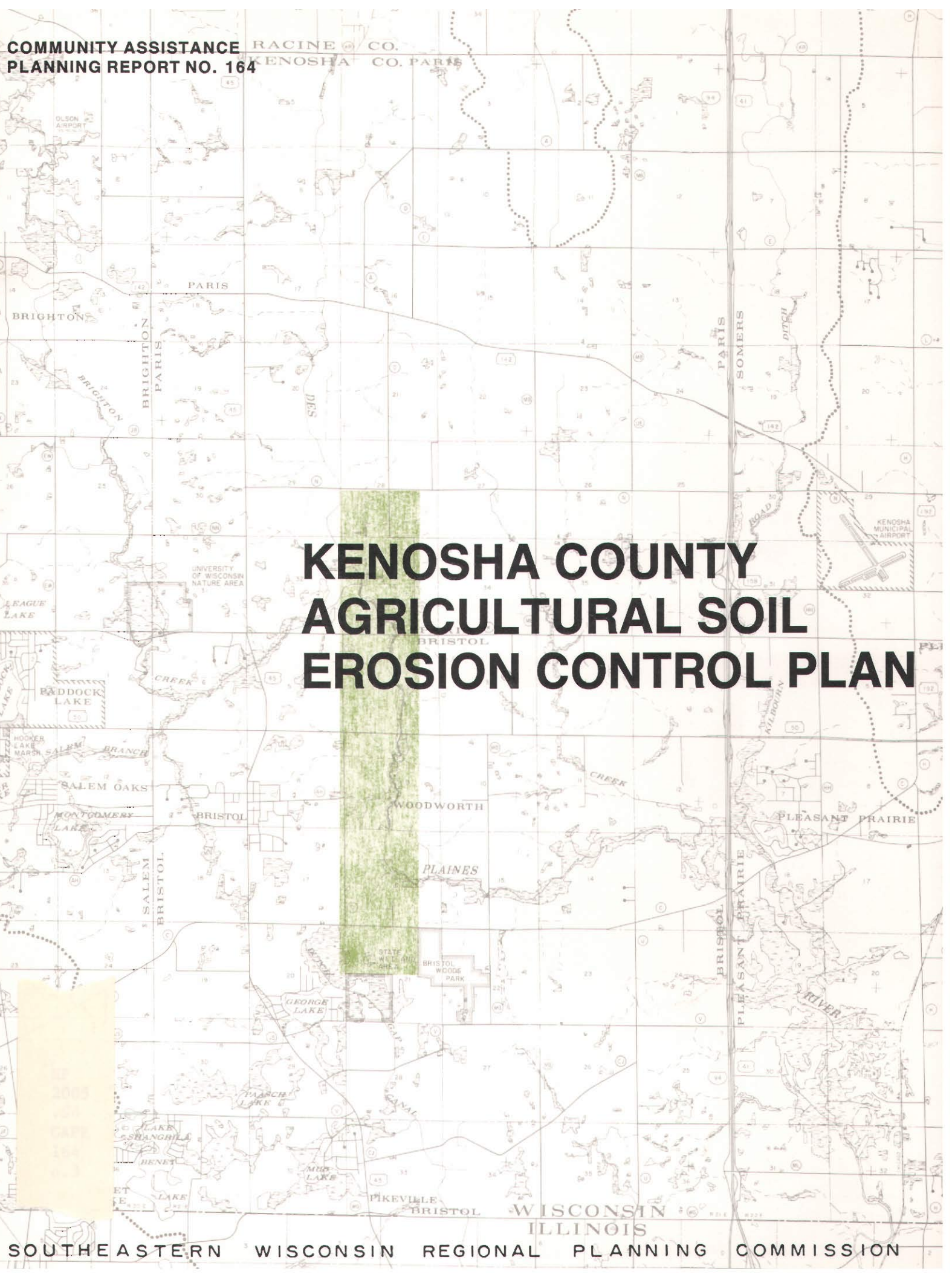




The background is a detailed topographic map of Kenosha County, Wisconsin. The map shows a grid of townships including Brighton, Paris, Bristol, Woodworth, Plaines, Pleasant Prairie, and Salem. It also depicts various geographical features such as Lake Michigan to the west, the Kalamazoo River to the east, and numerous smaller lakes like George Lake, Monks Lake, and Salem Lake. A prominent green vertical band highlights a specific area running through the center of the county, likely representing a watershed or a region of focus for the plan. The title 'KENOSHA COUNTY AGRICULTURAL SOIL EROSION CONTROL PLAN' is superimposed in large, bold, black capital letters across the middle of the map.

KENOSHA COUNTY AGRICULTURAL SOIL EROSION CONTROL PLAN

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**COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 164**

**KENOSHA COUNTY AGRICULTURAL
SOIL EROSION CONTROL PLAN**

Prepared by the
Southeastern Wisconsin Regional Planning Commission
P. O. Box 1607
Old Courthouse
916 N. East Avenue
Waukesha, Wisconsin 53187-1607

The preparation of this report was financed in part through a grant from the Wisconsin Department of Agriculture, Trade and Consumer Protection.

April 1989

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SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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April 17, 1989

Chairman and Members
Land Conservation Committee
Kenosha County Board
Kenosha County Courthouse
912 - 56th Street
Kenosha, Wisconsin 53140

Dear Committee Members:

Recognizing the need to abate cropland soil erosion, and to comply with the erosion control planning requirements of Section 92.10 of the Wisconsin Statutes, the Kenosha County Board in 1987 determined to prepare a cropland soil erosion control plan. The County Board requested the assistance of the Southeastern Wisconsin Regional Planning Commission in the preparation of the plan. This report presents the requested plan.

The soil erosion control plan as documented in this report identifies the agricultural soil erosion control problems existing in the County; recommends an agricultural soil erosion control objective and related standards; recommends a rank ordering of areas of the County for the application of erosion control measures; identifies the types and amounts of soil erosion control practices needed to reduce agricultural soil erosion to tolerable levels within the County; and identifies the actions which should be taken by the various units and agencies of government concerned to carry out the plan.

Adoption and implementation of the plan presented in this report should result in the material abatement of excessive cropland soil erosion, reducing soil erosion to tolerable levels by the year 2000. This should contribute to the preservation and protection of the invaluable soil resource of the County for use by future generations, and minimize the environmental problems associated with cropland soil erosion.

The Regional Planning Commission is pleased to have been able to be of assistance to the County in the preparation of this plan. The Commission, of course, stands ready to assist the County on request with plan implementation.

Sincerely,



Kurt W. Bauer
Executive Director

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TABLE OF CONTENTS

	Page		Page
Chapter I—INTRODUCTION	1	Recommended Soil Erosion Control	
The Kenosha County Soil		Objective, Principle, and Standards . . .	30
Erosion Control Plan	1		
Scheme of Presentation	1	Chapter V—RECOMMENDED SOIL	
Chapter II—DESCRIPTION		EROSION CONTROL PLAN	33
OF THE COUNTY	3	Erosion Control Priority Areas	33
Natural Resource Base	3	Water Quality Considerations	34
Physiographic and		Soil Erosion Control Practices	34
Topographic Features	3	Description of Soil	
Soils	3	Erosion Control Practices	34
Surface Water Resources	8	Conservation Tillage	34
Primary Environmental Corridors	8	Crop Rotation	38
Man-Made Environment	8	Contouring	38
Population Trends	8	Contour Strip-cropping	38
Land Use	11	Cover Crops	39
Cropping Patterns	14	Terracing	40
Concluding Remarks	15	Grassed Waterways	40
Chapter III—SOIL		Permanent Vegetative Cover	40
EROSION INVENTORY	17	Recommended Soil Erosion	
Soil Erosion Processes	17	Control Practices	42
Cropland Sheet and Rill Erosion	17	Recommended Soil Erosion	
Universal Soil Loss Equation	17	Control Practices—	
Inventory Procedures	18	Priority Area A	42
Rainfall Erosion Index (R)	18	Recommended Soil Erosion	
Soil Erodibility Factor (K)	18	Control Practices—	
Slope Length-Steepness		Balance of County	44
Factor (LS)	18	Environmental Considerations with	
Vegetative Cover Factor (C)	19	Conservation Tillage Systems	45
Erosion Control		Costs of Recommended Practices	45
Practice Factor (P)	19	Conservation Planning Requirements	45
Cropland Soil Erosion Rates	20	Proposed Time Frame	46
Noncropland Soil Erosion	21	Concluding Remarks	48
Erosion on Pastureland			
and Grazed Woodland	21	Chapter VI—PLAN	
Stream Bank Erosion	23	IMPLEMENTATION	51
Construction Site Erosion	23	Plan Implementation Agencies	51
Lake Michigan Shoreline Erosion	24	County Level	51
Concluding Remarks	26	Kenosha County Land	
Chapter IV—CROPLAND SOIL		Conservation Committee	51
EROSION CONTROL		Kenosha County Board	51
OBJECTIVE, PRINCIPLE,		State Level	51
AND STANDARDS	29	Wisconsin Department of Agriculture,	
Background	29	Trade and Consumer Protection	51
		Wisconsin Department	
		of Natural Resources	52

	Page		Page
University of Wisconsin-Extension	52	Program Monitoring and Evaluation	62
Federal Level	53	Recommendations for Monitoring and Evaluation	62
U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service	53	Staff and Cost-Share Assistance Needs	62
U. S. Department of Agriculture, Soil Conservation Service	53	Staff Needs	62
U. S. Department of Agriculture, Farmers Home Administration	53	Cost-Share Assistance Needs	64
Plan Adoption	53	Summary	64
County Level	53	County Level	64
State Level	53	Kenosha County Board of Supervisors	64
Federal Level	54	Kenosha County Land Conservation Committee	64
Plan Implementation Measures	54	State Level	65
Financial Assistance	54	Wisconsin Department of Agriculture, Trade and Consumer Protection	65
State Financial Assistance Programs	54	Wisconsin Department of Natural Resources	66
Federal Financial Assistance Program	55	University of Wisconsin-Extension	66
Recommendations for Use of Financial Assistance Programs	55	Federal Level	66
Technical Assistance Programs	56	U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service	66
Recommendations Regarding Technical Assistance Programs	56	U. S. Department of Agriculture, Soil Conservation Service	66
Conservation Compliance Requirements	58	U. S. Department of Agriculture, Farmers Home Administration	66
Wisconsin Farmland Preservation Program			
Soil Conservation Requirements	58	Chapter VII—SUMMARY	67
Conservation Requirements of the Food Security Act of 1985	59	Soil Erosion Control Objective	68
Recommendations Regarding Conservation Compliance Requirements	59	Soil Erosion Inventory and Analysis	68
Information and Education Program	60	Recommended Soil Erosion Control Practices	69
Recommendations for an Information and Education Program	60	Costs of Recommended Practices	69
Regulatory Measures for Erosion Control	61	Conservation Planning Requirements	70
		Erosion Control Priority Areas	71
		Water Quality Considerations	71
		Plan Implementation	72
		Construction Site Erosion Control	72
		Public Reaction to the Plan	73

LIST OF APPENDICES

Appendix		Page
A	USDA Agricultural Stabilization and Conservation Service Memorandum Regarding Use of County Soil Erosion Control Plans	77

B	Public Informational Meeting on the Kenosha County Soil Erosion Control Planning Program	79
	Appendix B-1 Newspaper Announcements of the Kenosha County Soil Erosion Control Planning Program Public Informational Meeting	79

LIST OF TABLES

Table		Page
Chapter II		
1	Population in Kenosha County: Census Years 1850-1980, and Estimated 1987	11
2	Land Use in Kenosha County: 1963 and 1985	12
Chapter III		
3	C-Factors Developed for Analysis of Cropland Soil Erosion in Kenosha County	20
4	Cropland Soil Erosion Rates in Kenosha County: 1985	20
5	Cropland Soil Erosion Rates in Kenosha County by Township: 1985	21
6	Cropland Soil Erosion Relative to T-Value in Kenosha County: 1985	23
7	Cropland Soil Erosion Relative to T-Value in Kenosha County by Township: 1985	24
Chapter IV		
8	Cropland Soil Erosion Control Objective, Principle, and Standards	31
Chapter V		
9	Criteria for the Grouping and Ranking of U. S. Public Land Survey Sections for Erosion Control Under the Kenosha County Soil Erosion Control Plan	34
10	Cropland Soil Erosion Rates in Kenosha County by Priority Area: 1985	36
11	Cropland Soil Erosion Relative to T-Value in Kenosha County by Priority Area: 1985	36
12	Criteria Utilized to Identify Farm Fields Having Potential Adverse Impacts on Surface- or Groundwater as a Result of Excessive Soil Erosion	37
13	Comparison of Moldboard Plow and Conservation Tillage Systems: Typical Field Operations, Residue, and Major Advantages and Disadvantages	39
14	Estimated Effectiveness of Erosion Control Practices	40
15	Typical Selection of Soil Erosion Control Practices Under the Kenosha County Soil Erosion Control Plan	42
16	Recommended Soil Erosion Control Practices for Cropland Having a Soil Loss Rate Greater than T-Value by Priority Area in Kenosha County	43
17	Anticipated Farm Conservation Planning Activity Under the Kenosha County Soil Erosion Control Plan	46
18	Cropland Soil Erosion Rates in Kenosha County Upon Implementation of Recommended Soil Erosion Control Practices	47
19	Cropland Soil Erosion Relative to T-Value in Kenosha County Upon Implementation of Recommended Soil Erosion Control Practices	47

Chapter VI

20	Farm Conservation Planning and Implementation Requirements Under the Kenosha County Soil Erosion Control Plan	57
21	Staffing Requirements for Implementation of the Kenosha County Soil Erosion Control Plan	63
22	Cost-Share Requirements for Implementation of the Kenosha County Soil Erosion Control Plan	65
23	Comparison of Cost-Share Funds Required and Cost-Share Funds Which May be Provided Through Existing Cost-Share Assistance Programs in Kenosha County	65

Chapter VII

24	Summary of Plan Implementation Responsibilities for the Kenosha County Soil Erosion Control Plan	73
----	--	----

LIST OF FIGURES**Chapter II**

1	Current and Alternative Future Population Levels for Kenosha County: 1950-2010	11
2	Acreages for Major Crops in Kenosha County: 1965, 1970, 1975, 1980, 1985, and 1986	14

Chapter V

3	Chisel Plowing	37
4	No-Till Planting	37
5	Contour Strip-cropping	40
6	Farmable Terrace	41
7	Vegetated Ridge Terrace	41
8	Grassed Waterway	41

LIST OF MAPS**Chapter II**

1	Physiographic Features of Kenosha County and the Southeastern Wisconsin Region	4
2	Topographic Characteristics of Kenosha County and the Southeastern Wisconsin Region	5
3	General Soil Associations in Kenosha County	6
4	Cropland Soil Erosion Potential in Kenosha County	7
5	Surface Water Resources in Kenosha County	9

Map		Page
6	Primary Environmental Corridors in Kenosha County	10
7	Existing Land Use in Kenosha County: 1985	13
Chapter III		
8	Cropland Soil Erosion Rates in Kenosha County: 1985	22
9	Cropland Soil Erosion Relative to T-Value in Kenosha County: 1985	25
10	Major Land Resource Areas	26
Chapter V		
11	Recommended Priority Areas for Cropland Soil Erosion Control in Kenosha County	35

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Chapter I

INTRODUCTION

The dust bowl experience of the 1930's generated a national interest in the wise use of the soil. Governmental agencies were created and cost-sharing programs developed to help farmers better manage the soil resource. Since that time, many agricultural landowners have practiced more responsible management aimed at the wise use and conservation of the invaluable soil resources of the nation. Others, however, have not. In addition, in Wisconsin, there has been a shift away from dairy farming and traditional crop rotation patterns generally compatible with long-term resource protection in favor of continuous row cropping that can lead to severe soil erosion and associated problems unless special precautions are taken.

Soil erosion takes place when water or wind carries away soil from inadequately protected land surfaces. When it occurs at a rapid rate, erosion can cause serious problems. The loss of topsoil from agricultural land, for example, means that the land loses part of its productive capacity. Eventually, no amount of fertilizer can, as a practical matter, replace this loss, and the ability of the land to produce crops may be jeopardized. Thus, the land and the people who occupy and work it may both become poorer. Downstream sites—the places to which the eroded soil is carried—experience a different but also very costly set of problems. These may include the costly clogging of culverts and drainageways, and diminished water quality, and in some cases interference with commercial as well as recreational navigation. Soil erosion contributes to water quality problems of lakes and streams, as the resulting sediment is volumetrically the greatest water pollutant, destroying fish and wildlife habitat and rendering recreational areas undesirable.

Because of the increasing concern over soil erosion, the Wisconsin Legislature in 1982 revised Chapter 92 of the Wisconsin Statutes, the state soil and water conservation law, to require the preparation of county soil erosion control plans focusing on the control of cropland soil erosion. A total of 55 counties located in approximately the southern two-thirds of the State, including Kenosha County, are required to prepare such a plan. Chapter 92 requires that an

erosion control plan: 1) specify maximum acceptable rates of erosion; 2) identify the parcels where soil erosion standards are not being met; 3) identify the land use changes or management practices that would bring each area of land into compliance with standards adopted by the county land conservation committee; 4) specify procedures to be used to assist landowners and land users in controlling soil erosion; and 5) establish priorities for controlling soil erosion.

THE KENOSHA COUNTY SOIL EROSION CONTROL PLAN

Recognizing the need for increased efforts to control soil erosion in Kenosha County and in an effort to comply with the planning requirements of Chapter 92 of the Wisconsin Statutes, the Kenosha County Board in 1987 determined to prepare a county soil erosion control plan, and requested the assistance of the Southeastern Wisconsin Regional Planning Commission in the preparation of such a plan. The County received a planning grant from the Wisconsin Department of Agriculture, Trade and Consumer Protection in partial support of the required work. The plan presented herein was prepared by the Regional Planning Commission in cooperation with the Kenosha County Land Conservation Office. The planning effort was carried out under the guidance of the Kenosha County Land Conservation Committee. The Land Conservation Office and the Commission staff were assisted in the preparation of the plan by a technical advisory committee consisting of county farmers and representatives of the Kenosha County Planning and Development Department, the Wisconsin Department of Natural Resources, the University of Wisconsin-Extension, and the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, and Soil Conservation Service. A full committee membership list is set forth on the inside front cover of this report.

SCHEME OF PRESENTATION

The Kenosha County soil erosion control plan is presented in seven chapters. Following this introductory chapter, Chapter II, "Description of

introductory chapter, Chapter II, "Description of the County," presents a description of those aspects of the natural resource base and man-made environment of Kenosha County which are particularly relevant in any consideration of soil erosion problems and efforts to address those problems. Chapter III, "Soil Erosion Inventory," describes the methodology and findings of a countywide inventory of cropland and related analysis of cropland soil erosion rates. Chapter IV, "Cropland Soil Erosion Control Objective, Principle, and Standards," presents a cropland soil erosion control objective, a supporting principle, and related standards, establishing maximum acceptable erosion

rates on cropland in the County. Chapter V, "Recommended Soil Erosion Control Plan," recommends priority areas for the application of cropland soil erosion control measures within the County, and identifies conservation practices required to reduce cropland soil erosion problems. Chapter VI, "Plan Implementation," recommends measures that should be undertaken by the County and the concerned state and federal agencies to help achieve the objective and standards underlying the plan—focusing, in particular, on technical assistance activities. Chapter VII, "Summary," presents a summary of the major findings and recommendations of the planning program.

Chapter II

DESCRIPTION OF THE COUNTY

The preparation of a workable soil erosion control plan for Kenosha County requires an understanding of the natural resource base and of the pattern of human activities that has been superimposed on that resource base. Accordingly, this chapter presents a description of those features of the natural resource base and of the man-made environment which are the most important in any consideration of soil erosion problems in the County. The first portion of the chapter describes salient elements of the natural resource base, including the topography, soils, and surface water resources of the County. The second portion of the chapter describes trends in population, land use, and cropping patterns in Kenosha County.

NATURAL RESOURCE BASE

Physiographic and Topographic Features

Glaciation has largely determined the physiography and topography, as well as the soils, of southeastern Wisconsin, including Kenosha County. The physiographic features or surficial land forms of southeastern Wisconsin are shown on Map 1, while the regional topography, or variation in elevation, is depicted in a generalized manner on Map 2. There is evidence of four major stages of glaciation in the Region. The last and most influential in terms of present physiography and topography was the Wisconsin stage, which is believed to have ended about 11,000 years ago.

As shown on Map 1, most of Kenosha County is covered by gently sloping or rolling ground moraine—that is, by heterogeneous material deposited beneath the ice. Elevations in Kenosha County range from about 580 feet National Geodetic Vertical Datum (NGVD) near the Lake Michigan shoreline to over 900 feet NGVD at some points in the western portion of the County.

Topographic features—particularly slope length and slope steepness—have a direct bearing on soil erosion potential. Slope length and steepness affect the velocity and, accordingly, the erosive potential of runoff. In general, soil loss per unit

area increases with the length and steepness of the slope.

