heron <sup>a</sup> .....	x <sup>i</sup>	--	--
Green-backed heron.....	x <sup>h</sup>	--	--
American bittern.....	x <sup>g</sup>	--	--
Least bittern.....	x <sup>g</sup>	--	--
Anatidae			
Canada goose.....	--	--	x
Mallard.....	x <sup>h</sup>	x <sup>h</sup>	--
Green-winged teal.....	--	--	x
Blue-winged teal.....	x <sup>g</sup>	--	--
Wood duck.....	x <sup>g</sup>	--	--
Greater scaup.....	--	x	x
Lesser scaup.....	--	--	x
Common goldeneye.....	--	x	x
Oldsquaw.....	--	x	x
Red-breasted merganser <sup>a</sup> .....	x	--	x
Cathartidae			
Turkey vulture.....	--	--	x
Accipitridae			
Goshawk.....	--	--	x
Sharp-shinned hawk.....	--	--	x
Cooper's hawk <sup>b</sup> .....	--	--	x
Red-tailed hawk.....	x <sup>g</sup>	x <sup>g</sup>	--
Red-shouldered hawk <sup>b</sup> .....	--	--	x
Broad-winged hawk.....	--	--	x
Rough-legged hawk.....	--	x	x
Northern harrier <sup>a</sup> .....	x <sup>g</sup>	--	--
Pandionidae			
Osprey <sup>c</sup> .....	--	--	x
Falconidae			
Peregrine falcon <sup>c d</sup> .....	--	--	x
Merlin <sup>a</sup> .....	--	--	x
American kestrel.....	x <sup>h</sup>	x <sup>h</sup>	--
Phasianidae			
Common bobwhite.....	--	--	x <sup>f</sup>
Ring-necked pheasant <sup>e</sup> .....	x <sup>h</sup>	x <sup>h</sup>	--
Gruidae			
Sandhill crane.....	x <sup>g</sup>	--	--
Rallidae			
King rail.....	x <sup>g</sup>	--	--
Virginia rail.....	x <sup>g</sup>	--	--
Sora.....	x <sup>g</sup>	--	--
American coot.....	x <sup>g</sup>	--	--
Charadriidae			
Killdeer.....	x <sup>h</sup>	--	--
Scolopacidae			
American woodcock.....	x <sup>g</sup>	--	--
Common snipe.....	x <sup>g</sup>	--	--
Upland sandpiper <sup>a</sup> .....	x <sup>g</sup>	--	--
Spotted sandpiper.....	x <sup>h</sup>	--	--
Greater yellowlegs.....	--	--	x
Lesser yellowlegs.....	--	--	x
Laridae			
Herring gull.....	x <sup>i</sup>	x	x
Ring-billed gull.....	x <sup>i</sup>	x	x
Forster's tern <sup>c</sup> .....	x <sup>g</sup>	--	x
Black tern <sup>a</sup> .....	x <sup>f g</sup>	--	--
Columbidae			
Rock dove <sup>e</sup> .....	x	--	--
Mourning dove.....	x	--	--
Cuculidae			
Yellow-billed cuckoo.....	x <sup>g</sup>	--	--
Black-billed cuckoo.....	x <sup>g</sup>	--	--
Strigidae			
Eastern screech-owl.....	x <sup>h</sup>	x <sup>h</sup>	--
Great horned owl.....	x	x <sup>f</sup>	--
Snowy owl.....	--	x <sup>f</sup>	--
Short-eared owl.....	x <sup>i</sup>	--	x
Caprimulgidae			
Whippoorwill.....	x <sup>i</sup>	--	x
Common nighthawk.....	x	--	--

Table A-13 (continued)

Scientific (family) and Common Name	Resident/ Breeding	Wintering	Migrant
Apodidae			
Chimney swift.....	x	--	--
Trochilidae			
Ruby-throated hummingbird.....	x	--	--
Alcedinidae			
Belted kingfisher.....	x <sup>h</sup>	--	--
Picidae			
Northern flicker <sup>a</sup> .....	x <sup>h</sup>	--	--
Red-bellied woodpecker.....	x <sup>h</sup>	--	--
Red-headed woodpecker.....	x <sup>h</sup>	--	--
Yellow-bellied sapsucker.....	--	--	x
Hairy woodpecker.....	x <sup>h</sup>	--	--
Downy woodpecker.....	x <sup>h</sup>	--	--
Tyrannidae			
Eastern kingbird.....	x <sup>h</sup>	--	--
Great crested flycatcher.....	x <sup>h</sup>	--	--
Eastern phoebe.....	x <sup>g</sup>	--	--
Yellow-bellied flycatcher.....	--	--	x <sup>f</sup>
Acadian flycatcher.....	x <sup>g</sup>	--	--
Least flycatcher.....	x <sup>g</sup>	--	--
Willow flycatcher.....	x <sup>g</sup>	--	--
Eastern wood-pewee.....	x <sup>h</sup>	--	--
Olive-sided flycatcher.....	--	--	x
Alaudidae			
Horned lark.....	x <sup>g</sup>	--	--
Hirundinidae			
Tree swallow.....	x <sup>h</sup>	--	--
Bank swallow.....	x <sup>h</sup>	--	--
Northern rough-winged swallow....	x <sup>h</sup>	--	--
Barn swallow.....	x <sup>h</sup>	--	--
Cliff swallow.....	x <sup>g</sup>	--	--
Purple martin.....	x <sup>h</sup>	--	--
Corvidae			
Blue jay.....	x	--	--
American crow.....	x	--	--
Paridae			
Black-capped chickadee.....	x <sup>h</sup>	--	--
Sittidae			
White-breasted nuthatch.....	x <sup>h</sup>	--	--
Red-breasted nuthatch.....	--	x	x
Certhiidae			
Brown creeper.....	--	x	x
Troglodytidae			
House wren.....	x	--	--
Winter wren.....	--	--	x
Marsh wren.....	x <sup>g</sup>	--	--
Sedge wren.....	x <sup>g</sup>	--	--
Mimidae			
Northern mockingbird.....	x <sup>f</sup>	--	--
Gray catbird.....	x <sup>h</sup>	--	--
Brown thrasher.....	x <sup>h</sup>	--	--
Muscicapidae			
American robin.....	x	--	--
Wood thrush.....	x <sup>h</sup>	--	--
Hermit thrush.....	--	--	x
Gray-cheeked thrush.....	--	--	x
Veery.....	x <sup>f g</sup>	--	--
Eastern bluebird <sup>a</sup> .....	x <sup>g</sup>	--	--
Golden-crowned kinglet.....	--	x	x
Ruby-crowned kinglet.....	--	--	x
Bombycillidae			
Cedar waxwing.....	x	--	--
Sturnidae			
European starling <sup>e</sup> .....	x	--	--
Vireonidae			
Red-eyed vireo.....	x <sup>h</sup>	--	--
Philadelphia vireo.....	--	--	x
Warbling vireo.....	x <sup>h</sup>	--	--
Emberizidae			
Black-and-white warbler.....	x <sup>f g</sup>	--	--
Blue-winged warbler.....	x <sup>g</sup>	--	--
Orange-crowned warbler.....	--	--	--