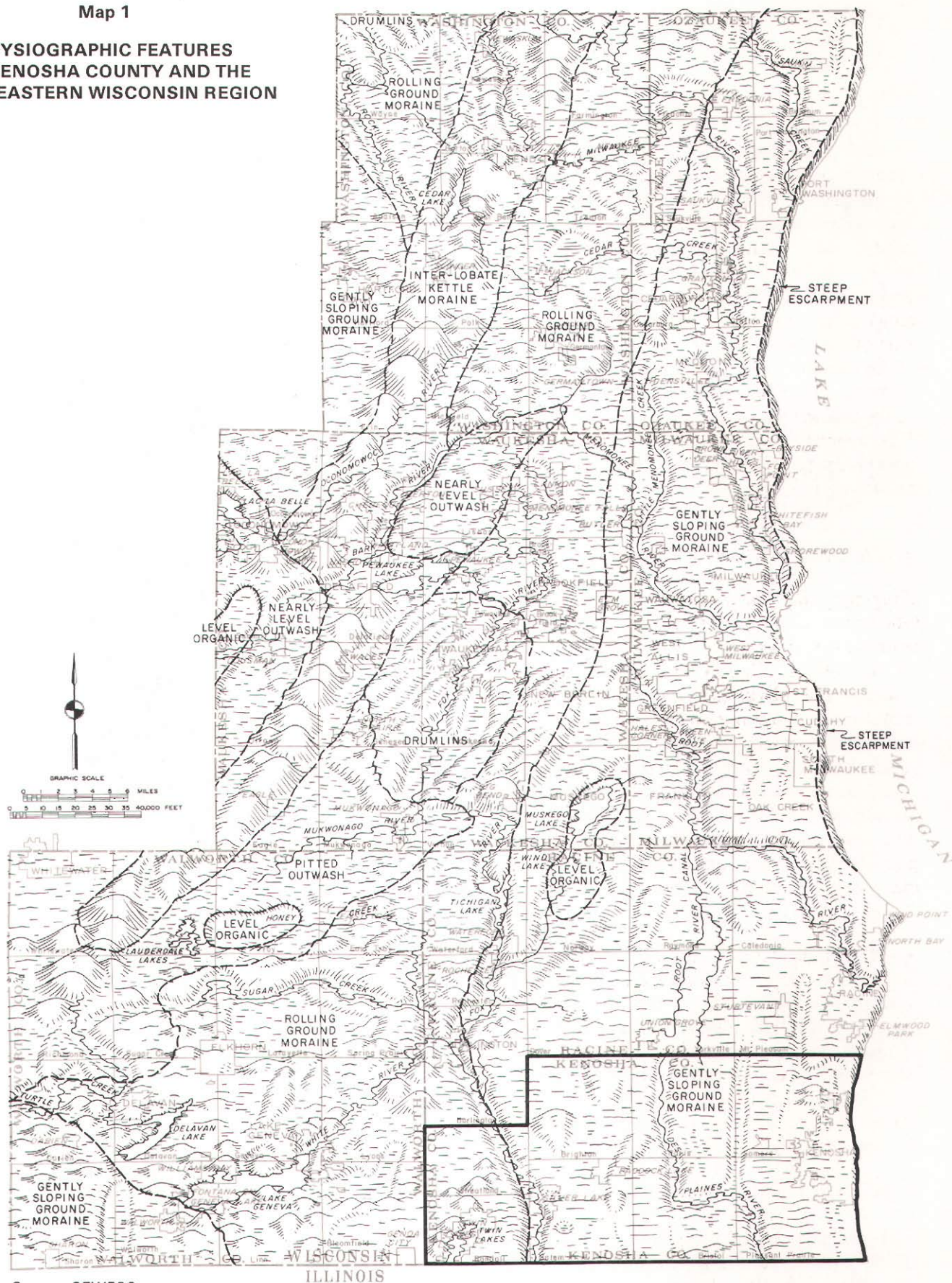
Soils

The soils in Kenosha County range from very poorly drained organic soils to excessively drained mineral soils. Nine soil associations are found in the County, as identified by the U. S. Department of Agriculture, Soil Conservation Service. A soil association is defined as a landscape having a distinctive pattern of soils. An association is typically comprised of one or more major soil types and at least one minor soil type, and is named after the major soil types. A description of the nine soil associations in Kenosha County and of their distribution within the County is presented on Map 3.

Soils vary in potential erosiveness owing primarily to differences in physical characteristics, including soil texture, soil structure, organic matter, and permeability. In order to provide insight into the potential for cropland soil erosion in Kenosha County, the soils of the County have been categorized as having slight, moderate, and severe erosion potential and mapped accordingly (see Map 4). The rating for each soil is based upon its capability class and subclass as assigned under the U. S. Soil Conservation Service agricultural land capability system.¹ The rating indicates the potential for both water and wind erosion. The rating is

¹Following procedures set forth in *Soil Erosion Control Planning Manual*, prepared by the Wisconsin Department of Agriculture, Trade and Consumer Protection, soils in capability classes and subclasses I, IIw, IIIw, IVw, V, VIw, and VIIw have been classified as having slight soil erosion potential; soils in capability subclasses IIe, IIs, IIIs, IVs, VIs, and VIIs have been classified as having moderate soil erosion potential; and soils in capability subclasses IIIe, IVe, VIe, and VIIe have been classified as having severe erosion potential. The agricultural land capability system itself is described in U. S. Soil Conservation Service Handbook 210, *Land Capability Classification*, September 1961.

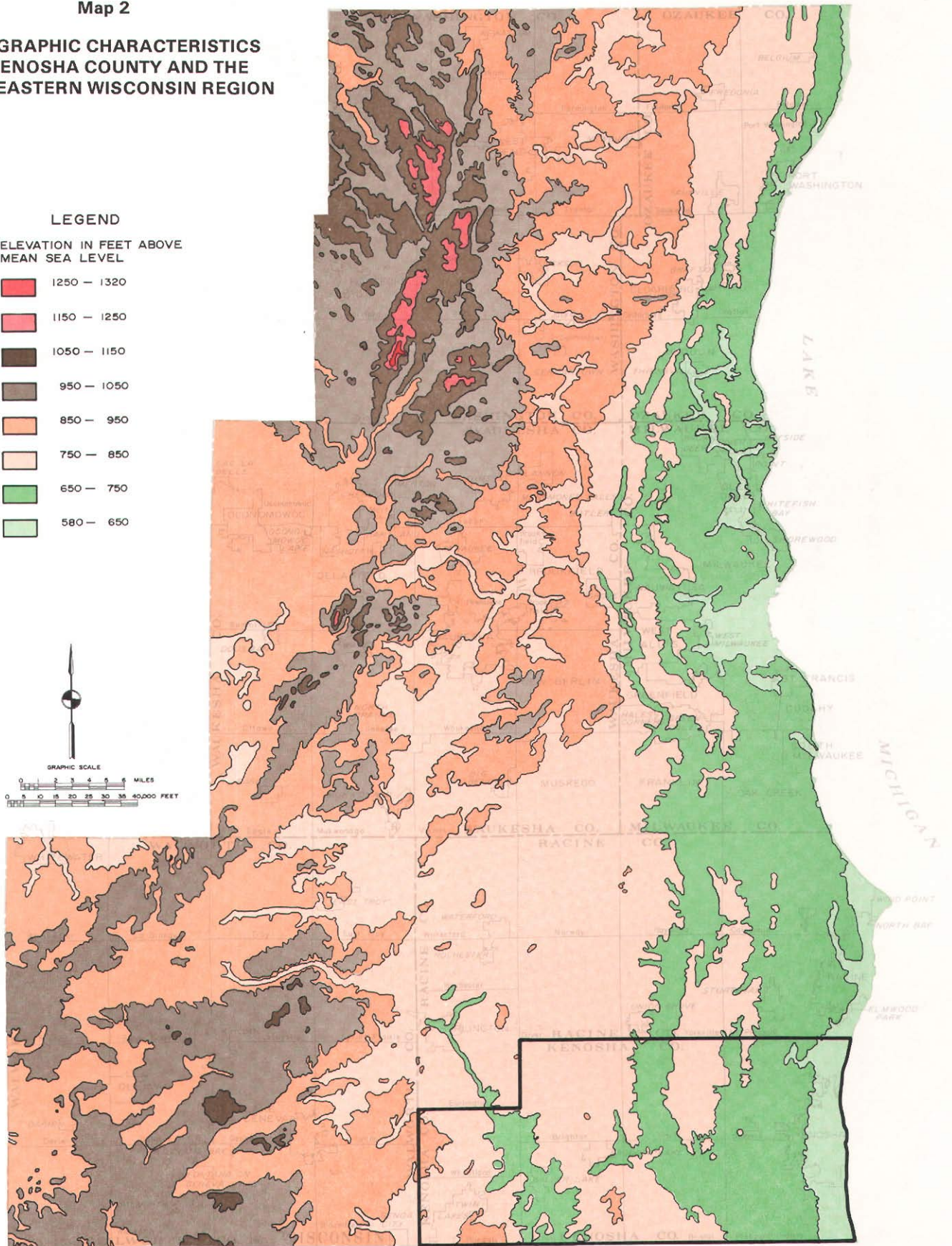
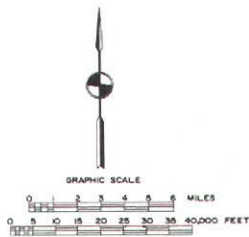
PHYSIOGRAPHIC FEATURES OF KENOSHA COUNTY AND THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Map 2

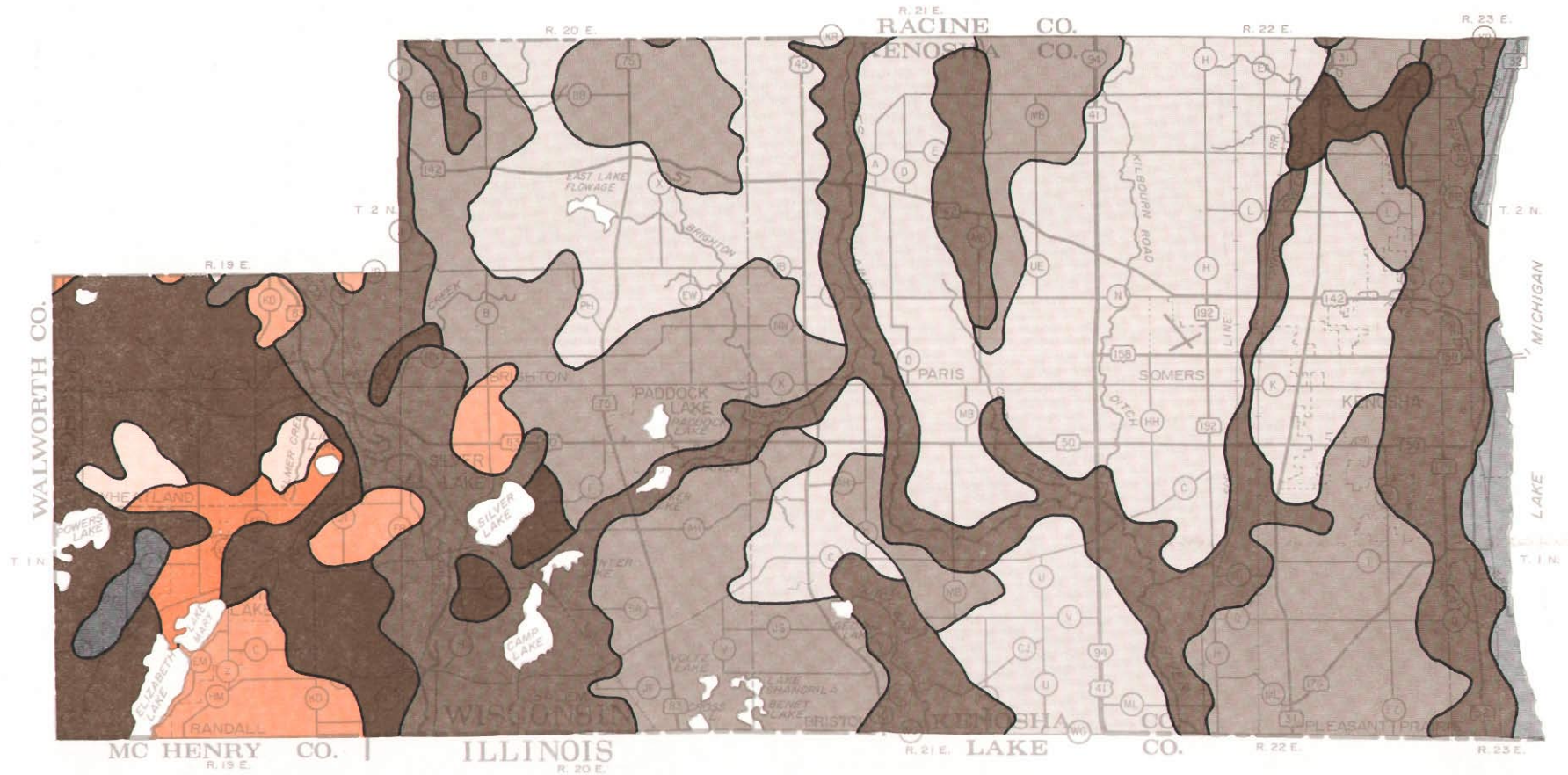
**TOPOGRAPHIC CHARACTERISTICS
OF KENOSHA COUNTY AND THE
SOUTHEASTERN WISCONSIN REGION**



Source: SEWRPC.

Map 3

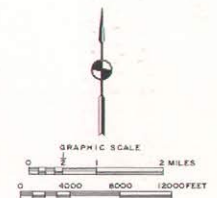
GENERAL SOIL ASSOCIATIONS IN KENOSHA COUNTY



LEGEND

- VARNA-ELLIOTT-ASHKUM ASSOCIATION: WELL-DRAINED TO POORLY DRAINED SOILS THAT HAVE A SILTY CLAY LOAM TO CLAY SUBSOIL; FORMED IN THIN LOESS AND THE UNDERLYING CLAY LOAM OR SILTY CLAY LOAM GLACIAL TILL ON RIDGES AND KNOBS
- MORLEY-BEECHER-ASHKUM ASSOCIATION: WELL-DRAINED TO POORLY DRAINED SOILS THAT HAVE A SILTY CLAY OR SILTY CLAY LOAM SUBSOIL; FORMED IN THIN LOESS AND THE UNDERLYING CLAY LOAM OR SILTY CLAY LOAM GLACIAL TILL ON RIDGES AND KNOBS
- HEBRON-MONTGOMERY-AZTALAN ASSOCIATION: WELL-DRAINED TO POORLY DRAINED SOILS THAT HAVE A LOAM TO SILTY CLAY SUBSOIL; UNDERLAIN BY CLAYEY TO LOAMY LACUSTRINE AND OUTWASH MATERIAL ON HILLS, KNOBS, AND LAKE PLAINS
- FOX-CASCO ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A CLAY LOAM AND SILTY CLAY LOAM SUBSOIL; MODERATELY DEEP TO SHALLOW OVER SAND AND GRAVEL, ON STREAM TERRACES

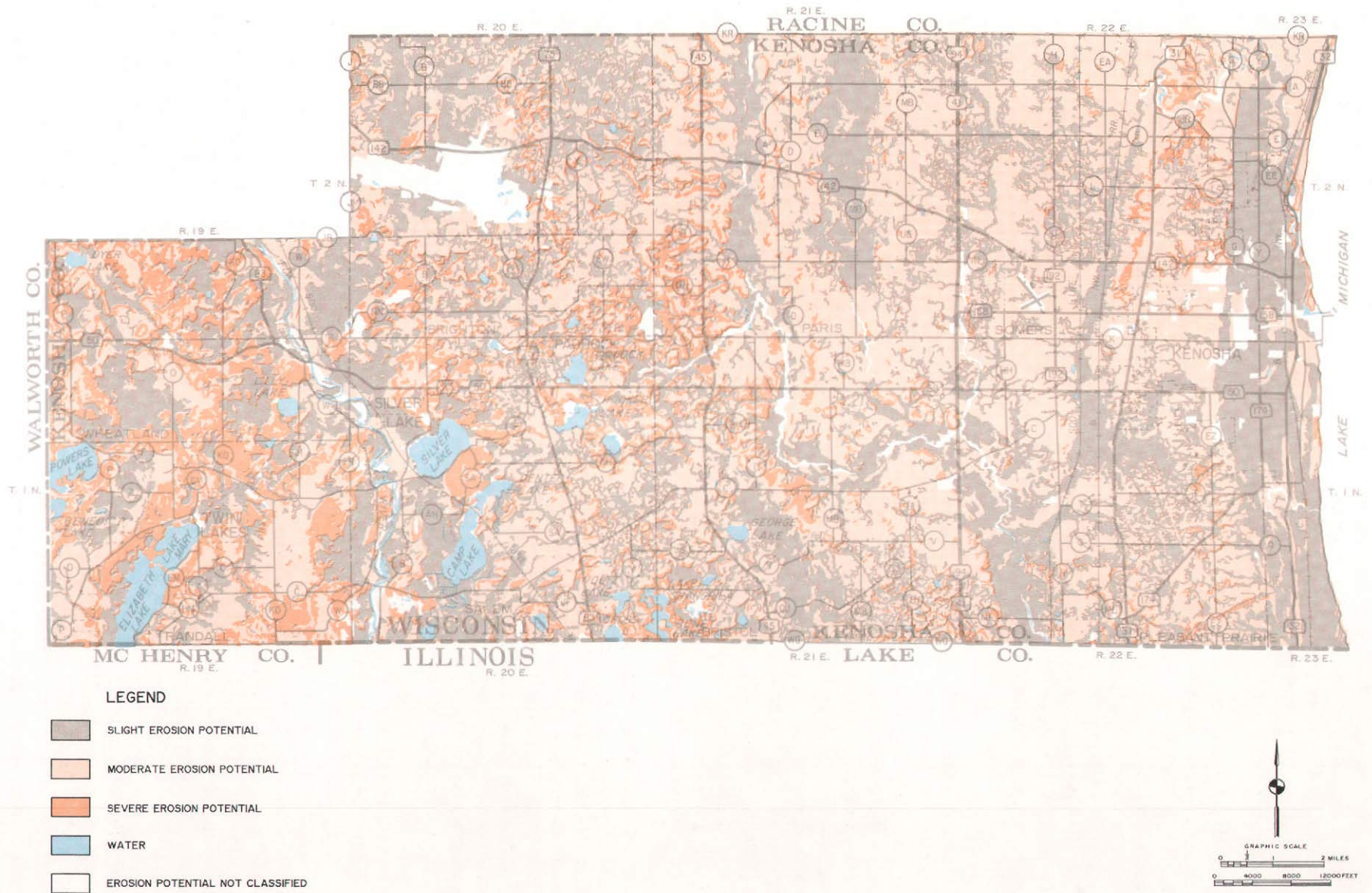
- HOUGHTON-PALMS ASSOCIATION: VERY POORLY DRAINED ORGANIC SOILS; IN BASINS AND DEPRESSIONS
- MIAMI ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A SILTY CLAY LOAM AND CLAY LOAM SUBSOIL; FORMED IN THIN LOESS AND THE UNDERLYING LOAMY GLACIAL TILL ON RIDGES AND KNOBS
- CASCO-RODMAN ASSOCIATION: WELL-DRAINED AND EXCESSIVELY DRAINED SOILS THAT HAVE A CLAY LOAM OR GRAVELLY LOAM SUBSOIL; SHALLOW OVER SAND AND GRAVEL, ON STREAM TERRACES AND MORAINIC RIDGES
- BOYER-GRANBY ASSOCIATION: WELL-DRAINED TO VERY POORLY DRAINED SOILS THAT HAVE A LOAM TO SAND SUBSOIL; UNDERLAIN BY SANDY GLACIAL OUTWASH ON RIDGES AND KNOBS AND IN DRAINAGEWAYS AND DEPRESSIONS
- WARSAW-PLANO ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A LOAM TO SILTY CLAY LOAM SUBSOIL; MODERATELY DEEP TO DEEP OVER SAND AND GRAVEL, ON STREAM TERRACES



Source: U. S. Department of Agriculture, Soil Conservation Service.

Map 4

CROPLAND SOIL EROSION POTENTIAL IN KENOSHA COUNTY



Source: U. S. Soil Conservation Service and SEWRPC.

based solely on the soil characteristics that affect the response of the soil to management and treatment. Farming practices, which have a direct bearing on the rate of erosion, are not considered in the rating.

Surface Water Resources

Lakes and streams constitute an extremely valuable part of the natural resource base of Kenosha County. They constitute a focal point of water-related recreational activities; provide an attractive setting for properly planned residential development; and have immeasurable environmental value. The major lakes and streams in the Kenosha County area shown on Map 5.

Soil erosion can create serious surface water problems. The resulting sediment is volumetrically the major pollutant entering surface waters. Sediment tends to damage fish and wildlife habitat, diminish the desirability of recreational areas, decrease the capacity of farm ponds and reservoirs, and increase the need for dredging of watercourses. Agricultural chemicals carried by eroded soil particles may be toxic to aquatic life and harmful to man. Nutrients carried on eroded soil particles accelerate the eutrophication—or aging—of lakes.

For water quality planning purposes, the Wisconsin Department of Natural Resources has divided the Southeastern Wisconsin Region into 27 watersheds, six of these being located partially within Kenosha County. As shown on Map 5, the Pike River watershed, the Root River watershed, and the watershed of minor streams tributary to Lake Michigan are located east of the subcontinental divide and are part of the Great Lakes-St. Lawrence River drainage area. The Des Plaines River, the Lower Fox River, and the Nippersink Creek watersheds are located west of the subcontinental divide and are part of the Mississippi River drainage area. It should be noted that the Department of Natural Resources refers to the watershed of minor streams tributary to Lake Michigan—excluding the northernmost portion of that watershed along the Lake Michigan shoreline—as the Pike Creek watershed.

Primary Environmental Corridors

Primary environmental corridors are linear areas in the landscape which encompass the most important elements of the natural resource base, including lakes, rivers, and streams and their associated floodlands and shorelands;

wetlands; woodlands; prairies; wildlife habitat areas; and rugged terrain and high-relief topography. Such corridors have been identified throughout southeastern Wisconsin, including Kenosha County, by the Regional Planning Commission by analyzing and overlaying the land use and natural resource data pertinent to the determination of the location of significant concentrations of such resources. The preservation of these corridors in essentially natural, open uses is important to the maintenance of a high level of environmental quality in the Region, to the protection of its natural beauty, and to the provision of opportunities for certain scientific, educational, and recreational activities. The exclusion of urban development from these corridors will also prevent the creation of serious and costly developmental problems such as wet and flooded basements, foundation failures, and excessive clearwater infiltration and inflow into sanitary sewerage systems.

Map 6 shows the pattern of primary environmental corridors in Kenosha County in 1985. These corridors encompass about 28,600 acres, or about 16 percent of the total area of Kenosha County. Of this total, about 4,600 acres, or about 16 percent, consist of surface water; about 12,200 acres, or about 43 percent, consist of wetlands; about 5,200 acres, or about 18 percent, consist of upland woodlands; about 5,600 acres, or about 20 percent, consist of other open lands; and about 1,000 acres, or just over 3 percent, consist of isolated urban enclaves within the corridor configuration.

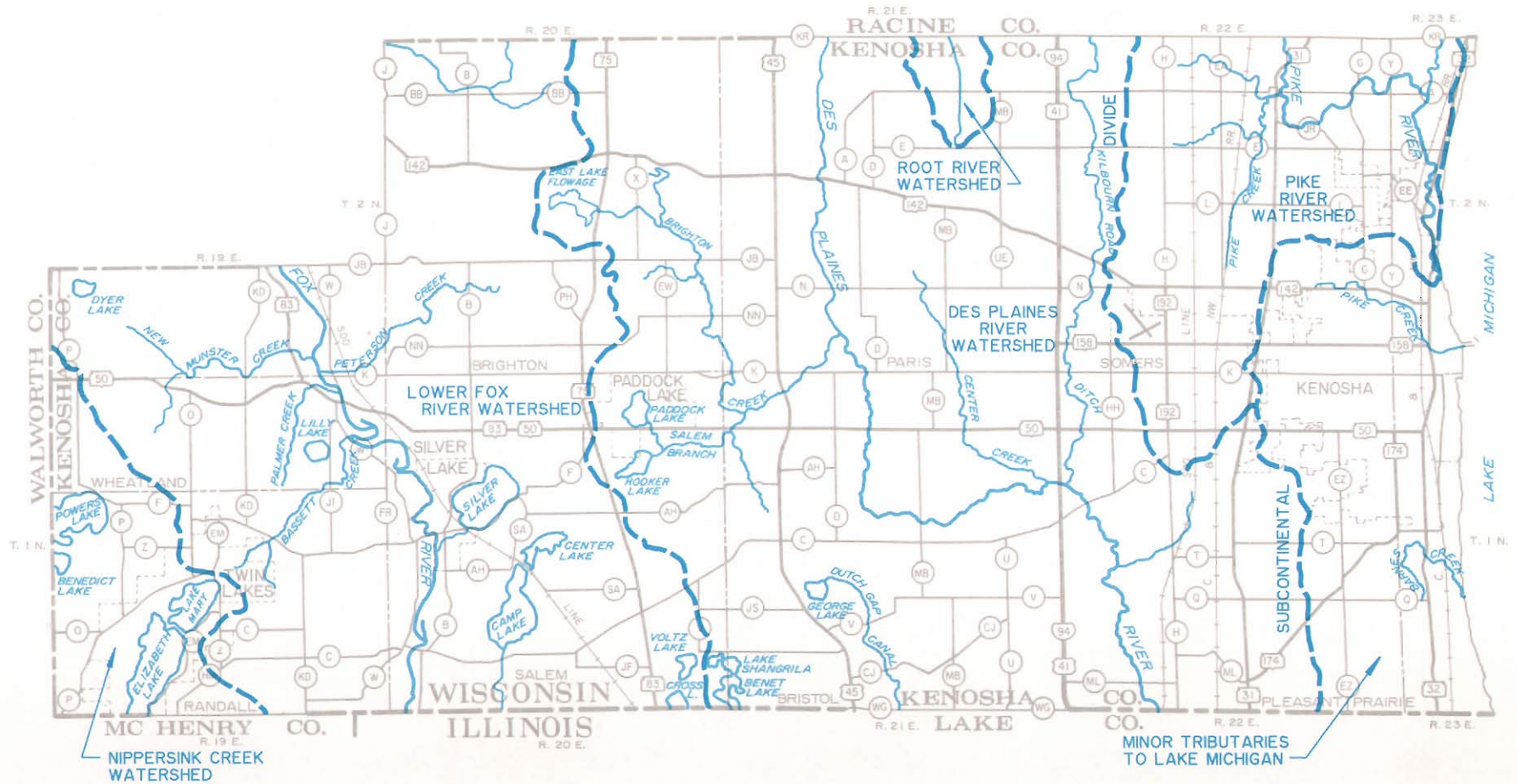
MAN-MADE ENVIRONMENT

Population Trends

The resident population of Kenosha County stood at about 75,200 persons in 1950, having increased to this level from about 10,700 persons in 1850 and 21,700 persons in 1900 (see Table 1). The county population increased by about 25,400 persons from 1950 to 1960, or by about 34 percent; and by an additional 17,300 persons, or an additional 17 percent, from 1960 to 1970. A very modest increase in the county population of about 5,200 persons, or just over 4 percent, occurred from 1970 to 1980, so that in 1980, the resident population of the County stood at about 123,100 persons. Population estimates prepared by the Wisconsin Department of Administration indicate that the 1988 resident population level of the County was virtually the same as the 1980 level.

Map 5

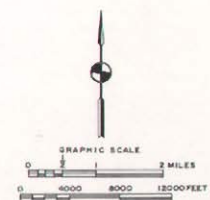
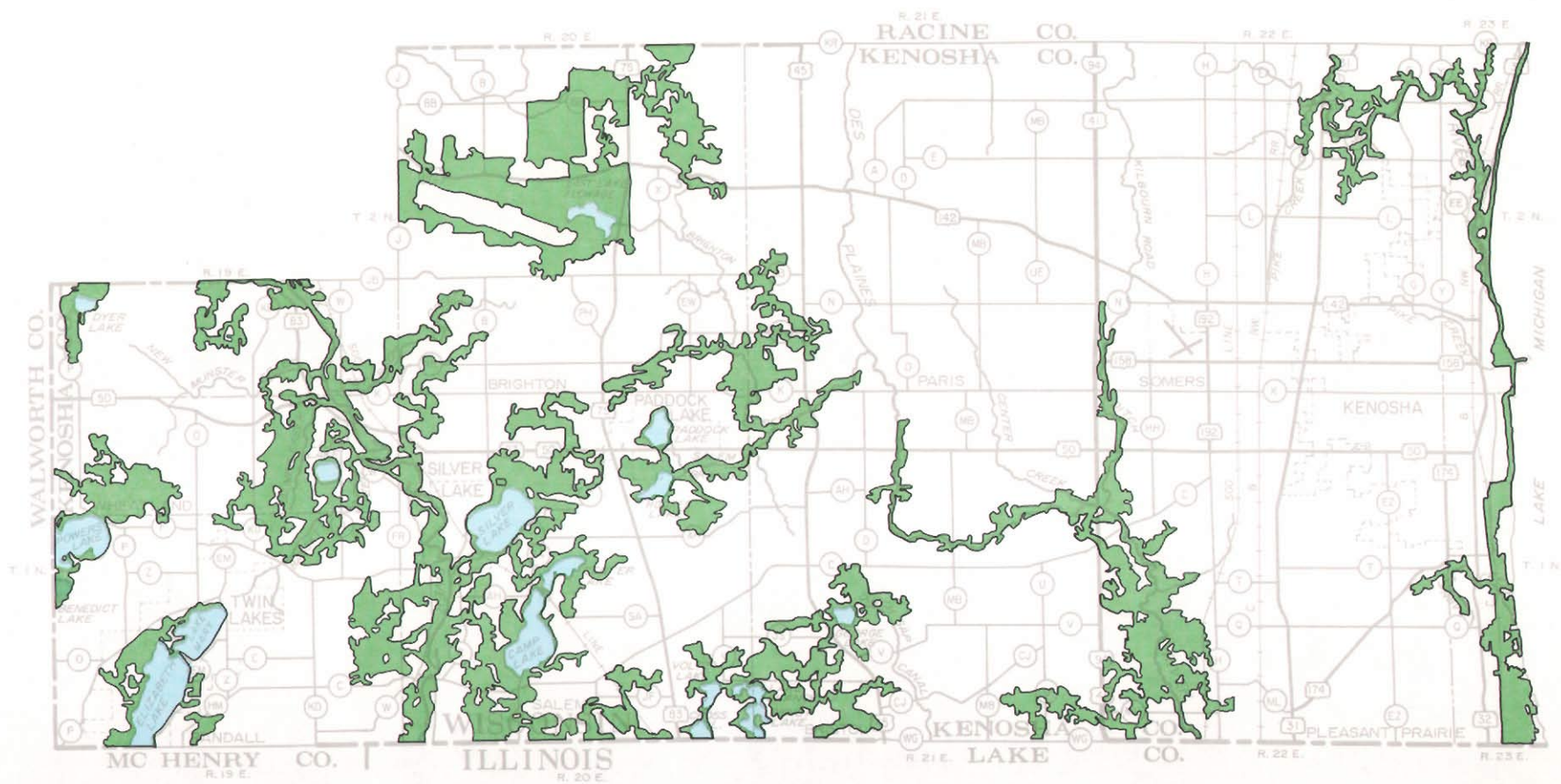
SURFACE WATER RESOURCES IN KENOSHA COUNTY



Source: SEWRPC.

Map 6

PRIMARY ENVIRONMENTAL CORRIDORS IN KENOSHA COUNTY



Source: SEWRPC.

Table 1

**POPULATION IN KENOSHA COUNTY:
CENSUS YEARS 1850-1980, AND ESTIMATED 1987**

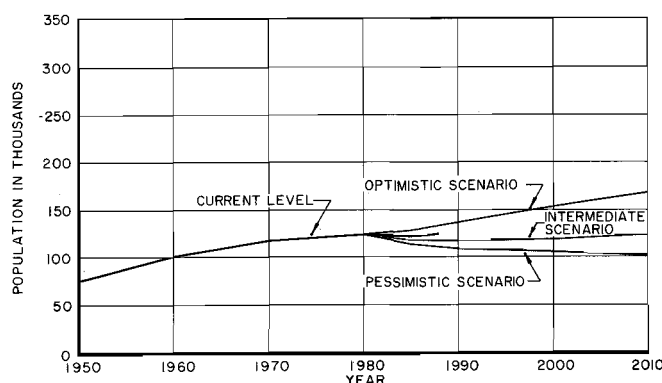
Year	Total Population		
	Number	Change from Preceding Time Period	
		Absolute	Percent
1850	10,734	--	--
1860	13,900	3,166	29.5
1870	13,147	-753	-5.4
1880	13,550	403	3.1
1890	15,581	2,031	15.0
1900	21,707	6,126	39.3
1910	32,929	11,222	51.7
1920	51,284	18,355	55.7
1930	63,277	11,993	23.4
1940	63,505	228	0.4
1950	75,238	11,733	18.5
1960	100,615	25,377	33.7
1970	117,917	17,302	17.2
1980	123,137	5,220	4.4
1988	123,127	-10	--

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

Population projections have been prepared by the Regional Planning Commission for Kenosha County and the Southeastern Wisconsin Region through the year 2010, and are presented in SEWRPC Technical Report No. 11 (2nd Edition), The Population of Southeastern Wisconsin. Because of the uncertainty entailed in any projection of future population levels in times of great social and economic change, such as are being presently experienced, the Commission has postulated three alternative future scenarios as a basis for population projection—two intended to identify extremes and one intended to identify an intermediate, or most probable future. Critical social and economic factors that could be expected to have an impact upon future mortality, fertility, and migration rates within the United States, the State, and the Southeastern Wisconsin Region were examined, and a reasonably extreme range of values was established for each component of population change.

Figure 1

**CURRENT AND ALTERNATIVE
FUTURE POPULATION LEVELS FOR
KENOSHA COUNTY: 1950-2010**



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

The “most reasonably optimistic” scenario of population change was provided by combining all factors that were internally consistent to create favorable conditions for population growth in the Region, and the “most reasonably pessimistic” scenario was provided by similarly combining all factors that would create unfavorable conditions for population growth in the Region.

As indicated in Figure 1, the resident population of Kenosha County may be expected to increase by approximately 43,700 persons by the year 2010 under the optimistic scenario. This increase, from a 1980 level of 123,100 persons to a 2010 level of 166,800 persons, would represent a 35 percent increase over 30 years. The intermediate scenario envisions virtual stability in the county population from 1980 to 2010, while the pessimistic scenario envisions a population loss of approximately 21,300 persons. This loss would represent a 17 percent decrease from the 1980 population level. As further indicated in Figure 1, population levels in Kenosha County between 1980 and 1988 most closely approximated the trend envisioned under the intermediate growth scenario.

Land Use

Although Kenosha County is considered to be a relatively urbanized county, just over four-fifths of the area of the County was still devoted to rural uses in 1985, while just under one-fifth was devoted to urban uses. As indicated in Table 2, in 1985 urban lands—consisting of lands

Table 2
LAND USE IN KENOSHA COUNTY: 1963 AND 1985

Land Use Category	1963		1985		Change: 1963-1985	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent
Urban						
Residential	10,712	6.0	15,320	8.6	4,608	43.0
Commercial	450	0.2	615	0.4	165	36.7
Industrial	711	0.4	917	0.5	206	29.0
Transportation, Communication, and Utilities	8,142	4.6	9,912	5.6	1,770	21.7
Governmental and Institutional	835	0.5	1,314	0.7	479	57.4
Recreational	1,827	1.0	2,749	1.6	922	50.5
Unused Urban	1,242	0.7	1,144	0.6	-98	-7.9
Subtotal	23,919	13.4	31,971	18.0	8,052	33.7
Rural						
Agricultural						
Cropland	97,718	54.8	93,239	52.3	-4,479	-4.6
Orchards and Nurseries	481	0.3	337	0.2	-144	-29.9
Pasture and Other	15,843	8.9	12,589	7.1	-3,254	-20.5
Subtotal	114,042	64.0	106,165	59.6	-7,877	-6.9
Wetlands	16,518	9.3	15,233	8.5	-1,285	-7.8
Woodlands	9,907	5.6	9,655	5.4	-252	-2.5
Extractive and Landfill Sites	564	0.3	1,091	0.6	527	93.4
Unused Rural and Other Open Lands	8,928	5.0	9,230	5.2	302	3.4
Surface Water	4,351	2.4	4,829	2.7	478	11.0
Subtotal	154,310	86.6	146,203	82.0	-8,107	-5.3
Total	178,229	100.0	178,174	100.0	-55	-.a

^aLess than 0.1 percent.

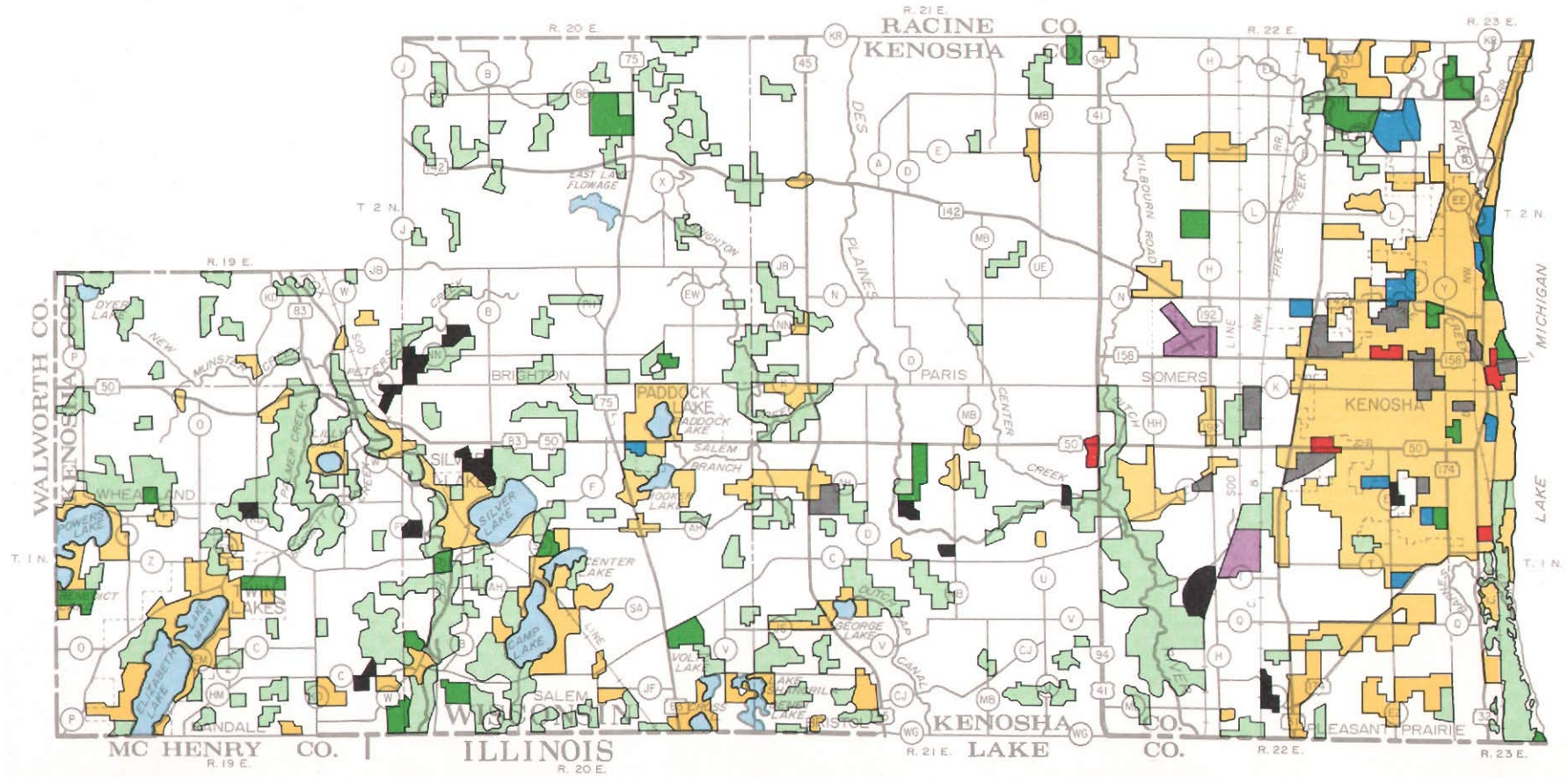
Source: SEWRPC.

devoted to residential, commercial, industrial, governmental and institutional, recreational, and transportation, communication and utility uses—encompassed about 32,000 acres, or about 18 percent of the total area of Kenosha County. Lands in residential use comprised the largest share of the area in urban use—about 15,300 acres, or about 48 percent of the area in urban use and about 9 percent of the total area of the County. As shown on Map 7, within Kenosha County urban land development has occurred both within expanding urban centers and within isolated enclaves in outlying areas of the County.

As further indicated in Table 2, rural land uses accounted for about 146,200 acres, or 82 percent of the area of the County in 1985. Agricultural lands encompassed just over 106,100 acres, or about 73 percent of the rural lands in the County, and about 60 percent of the total area of the County. The agricultural acreage included about 93,200 acres of cropland; 12,600 acres of pasture and unused agricultural land; and about 300 acres of orchards and nurseries. Other major rural land use categories in Kenosha County include wetlands—which in 1985 encompassed about 15,200 acres, or about 9 percent of the total

Map 7

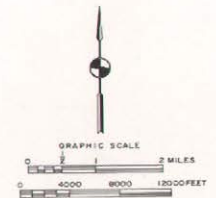
EXISTING LAND USE IN KENOSHA COUNTY: 1985



LEGEND

PREDOMINANT LAND USE

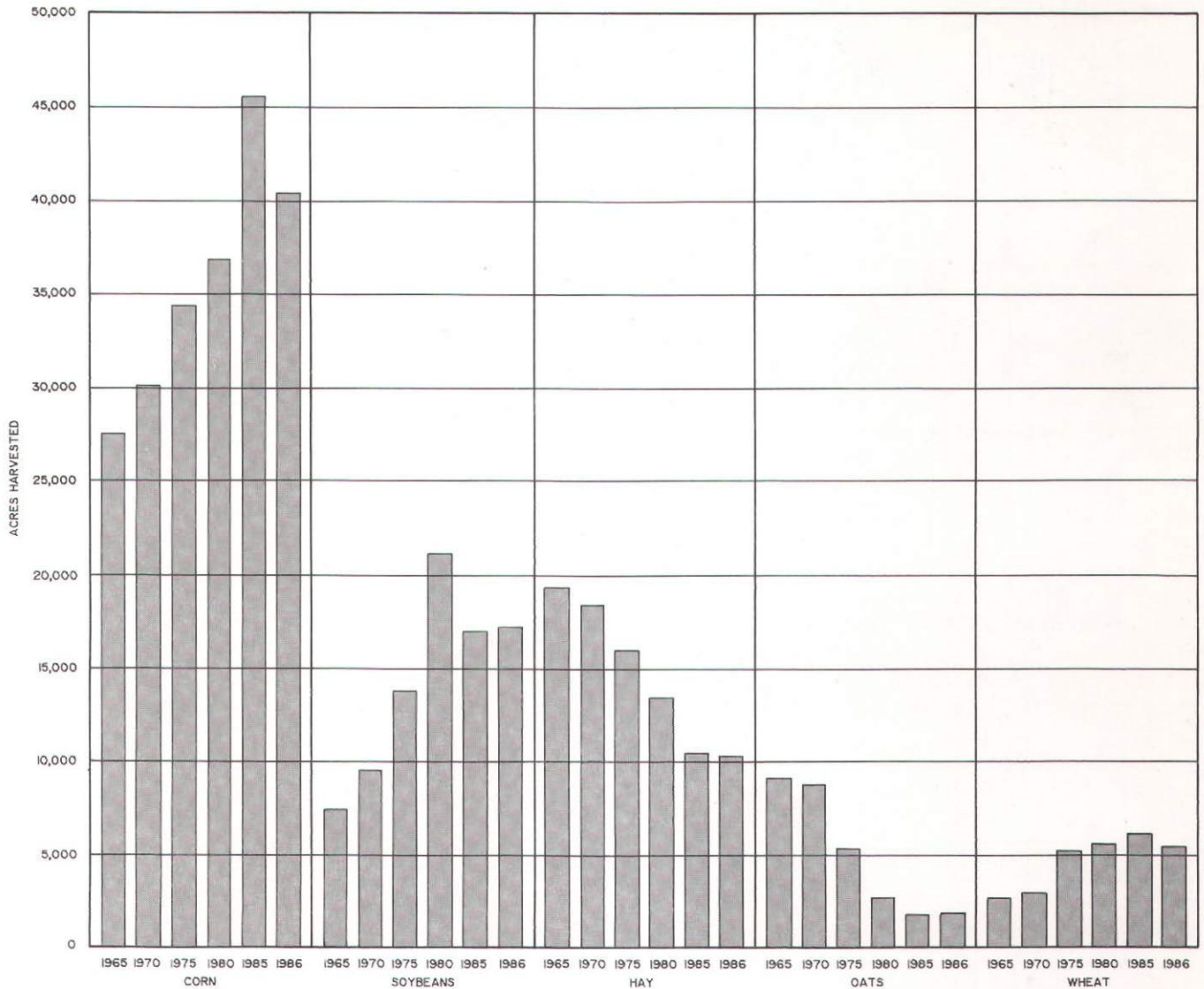
 RESIDENTIAL	 GOVERNMENTAL AND INSTITUTIONAL
 COMMERCIAL	 WOODLAND AND WETLAND
 INDUSTRIAL	 RECREATIONAL
 EXTRACTIVE AND LANDFILL	 MAJOR LAKE
 TRANSPORTATION, COMMUNICATION AND UTILITIES	 AGRICULTURAL AND OPEN SPACE



Source: SEWRPC.