Table A-13 (continued)

Scientific (family) and Common Name	Resident/ Breeding	Wintering	Migrant
Emberizidae (continued)			
Nashville warbler.....	--	--	x
Yellow warbler.....	x <sup>h</sup>	--	--
Magnolia warbler.....	--	--	x
Cape may warbler.....	--	--	x
Yellow-rumped warbler.....	--	--	x
Black-throated green warbler.....	--	--	x
Blackburnian warbler.....	--	--	x
Chestnut-sided warbler.....	x <sup>f g</sup>	--	--
Blackpoll warbler.....	--	--	x
Palm warbler.....	--	--	x
Ovenbird.....	x	--	--
Northern waterthrush.....	--	--	x
Connecticut warbler.....	--	--	x
Common yellowthroat.....	x <sup>h</sup>	--	--
Wilson's warbler.....	--	--	x
American redstart.....	x <sup>f g</sup>	--	--
Bobolink.....	x <sup>g</sup>	--	--
Eastern meadowlark.....	x <sup>g</sup>	--	--
Western meadowlark.....	x <sup>g</sup>	--	--
Yellow-headed blackbird.....	x <sup>g</sup>	--	--
Red-winged blackbird.....	x <sup>h</sup>	--	--
Northern oriole.....	x	--	--
Rusty blackbird.....	--	--	x
Brewer's blackbird.....	x <sup>g</sup>	--	--
Common grackle.....	x	--	--
Brown-headed cowbird.....	x <sup>h</sup>	--	--
Scarlet tanager.....	x <sup>g</sup>	--	--
Northern cardinal.....	x	--	--
Rose-breasted grosbeak.....	x <sup>h</sup>	--	--
Indigo bunting.....	x <sup>h</sup>	--	--
Dickcissel <sup>a</sup> .....	x <sup>g</sup>	--	--
Rufous-sided towhee.....	x <sup>g</sup>	--	--
Savannah sparrow.....	x <sup>g</sup>	--	--
Grasshopper sparrow <sup>a</sup> .....	x <sup>g</sup>	--	--
Henslow's sparrow.....	x <sup>g</sup>	--	--
Vesper sparrow <sup>a</sup> .....	x <sup>g</sup>	--	--
Dark-eyed junco.....	--	x	x
American tree sparrow.....	--	x	x
Chipping sparrow.....	x	--	--
Field sparrow <sup>a</sup> .....	x <sup>g</sup>	--	--
White-crowned sparrow.....	--	--	x
White-throated sparrow.....	--	--	x
Fox sparrow.....	--	--	x
Swamp sparrow.....	x <sup>g</sup>	--	--
Song sparrow.....	x <sup>h</sup>	--	--
Snow bunting.....	--	x <sup>f</sup>	x
Purple finch.....	--	x	x
Common redpoll.....	--	x	x
Pine siskin.....	--	x	x
American goldfinch.....	x	--	--
Passeridae			
House sparrow <sup>e</sup> .....	x	--	--

<sup>a</sup>On watch status in Wisconsin.<sup>b</sup>Threatened in Wisconsin.<sup>c</sup>Endangered in Wisconsin.<sup>d</sup>Endangered in the United States.<sup>e</sup>Introduced in North America.<sup>f</sup>Occasional or rare in the study area.<sup>g</sup>Species lost as a breeding population with full urbanization of the study area.<sup>h</sup>Species reduced as a breeding population with full urbanization of the study area.<sup>i</sup>Nonbreeding resident.

Source: Wisconsin Department of Natural Resources; The Nature Conservancy;  
 Texas A&I University; John E. Bielefeldt, Ornithologist; James A.  
 Hamers, Area birdwatcher; and SEWRPC.

habitats of these types do not occur in the study area, urbanization of the Carol Beach area would probably have little effect on the statewide status of these raptors.

Several individual Forster's terns were recorded at the Chiwaukee Prairie on May 1, 1984, by the staff of the U. S. Army Corps of Engineers, the Wisconsin Department of Natural Resources, and the Commission. The Commission staff and local birdwatchers have also reported observing Forster's terns in the study area during the mid- and late-summer months. The occurrence of this endangered tern through the summer months indicates that it may be nesting within or near the study area. Populations of Forster's terns have declined in Wisconsin because of wetland loss, disturbance of nesting sites, and water level changes during nesting periods. Forster's terns prefer marsh habitats that are isolated from developed areas.<sup>11</sup> Maintenance of large tracts of marsh habitat should ensure suitable nesting habitat for these birds.