Figure 2

ACREAGES FOR MAJOR CROPS IN KENOSHA COUNTY: 1965, 1970, 1975, 1980, 1985, AND 1986



Source: Wisconsin Agricultural Reporting Service and SEWRPC.

area of the County—and woodlands—which encompassed about 9,700 acres, or about 5 percent of the total area of the County.

The change in land use in Kenosha County between 1963—the base year for the Regional Planning Commission's initial land use inventory—and 1985 is also indicated in Table 2. During this 22-year time period, urban land use in Kenosha County increased by about 8,100 acres, or about 34 percent. Most of this increase consisted of lands developed for residential and

transportation use. As indicated in Table 2, much of the new development occurred in areas formerly in agricultural use.

Cropping Patterns

As shown in Figure 2, cropping patterns in Kenosha County have changed somewhat during the past two decades. Generally, there has been an increase in erosion-prone crops, particularly corn and soybeans, and a decrease in crops that are less susceptible to erosion, including oats and hay. Thus, the acreage in corn

increased by about 13,000 acres, or about 47 percent—from about 27,700 acres in 1965 to about 40,700 acres in 1986. The acreage in soybeans totaled about 17,200 in 1986—about 9,800 acres, or 132 percent, more than the 1965 acreage of 7,400.

As further indicated in Figure 2, the acreage in hay decreased by about 8,950, or about 46 percent—from about 19,300 acres in 1965 to about 10,350 acres in 1986. The acreage in oats decreased substantially, from about 9,100 acres in 1965 to about 1,700 acres in 1986—a decrease of about 7,400 acres, or about 81 percent.

Vegetable crops are grown on a limited basis in Kenosha County. The acreage in vegetable crops totaled about 4,800 in 1986, consisting primarily of cabbage and sweet corn. While historical records on vegetable crop production in the County are not available, acreage levels are believed to have declined somewhat over the past decade.

The foregoing trends in cropping patterns reflect a shift away from dairy farming and traditional crop rotations, which may include several years of hay, toward continuous row cropping. In this regard, it should be noted that the number of

dairy herds in Kenosha County decreased from about 271 in 1965 to about 113 in 1986, or by 58 percent. While traditional crop rotations are generally compatible with long-term resource protection, continuous row cropping can lead to severe soil erosion unless special precautions are taken.

CONCLUDING REMARKS

This chapter has presented a description of those features of the natural resource base and the man-made environment of Kenosha County which are important in any consideration of soil erosion problems in the County. Natural resource base features considered in this chapter included topography, physiography, soils, and surface water resources. Aspects of the man-made environment considered included population, land use, and cropping patterns. Among the most important trends observed in this chapter is the increase in erosion-prone cropland, particularly the land devoted to corn and soybeans, and a decrease in land devoted to crops that are less susceptible to erosion, including oats and hay—a reflection of a general shift away from dairy farming and traditional crop rotation toward continuous row cropping.

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Chapter III

SOIL EROSION INVENTORY

The rate of soil erosion on cropland for any given set of climatic conditions will vary with such factors as the cropping system, management practices, soil characteristics, and topographic features of the individual farm fields. Under the Kenosha County soil erosion control planning program, an inventory and analysis of existing cropland was undertaken in order to determine the extent and severity of cropland soil erosion problems within the County. This chapter describes the methodology and findings of that inventory and analysis work. In addition, this chapter presents a general description of soil erosion for certain other land uses.

SOIL EROSION PROCESSES

The primary agents of soil erosion are wind and water. It is estimated that, for cultivated cropland in Wisconsin, water erosion is about three times that caused by wind, although in the Central Sands area of the State, wind erosion is estimated to be more than twice that caused by water. Water erosion is considered to be the primary cropland soil erosion problem in Kenosha County.

Water erosion on cropland can be characterized as raindrop or splash erosion, sheet erosion, rill erosion, and gully erosion. Raindrop or splash erosion, the initial phase of water erosion, is the result of the impact of raindrops falling on soil particles, dislodging and splashing them about, so that they can be readily transported by surface runoff. Sheet erosion is characterized by the removal of a relatively uniform, thin layer of soil from the land surface, the result of runoff in the form of shallow sheets of water flowing over the ground. Such shallow surface flow typically does not move more than a few feet before collecting in surface depressions. Rill erosion occurs when sheet runoff begins to concentrate in surface depressions and, gaining in velocity, cuts small but well-defined channels termed "rills." Rills are at most a few inches deep and are easily obliterated by ordinary tillage. Gully erosion is an advanced form of soil erosion. Gullies may result when concentrated runoff widens and deepens rills, or when flows from several rills combine and form a larger

channel. In contrast to rills, gullies are not obliterated by normal tillage.

Under certain conditions, soils may also be removed and transported by the wind. Extensive areas of unprotected sandy soils and drained and cultivated organic soils are susceptible to wind erosion in the absence of effective wind breaks. In Kenosha County, areas covered by soils considered to be highly susceptible to wind erosion encompass about 10,200 acres, or 6 percent of the total area of the County. About 2,700 acres, or 26 percent of this total, are in agricultural use.

The inventory and analysis work conducted as part of the Kenosha County soil erosion control planning program focused on water erosion—specifically, sheet and rill erosion. Sheet and rill erosion is a widespread problem causing massive amounts of soil to be moved about on, and, in many cases, completely off inadequately protected cropland. Though often not perceived as a problem by the farm operator, sheet and rill erosion can seriously impair soil productivity in the long term and can cause serious and costly offsite damages and environmental problems. Gully and wind erosion problems, which may occur in localized areas in Kenosha County, should be addressed along with sheet and rill erosion as the county soil erosion control plan is implemented and detailed farm conservation plans are prepared.

CROPLAND SHEET AND RILL EROSION

Universal Soil Loss Equation

Estimates of the amount of sheet and rill erosion may be developed through application of a mathematical formula known as the universal soil loss equation. The universal soil loss equation is used to estimate the average soil loss from sheet and rill erosion. The equation may be written as:

where:

- A = soil loss, expressed in tons per acre per year;
- R = rainfall erosion index, expressed in

hundreds of foot-tons per acre, times the maximum 30-minute rainfall intensity, in inches per hour, for all significant storms on an average annual basis;

- K = soil erodibility factor, or the average soil loss, expressed in tons per acre per unit of R, from a particular soil in cultivated continuous fallow condition—that is, tilled continuously so as to be maintained free of vegetation and surface crusting—with a standard plot length of 72.6 feet and slope of 9 percent;
- LS = slope length and steepness factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss expected from a plot 72.6 feet in length, with a slope of 9 percent;
- C = vegetative cover factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss from a site in cultivated continuous fallow; and
- P = erosion control practice factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss from a site with no erosion control practices.

A detailed description of the universal soil loss equation can be found in Agricultural Handbook Number 537, issued by the U. S. Department of Agriculture.¹ It should be recognized that the soil “loss” estimated by the equation refers to soil dislodged and moved from place to place. The equation does not indicate the distance moved, nor does it indicate whether the movement is to a waterway, a neighboring farm field, or a different location on the same field.

In order to provide perspective on the severity of the soil erosion problem, soil loss as estimated by the universal soil loss equation is often compared to the soil loss tolerance, or “T-value.” The term “T-value” refers to the maximum annual average rate of soil loss that can be sustained without impairing the productivity of the soil. T-values have been determined for each

soil type by the U. S. Soil Conservation Service. For soils in Kenosha County, T-values generally range between two and five tons per acre per year. While comparisons to T-values are relied upon to provide insight into the severity of soil erosion problems and are widely used in conservation planning, a number of questions have developed regarding the concept of soil loss tolerances. Soil loss tolerances are considered further in the next chapter of this report.

Inventory Procedures

As part of the soil erosion control planning program, each cropland field in Kenosha County was identified on Commission 1985 one inch equals 400 feet scale, ratioed and rectified vertical aerial photographs. Data were then developed for each farm field to facilitate the estimation of soil erosion through application of the universal soil loss equation. A total of 3,218 cropland fields were identified, having a combined area of about 91,945 acres, or an average of 28.6 acres per field. The data required for application of the universal soil loss equation were developed as described below.

Rainfall Erosion Index (R): The rainfall erosion index is an indicator of the erosive force of rainfall for an area during a normal year. The rainfall index established by the U. S. Soil Conservation Service for Kenosha County is 140, and that value was used in the determination of soil loss rates presented later in this chapter.

Soil Erodibility Factor (K): The soil erodibility factor is an indicator of the susceptibility of soil to erosion, being a reflection of soil texture, structure, organic matter, and permeability. Soil erodibility factors have been determined by the U. S. Soil Conservation Service for each soil type. Under the Kenosha County cropland soil erosion inventory, the soil erodibility factor for each farm field was determined from U. S. Soil Conservation soil survey data. Where a farm field was covered by soils having different erodibility factors, a weighted average erodibility factor was assigned, based upon the proportionate areas covered by each of the various soil types.

Slope Length-Steepness Factor (LS): The steepness and length of slope have a direct bearing on the rate of soil loss. In general, soil loss per unit area increases as the slopes get longer and steeper. The LS-factor is a reflection of both the length and steepness of slope.

¹U. S. Department of Agriculture, *Agricultural Handbook Number 537, Predicting Rainfall Erosion Losses, A Guide to Conservation Planning*, 1978.

The following procedures were followed in developing LS-factors for farm fields under the Kenosha County cropland soil erosion inventory:

1. The steepness of slope was determined for each farm field from the detailed operational soil survey completed in 1965 by the Regional Planning Commission in cooperation with Kenosha County and the U. S. Soil Conservation Service, each farm field being assigned the percent slope indicated on the soil survey maps. Where a farm field was covered by soil mapping units having different slopes, a weighted average percent slope was assigned to the farm field based upon the proportionate area covered by each of the various soil types.
2. Representative slope lengths were developed for given percent slopes, based upon consultation with the Kenosha County Land Conservation Office and with U. S. Soil Conservation Service staff members with extensive experience in farm planning in Kenosha County, and therefore knowledgeable about the topographic characteristics of the County. For each slope steepness-length combination, an LS-factor was calculated according to the formula set forth in U. S. Department of Agriculture, Agricultural Handbook Number 537.² Each farm field was then assigned an LS-factor based upon its percent slope.

Vegetative Cover Factor (C): The effects of cropping and management practices on soil erosion are taken into account in the universal soil loss equation through the vegetative cover factor, or "C-factor." The C-factor for a particular cropland field is a reflection of its particular crop sequence and management practices. The C-factor is equal to 1.0 for cultivated continuous fallow ground—that is, tilled ground continuously maintained free of vegetation and surface crusting. At the other extreme, the C-factor for an established alfalfa and grass field is 0.006.

In the absence of field-specific information regarding cropping patterns and tillage practices for Kenosha County, representative C-factors were developed for subareas of the County

considered to have relatively homogeneous cropping and management practices. With the assistance of the Kenosha County Land Conservation Office and the U. S. Department of Agriculture, Soil Conservation Service, C-factors were developed for the eastern, central, and western portions of the County as indicated in Table 3. The C-factors presented in Table 3 are intended to reflect the most common agricultural activity and tillage practices in each area and take into account the extent of conservation tillage. It should be noted in this regard that while chisel tillage is not uncommon in Kenosha County, much of the chisel tillage is accomplished without leaving sufficient residue for erosion control purposes. In such cases, erosion rates may not be much different from those experienced with conventional moldboard plowing. Available data indicate that the use of effective conservation tillage is presently very limited in Kenosha County. It is estimated that just under 3 percent of the corn acreage and just over 1 percent of the soybean acreage in Kenosha was in conservation tillage in 1986.³

Erosion Control Practice Factor (P): The effects of conservation practices such as contour cropping, contour strip-cropping, and terracing are taken into account in the universal soil loss equation through the erosion control practice factor, or "P-factor."⁴ The following procedures were utilized in determining P-factors for cropland fields in Kenosha County:

1. Farm fields on which such practices have been implemented were identified based upon an inspection of farm fields as shown on Commission 1985 one inch equals 400 feet scale vertical aerial photographs for evidence of such practices, and upon consultation with the Kenosha County Land Conservation Office and U. S. Department of Agriculture, Soil Conservation Service, staff members familiar with farming practices within the County. It should be noted that this inventory indicated that contour

³*Conservation Tillage Information Center, 1986 National Survey of Conservation Tillage Practices—Wisconsin County Summary.*

⁴*The effects of terracing are also reflected in the universal soil loss equation in the LS-factor.*

²*Ibid.*

Table 3

C-FACTORS DEVELOPED FOR ANALYSIS OF CROPLAND SOIL EROSION IN KENOSHA COUNTY

Area	Typical Agricultural Activity	C-Factor
<u>Western Kenosha County</u>		
Towns of Randall and Wheatland	Dairying	0.17
<u>Central Kenosha County</u>		
Towns of Brighton, Bristol, Paris, and Salem	Cash cropping, with some dairying	0.25
<u>Eastern Kenosha County</u>		
Towns of Pleasant Prairie and Somers	Cash cropping	0.30

Source: U. S. Soil Conservation Service; Kenosha County Land Conservation Office; and SEWRPC.

cropping, contour strip-cropping, and terracing were practiced on a very limited basis in Kenosha County. Contour cropping was identified on farm fields encompassing a total area of about 106 acres, or 0.1 percent of all cropland in Kenosha County in 1985. Contour strip-cropping was identified on farm fields encompassing a total area of only 303 acres, or about 0.3 percent of all cropland. Terracing was identified on two farm fields encompassing a total area of 114 acres, about 0.1 percent of all cropland.

2. A P-factor value of less than 1.0 was subsequently assigned for each farm field for which contouring, contour strip-cropping, or terracing was identified, in accordance with the methodology set forth in the U. S. Soil Conservation Service Technical Guide. The large balance of cropland fields in the County was assigned a P-factor of 1.0.

Cropland Soil Erosion Rates

The rate of sheet and rill erosion was calculated for cropland fields in Kenosha County through application of the universal soil loss equation, using the data developed under the cropland inventory. The resulting soil loss rates expressed in tons per acre per year are presented for the County overall, for U. S. Public Land Survey townships, and for U. S. Public Land Survey sections in Tables 4 and 5, and on Map 8.

Table 4

CROPLAND SOIL EROSION RATES IN KENOSHA COUNTY: 1985

Soil Loss Rate (tons per acre per year)	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
Less than 3.0	854	22,560	24.5
3.0 - 3.9	553	17,988	19.6
4.0 - 4.9	635	22,704	24.7
5.0 - 5.9	300	9,008	9.8
6.0 - 6.9	246	6,703	7.3
7.0 - 7.9	211	5,378	5.9
8.0 - 8.9	106	1,967	2.1
9.0 - 9.9	84	2,044	2.2
10.0 - 14.9	198	3,244	3.5
15.0 or More	31	349	0.4
Total	3,218	91,945	100.0
Average Soil Loss Rate	4.5 Tons/Acre/Year		

NOTE: The area of cropland in Kenosha County presented in this table and in subsequent tables of this report, 91,945 acres, is slightly less than the area indicated in Table 2 in Chapter II. The data presented in Table 2 are from the Regional Planning Commission's most recent regionwide land use inventory, which is based upon Commission one inch equals 400 feet scale, ratioed and rectified aerial photographs taken in March 1985.

The cropland area reported in this table and subsequent tables of this report is based upon the cropland inventory conducted as part of the county soil erosion control planning program. Under that inventory, individual cropland fields were identified on 1985 Commission aerial photographs. Fields which were known to have been taken out of production between the date of the aerial photography and the date of the inventory and analysis work under the county soil erosion control planning program in 1987 are not included in this total.

Source: SEWRPC.

As indicated in Table 4, the average rate of sheet and rill erosion in Kenosha County in 1985 was 4.5 tons per acre per year. The soil loss rate was less than 3.0 tons per acre per year on about 22,600 acres of cropland, representing about 25 percent of all cropland. At the other extreme, the soil loss rate was 10 tons per acre per year or more on about 3,600 acres, representing about 4 percent of all cropland. As shown on Map 8, there was considerable variation in the rate of

Table 5

CROPLAND SOIL EROSION RATES IN KENOSHA COUNTY BY TOWNSHIP: 1985

U. S. Public Land Survey Township	Cropland Eroding at Less than 3.0 Tons/Acre/Year		Cropland Eroding at 3.0-4.9 Tons/Acre/Year		Cropland Eroding at 5.0-6.9 Tons/Acre/Year		Cropland Eroding at 7.0 Tons/Acre/ Year or More		Total Cropland		Average Soil Loss Rate Tons/Acre/Year
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
1 North, 19 East (Randall-Wheatland)	4,450	44.7	3,280	32.9	1,223	12.3	1,001	10.1	9,954	100.0	3.7
1 North, 20 East (Salem)	1,718	19.9	3,101	35.9	1,395	16.1	2,428	28.1	8,642	100.0	5.3
1 North, 21 East (Bristol)	2,748	19.6	6,408	45.7	1,875	13.4	2,992	21.3	14,023	100.0	5.0
1 North, 22 East (Pleasant Prairie)	836	8.9	2,985	31.9	4,344	46.4	1,202	12.8	9,367	100.0	5.4
1 North, 23 East (Pleasant Prairie)	341	52.8	305	47.2	0	--	0	--	646	100.0	2.7
2 North, 19 East (Wheatland)	2,861	60.0	1,033	21.6	552	11.6	326	6.8	4,772	100.0	3.0
2 North, 20 East (Brighton)	3,004	24.2	5,764	46.3	1,656	13.3	2,019	16.2	12,443	100.0	4.6
2 North, 21 East (Paris)	5,159	28.5	9,625	53.1	2,132	11.8	1,189	6.6	18,105	100.0	4.1
2 North, 22 East (Somers)	836	6.3	8,054	60.8	2,532	19.1	1,820	13.8	13,242	100.0	4.9
2 North, 23 East (Somers)	607	80.8	137	18.2	2	0.3	5	0.7	751	100.0	2.5
County Total	22,560	24.5	40,692	44.3	15,711	17.1	12,982	14.1	91,945	100.0	4.5

Source: SEWRPC.

cropland soil erosion within the County, with areas having the highest erosion rates generally occurring in the central area.

Actual soil loss rates within the County relative to "tolerable" soil loss rates, or "T-value," are presented in Tables 6 and 7 and on Map 9. As indicated in Table 6, for about 41,900 acres of cropland, or about 46 percent of all cropland in Kenosha County, the soil loss rate was less than or equal to T-value. Conversely, about 37,500 acres, or just over 40 percent of all cropland, was eroding at rates between 1.1 and 2.0 times T-value; about 9,000 acres, or about 10 percent, was eroding at rates between 2.1 and 3.0 times T-value; and the balance—about 3,500 acres, or about 4 percent—was eroding at rates of more than 3.0 times T-value.

As previously noted, as part of the soil erosion inventory, farm fields covered by more than one soil mapping unit were assigned weighted average values for certain factors in the universal soil loss equation, including the percent slope and soil erodibility factor. The resulting estimates of soil loss thus represent average values for entire farm fields and may not indicate higher rates of erosion which may be occurring on very steep portions of individual fields. As part of the detailed farm conservation planning

work envisioned under the erosion control plan, it may be expected that soil loss rates greater than the average rates presented herein will be identified for portions of individual farm fields.

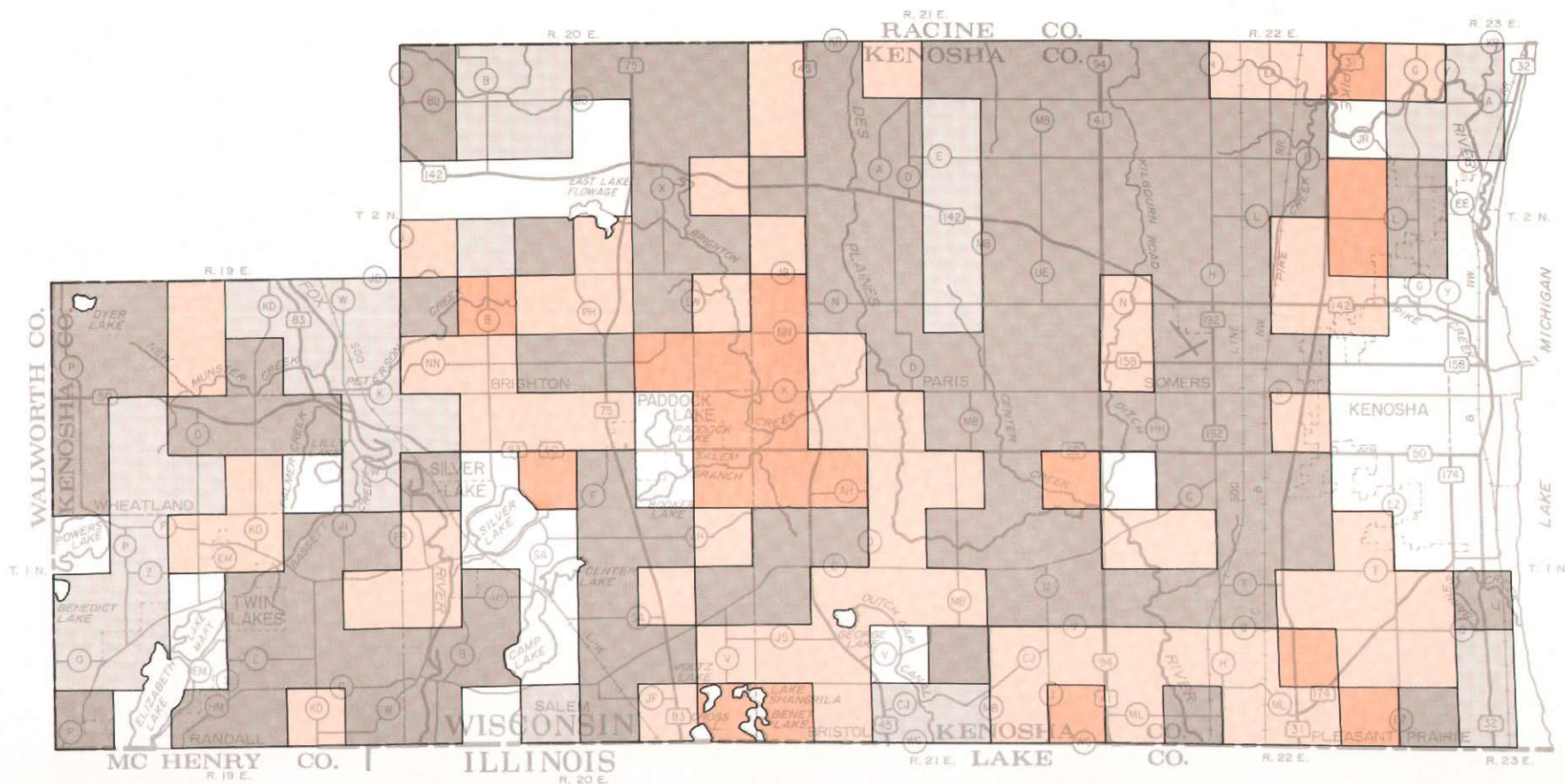
NONCROPLAND SOIL EROSION

As already noted, under the county soil erosion control planning program, primary data collection activity focused on cropland soil erosion. A general description of soil erosion attendant to other selected land uses is presented below.

Erosion on Pastureland and Grazed Woodland
Pastureland and grazed woodlands are susceptible to excessive erosion under certain circumstances, particularly when overgrazing occurs on steep slopes. Data regarding the rate of soil erosion on pastureland and grazed woodlands specific for Kenosha County are not available. However, the 1982 National Resources Inventory (NRI) conducted by the U. S. Soil Conservation Service indicated that, within major land resource area No. 95B—which as shown on Map 10 includes approximately the western one-fourth of Kenosha County and all or portions of 19 other counties in southern and eastern Wisconsin—the estimated average rate of water erosion on pastureland was 0.4 ton per acre per

Map 8

CROPLAND SOIL EROSION RATES IN KENOSHA COUNTY: 1985



LEGEND

AVERAGE SOIL LOSS RATE IN TONS PER ACRE PER YEAR FOR U.S. PUBLIC LAND SURVEY SECTIONS HAVING AT LEAST 100 ACRES OF CROPLAND:

- LESS THAN 3.0
- 3.0 - 4.9
- 5.0 - 6.9
- 7.0 OR MORE

U.S. PUBLIC LAND SURVEY SECTIONS HAVING LESS THAN 100 ACRES OF CROPLAND:



Source: SEWRPC.

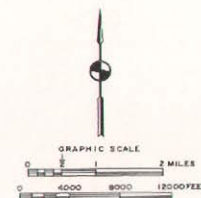


Table 6

**CROPLAND SOIL EROSION RELATIVE
TO T-VALUE IN KENOSHA COUNTY: 1985**

Soil Loss Rate in Multiples of T-Value	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
1.0 or Less	1,461	41,890	45.6
1.1 - 1.5	725	25,959	28.2
1.6 - 2.0	430	11,554	12.6
2.1 - 3.0	387	8,997	9.8
3.1 - 4.0	149	2,740	3.0
4.1 - 5.0	38	509	0.5
5.1 or More	28	296	0.3
Total	3,218	91,945	100.0

Source: SEWRPC.

year.⁵ The National Resources Inventory further indicated that, within this area, 2 percent of all pastureland was eroding at rates exceeding T-value. The estimated average rate of water erosion on grazed woodlands in this area, as estimated by the National Resources Inventory, was 0.6 ton per acre per year. An estimate of the percent of grazed woodlands eroding at rates exceeding T-value is not available.

The National Resources Inventory indicated that within major land resources area No. 110—which as shown on Map 10 includes approximately the eastern three-fourths of Kenosha County and portions of Milwaukee and Racine Counties—the estimated average rate of sheet and rill erosion on pastureland was about 0.1 ton per acre per year. Under the National Resources Inventory,

⁵The 1982 National Resources Inventory was a sample survey conducted by the U. S. Soil Conservation Service intended to provide statistically valid natural resource data for "major land resource areas." Major land resource areas are regions having similar soils, topography, and climate, as well as many similar resource-related opportunities and problems. Additional documentation of the National Resources Inventory is presented in *National Resources Inventory-Wisconsin-1982*, prepared by the U. S. Soil Conservation Service.

no pastureland in this area was identified as eroding at rates exceeding T-value. Erosion rates for grazed woodlands in this area are not available from the National Resources Inventory.

While an inventory and analysis of erosion on pastureland and grazed woodlands was not conducted as part of the soil erosion control planning program, it is envisioned that the detailed farm planning activities required to address the cropland soil erosion problems identified in this report will also address any apparent erosion problems on pastureland and grazed woodlands.

Stream Bank Erosion

Erosion of stream banks in rural areas may be promoted by livestock disturbance, cropping activity immediately adjacent to a stream, and certain recreational activities. Increased storm-water runoff from urbanizing areas may also contribute to increased stream bank erosion in downstream rural areas. Stream bank erosion is not considered to be a significant problem in Kenosha County, and such problems as may exist are considered to be localized in nature. Although an analysis of stream bank erosion was not conducted as part of the soil erosion control planning program, it is envisioned that the detailed farm planning activities required to address cropland soil erosion problems will also address any apparent stream bank erosion problems.

Construction Site Erosion

The development and redevelopment of land for residential, commercial, industrial, institutional, transportation, and other intensive urban uses may result in significant soil erosion. Such erosion can contribute to problems on the construction site itself, such as rilled and gullied slopes and washed-out roads, and to offsite problems including water quality degradation and clogging of culverts, roadside ditches, channels, and bays. Upon completion, increased runoff from impervious pavements, building roofs, and compacted soil at the developed site may cause erosion on adjacent lands and may increase the potential for flooding.

Soil erosion rates attendant to construction activities are extremely variable. The amount of erosion depends upon the time period and areal extent of the construction operation; the topography of the site; the soil characteristics; the construction methods utilized; and the ameliora-

Table 7

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN KENOSHA COUNTY BY TOWNSHIP: 1985

U. S. Public Land Survey Township	Cropland Eroding at 1.0 Times T-Value or Less		Cropland Eroding at 1.1-1.5 Times T-Value		Cropland Eroding at 1.6-2.0 Times T-Value		Cropland Eroding at More than 2.0 Times T-Value		Total Cropland		Average Soil Loss Rate in Multiples of T-Value
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
1 North, 19 East (Randall-Wheatland)	6,794	68.3	1,471	14.8	951	9.5	738	7.4	9,954	100.0	0.9
1 North, 20 East (Salem)	3,014	34.9	2,135	24.7	1,342	15.5	2,151	24.9	8,642	100.0	1.4
1 North, 21 East (Bristol)	4,877	34.8	4,360	31.1	1,929	13.7	2,857	20.4	14,023	100.0	1.3
1 North, 22 East (Pleasant Prairie)	2,744	29.3	2,350	25.1	2,190	23.4	2,083	22.2	9,367	100.0	1.4
1 North, 23 East (Pleasant Prairie)	646	100.0	0	--	0	--	0	--	646	100.0	0.6
2 North, 19 East (Wheatland)	3,505	73.4	586	12.3	435	9.1	246	5.2	4,772	100.0	0.7
2 North, 20 East (Brighton)	5,686	45.7	3,146	25.3	1,768	14.2	1,843	14.8	12,443	100.0	1.2
2 North, 21 East (Paris)	8,695	48.0	6,643	36.7	1,479	8.2	1,288	7.1	18,105	100.0	1.1
2 North, 22 East (Somers)	5,185	39.2	5,261	39.7	1,460	11.0	1,336	10.1	13,242	100.0	1.2
2 North, 23 East (Somers)	744	99.1	7	0.9	0	--	0	--	751	100.0	0.5
County Total	41,890	45.6	25,959	28.2	11,554	12.6	12,542	13.6	91,945	100.0	1.2

Source: SEWRPC.

tive measures taken to control soil erosion. Erosion rates on land under construction may be very high, ranging up to 200 tons per acre per year.

As indicated in Chapter II, Kenosha County has experienced a substantial increase in lands devoted to intensive urban uses. Such lands increased by about 8,100 acres, or 34 percent, between 1963 and 1985, with residential lands accounting for about 4,600 acres, or about 57 percent, of the total increase. A total of 4,488 residential lots were platted during this time period, an average of 204 lots per year. From 1985 through 1987, a total of 100 residential lots were platted, an average of 33 lots per year. Within Kenosha County, urban land development—and the attendant potential for construction site erosion—has occurred both within expanding urban centers and within isolated enclaves in outlying areas of the County (see Map 7 in Chapter II).

Soil erosion from construction sites can be minimized through appropriate soil erosion control practices. The Wisconsin Department of Natural Resources, in conjunction with the

League of Wisconsin Municipalities, recently prepared a model ordinance which local units of government may adopt to control construction site erosion.⁶ The model ordinance requires erosion control practices which reduce the amount of sediment and other pollutants leaving construction sites during the development process. The ordinance sets forth requirements with regard to seeding, sodding, mulching, and other means of stabilizing disturbed ground; use of sedimentation basins and filter fences to minimize the amount of sediment leaving the site; diversion of runoff from upland areas away from the construction site; and other erosion control practices. Neither Kenosha County nor any of the local units of government in the County have adopted such an ordinance to date.

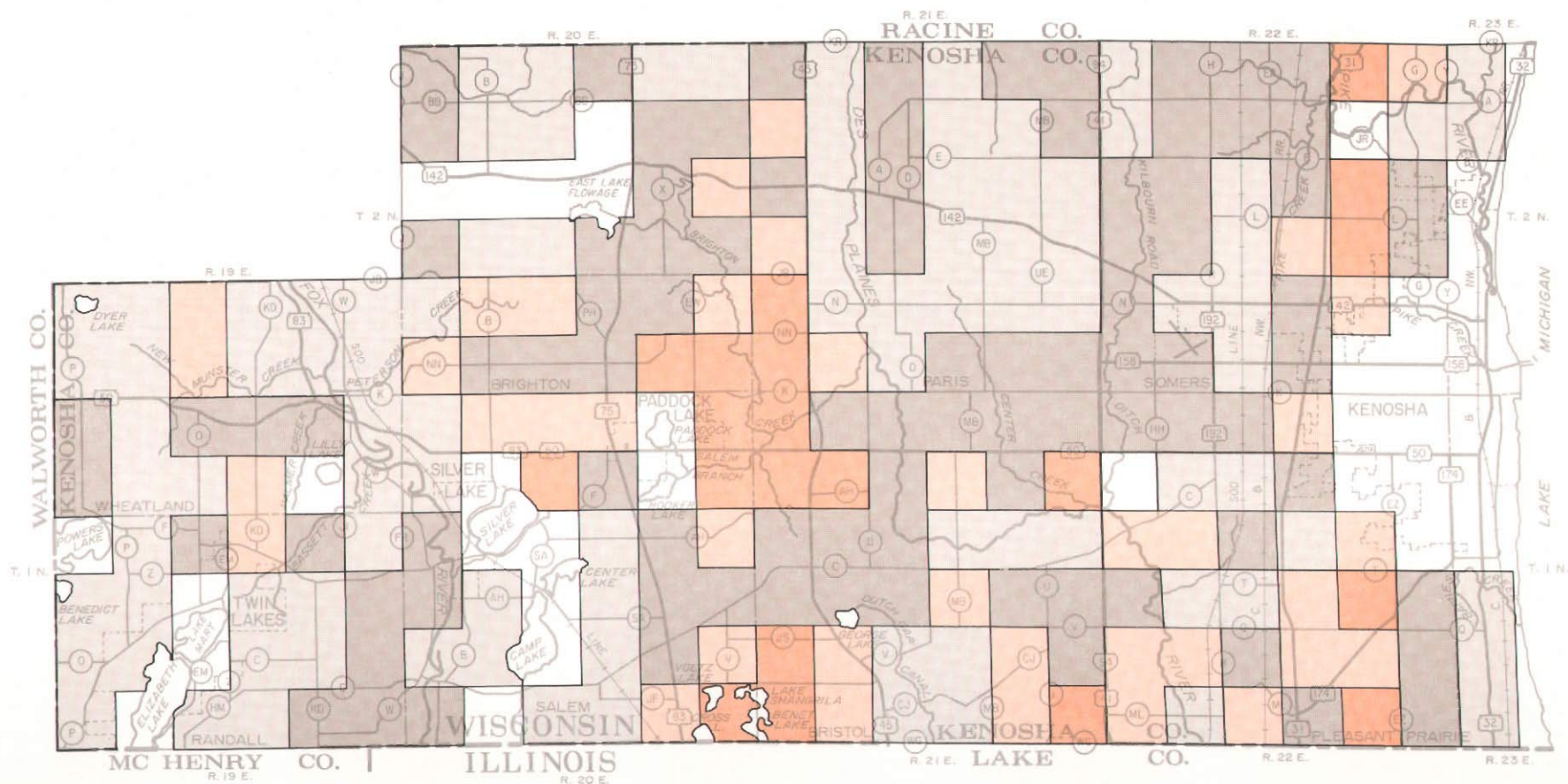
Lake Michigan Shoreline Erosion

Lake Michigan shoreline erosion constitutes a serious threat to land and improvements along portions of the Lake Michigan shoreline in Kenosha County. The approximately four-and-

⁶"A Model Ordinance," *The Municipality*, Volume 82, No. 1, January 1987.

Map 9

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN KENOSHA COUNTY: 1985

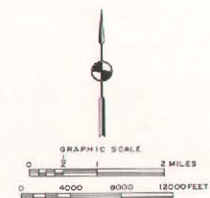


LEGEND

AVERAGE SOIL LOSS RATE IN MULTIPLES OF T-VALUE FOR U.S. PUBLIC LAND SURVEY SECTIONS HAVING AT LEAST 100 ACRES OF CROPLAND:

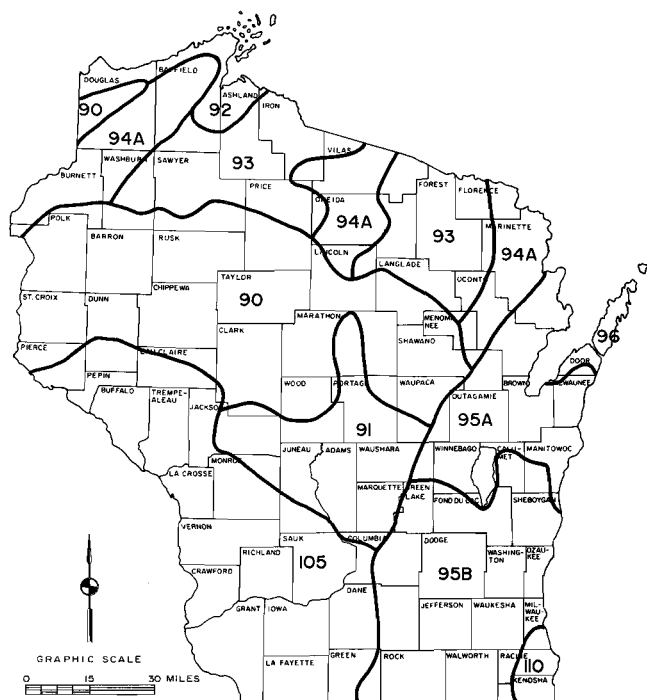
- 1.0 TIMES T-VALUE OR LESS
- 1.1 - 1.5 TIMES T-VALUE
- 1.6 - 2.0 TIMES T-VALUE
- 2.1 TIMES T-VALUE OR MORE

U.S. PUBLIC LAND SURVEY SECTIONS HAVING LESS THAN 100 ACRES OF CROPLAND:



Map 10

MAJOR LAND RESOURCE AREAS



Source: U. S. Soil Conservation Service and SEWRPC.

one-half-mile shoreline reach in the Town of Pleasant Prairie in particular was identified in the shore erosion study conducted under the Wisconsin coastal management program as the most critical reach of the entire Lake Michigan coast in Wisconsin in terms of shore damage and recession rates.⁷ Long-term recession rates—average annual rates over the period 1835 to 1980—for that reach range between 1.5 and 8.8 feet per year depending on the location. Short-term recession rates—average annual rates over the period 1970 to 1980—range from 0.6 to 12.6 feet per year, with shoreline accretion occurring at several points.⁸

Shoreline erosion problems may be mitigated or prevented through structural shore protection measures and regulatory approaches. Structural measures—including the installation of revetment, seawalls, groins, and breakwaters and measures to stabilize coastal bluffs—are particularly important where erosion threatens public and private development. In the most recent large-scale shore protection project in the County—which was substantially completed in 1987—the Town of Pleasant Prairie took steps to protect seriously threatened shoreline reaches adjacent to First Avenue in the Carol Beach area

of the Town. Stone revetment was installed along about 4,450 feet of shoreline and nine jetties were installed. Shore protection was also installed by many private owners of erosion-threatened property in the area at that time.

Land use regulations can be used to protect proposed development from excessive shoreline erosion and bluff recession by establishing setback provisions which restrict the location of buildings and other land uses which are vulnerable to damage or destruction from erosion. Approaches that may be used in establishing structural setback distances are described in SEWRPC Community Assistance Planning Report No. 86, A Lake Michigan Coastal Erosion Management Study for Racine County, Wisconsin.

CONCLUDING REMARKS

This chapter has described the methodology and findings of an inventory and analysis of cropland soil erosion in Kenosha County. That work indicated that the average rate of sheet and rill erosion on cropland in Kenosha County was 4.5 tons per acre per year in 1985. The soil loss rate was less than three tons per acre per year on about 22,600 acres of cropland, or about 25 percent of all cropland in the County. At the other extreme, the soil loss rate was 10 tons per acre per year or more on about 3,600 acres, representing about 4 percent of all cropland. About 50,000 acres, or about 54 percent of all cropland in the County, was identified as having a soil loss rate in excess of soil loss tolerances, or “T-values,”

⁷D. M. Mickelson, et al., Shore Erosion Study: Technical Report—Shoreline Erosion and Bluff Stability Along Lake Michigan and Lake Superior Shorelines of Wisconsin, 1977.

⁸The recession rates for the Lake Michigan shoreline in the Town of Pleasant Prairie are those documented 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. Also, recession rates for that shoreline reach and the balance of the Lake Michigan shoreline in Kenosha County are documented for other time periods in the shore erosion study report referenced in the previous footnote.

established by the U. S. Soil Conservation Service. Specifically, about 37,500 acres, or just over 40 percent of all cropland, was eroding at rates between 1.1 and 2.0 times T-value; about 9,000 acres, or about 10 percent, was eroding at rates between 2.1 and 3.0 times T-value; and the balance—about 3,500 acres, or about 4 percent—was eroding at rates greater than 3.0 times T-value. There was considerable variation in the rate of cropland soil erosion within the County, with areas having the highest erosion rates generally occurring in the central area. Subsequent chapters of this report establish a cropland soil erosion control objective and related standards and set forth a plan for the abatement of the identified cropland soil erosion problems.