Two species of birds, the red-shouldered hawk (Buteo lineatus) and Cooper's hawk (Accipiter cooperii), which occur as migrants in the study area, are identified as threatened species in Wisconsin. The decline of red-shouldered hawks in Wisconsin is probably due to the loss of breeding habitat--large tracts of woods, usually located near water, with little human disturbance.<sup>12</sup> Cooper's hawk declines have been attributed to the use of insecticides, persecution, and the loss of forest habitat.<sup>13</sup> Since habitat of this type does not occur in the study area, urbanization of the Carol Beach area would probably have little effect on the statewide status of these hawks.

Eleven species of resident/breeding birds--great blue heron (Ardea herodias), red-breasted merganser (Mergus serrater), northern harrier (Circus cyaneus), upland sandpiper (Bartramia longicauda), black tern (Chlidonias niger), northern flicker (Colaptes auratus), eastern bluebird (Sialia sialis), dickcissel (Spiza americana), grasshopper sparrow (Ammodramus savannarum), vesper sparrow (Poocetes gramineus), and field sparrow (Spizella pusilla)--which occur in the study area are on the Wisconsin watch species list because of statewide declines in their populations or loss of suitable nesting habitat.<sup>14</sup> Maintenance of suitable marsh, wet prairie, and dune/swale habitat should ensure viable populations of these bird species within the study area, as well as contribute to the development of stable populations in other areas of the Lake Michigan coastal zone.

Finally, the merlin (Falco columbarius) occurs in the study area during the spring and fall migration periods. The merlin has experienced long-term population declines in the past. The reasons for the low population of this bird are unclear. Because of the past decline in population, the merlin is also on the Wisconsin watch species list.

<sup>11</sup>Ibid.

<sup>12</sup>John E. Bielefeldt, Ornithologist, Personal communication, January 1984.

<sup>13</sup>Betty L. Les, The Vanishing Wild: Wisconsin's Endangered Wildlife and Its Habitat, Wisconsin Department of Natural Resources, 1979.

<sup>14</sup>Ibid.

Because of the mixture of lowland and upland woodlots, shrub areas, wet meadows, marshes, and prairies still present in the study area, along with the favorable summer climate, the study area supports a wide variety of bird species, which in turn serve a variety of functions. The hawks (Accipitridae and Falconidae) and owls (Strigidae) function as major rodent predators within the ecosystem. Swallows (Hirundinidae), woodpeckers (Picidae), nuthatches (Sittidae), and flycatchers (Tyrannidae), as well as several other species, serve as major insect predators. In addition to their ecological roles, birds such as great blue herons, sandhill cranes, American robins (Turdus migratorius), red-winged blackbirds (Agelaius phoeniceus), northern orioles (Icterus galbula), northern cardinals (Cardinalis cardinalis), belted kingfishers (Ceryle alcyon), and mourning doves (Zenaida macroura) are subjects of popular interest for birdwatchers, photographers, and much of the general public.

Game birds which are found in the study area include ring-necked pheasant (Phasianus colchicus), American woodcock (Scolopax minor), common snipe (Gallinago gallinago), rails (Rallidae), dabbling and diving ducks (Anatidae), American coot (Fulica americana), and geese (Anatidae). Pheasant and woodcock are essentially upland game birds and provide some opportunities for hunting. Waterfowl populations, particularly those of the mallard (Anas platyrhynchos), are fairly large and provide good opportunities for hunting.

With the increase in urbanization of the study area, not only will the quantity and quality of suitable habitat for game species decline, but the potential for hunter/resident conflicts will increase. With full urbanization of the study area, hunting privileges can be expected to be eliminated.

Not all birds are viewed as an asset from an ecological, economic, or social point of view. With the advance of urbanization and, therefore, the loss of natural habitat, conditions may be expected to become less compatible for the more desirable bird species. House sparrows (Passer domesticus), European starlings (Sturnus vulgaris), common grackles (Quiscalus quiscula), and pigeons (Columba livia) will likely replace the more desirable birds in the study area because of their great tolerance for urban conditions. Even the red-winged blackbird is beginning to feel the urban impact as wetland areas, particularly cat-tail marshes, are drained or filled throughout the Lake Michigan coastal zone in southeastern Wisconsin.

**Mammals:** A variety of mammals, ranging in size from large animals like the northern white-tailed deer (Odocoileus virginianus) to small animals like the cinereous shrew (Sorex cinereus) are found in the Chiwaukee Prairie-Carol Beach study area. Table A-14 lists 32 mammals whose range is known to extend into the study area.

None of the mammal species identified in the study area are considered to be endangered or threatened in Wisconsin. However, the gray fox (Urocyon cinereoargenteus) is a Wisconsin watch list species because of its long-term decrease in population, the reasons for which are unclear.<sup>15</sup> In addition, two other

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<sup>15</sup> Ibid.