Data regarding the rate of erosion on pastureland and grazed woodland specific for Kenosha County are not available. However, the 1982 National Resources Inventory (NRI) conducted by the U. S. Soil Conservation Service indicated that, within a reporting area which includes the western one-fourth of Kenosha County, the estimated average rate of sheet and rill erosion was 0.4 ton per acre per year on pastureland and 0.6 ton per acre per year on grazed woodlands. The National Resources Inventory further reported that within a reporting area which includes the eastern three-fourths of Kenosha County, the estimated average erosion rate was 0.1 ton per acre per year on pastureland, with no erosion rate estimate available for grazed woodlands. It is envisioned that erosion problems on pasturelands and grazed woodlands will be identified and addressed as part of the detailed farm planning activities required to address

cropland soil erosion problems. It is further envisioned that stream bank erosion problems—generally considered to be localized in nature in Kenosha County—will also be identified and addressed as part of the detailed farm planning activities.

This chapter has also pointed out the potential for serious construction site erosion problems as Kenosha County continues to urbanize. Erosion rates on land under construction may be very high—up to 200 tons per acre per year. Construction site erosion can, however, be minimized through appropriate erosion control practices. The adoption and enforcement by local units of government of construction site erosion control ordinances—such as the model ordinance recently prepared by the Wisconsin Department of Natural Resources in conjunction with the League of Wisconsin Municipalities—can significantly reduce construction site erosion problems.

Lake Michigan shoreline erosion constitutes a serious threat to land and improvements along portions of the Lake Michigan shoreline in Kenosha County. The approximately four-and-one-half-mile shoreline reach in the Town of Pleasant Prairie in particular has been identified as the most critical reach of the entire Lake Michigan coast in Wisconsin in terms of shore damage and recession rates. Shoreline erosion problems may be mitigated or prevented through structural shore protection measures—such as the installation of revetment, seawalls, groins, and breakwaters and measures to stabilize coastal bluffs—and through regulatory approaches, including structural setback provisions in zoning ordinances.

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Chapter IV

CROPLAND SOIL EROSION CONTROL OBJECTIVE, PRINCIPLE, AND STANDARDS

Planning is a rational process for formulating and meeting objectives. The formulation of objectives, therefore, is an essential task which must be undertaken before plans can be properly prepared. This chapter presents a cropland soil erosion objective for Kenosha County, together with a supporting principle and related standards, all as recommended for adoption by the Technical Advisory Committee as part of the County soil erosion control plan.¹

BACKGROUND

Central to the formulation of cropland soil erosion objectives and standards is a consideration of what constitutes excessive erosion. Traditionally in conservation planning, excessive erosion has been defined as erosion in excess of the specific soil loss tolerance for a given soil. A soil loss tolerance, or "T-value," has been established by the U. S. Soil Conservation Service for each soil type. Soil loss tolerance is defined by the Soil Conservation Service as the maximum level of soil erosion that will permit a high level of crop productivity to be sustained

economically and indefinitely. Considered in the establishment of soil loss tolerances, or T-values, are soil depth, including depth to a restrictive layer, permeability, and other factors. For soils in Kenosha County, T-values range from two to five tons per acre per year.

Chapter Ag 160 of the Wisconsin Administration Code, which governs the preparation of county soil erosion control plans, requires that every county soil erosion control plan establish maximum acceptable rates of cropland soil erosion and that these rates be expressed in terms of T-value, or multiples or fractions of T-value. Chapter Ag 160 further requires that these rates meet certain minimum statewide goals, including an ultimate goal that erosion on all cropland be reduced to no more than T-value by the year 2000. Several interim goals are also prescribed.

Attainment of T-value on all cropland would represent a substantial reduction in cropland soil erosion in Kenosha County, and would contribute significantly to the long-term maintenance of soil productivity. It should be recognized in this respect that while T-values enjoy a widespread use as a basis for soil conservation planning, T-values are not universally accepted as goals for cropland soil erosion control. There is growing concern that T-values have been set too high to adequately protect the long-term productivity of the soil. If the actual topsoil formation rate is less than the assigned T-value, topsoil may be gradually depleted even though erosion would appear to be at tolerable levels. It should also be recognized in this respect that the established T-values do not take into account offsite impacts attendant to cropland soil erosion. Controlling erosion at T-value does not ensure the prevention of erosion-related water quality problems or other offsite damages, such as the clogging of culverts and ditches. Nevertheless, a reduction in cropland soil erosion to T-value throughout Kenosha County would contribute significantly to the abatement of such offsite problems.

Some conservationists argue for more aggressive control of cropland erosion, calling for the prevention of all "accelerated" erosion. Acceler-

¹For purposes of this report, the following definitions of these terms will be employed: 1) objective—a goal or end toward the attainment of which plans and policies are directed; 2) principle—a fundamental, primary, or generally accepted tenet used to assert the validity of objectives and to prepare standards and plans; 3) standard—a criterion used as a basis of comparison to determine the adequacy of alternative and recommended plan proposals to attain objectives; 4) plan—a design which seeks to achieve the agreed-upon objectives; 5) policy—a rule or course of action used to ensure plan implementation; and 6) program—a coordinated series of policies and actions to carry out a plan. Although this chapter discusses only the first three of these terms, an understanding of the interrelationship of the basic concepts which the foregoing terms represent is essential to the discussion of objectives, principles, and standards.

ated erosion refers to erosion induced by man, as opposed to "normal" erosion caused by geological processes under natural environmental conditions. This position was espoused by the Ad Hoc Committee on Land Resources, created by the Wisconsin Chapter of the Soil and Water Conservation Society, in a report entitled "Soil Conservation Policies for the 1980's."² That report notes that soil productivity in terms of crop yield is declining at about 2 percent annually, and that increased use of fertilizer and cultural technology have been relied on to offset this decline. The report cautions that there is no assurance that technological advances can indefinitely counter the losses in natural soil productivity. While there are practical impediments to achieving zero accelerated erosion on a widespread basis, there may come a time when soil erosion control beyond currently established soil loss tolerance levels will be required.

RECOMMENDED SOIL EROSION CONTROL OBJECTIVE, PRINCIPLE, AND STANDARDS

After careful deliberation, the Technical Advisory Committee recommended the adoption of the cropland soil erosion control objective, supporting principle, and related standards set forth in Table 8. It should be noted that the standards set forth in Table 8 incorporate the minimum standards for erosion control pre-

scribed in Chapter Ag 160 of the Wisconsin Administrative Code—including, importantly, the reduction of soil erosion on all cropland to no more than T-value by the year 2000.

The recommended objective and related standards are based upon the following conclusions drawn by the Advisory Committee during its deliberation on this matter:

- That despite their limitations, soil loss tolerances, or T-values, established by the U. S. Soil Conservation Service currently provide the best available basis for establishing cropland soil erosion objectives and standards—although continuing research of those tolerances is required.
- That the attainment of the recommended standards would result in a substantial reduction in cropland soil erosion in Kenosha County, contributing significantly to the maintenance of the long-term productivity of soil resources and to the abatement of erosion-related water quality problems and other offsite damages.
- That given the amount of cropland—about 50,000 acres, or about 54 percent of all cropland in the County—eroding at rates in excess of T-value, and given the trend toward production of erosion-prone crops, the reduction of soil loss to tolerable levels throughout the County by the year 2000 represents a major challenge to the County's agricultural sector.
- That in the long term, the County may wish to explore more aggressive erosion control objectives and standards as warranted by continuing erosion research.

²*Wisconsin Chapter, Soil Conservation Society of America (now Soil and Water Conservation Society), "Soil Conservation Policies for the 1980's," Report of the Ad Hoc Committee on Land Resources, November 1984.*

Table 8

CROPLAND SOIL EROSION CONTROL OBJECTIVE, PRINCIPLE, AND STANDARDS

OBJECTIVE

The maintenance of the long-term productivity of soils through the prevention of excessive cropland soil erosion.

PRINCIPLE

Erosion can diminish soil productivity by degrading the physical, biological, and chemical properties of the topsoil and by decreasing the depth of soil that is suitable for plant rooting. Prevention of excessive cropland soil erosion is necessary to ensure soil productivity for future generations. Prevention of excessive cropland soil erosion would also contribute to the abatement of erosion-related water quality problems and other offsite damages, including the clogging of culverts and drainageways.

STANDARDS

A. Standards for Individual Fields

1. The soil erosion rate on individual cropland fields should not exceed T-value on or after January 1, 2000.
2. The soil erosion rate on individual cropland fields should not exceed three times T-value on or after July 1, 1990.
3. The soil erosion rate on individual cropland fields should not exceed two times T-value on or after July 1, 1995.
4. The soil erosion rate on individual cropland fields on farms owned by any department or agency of state government should not exceed T-value on or after July 1, 1990.

B. Standards for the County

1. The average soil erosion rate for all cropland in the County should not exceed 1.5 times T-value on or after July 1, 1990.
2. The average soil erosion rate for all cropland in the County should not exceed T-value on or after July 1, 1993.

NOTE: "T-value" is the tolerable soil loss rate—the maximum level of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely, as determined by the U. S. Soil Conservation Service. "Excessive" cropland erosion refers to erosion in excess of the tolerable rate, or T-value.

Source: SEWRPC.

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Chapter V

RECOMMENDED SOIL EROSION CONTROL PLAN

A variety of conservation practices are available to farmers for the control of cropland soil erosion. These practices range from structural approaches, such as the installation of terraces and the construction of grassed waterways, to management approaches, such as conservation tillage and contour plowing. An important objective of the county soil erosion control planning program was the identification of those practices that would be the most effective in addressing the soil erosion problems identified within the County. Accordingly, this chapter identifies the types and amounts of conservation practices believed to have the greatest potential for reducing cropland soil erosion to tolerable levels in Kenosha County. This chapter also identifies the detailed farm conservation planning activities which would be required to implement the recommended practices.

While the responsibility for implementation of soil erosion control practices ultimately rests with the individual farmer, various county, state, and federal agencies can help to increase the awareness of cropland soil erosion problems and promote implementation of soil erosion control practices through technical assistance, financial assistance, and informational and educational activities. Because cropland soil erosion problems are widespread, and because the public resources available to address such problems are limited, it is important that the available resources be appropriately directed, or targeted, to ensure the maximum resulting benefit. Accordingly, this chapter also recommends a rank ordering of areas of the County for application of soil erosion control measures, and provides a general time frame to help guide the use of the available soil erosion control resources. A description of county, state, and federal technical and financial programs which can be used to assist in the needed implementation of soil erosion control measures is provided in the next chapter of this report, together with specific recommendations regarding the use of those programs in Kenosha County.

This chapter consists of four sections. The first section describes the recommended priority areas for the application of soil erosion control measures in Kenosha County. The second sec-

tion describes the various types of soil erosion control practices available and identifies those types and amounts needed to abate the soil erosion problems existing in the County. The third section identifies the detailed farm conservation planning activities required to implement the recommended practices. The fourth section establishes a time frame for addressing the identified soil erosion problems within the respective priority areas.

EROSION CONTROL PRIORITY AREAS

The rank ordering of subareas of the County for soil erosion control purposes is a key aspect of the county soil erosion control plan. Such a rank ordering could be accomplished in a number of ways. The Kenosha County Soil Erosion Control Planning Program Technical Advisory Committee determined that the rank ordering of areas for erosion control should be based primarily upon the soil loss rate and the amount of excessive soil erosion occurring, with those areas having the highest soil loss rate and greatest amount of excessive soil loss assigned the highest priority for erosion control. The Committee further determined that U. S. Public Land Survey sections, each approximating 640 acres in area, should serve as the basic geographic unit for the rank ordering—and that the U. S. Public Land Survey sections should be classified into priority categories based upon the average soil loss rate and the amount of excessive erosion occurring. The approach recommended by the Advisory Committee was intended to address the most serious soil erosion problems first and to achieve the maximum reduction in soil erosion as quickly as possible with the limited resources available.

The specific criteria for grouping and ranking U. S. Public Land Survey sections for erosion control, developed under the guidance of the Technical Advisory Committee, are set forth in Table 9. Based upon those criteria, each U. S. Public Land Survey section containing cropland eroding at excessive rates was assigned to one of four priority categories, as shown on Map 11. Summary information regarding cropland soil erosion rates for each of the priority areas is

Table 9

**CRITERIA FOR THE GROUPING AND RANKING
OF U. S. PUBLIC LAND SURVEY SECTIONS FOR
EROSION CONTROL UNDER THE KENOSHA
COUNTY SOIL EROSION CONTROL PLAN**

Priority Area Identifier	Priority Area Criteria
A	U. S. Public Land Survey sections having an average soil loss rate of at least 1.5 times T-value and at least 100 acres of cropland with a soil loss rate exceeding T-value
B	U. S. Public Land Survey sections having an average soil loss rate of 1.2 to 1.4 times T-value and at least 100 acres of cropland with a soil loss rate exceeding T-value
C	Other U. S. Public Land Survey sections having at least 100 acres of cropland with a soil loss rate exceeding T-value
D	U. S. Public Land Survey sections having 1 to 99 acres of cropland with a soil loss rate exceeding T-value

Source: SEWRPC.

presented in Tables 10 and 11. As indicated in Table 11, Priority Area A—the highest priority area for erosion control—includes 65 U. S. Public Land Survey sections, which together encompassed about 21,309 acres of cropland in 1985. On the average, cropland in Priority Area A was eroding at 1.9 times T-value, and about 18,464 acres, or about 87 percent of all cropland in the 65 sections concerned, was eroding at rates exceeding T-value. Conversely, Priority Area D—the lowest priority area for erosion control—includes 68 U. S. Public Land Survey sections, which together encompassed about 16,722 acres of cropland. On the average, cropland in Priority Area D was eroding at 0.8 times T-value, and about 3,344 acres, or about 20 percent of all cropland in the 68 sections concerned, was eroding at rates exceeding T-value.

Water Quality Considerations

The county soil erosion control planning program included an identification of farm fields within Priority Area A having potential adverse impacts on surface water or groundwater as a result of excessive soil erosion. The identification of potential surface water problems was based upon an analysis of the existing drainage pattern, the proximity of the eroding field to the

surface water network, and the extent of effective buffering between the eroding field and the surface water, as determined from a review of topographic maps and aerial photographs, and from field inspection. The identification of potential groundwater impacts was based upon analysis of drainage patterns as well as the types of soils, depth to groundwater and bedrock, and vegetative cover for internally drained areas, as determined from a review of topographic maps, aerial photographs, and soil survey maps, as well as from field inspection. Table 12 sets forth the criteria utilized to identify farm fields having potential adverse impacts on surface- or groundwater as a result of excessive soil erosion. This analysis indicated that of the 18,500 acres of excessively eroding cropland in Priority Area A, about 16,200 acres, or just over 87 percent, have the potential to contribute to surface- or groundwater pollution. It is important to note that the analysis provided an indication of the potential for water pollution; actual water quality impacts will depend upon the intensity, duration, and frequency of rainfall, as well as agricultural practices.

SOIL EROSION CONTROL PRACTICES

The major conservation practices that may be utilized in efforts to control cropland soil erosion include conservation tillage, changes in crop rotations, contouring, contour strip-cropping, terraces, grassed waterways, cover crops, and permanent vegetative cover. The first part of this section describes these practices, while the second part identifies the types and amounts of such practices recommended for the abatement of cropland soil erosion problems in Kenosha County.

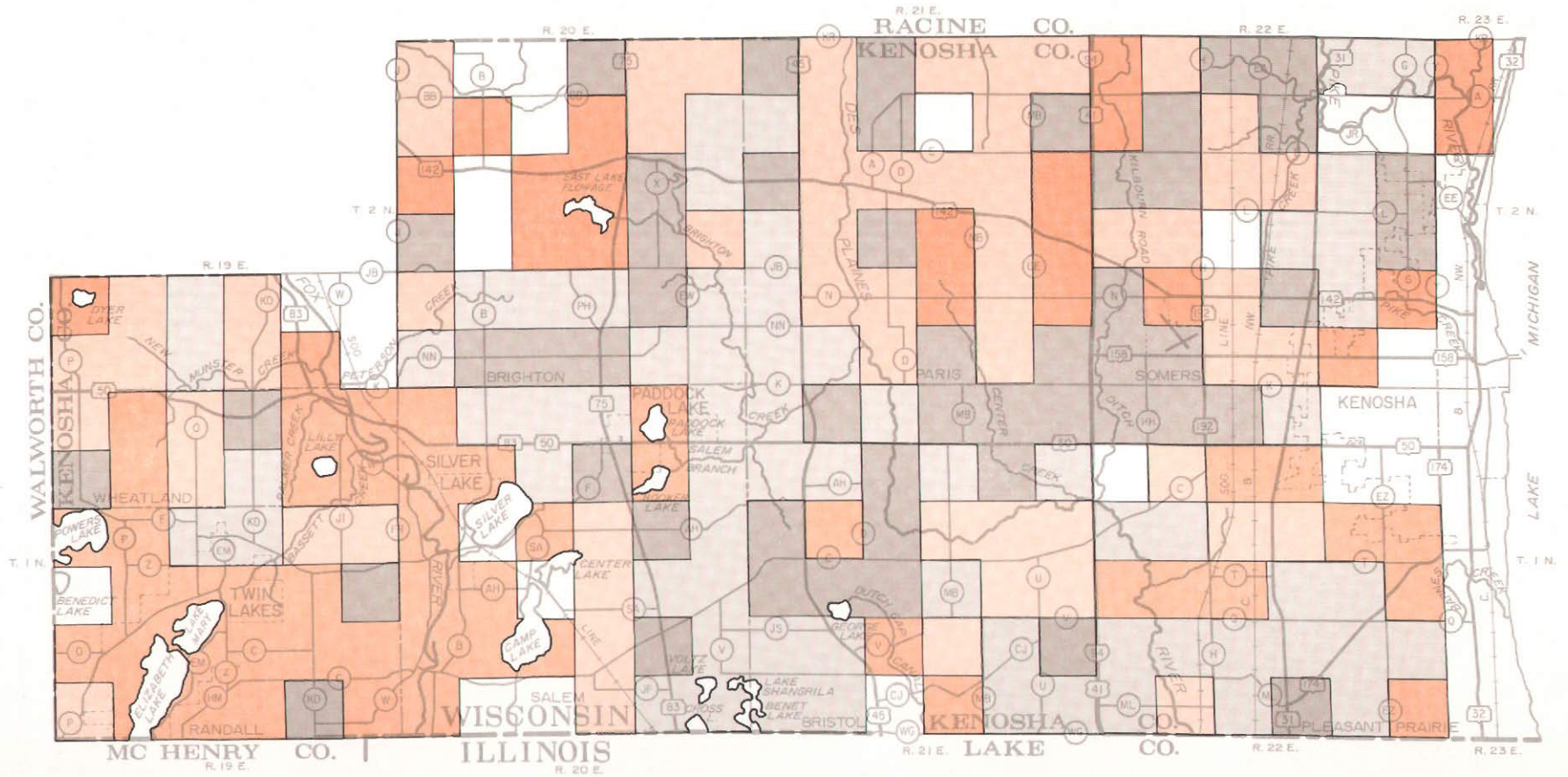
Description of Soil Erosion Control Practices

Conservation Tillage: The term conservation tillage refers to any tillage and planting system that maintains a crop residue on at least 30 percent of the soil surface after planting to reduce soil erosion by water.¹ There are many conservation tillage systems. Major types of conserva-

¹Where soil erosion by wind is the primary concern, a conservation tillage system is defined as one which maintains at least 1,000 pounds of flat small grain residue equivalent on the surface during the critical erosion period.

Map 11

RECOMMENDED PRIORITY AREAS FOR CROPLAND SOIL EROSION CONTROL IN KENOSHA COUNTY



LEGEND

- PRIORITY AREA A
- PRIORITY AREA B
- PRIORITY AREA C
- PRIORITY AREA D

Source: SEWRPC.

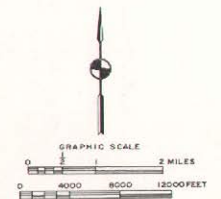


Table 10

CROPLAND SOIL EROSION RATES IN KENOSHA COUNTY BY PRIORITY AREA: 1985

Priority Area (See Map 11)	Cropland Eroding at Less than 3.0 Tons/Acre/Year		Cropland Eroding at 3.0-4.9 Tons/Acre/Year		Cropland Eroding at 5.0-6.9 Tons/Acre/Year		Cropland Eroding at 7.0 or More Tons/Acre/Year		Total Cropland		Average Soil Loss Rate Tons/Acre/Year
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
A	1,346	6.3	5,165	24.2	6,575	30.9	8,223	38.6	21,309	100.0	6.6
B	1,899	9.0	12,311	58.3	4,272	20.2	2,632	12.5	21,114	100.0	4.9
C	7,872	29.6	14,166	53.2	3,580	13.4	1,004	3.8	26,622	100.0	3.8
D	7,477	44.7	6,838	40.9	1,284	7.7	1,123	6.7	16,722	100.0	3.4
Other	3,966	64.2	2,212	35.8	0	--	0	--	6,178	100.0	2.4
County Total	22,560	24.5	40,692	44.3	15,711	17.1	12,982	14.1	91,945	100.0	4.5

Source: SEWRPC.