Table A-14

## MAMMALS OCCURRING IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA

Scientific and Common Name	Species Significantly Reduced or Lost With Full Urbanization	Species Showing Insignificant Decline or Increase with Full Urbanization	Species Likely to Significantly Increase With Full Urbanization
<b>Didelphidae</b>			
<i>Didelphis marsupialis</i> --Common opossum..	--	--	x
<b>Insectivora</b>			
<i>Sorex cinereus</i> --Cinereous shrew.....	x	--	--
<i>Blarina brevicauda</i> --			
Short-tailed shrew.....	--	x	--
<b>Chiroptera</b>			
<i>Myotis lucifugus</i> --Little brown bat.....	x	--	--
<i>Lasiorycteris noctivagans</i> --			
Silver-haired bat.....	x	--	--
<i>Eptesicus fuscus</i> --Big brown bat.....	x	--	--
<i>Lasiurus borealis</i> --Red bat.....	x	--	--
<i>Lasiurus cinereus</i> --Hoary bat.....	x	--	--
<b>Lagomorpha</b>			
<i>Salvialagus floridanus</i> --			
Mearns's cottontail.....	--	--	x
<b>Rodentia</b>			
<i>Marmota monax</i> --Southern woodchuck.....	--	--	x
<i>Citellus tridecemlineatus</i> --			
Striped ground squirrel.....	--	x	--
<i>Citellus franklinii</i> --			
Franklin's ground squirrel.....	x	--	--
<i>Tamias striatus</i> --Ohio chipmunk.....	--	x	--
<i>Sciurus carolinensis</i> --			
Minnesota gray squirrel.....	--	--	x
<i>Peromyscus maniculatus</i> --			
Prairie deer mouse.....	x	--	--
<i>Peromyscus leucopus</i> --			
Northern white-footed mouse.....	--	x	--
<i>Microtus pennsylvanicus</i> --			
Meadow vole.....	x	--	--
<i>Microtus ochrogaster</i> --Prairie vole.....	x	--	--
<i>Ondatra zibethicus</i> --Common muskrat.....	x	--	--
<i>Rattus norvegicus</i> <sup>a</sup> --Norway rat.....	--	--	x
<i>Mus musculus</i> <sup>a</sup> --House mouse.....	--	--	x
<i>Zapus hudsonius</i> --			
Intermediate meadow jumping mouse.....	x	--	--
<b>Carnivora</b>			
<i>Canis latrans</i> --Northeastern coyote.....	--	x	--
<i>Vulpes fulva</i> --Eastern red fox.....	--	x	--
<i>Urocyon cinereoargenteus</i> <sup>b</sup> --			
Wisconsin gray fox.....	x	--	--
<i>Procyon lotor</i> --Raccoon.....	--	--	x
<i>Mustela pexosa</i> --			
Allegheny least weasel.....	x	--	--
<i>Mustela frenata</i> --			
New York long-tailed weasel.....	x	--	--
<i>Mustela vison</i> --Mink.....	x	--	--
<i>Taxidea taxus</i> --Jackson's badger.....	x	--	--
<i>Mephitis mephitis</i> --			
Northern plains skunk.....	--	--	x
<b>Artiodactyla</b>			
<i>Odocoileus virginianus</i> --			
Northern white-tailed deer	--	x	--

<sup>a</sup> Alien or nonnative species.<sup>b</sup> On watch status in Wisconsin.

Source: Wisconsin Department of Natural Resources, The Nature Conservancy, and SEWRPC.

species of mammals which occur in the study area--the prairie vole (Microtus ochrogaster) and Franklin's ground squirrel (Citellus franklinii)--have been identified as uncommon to rare in the Lake Michigan drainage basin.<sup>16</sup>

It is estimated that 17, or 53 percent, of the mammal species present in the study area would decline or be lost with full urbanization, including the gray fox, prairie vole, and Franklin's ground squirrel. Also, about eight, or 25 percent, of the mammal species would experience population increases. Notably, those mammals experiencing increased populations would tend to be the pest species, such as the Norway rat (Rattus norvegicus), house mouse (Mus musculus), raccoon (Procyon lotor), and northern plains skunk (Mephitis mephitis). These four mammal species are also known to be disease vectors. In addition, populations of the common opossum (Didelphis marsupialis), southern woodchuck (Marmota monax), Minnesota gray squirrel (Sciurus carolinensis), and Mearn's cottontail (Salvilagus floridanus), which may be considered by some to be pest species while others may find them aesthetically pleasing, would also likely increase. The populations of the remaining seven mammal species could be expected to show no effect or to exhibit only a slight decline or increase as a result of full urbanization.

## CONCLUSIONS

In summary, a total of 214 game and nongame wildlife species, including 7 species of amphibians, 14 species of reptiles, 161 species of birds of which 106 species are resident or breeding birds, and 32 species of mammals, are known or likely to occur within the Chiwaukee Prairie-Carol Beach study area. Of these 214 species, 4 are identified as endangered in Wisconsin and 3 are identified as threatened in Wisconsin. In addition, 20 species occurring in the study area are on the Wisconsin watch list and two species have been identified as rarely occurring in the Lake Michigan drainage basin.

Because of the Chiwaukee Prairie-Carol Beach study area's location along the Mississippi Flyway, the area provides important habitat for the interstate and international migration of birds. As such, the study area contributes to the populations, and thus the gene pools, of wildlife habitat areas throughout the Flyway.

The maintenance of 702 acres of wildlife habitat, of which approximately 566 acres, or 81 percent, are identified as wetland, is essential to both the short-term and long-term survival and viability of the majority of game and nongame species occurring within the study area. The study area provides the last essentially undisturbed habitat of this type along the entire western shore of Lake Michigan.

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<sup>16</sup>Charles A. Long, "Mammals of the Lake Michigan Drainage Basin," Environmental Status of the Lake Michigan Region, Vol. 15, Argonne National Laboratory, May 1974.

## Appendix A-7

### ANALYSIS OF WETLANDS IN THE CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA: CRITERION G--AREAS OF SPECIAL RECREATIONAL, SCENIC, OR SCIENTIFIC INTEREST, INCLUDING SCARCE WETLAND TYPES

#### INTRODUCTION

Criterion g of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the rezoning may have a significant adverse impact upon areas of special recreational, scenic, or scientific interest, including scarce wetland types. Many wetland tracts in the Chiwaukee Prairie-Carol Beach study area possess special scientific and recreational values. Areas of special scientific interest in the study area--in addition to the wildlife habitat areas identified in Appendix A-6--include critical plant habitat areas where several Wisconsin rare, threatened, or endangered plant species have been identified; natural areas containing intact plant community assemblages which closely resemble the pre-European settlement landscape; and archaeological sites consisting of early American Indian village sites and campsites. Owing to its abundance of natural and scientific features, the study area is particularly well suited for certain special recreational pursuits--particularly nature study and nature photography. An analysis of areas of special scientific and recreational interest is presented herein.