Table 11

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN KENOSHA COUNTY BY PRIORITY AREA: 1985

Priority Area (See Map 11)	Cropland Eroding at 1.0 Times T-Value or Less		Cropland Eroding at More than 1.0 Times T-Value								Total Cropland		Average Soil Loss Rate in Multiples of T-Value
			Cropland Eroding at 1.1-1.5 Times T-Value		Cropland Eroding at 1.6-2.0 Times T-Value		Cropland Eroding at More than 2.0 Times T-Value		Subtotal				
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
A	2,845	13.4	4,482	21.0	5,172	24.3	8,810	41.3	18,464	86.6	21,309	100.0	1.9
B	5,026	23.8	10,729	50.8	3,423	16.2	1,936	9.2	16,088	76.2	21,114	100.0	1.3
C	14,463	54.3	9,255	34.8	2,034	7.6	870	3.3	12,159	45.7	26,622	100.0	1.0
D	13,378	80.0	1,493	9.0	925	5.5	926	5.5	3,344	20.0	16,722	100.0	0.8
Other	6,178	100.0	0	--	0	--	0	--	0	--	6,178	100.0	0.6
Total	41,890	45.6	25,959	28.2	11,554	12.6	12,542	13.6	50,055	54.4	91,945	100.0	1.2

Source: SEWRPC.

tion systems include mulch till systems, no-till systems, and variations of no-till systems, including ridge-till and strip-till systems.

Under mulch-till systems, the entire soil surface is disturbed by tillage before planting. Tillage implements may include chisel plows, disks, and field cultivators, with one primary pass and one or two secondary passes typically made. Chisel plowing is illustrated in Figure 3. Weed control is achieved through a combination of herbicides and cultivation. To be considered conservation

tillage, residue cover should be at least 30 percent after planting. Mulch-till systems are also referred to as minimum- or reduced-till systems.

Under no-till systems, the soil is left essentially undisturbed from harvesting through planting (see Figure 4). Planting is done on a narrow seedbed about one to three inches wide. Weed control is achieved primarily through application of herbicides. Residue cover at planting is usually between 60 and 70 percent of the surface area, but may be as high as 80 to 90 percent.

Table 12

CRITERIA UTILIZED TO IDENTIFY FARM FIELDS HAVING POTENTIAL ADVERSE IMPACTS ON SURFACE- OR GROUNDWATER AS A RESULT OF EXCESSIVE SOIL EROSION

Farm Fields Having Potential Adverse Impact on Surface Water	Farm Fields Having Potential Adverse Impact on Groundwater
1. The runoff from the farm field enters a lake, stream, or pond—with an outlet—or a wetland bordering same, directly or through a channelized flow such as a gully, ditch, or natural swale 2. The runoff from the farm field ultimately drains to a lake, stream, or pond—with an outlet—or a wetland bordering same, but first travels by overland flow through other lands which do not adequately buffer the water resource^a	1. The runoff from the farm field drains to a depression or flat area with mineral soils less than two feet to bedrock or groundwater 2. The runoff from the farm field drains to a depression or flat area with organic soils 3. The runoff from the farm field drains to an internally drained wetland 4. The runoff from the farm field drains to a small pond with no outlet

^aThe determination of adequate buffer included a consideration of the type of lands that the runoff flowed through—meadow, woodland, cropland—and land slope. On slopes of 0 to 2 percent, adequate buffer consists of 100 feet of meadow, 150 feet of woodland, or 300 feet of cropland with hay rotation; on slopes of 2 to 6 percent adequate buffer consists of 150 feet of meadow or 250 feet of woodland; and on slopes of 6 to 12 percent adequate buffer consists of 200 feet of meadow or 300 feet of woodland. These buffer lengths apply to runoff from a watershed area of less than 40 acres. For watershed area greater than 40 acres, the minimum buffer length should be increased by 50 percent.

Source: Washington County Land Conservation Department and SEWRPC.

Figure 3

CHISEL PLOWING



Source: U. S. Department of Agriculture, Soil Conservation Service.

Figure 4

NO-TILL PLANTING



Source: U. S. Department of Agriculture, Soil Conservation Service.

A ridge-till system is a variation of no-till, under which about one-third of the soil surface is tilled at planting with sweeps or row cleaners. Planting is done on four- to six-inch-high ridges formed the previous year. Weed control is achieved through a combination of herbicides and cultivation. Residue cover after planting is between 35 and 65 percent of the soil surface. Strip-till systems are similar to ridge-till systems in that about one-third of the soil surface is tilled at planting. Planting, however, is done on a level surface rather than on ridges.

Typical field operations, percent residues, and major advantages and disadvantages for major types of conservation tillage systems and the conventional moldboard plow system are set forth in Table 13.

Conservation tillage systems result in a significant reduction in soil erosion. For continuous corn, for example, conservation tillage may reduce soil loss by 55 to 85 percent, compared to moldboard plowing (see Table 14). The potential for controlling soil erosion depends upon the amount of tillage, the type and amount of crop residue, and the roughness of the soil.

Crop Rotation: Crop rotation is a cropping system in which row crops, small grains, and forage crops are grown in a planned sequence to reduce soil erosion. This sequence may be used on an entire field or as strips on one field. Forage-based rotations reduce soil erosion and direct runoff. Soil loss from a good-quality grass and legume meadow is negligible. When the sod is plowed, residual effects improve infiltration, leaving the soil less erodible. The effects of the sod are greatest during the first year, but are also significant during the second year. Rotating two kinds of row crop or row crop and small grain is not as effective as including forage crops in the rotation, but may aid in control of some diseases and pests, and usually reduces the amount of fertilizers and herbicides required, a particularly important consideration. The impact of crop rotations on soil erosion thus depends on the type and sequence of crops grown. For example, changing from continuous row crops—corn and soybeans—to a rotation of three years of row crop, one year of oats, and three years of hay would reduce average annual soil loss by about 60 percent. Changing from continuous row crops to a rotation of one year of row crop, one year of oats, and four years of

hay would reduce average annual soil loss by about 80 percent.

The advantages of this cropping sequence include reduced pesticide, herbicide, and fertilizer use, and ease of implementation. The disadvantages of this cropping sequence are that it reduces erosion primarily during periods when the land is under cover by legumes or small grains, with erosion being only slightly reduced during the years when row crops are grown; and that it is applicable only on farms where both row crops and legumes are needed in the farming operation.

Contouring: Contouring is a planting practice in which the crop rows follow the land contours across the slope. The average soil loss reduction from contouring is about 50 percent on moderate slopes, but less on steeper slopes.

The advantage of contouring is that erosion control is provided for storms with up to moderate levels of rainfall, with the greatest effectiveness on slopes of 3 to 8 percent. The disadvantages of contouring are that it is ineffective in severe rainstorms; it needs to be supported by terraces or runoff diversions on long slopes; field contour lines are difficult to follow with large equipment, resulting in time consumption and the creation of point rows; and, with poorly drained soils, wetness problems are aggravated.

Contour Strip-cropping: Contour strip-cropping is a method of growing crops in a systematic arrangement of alternating strips or bands of hay or small grain and row crops which follow the land contours across the slope (see Figure 5). High-quality hay strips 100 to 125 feet in width may filter 75 percent or more of the suspended soil from the runoff from the cultivated strips. Strip-crop systems using a four-year rotation—two years of meadow, one of row crop, and one year of small grain in which new meadow is established—reduce soil loss to about half of the average for the same rotation contour farmed without the alternating strips, or about 25 percent of the rotation average with the rows up and down a moderate slope. The soil loss reduction from contour strip-cropping ranges from 75 percent to 95 percent in comparison to continuous corn planted up and down the slope.

Contour strip-cropping is the most applicable for farmers who need both row crops and hay in their farming operations.

Table 13

**COMPARISON OF MOLDBOARD PLOW AND CONSERVATION TILLAGE SYSTEMS
TYPICAL FIELD OPERATIONS, RESIDUE, AND MAJOR ADVANTAGES AND DISADVANTAGES**

System	Typical Field Operations	Percent Residue	Major Advantages	Major Disadvantages
Moldboard Plow	Fall or spring plow; two spring diskings; plant; cultivate	0-10	Prepares a fine seedbed Excellent pesticide and fertilizer incorporation opportunities Adaptable for poorly drained soils Full range of management options	Minimal erosion control High field costs and horsepower requirements Timeliness problems Can cause soil damage
Mulch-Till Chisel Plow	Fall or spring primary tillage; spring disk; plant; cultivate	30 or more	Very good erosion control Good pesticide and fertilizer incorporation opportunities Adaptable to many soil types High field efficiency capacity Wide range of management options	Easy to overtill soil High horsepower requirements Not suggested for rocky soils Rapid moisture loss possible in spring
Offset Disk	Fall or spring disk; spring disk; plant; cultivate	30 or more	Very good erosion control Good pesticide and fertilizer incorporation opportunities One-pass tillage possible on coarse soils Wide range of management options	Only tills 4-6 inches deep High horsepower requirements Not suggested for rocky soils Rapid moisture loss possible in spring
Ridge-Plant	Stalk chopping; planting on ridges; cultivate to maintain ridges	35-65	Good erosion control on contour Offers controlled traffic farming opportunities Suitable for more poorly drained soils Lower fuel/labor costs Lower horsepower requirements	Rotation options are limited Not recommended for slopes over 6-8 percent No pesticide or fertilizer incorporation opportunities Special equipment needed Requires special ridge maintenance and operation
No-Till	Spray; plant into undisturbed surface; postemergent spraying necessary	65-90	Maximum erosion control Low fuel/labor costs Low horsepower requirements Well suited for coarse-textured soils Improved soil structure	No pesticide or fertilizer incorporation opportunities Not suited to poorly drained soils More management skills required Increased dependence on chemicals

NOTE: This table pertains primarily to growing of corn.

Source: University of Wisconsin-Extension, "Conservation Tillage for Corn Handbook," 1986.

Cover Crops: Cover crops are crops of close growing grasses, legumes, or small grain used primarily for seasonal protection and for soil improvement. The crop usually occupies land for a period of one year or less. The purposes of the cover crop are to provide vegetative protection from soil erosion by wind and water during periods when the major crops do not furnish adequate cover; to add organic material to the soil; and to improve infiltration, aeration, and tilth.

Depending on weather conditions in any given year, a cover crop may be a help or a hindrance. If the soil wetness in the spring is a problem, the

early growth of a wheat cover crop can enable earlier corn planting by removing excess water from the soil. Conversely, if soil moisture supplies are critical, water used for growth of the winter cover crop may reduce the amount of water available to the primary crop later in the growing season and thereby lower crop yields. An example of a cover crop is spring oats planted in the fall after harvesting a row crop. The growing oats freeze, but the tops protect the soil during the winter. The soil loss reduction from cover crops will vary depending upon that crop which preceded the cover crop, the time that the cover crop was planted, and the type of cover crop utilized.

Table 14

**ESTIMATED EFFECTIVENESS
OF EROSION CONTROL PRACTICES**

Primary Practices	Approximate Soil Loss Reduction ^a (percent)
Conservation Tillage (up and down the slope)	55 - 85
Contouring (moldboard plow)	10 - 50
Contour Strip-cropping (moldboard plow)	75 - 95
Terracing (moldboard plow)	60 - 80
Crop Rotation (moldboard plow, up and down the slope)	Variable ^b
Grassed Waterways	Up to 99 in grassed channel
Permanent Vegetative Cover	Up to 99

^aIn comparison to soil loss assuming continuous corn and moldboard plowing up and down the slope.

^bDepends upon type and sequence of crops grown.

Source: U. S. Soil Conservation Service, Waukesha County Land Conservation Department, and SEWRPC.

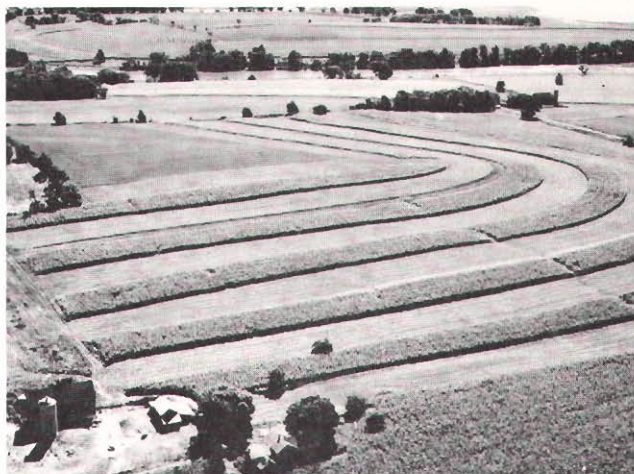
Terracing: A terrace system is a series of earth embankments or ridges and channels constructed across the slope at a prescribed spacing. Terraces reduce the slope length by dividing the overall slope into segments. The soil loss reduction from terracing can range from 60 percent to 80 percent.

The most common types of terraces used in southeastern Wisconsin are the farmable terrace and the vegetated ridge terrace. The selection of the type of terrace system is determined by the inherent soil and slope conditions and crop management practices employed on the field. Farmable terraces are used on gently sloping land. The ridges of these terraces have relatively flat front and back slopes and are entirely farmable (see Figure 6).

The vegetated ridge terrace is used on steep land. The ridges of this type of terrace system have

Figure 5

CONTOUR STRIP-CROPPING



Source: U. S. Department of Agriculture, Soil Conservation Service.

steep front and back slopes. The ridges and channels are not farmable and are maintained in erosion-resistant vegetation (see Figure 7).

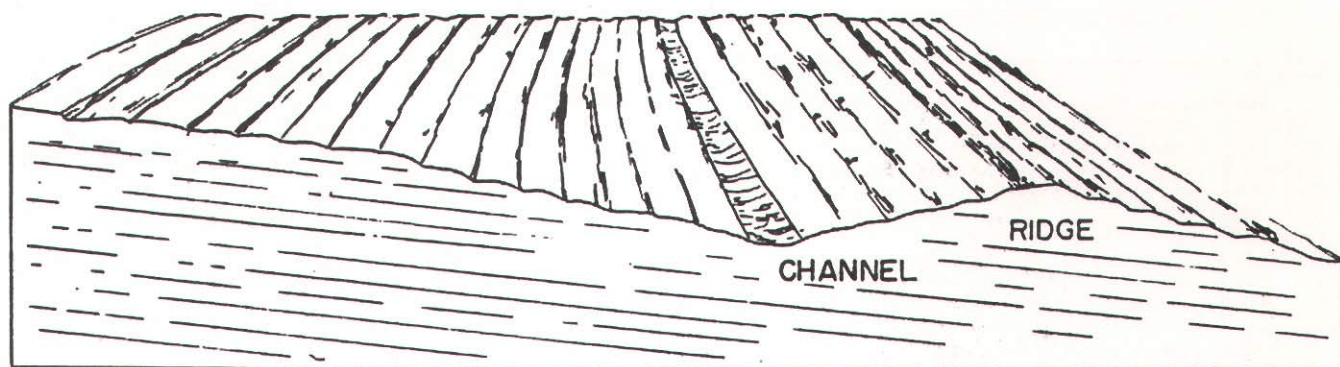
Terraces may use underground outlets or channels to collect and transport runoff water from the field.

Grassed Waterways: Grassed waterways and outlets are natural drainageways or constructed channels shaped to required dimensions and maintained in erosion-resistant perennial vegetation (see Figure 8). Grassed waterways collect and transport runoff water from fields, diversions, terraces, or other structures. A grassed-lined waterway reduces erosion by lowering water flow velocity over the soil surface and binding the surface soil particles with grass roots. The soil loss reduction from grassed waterways ranges up to 99 percent in the grassed channel.

Although periodic mowing is required, grassed waterways are aesthetically pleasing and offer cover for wildlife, especially when mowing is delayed until mid-summer.

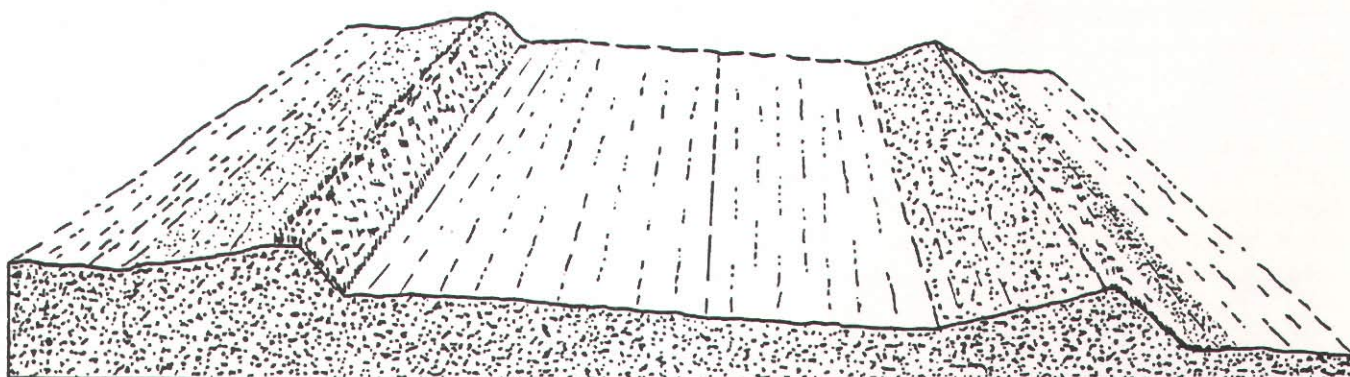
Permanent Vegetative Cover: Permanent vegetative cover refers to the conversion of very erodible cropland to a less intensive use, involving the establishment of a permanent vegetative cover, such as perennial grasses, legumes, forbs, shrubs, or trees. The soil loss reduction from permanent vegetative cover ranges up to 99 percent.

Figure 6
FARMABLE TERRACE



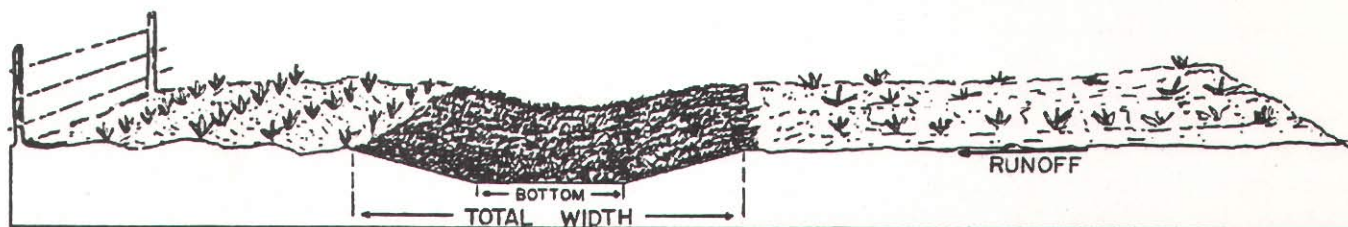
Source: U. S. Department of Agriculture, Soil Conservation Service; and Waukesha County Land Conservation Department.

Figure 7
VEGETATED RIDGE TERRACE



Source: U. S. Department of Agriculture, Soil Conservation Service; and Waukesha County Land Conservation Department.

Figure 8
GRASSED WATERWAY



Source: U. S. Department of Agriculture, Soil Conservation Service; and Waukesha County Land Conservation Department.

Table 15

**TYPICAL SELECTION OF SOIL EROSION
CONTROL PRACTICES UNDER THE KENOSHA
COUNTY SOIL EROSION CONTROL PLAN**

Areas Characterized by Dairying	Areas Characterized by Cash Cropping
1. Rotation Change	1. Contour Cropping
2. Contour Cropping	2. Rotation Change
3. Contour Strip-cropping	3. Contour Strip-cropping
4. Conservation Tillage	4. Conservation Tillage
5. Permanent Vegetative Cover	5. Permanent Vegetative Cover

Source: U. S. Soil Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

Recommended Soil Erosion Control Practices

Under the soil erosion control planning program, a "systems level" determination was made of the types of erosion control practices that would effectively address soil erosion problems in Kenosha County. This systems level planning required the establishment of a general ordering of conservation practices for assignment to excessively eroding farm fields. Based upon consultation with the Kenosha County Land Conservation Office and U. S. Soil Conservation Service staffs, an ordering of management practices was identified for areas with predominantly dairy operations and for areas with predominantly cash cropping operations. For dairy operations, it was determined that a change to a somewhat less intensive rotation would be the first choice among erosion control practices, followed by contour cropping, contour strip-cropping, and conservation tillage (see Table 15). Combinations of "higher ranked" practices were considered before consideration of lower ranked practices. For example, a combination of a rotation change and contour cropping was considered prior to consideration of contour strip-cropping or conservation tillage. As indicated in Table 15, a similar order was established for areas with predominantly cash cropping operations. In developing Table 15, it was recognized that despite the priority placed upon conventional tillage practices, a substantial amount of land would nevertheless be designated for conservation tillage systems because of the limited potential for farming on the contour, owing to the irregular topography throughout much of the County.

The systems level of planning described herein was undertaken to provide insight into the types and amounts of conservation practices that could be applied to effectively address soil erosion problems in Kenosha County. As discussed in more detail later in this chapter, detailed conservation plans must be prepared for farms with excessively eroding cropland to adapt and refine the systems level recommendations. It is not intended that the ordering set forth in Table 15 be strictly adhered to in the preparation of such detailed farm plans. Rather, the practices ultimately selected must be cooperatively determined by a qualified conservationist and the farmer, taking into account the characteristics of the farm operation and the farmer's individual resources and objectives.

Recommended Soil Erosion Control Practices—

Priority Area A: Using the systems level approach described above, a specific erosion control practice or set of practices was identified for each farm field in Priority Area A which had been identified as experiencing excessive soil erosion—that is, erosion in excess of T-value. Such fields were inspected in the spring of 1988 to help identify appropriate erosion control practices. The universal soil loss equation was utilized to ensure the identification of practices which would reduce soil loss to tolerable levels. The types and amounts of practices recommended to be applied to excessively eroding cropland in Priority Area A are summarized in Table 16.