#### ANALYSIS

##### Areas of Special Scientific Interest

Critical Plant Habitat: Critical plant habitat areas were identified in the Chiwaukee Prairie-Carol Beach study area using site locations for 18 Wisconsin rare, threatened, and endangered plant species known to occur in the study area. These species are listed in Table A-15.

These 18 plant species are known to occur in the study area based on site records provided by the Wisconsin Department of Natural Resources-Scientific Areas Section, The Nature Conservancy, and the University of Wisconsin; field studies conducted by the Commission staff; and a polling of botanists and naturalists familiar with the area.

To determine the areal extent of critical plant habitat areas within the study area, all known sites of the 18 species of plants considered to be rare, threatened, or endangered in Wisconsin were mapped. The mapped sites were field checked to determine the integrity of the habitat and the status of the plant species concerned. Those areas which were determined to be suitable for the long-term maintenance of the rare, endangered, or threatened species were mapped (see Map A-8).

Table A-15

WISCONSIN ENDANGERED, THREATENED,  
AND RARE PLANT SPECIES PRESENT IN THE  
CHIWAUKEE PRAIRIE-CAROL BEACH STUDY AREA

Endangered Plant Species

Fimbristylis puberula--Chestnut sedge  
Phlox glaberrima--Smooth phlox  
Polygala incarnata--Pink milkwort

Threatened Plant Species

Habenaria (Platanthera) leucophaea<sup>a</sup>--Prairie white-fringed orchid  
Tofieldia glutinosa--False asphodel

Watch List Plant Species Pending  
Designation as Endangered or Threatened Species

Asclepias purpurascens<sup>b</sup>--Purple milkweed  
Gerardia skinneriana<sup>b</sup>--Pale false foxglove  
Cacalia tuberosa<sup>c</sup>--Prairie Indian plantain  
Calamovilfa longifolia<sup>c</sup>--Sand reed  
Gerardia gattingeri<sup>c</sup>--Round-stemmed false foxglove

Watch List Plant Species<sup>d</sup>

Carex crawei--Sedge  
Carex richardsonii--Sedge  
Coreopsis lanceolata--Sand coreopsis  
Liatris spicata--Spiked blazing star  
Satureja akansana--Low calamint  
Scleria triglomerata--Tall nut-rush  
Scleria verticillata--Low nut-rush  
Solidago ohioensis--Ohio goldenrod

NOTE: Two additional threatened species--Asclepias sullivantii (prairie milkweed) and Cypripedium candidum (white lady's-slipper orchid)--have also been reported in the study area, but these reports are unconfirmed.

<sup>a</sup> Plant species presently under review by the U. S. Fish and Wildlife Service for listing as a federal threatened species.

<sup>b</sup> Proposed for listing as a Wisconsin endangered plant species.

<sup>c</sup> Proposed for listing as a Wisconsin threatened plant species.

<sup>d</sup> Watch list plant species were identified using the Wisconsin Department of Natural Resources Technical Bulletin No. 92, "Endangered and Threatened Vascular Plants in Wisconsin," by Robert H. Read, 1976.

Source: Wisconsin Department of Natural Resources and SEWRPC.

A total of 595 acres of critical plant habitat areas were identified in the Chiwaukee Prairie-Carol Beach study area. Approximately 505 acres, or 85 percent of the total critical plant habitat area, are identified as wetland. The remaining 90 acres, or 15 percent, are identified as upland.

Natural and Scientific Areas: Natural areas, as defined by the Wisconsin Scientific Areas Preservation Council, are tracts of land or water so little modified by man's activity, or which have sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape. Natural area sites are ranked into one of the following three categories: natural area of statewide or greater significance, natural area of countywide or regional significance, and natural area of local significance.

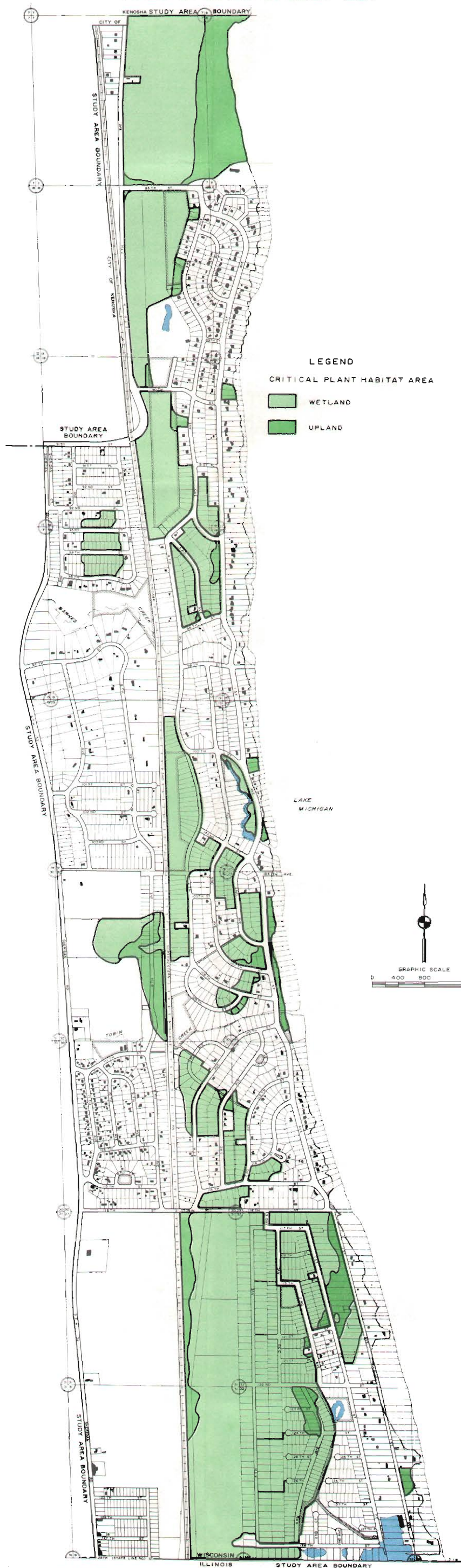
The ranking of a natural area into one of these three categories is based upon consideration of the diversity of plant and animal species and community types present; the structure and integrity of the native plant or animal community; the extent of disturbance from man's activity such as logging, grazing, water level changes, and pollution; the commonness of the plant and animal communities present; any unique natural features within the area; the size of the area; and the educational value. More specifically, the three types of natural areas are defined as follows:

1. Natural areas of statewide or greater significance (NA-1) are those natural areas which have not been significantly modified by man's activity or have sufficiently recovered from the effects of such activity so as to contain nearly intact native plant and animal communities which are believed to be representative of the pre-European settlement landscape, but which have not yet been classified as state scientific areas.
2. Natural areas of countywide or regional significance (NA-2) are those natural areas which have been slightly modified by man's activities, or which have sufficiently recovered from the effects of such activities so as to contain good examples of native plant and animal communities representative of the pre-European settlement landscape. These natural areas are of lesser significance because their quality is less than ecologically ideal and there is evidence of past or present disturbance, such as logging, grazing, water level changes as a result of ditching or filling, or pollution; the area may contain plant or animal community types commonly found in the Region, in which case only the best examples would qualify for state scientific area recognition; or the area may be too small to qualify as a state scientific area. These natural areas may serve local communities as educational sites or as passive recreational areas and ecological zones which lend naturalness to their surroundings. In addition, these natural areas, if protected in an undisturbed condition, may be expected to increase in value over time. Therefore, some of these areas may in the future become natural or scientific areas of statewide significance.
3. Natural areas of local significance (NA-3) are those natural areas which have been significantly modified by man's activities, but nevertheless retain a modest amount of natural cover. Such natural areas are suitable for local educational use. Natural areas of local significance may reflect the patterns of former vegetation, or serve as examples of the



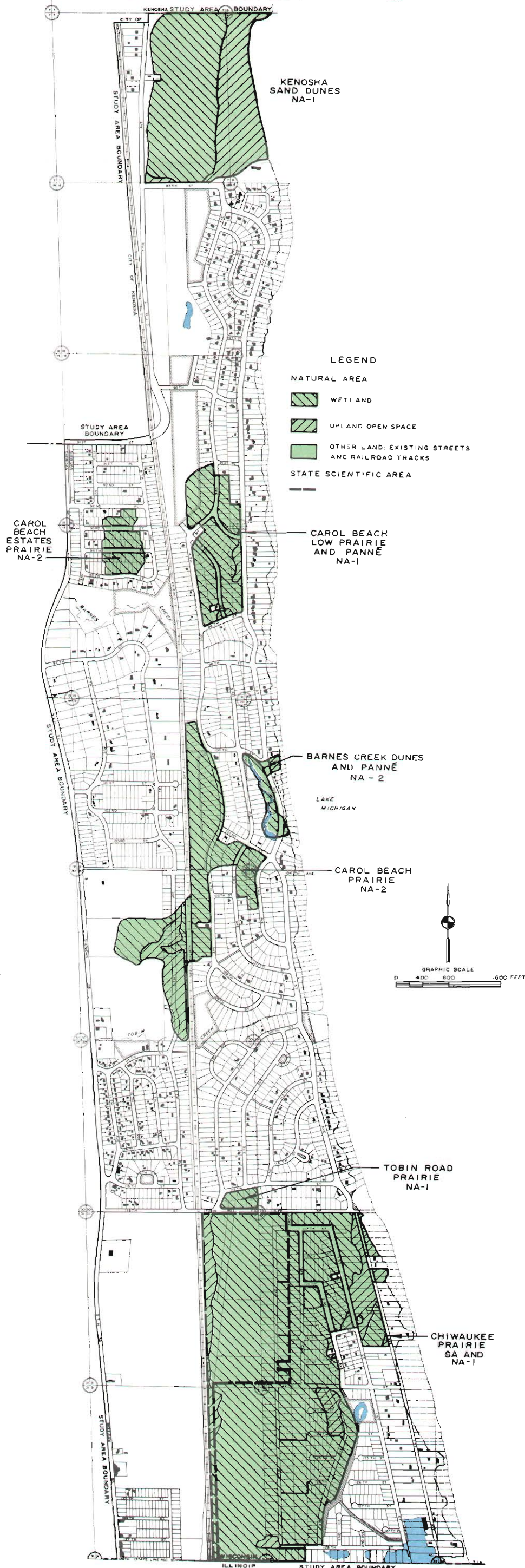
Map A-8

CRITICAL PLANT HABITAT AREAS IN  
THE CHIWAUKEE PRAIRIE-CAROL BEACH  
STUDY AREA: REVISED BASED ON  
FIELD STUDIES IN JULY 1984



Map A-9

NATURAL AND SCIENTIFIC AREAS IN  
THE CHIWAUKEE PRAIRIE-CAROL  
BEACH STUDY AREA: REVISED BASED  
ON FIELD STUDIES IN JULY 1984





influence of human settlements on vegetation. These natural areas may also be expected to increase in value if protected in an undisturbed condition.

Those natural areas which represent the best remaining examples of plant and animal communities, geological sites, or archaeological sites may be designated as state scientific areas (SA). These areas have been determined to be of at least statewide significance and have been so designated by the Scientific Areas Preservation Council.

The State Scientific Areas Preservation Council has designated one scientific area and identified and ranked seven natural areas totaling 491 acres within the study area. In addition, because of the botanical significance of the Chiwaukee Prairie State Scientific Area and its nationally recognized scientific value, the U. S. Department of the Interior has designated the area as a National Natural Landmark. Approximately 394 acres, or 80 percent, of the total scientific and natural areas are identified as wetland; and 2 acres, or less than 1 percent, are identified as open water. The remaining 95 acres, or 19 percent, are identified as upland, including existing roadways.

Specifically, 82 acres are included within the Chiwaukee Prairie State Scientific Area; a total of 404 acres<sup>1</sup> are identified as NA-1 and include the Chiwaukee Prairie, the Carol Beach low prairie and panne, the Kenosha Sand Dunes, and the Tobin Road Prairie; and a total of 87 acres are identified as NA-2 and include the Barnes Creek dunes and panne, the Carol Beach Estates prairie,<sup>2</sup> and the Carol Beach prairie. No NA-3 areas have been designated by the Scientific Areas Preservation Council within the study area.

A description of the scientific and natural areas within the Chiwaukee Prairie-Carol Beach study area is presented in Table 7 of Chapter II of this report, and the locations of these areas are shown on Map A-9.

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<sup>1</sup>This figure includes the entire area of the Chiwaukee Prairie natural area, including the 82-acre area which has been designated a state scientific area.

<sup>2</sup>Approximately 3.0 acres of the Carol Beach Estates prairie are included within the shoreland area. Most of this 3.0-acre area includes low prairie which has been invaded by, and is now dominated by, shrubs. Unless appropriate shrub control measures, including burn management, are applied to the entire prairie within the next few seasons, it is unlikely that the Carol Beach Estates prairie will retain its natural area and critical plant habitat values. In its present condition, the approximately 3.0-acre portion of the Carol Beach Estates prairie can be considered only as a buffer zone or area for potential restoration. Because the Carol Beach Estates prairie has been subdivided, placed into multiple land ownerships, and partially developed, it is unlikely that the prairie will be placed into a protective ownership which would facilitate the necessary management. Furthermore, because of the amount of development already present, the use of burn management within this natural area may no longer be practical. Accordingly, the significant values currently found in this prairie likely will be lost in the near future even if regulatory measures are taken to prevent further development of the land.

Scarce Wetland Types: Scarce wetland types in Wisconsin include bogs south of the vegetative tension zone,<sup>3</sup> calcareous fens, and low prairies. Furthermore, wetlands are considered to be scarce wetland types if they contain a plant community integrity and structure sufficient to be designated as a state scientific area; are ranked as significant natural areas (NA-1 or NA-2); and/or provide suitable habitat for endangered and threatened plant and animal species. In addition, scarce wetlands, as viewed from a wildlife management perspective, include those wetland areas important for waterfowl production and located along major migratory routes.<sup>4</sup> Wetlands, particularly important for waterfowl migration and production, include the deep and shallow marshes. Because of wetland draining and filling practices, shallow marshes which contribute to good-quality waterfowl production are becoming scarce, particularly in the southeastern portion of the State. Scarce wetlands important to the fishery resources within the State include estuarine wetlands adjacent to the Great Lakes and those groundwater recharge wetlands which augment the flow of small rivers and streams through groundwater discharge.<sup>5</sup>

The Chiwaukee Prairie-Carol Beach study area contains approximately 60 acres of calcareous fen and large tracts of low prairie. In addition, the integrity and structure of these two wetland types, as well as of the shallow marsh, sedge meadow, fresh (wet) meadow, and shrub carr wetland types, is such that, as mentioned above, approximately 394 acres, or 53 percent of the wetlands within the study area, are ranked as significant natural areas or designated as a state scientific area.

The study area supports seven state endangered and five state threatened animal and plant species. Also, five additional plant species which occur in the study area are pending designation as state endangered or threatened species. Four state endangered species--Blanchard's cricket frog (Acris crepitans blanchardi), Forster's tern (Sterna forsteri), chestnut sedge (Fimbristylis puberula), and smooth phlox (Phlox glaberrima)--three state threatened species--Blanding's turtle (Emydoidea blandingi), prairie white-fringed orchid (Habenaria leucophaea), and false asphodel (Tofieldia glutinosa)--and three of the pending state endangered or threatened species--purple milkweed (Asclepias purpurascens), pale false foxglove (Gerardia skinneriana), and prairie Indian plantain (Cacalia tuberosa)--are dependent for all or a portion of their life cycles on the wetland habitat present within the study area. In addition, the study area contains the only known state population of chestnut sedge, and contains the largest Midwest population of prairie white-fringed orchid.

The Chiwaukee Prairie-Carol Beach study area also contains an extensive system of swales which contain stands of shallow marsh and some deep marsh habitat.

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<sup>3</sup>The tension zone is a theoretical band which crosses the State of Wisconsin from about Milwaukee County to Polk County, and represents the range limits of 182 species of vascular plants.

<sup>4</sup>John F. Wetzel, Migratory Bird Specialist, Wisconsin Department of Natural Resources, Personal communication, August 1984.

<sup>5</sup>George Boronow, Wisconsin Department of Natural Resources Area Fish Manager for Kenosha, Racine, and Walworth Counties, Personal communication, August 1984.

In addition to their migratory waterfowl habitat role, these wetlands provide for good levels of waterfowl production within the study area.<sup>6</sup>

Estuarine wetlands, important to the Great Lakes fishery, do not occur within the Chiwaukee Prairie-Carol Beach study area. However, as noted in Appendix A-2, some localized areas of wetland within the study area may serve as groundwater recharge areas which augment streamflows within the study area. Such wetland areas are important for the maintenance of the fishery within these streams, as well as the adjacent near-shore area.

Archaeological Sites: A number of archaeological sites, consisting primarily of early American Indian campsites and villages, have been identified in the study area. Information regarding identified archaeological sites was made available to the Chiwaukee Prairie-Carol Beach study by the State Historical Society of Wisconsin and is summarized herein.

Files of the State Historical Society indicate that nine archaeological sites have been identified by various sources in the study area. Most of the sites were reported prior to 1925, and portions of some of the sites have been developed in urban use. Eight of the sites lie entirely within the study area. Of these eight sites, five consist, in part, of wetland areas, while three contain no wetland areas whatsoever. One of the identified sites is located partially within and partially outside the study area. The portion of this site within the study area does not contain any wetland areas.

The most significant archaeological site identified to date is the Barnes Creek site located near Barnes Creek in Section 19 of U. S. Public Land Survey Township 1 North, Range 23 East, which has been listed on the National Register of Historic Places. This site contains important information on the cultural history and settlement patterns of the Woodland Stage peoples (circa 200 BC-1200 AD) and earlier groups. Excavations at the Barnes Creek site have been conducted by the University of Wisconsin-Parkside and the local archaeological society. The UW-Parkside report for the Barnes Creek site urges the preservation of the site and notes that the development of the eastern portion of the site "must not be allowed to result in the loss of this significant portion of our culture history." That report also calls for further study of the area to more precisely identify the site limits.

The other archaeological sites in the study area have not yet been closely studied by archaeologists. As noted above, most of these sites were reported before 1925 and have not been examined since. Existing site boundaries are, for the most part, highly generalized.

The State Historical Society has expressed a belief that the archaeological sites in the study area are "extremely significant." However, because of insufficient or outdated information, with the exception of for the Barnes Creek site, the historical society is unable to indicate which sites warrant preservation without further field study.

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<sup>6</sup>Thomas J. Becker, Wisconsin Department of Natural Resources Area Wildlife Manager for Kenosha, Racine, and Walworth Counties, Personal communication, August 1984.

It is important to note that additional archaeological work is beyond the scope of the Chiwaukee Prairie-Carol Beach planning program. The only practical alternative is to use the boundaries of the known archaeological sites identified by the State Historical Society as the best approximations available. The Barnes Creek site, which has been the subject of intensive study and which has been listed on the National Register of Historic Places, should be preserved essentially intact. The other sites should be preserved insofar as practicable--at least until archaeological surveys can be undertaken to identify the site boundaries more precisely.

Areas of Special Recreational Interest: The Chiwaukee Prairie-Carol Beach area affords the opportunity for participation in certain special recreational activities. As documented in this appendix, the study area encompasses extensive wetland-prairie areas, including certain natural areas of intact plant communities resembling the presettlement landscape; a large variety of resident and migratory bird species and other animal species; and a large variety of plant species, including certain Wisconsin rare, threatened, and endangered species. Owing to this abundance of natural features, the study area is particularly well suited for birdwatching, other forms of nature study, and nature photography, as well as for more casual appreciation and enjoyment of the wetland-prairie environment. These recreational activities depend upon continued maintenance of existing natural resource values. In this regard, opportunities for these activities will continue to be provided in the study area if the wildlife habitat areas identified in Appendix A-6 and the critical plant and natural areas identified herein are substantially preserved.

## CONCLUSION

Criterion g of Section NR 115.05(2)(e)4 of the Wisconsin Administrative Code prohibits the rezoning of a shoreland-wetland zoning district if the proposed rezoning may have a significant adverse impact upon areas of special recreational, scenic, or scientific interest, including scarce wetland types. This appendix--A-7--has indicated that many wetland tracts in the Chiwaukee Prairie-Carol Beach study area possess special scientific and recreational values.

Areas of special scientific interest in the study area--in addition to the wildlife habitat areas identified in Appendix A-6--include critical plant habitat areas where several Wisconsin rare, threatened, or endangered plant species have been identified; natural areas containing intact plant community assemblages which closely resemble the pre-European settlement landscape; and archaeological sites consisting of early American Indian village sites and campsites.

The maintenance of 595 acres of critical plant habitat areas and 491 acres of scientific and natural areas is important to both the short- and long-term biological integrity of the Chiwaukee Prairie-Carol Beach study area. These areas serve as an important species reservoir and as a gene pool for numerous native plant species, including several considered to be rare, threatened, and endangered in Wisconsin. The large, interconnecting tracts of land between the scientific and natural areas, which provide critical plant habitat, combined with the high- and medium-value wildlife habitat areas, provide for an important flow of plant and animal species, along with their genetic characters, between the Kenosha Sand Dunes and the Chiwaukee Prairie, and Illinois Beach

State Park just north of Waukegan, Illinois. The continuance of the area as a functional biological unit is dependent on maintaining the vegetal structure and integrity of the beach dune and swale complex within the study area.

A total of nine archaeological sites have been identified in the study area. Those sites are generally considered to be significant, containing important information on the cultural history and settlement patterns of Woodland Stage peoples (circa 200 BC-1200 AD) and possibly earlier groups. The Barnes Creek site has been the subject of intensive study and has been listed on the National Register of Historic Places. This site should be preserved intact, pending any modification of the site boundaries resulting from further archaeological study. The other sites have not been evaluated recently and their site boundaries are more generalized. These sites should be preserved insofar as practicable--at least until archaeological surveys can be undertaken to identify the site boundaries more precisely.

Owing to the abundance of natural features, the Chiwaukee Prairie-Carol Beach study area is particularly well suited for certain special recreational activities, including birdwatching, other forms of nature study, and nature photography, as well as for casual appreciation and enjoyment of the existing wetland-prairie environment. Opportunities for these activities will be maintained if the wildlife habitat areas identified in Appendix A-6 and the critical plant habitat areas and natural areas identified herein are substantially preserved.