As indicated in Table 16, the plan recommends that management practices involving conventional moldboard plowing—including rotation changes, contouring, or contour strip-cropping—be implemented on about 3,540 acres, or about 19 percent, of the excessively eroding cropland in Priority Area A. It is important to note that despite the high priority given to erosion control practices involving conventional tillage under the plan, only a relatively small portion of the excessively eroded cropland—about 19 percent, as noted above—was found to be able to be effectively treated in this manner. This is primarily due to the irregularity of the topography in Priority Area A, which causes most of the excessively eroding cropland in the area to be unsuitable for contour cropping or contour strip-cropping in accordance with U. S. Soil Conservation Service standards.

Table 16

**RECOMMENDED SOIL EROSION CONTROL PRACTICES FOR CROPLAND HAVING A
SOIL LOSS RATE GREATER THAN T-VALUE BY PRIORITY AREA IN KENOSHA COUNTY**

Management Practice	Priority Area A		Priority Area B		Priority Area C		Priority Area D		County Total	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
<u>Conventional Tillage</u> <u>(Moldboard Plowing)</u>										
Basic Rotation Change	2,180	11.8	3,930	24.4	3,780	31.1	710	21.2	10,600	21.2
Contouring or Contour Strip-cropping	510	2.8	540	3.4	400	3.3	90	2.7	1,540	3.1
Basic Rotation Change Along with Contouring or Contour Strip-cropping	850	4.6	310	1.9	260	2.1	190	5.7	1,610	3.2
Subtotal	3,540	19.2	4,780	29.7	4,440	36.5	990	29.6	13,750	27.5
<u>Conservation Tillage</u>										
Conservation Tillage Combined with Other Practices:										
Basic Rotation Change	1,910	10.3	1,150	7.2	860	7.1	410	12.3	4,330	8.6
Contouring or Contour Strip-cropping	100	0.5	30	0.2	30	0.2	30	0.9	190	0.4
Basic Rotation Change Along with Contouring or Contour Strip-cropping	80	0.4	20	0.1	20	0.2	30	0.9	150	0.3
Major Rotation Change	3,830	20.8	1,600	9.9	900	7.4	380	11.4	6,710	13.4
Conservation Tillage Alone	6,730	36.5	8,000	49.7	5,500	45.2	1,080	32.3	21,310	42.6
Subtotal	12,650	68.5	10,800	67.1	7,310	60.1	1,930	57.8	32,690	65.3
<u>Permanent Vegetative Cover</u>	2,270	12.3	510	3.2	410	3.4	420	12.6	3,610	7.2
Total Acres Exceeding T-Value	18,460	100.0	16,090	100.0	12,160	100.0	3,340	100.0	50,050	100.0

NOTE: For cash cropping operations, it is anticipated that contour buffer strip-cropping would be used instead of contour strip-cropping. Contour buffer strip-cropping consists of narrow protective grass buffer strips—commonly covering 20 percent of the field—alternated with wide cultivated strips.

For purposes of this report, a "basic" rotation change is defined as one which does not change the nature of the cropping system—involving, for example, substitution of a year of hay for a year of row crop in a dairy operation, or substitution of a year of small grain for a year of row crop in a cash cropping operation. Conversely, a "major" rotation change is defined as one which changes the nature of the cropping system—involving, for example, a shift from continuous row cropping to a rotation in which oats and hay comprise one-half of the rotation.

Recommended practices for Priority Areas B, C, and D are estimates based upon the recommended sequence for selection of erosion control practices set forth in Table 15, adjusted to reflect the proportional relationships between practice levels and excessively eroding cropland acreage for Priority Area A.

Source: U. S. Soil Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

As further indicated in Table 16, of the 3,540 acres of cropland recommended to be treated through practices involving conventional moldboard plowing, 510 acres would be treated through contouring or contour strip-cropping; 2,180 acres through a "basic" rotation change; and 850 acres through a "basic" rotation change in conjunction with contouring or contour strip-cropping. For purposes of this report, a "basic" rotation change is defined as one which does not

change the nature of the cropping system—involving, for example, substitution of a year of hay for a year of row crop in a dairy operation, or substitution of a year of small grain for a year of row crop in a cash cropping operation.

The plan recommends that conservation tillage be implemented on about 12,650 acres in Priority Area A, or 69 percent of all excessively eroding cropland in Priority Area A (see Table 16). The

plan envisions that conservation tillage would primarily involve reduced tillage systems—typically involving fall chisel plowing and spring disking—leaving at least 30 percent of the soil surface covered by crop residue after planting. In some cases, a somewhat higher level of residue may be required.

As further indicated in Table 16, the plan recommends conservation tillage as the sole management practice on about 6,730 acres, or 37 percent of the excessively eroding cropland in Priority Area A, and recommends conservation tillage in conjunction with other management practices on about 5,920 acres, or 32 percent of the excessively eroding cropland in that area. It should be noted that conservation tillage in conjunction with a “major” rotation change is recommended for about 3,830 acres, or 21 percent of the excessively eroding cropland in Priority Area A. For purposes of this report, a “major” rotation change is defined as one which changes the nature of the cropping system—involving, for example, a shift from continuous row cropping to a rotation in which oats and hay comprise one-half of the rotation.

Under the plan, the remainder of the excessively eroding cropland in Priority Area A—about 2,270 acres, or 12 percent—would be placed in permanent vegetative cover owing to the steepness of the slope or the highly erodible nature of the soil.

In addition to the management practices described above, grassed waterways would be required on some fields to help convey concentrated runoff from such fields, thereby preventing gully erosion. The need for 46,700 feet of such waterways on cropland in Priority Area A has been identified.

Recommended Soil Erosion Control Practices—Balance of County: Under the county soil erosion control planning program, the conservation practices required to address identified cropland soil erosion control problems in Priority Areas B, C, and D were determined based upon the established sequence for selection of recommended practices set forth in Table 15, adjusted to reflect the proportional relationships between the practice levels and the excessively eroding cropland acreage for Priority Area A. The resulting estimates for Priority Areas B, C, and D, as well as for the County overall, are also set forth in Table 16.

As indicated in Table 16, the plan recommends that management practices involving conventional moldboard plowing—including rotation changes, contouring, or contour strip-cropping—be implemented on about 13,750 acres, or about 28 percent of the excessively eroding cropland in the County. This includes 10,600 acres proposed to be treated through basic rotation changes; 1,540 acres proposed to be treated through contouring or contour strip-cropping; and 1,610 acres proposed to be treated through a basic rotation change in conjunction with contouring or contour strip-cropping. Rotation changes may be able to be relied on more frequently as the sole management practice in Priority Areas B, C, and D than in Priority Area A, owing to the generally lower soil loss rates.

The plan recommends that conservation tillage—primarily reduced tillage systems leaving at least a 30 percent crop residue after planting—be implemented on about 32,690 acres, or about 65 percent of the excessively eroding cropland in the County. The plan recommends conservation tillage as the sole management practice on about 21,310 acres, or just over 42 percent of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 11,380 acres, or about 23 percent.

As further indicated in Table 16, under the plan, the remainder of the excessively eroding cropland—about 3,610 acres, or 7 percent—would be placed in permanent vegetative cover.

In addition to the management practices described above, an estimated 126,000 feet of grassed waterways would be installed within the County.

It should be noted that while the erosion control plan identifies the general types and amounts of practices which may be used to address soil erosion problems in the County, detailed farm conservation plans are required to adapt and refine those recommendations for individual farm units. As such farm plans are prepared, other types of practices, beyond those specified above, may be recommended. For example, terraces may be recommended on some farms, although the use of terraces may be expected to be limited owing to the high installation costs, and to the irregularity of the topography of the County which causes much of the farmland in the County to be unsuitable for terracing. In addition, a cover crop such as winter wheat may

be recommended to reduce soil erosion on some farms—particularly in conjunction with the raising of vegetable crops. Furthermore, windbreaks and other wind erosion control practices may be recommended in some areas, particularly in low-lying areas covered by organic soils.

Environmental Considerations with Conservation Tillage Systems: Conservation tillage systems are effective in reducing soil erosion and sediment delivery to streams. Relative to other conservation tillage systems, no-till systems may present a greater potential for groundwater contamination by herbicides and fertilizers and accordingly require more careful management. The highest potential for groundwater contamination exists with soil shallow to groundwater or bedrock (i.e., less than three feet) or soils with rapid permeability (sandy textures).

Conservation tillage systems tend to require a more intensive level of production management. With these tillage systems, weed and insect problems tend to be different and may require closer monitoring than under conventional moldboard plowing. Integrated pest management technologies with crop scouting can be used to reduce pest problems and to minimize agricultural chemical inputs. With crop scouting, pest infestation levels—typically insects and/or weeds—are monitored closely throughout the growing season. Random locations within fields are sampled for the presence and relative abundance of pests, their developmental stages with respect to the crop grown, and their potential for adversely affecting yields. In some locations, spot treatment may be prescribed to keep pest population levels in check. More often, infestations are evaluated against their potential to significantly lower yields. In some cases, no pesticide application is made, as the cost of treatment is found to equal or exceed the cost of projected yield reductions. In other cases, the pests are brought under control to ensure marketability, but application is timed and measured so as to work the most effectively. Through such programs, the calendar or routine application of chemicals is used less. A similar integrated type of approach with soil testing can be used to ensure the judicious application of fertilizers.

Costs of Recommended Practices

Of the soil erosion control practices specified in Table 16, implementation costs may be readily

estimated for two practices—namely, grassed waterways and establishment of permanent vegetative cover. Costs associated with installation of grassed waterways without tiles, including a 10 percent allowance for required design work, would approximate \$415,800 for the County overall, including \$154,100 in Priority Area A, \$133,700 in Priority Area B, \$100,600 in Priority Area C, and \$27,400 in Priority Area D. Costs associated with the establishment of permanent vegetative cover would approximate \$270,800 countywide, including \$170,300 in Priority Area A, \$38,300 in Priority Area B, \$30,700 in Priority Area C, and \$31,500 in Priority Area D.

The costs associated with implementation of the other recommended practices—including, importantly, conservation tillage systems—are far more difficult to specify. Of concern to the farmer is the difference in net return as the farmer shifts from conventional moldboard plowing to a form of conservation tillage. On the one hand, net return may be adversely affected by potentially decreased yields, although in some cases yields could actually increase; by potentially greater use of pesticides; and by a potential initial capital outlay for specialized equipment used in some conservation tillage systems. On the other hand, net return may be positively affected by lower fuel consumption and lower operation and maintenance costs, because conservation tillage systems involve fewer tillage operations. Moreover, in the long term, net return may be positively affected owing to the maintenance of natural soil productivity. The impacts on net return of shifting from conventional to conservation tillage may be expected to vary from farm to farm, depending upon the size of operation; the physical characteristics of the farm including soil and topographic characteristics; the types of crops grown; and the type and condition of existing farm machinery.

CONSERVATION PLANNING REQUIREMENTS

As previously noted, while the county soil erosion control plan identifies the general types of practices which may be utilized to control soil erosion, detailed farm conservation plans will be required to adapt and refine those recommendations for individual farm units. Conservation

plans are detailed plans, generally prepared with the assistance of the U. S. Soil Conservation Service or County Land Conservation Department staffs, intended to guide agricultural activity in a manner which conserves soil and water resources. The conservation plan indicates desirable tillage practices, cropping patterns, and rotation cycles, considering the specific topography, hydrology, and soil characteristics of the farm, together with the specific resources of the farm operator and the operator's objectives as owner or manager of the land.

It is estimated that 60 farm operations, representing about 11 percent of the total of 560 farm operations in Kenosha County, have sound, up-to-date farm conservation plans—including 20 farms for which plans were prepared in the recent past to assist operators in meeting the soil erosion control compliance requirements of the Wisconsin Farmland Preservation Program. The remaining 500 farms, representing about 89 percent of all farms in the County, either have conservation plans which are outdated or have no farm conservation plans whatsoever. It is anticipated that farm plans would be prepared for these farms during the implementation of the county soil erosion control plan.²

Estimates of the farm conservation planning activity required within the four erosion control priority areas are set forth in Table 17. In developing these estimates, it was assumed that the number of farms requiring preparation or revision of farm conservation plans is proportional to the total cropland acreage of each priority area.

²For purposes of estimating farm conservation planning requirements and attendant staffing requirements under the plan, it was assumed that conservation plans would be prepared for the 500 farms in Kenosha County that either have conservation plans that are outdated or have no conservation plans whatsoever. As the recommended farm planning work proceeds, it may be expected that certain farms will be readily identified as having no cropland with soil loss rates exceeding T-value. It is estimated that 7 percent of the 500 farms concerned are not experiencing soil loss in excess of T-value. It would, nevertheless, be desirable during plan implementation to screen such farms for evidence of any erosion-related water quality problems.

Table 17

**ANTICIPATED FARM CONSERVATION
PLANNING ACTIVITY UNDER THE KENOSHA
COUNTY SOIL EROSION CONTROL PLAN**

Priority Area	Farms Requiring the Preparation of New Conservation Plans
A	125
B	125
C	150
D	100
Total	500

Source: Kenosha County Land Conservation Office and SEWRPC.

As indicated in Chapter III of this report, wind erosion and stream bank erosion within rural areas are generally not considered to be significant problems in Kenosha County, and such problems that may exist are considered to be localized in nature. It is anticipated that the detailed farm conservation planning described above would address any apparent wind erosion or stream bank erosion problems.

PROPOSED TIME FRAME

As indicated in Chapter IV, the long-range objective of the county soil erosion control plan is the reduction of soil erosion on all cropland in Kenosha County to tolerable levels by the year 2000. In order to meet this long-range objective, it is recommended that, to the extent practicable, available public soil erosion control resources be directed toward the resolution of soil erosion problems in Priority Area A during the years 1988 through 1990; in Priority Area B during the years 1991 through 1993; in Priority Area C during the years 1994 through 1996; and in Priority Area D during the years 1997 through 1999.

A summary of cropland soil erosion rates in Kenosha County, assuming that soil erosion problems in Priority Areas A, B, C, and D are addressed sequentially, according to the time frame described above, is set forth in Tables 18 and 19. As shown in Table 19, adherence to the proposed time frame would reduce the acreage of

Table 18

**CROPLAND SOIL EROSION RATES IN KENOSHA COUNTY UPON
IMPLEMENTATION OF RECOMMENDED SOIL EROSION CONTROL PRACTICES**

Condition	Cropland Eroding at Less than 3.0 Tons/Acre/Year		Cropland Eroding at 3.0-4.9 Tons/Acre/Year		Cropland Eroding at 5.0-6.9 Tons/Acre/Year		Cropland Eroding at 7.0 or More Tons/Acre/Year		Total Cropland		Average Soil Loss Rate Tons/Acre/Year
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
Existing Conditions: 1985	22,560	24.5	40,692	44.3	15,711	17.1	12,982	14.1	91,945	100.0	4.5
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Area A—by 1990	22,721	24.7	55,308	60.1	9,157	10.0	4,759	5.2	91,945	100.0	3.8
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A and B— by 1993	22,822	24.8	61,921	67.4	5,075	5.5	2,127	2.3	91,945	100.0	3.5
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A, B, and C—by 1996	22,854	24.8	66,353	72.2	1,615	1.8	1,123	1.2	91,945	100.0	3.3
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A, B, C, and D—by 1999	22,854	24.9	68,516	74.5	575	0.6	0	--	91,945	100.0	3.2

Source: SEWRPC.

Table 19

**CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN KENOSHA COUNTY
UPON IMPLEMENTATION OF RECOMMENDED SOIL EROSION CONTROL PRACTICES**

Condition	Cropland Eroding at 1.0 Times T-Value or Less		Cropland Eroding at More than 1.0 Times T-Value								Total Cropland		Average Soil Loss Rate in Multiples of T-Value
			Cropland Eroding at 1.1-1.5 Times T-Value		Cropland Eroding at 1.6-2.0 Times T-Value		Cropland Eroding at More than 2.0 Times T-Value		Subtotal				
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total	
Existing Conditions: 1985	41,890	45.6	25,959	28.2	11,554	12.6	12,542	13.6	50,055	54.4	91,945	100.0	1.2
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Area A—by 1990	60,354	65.6	21,477	23.4	6,382	6.9	3,732	4.1	31,591	34.4	91,945	100.0	1.0
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A and B— by 1993	76,442	83.1	10,748	11.7	2,959	3.2	1,796	2.0	15,503	16.9	91,945	100.0	0.9
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A, B, and C—by 1996	88,601	96.4	1,493	1.6	925	1.0	926	1.0	3,344	3.6	91,945	100.0	0.8
Conditions upon Implemen- tation of Soil Erosion Control Practices in Priority Areas A, B, C, and D—by 1999	91,945	100.0	0	--	0	--	0	--	0	--	91,945	100.0	0.8

Source: SEWRPC.

excessively eroding cropland from about 50,100 acres, or 54 percent of all cropland in the County in 1985, to 31,600 acres, or 34 percent of all cropland by the end of 1990; to 15,500 acres, or 17 percent of all cropland, by the end of 1993; to 3,300 acres, or just under 4 percent of all cropland, by the end of 1996; and to zero acres by the end of 1999.

CONCLUDING REMARKS

The soil erosion control plan set forth in this chapter identifies the amounts and types of soil erosion control practices necessary to reduce cropland soil erosion in Kenosha County to tolerable levels; identifies priority areas for cropland soil erosion within the County; identifies the detailed farm conservation planning activities required to help implement the recommended practices; and identifies the time frame for addressing identified soil erosion control problems within the priority areas.

The plan recommends that management practices involving conventional moldboard plowing—including rotation changes, contouring, or contour strip-cropping—be implemented on about 13,750 acres, or about 28 percent, of the excessively eroding cropland in the County. This includes 10,600 acres proposed to be treated through basic rotation changes; 1,540 acres proposed to be treated through contouring or contour strip-cropping; and 1,610 acres proposed to be treated through a basic rotation change in conjunction with contouring or contour strip-cropping.

The plan recommends that conservation tillage—primarily reduced tillage systems leaving at least a 30 percent crop residue after planting—be implemented on about 32,690 acres, or 65 percent of the excessively eroding cropland in the County. The plan recommends conservation tillage as the sole management practice on about 21,310 acres, or just over 42 percent of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 11,380 acres, or about 23 percent.

Under the plan, the remainder of the excessively eroding cropland—about 3,610 acres, or 7 percent—would be placed in permanent vegetative

cover. In addition, an estimated 126,000 feet of grassed waterways would be installed within the County.

Conservation tillage systems are effective in reducing soil erosion and sediment delivery to streams. These systems tend to require an intensive level of production management. Careful monitoring of all agricultural inputs is extremely important to minimize the detrimental effects of these inputs on the quality of the environment. Integrated pest management technologies are recommended for conservation tillage to prevent excessive application of pesticides. A similar integrated type of approach with soil testing can be used to ensure the judicious application of fertilizers.

While the county soil erosion control plan identifies the general types of practices which may be utilized to control soil erosion, detailed farm conservation plans will be required to adapt and refine those recommendations for individual farm units. Farm conservation plans are detailed plans, generally prepared with the assistance of the U. S. Soil Conservation Service or County Land Conservation Department staffs, indicating desirable tillage practices, cropping patterns, and rotation cycles, considering the specific topography, hydrology, and soil characteristics of the farm, together with the specific resources of the farm operator and the operator's objectives as owner and manager of the land. It is anticipated that, during implementation of the county soil erosion plan, farm plans will be prepared for about 500 farms which have outdated plans or no plans whatsoever.

The soil erosion control plan also recommends a rank ordering of areas of the County for erosion control, providing a general framework to help guide the concerned county, state, and federal agencies in efforts to address soil erosion problems in the County. Four priority areas, each consisting of groups of U. S. Public Land Survey sections, have been identified based upon soil erosion rates and the amount of excessive erosion occurring (see Map 11). Priority Area A consists of those U. S. Public Land Survey sections having an average soil loss rate of at least 1.5 times T-value and at least 100 acres of cropland with a soil loss rate exceeding T-value. Priority Area B consists of those U. S. Public Land

Survey sections having an average soil loss rate of 1.2 to 1.4 times T-value and at least 100 acres of cropland with a soil loss rate exceeding T-value. Priority Area C consists of those other U. S. Public Land Survey sections having at least 100 acres of cropland with a soil loss rate exceeding T-value. Priority Area D consists of those U. S. Public Land Survey sections having between 1 and 99 acres of cropland with a soil loss rate exceeding T-value. The plan recommends that in order to meet the long-range objective of reducing soil erosion on all cropland in Kenosha County to tolerable levels by the year

2000, available public soil erosion control resources be directed toward the resolution of soil erosion problems in Priority Area A during the years 1988 through 1990; in Priority Area B during the years 1991 through 1993; in Priority Area C during the years 1994 through 1996; and in Priority Area D during the years 1997 through 1999. A description of the technical assistance and financial assistance programs of the concerned county, state, and federal agencies, and specific recommendations regarding the use of those programs in Kenosha County, is set forth in the next chapter of this report.

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Chapter VI

PLAN IMPLEMENTATION

The recommended soil erosion control plan described in the previous chapter of this report provides a guide for addressing cropland soil erosion control problems in Kenosha County in an effort to reduce cropland soil erosion throughout the County to tolerable levels by the year 2000. In a practical sense, however, the plan is not complete until the steps required to implement it have been specified. Accordingly, this chapter outlines the actions which must be taken by the various units and agencies of government concerned if the recommended plan is to be carried out. Those units and agencies of government which have plan adoption and plan implementation responsibilities applicable to the soil erosion control plan are identified; desirable plan adoption actions are specified; and specific implementation activities are recommended.

PLAN IMPLEMENTATION AGENCIES

Implementation of the soil erosion control plan depends on the cooperative actions of a number of county, state, and federal units or agencies of government. Those units or agencies of government whose actions will have a significant effect, either directly or indirectly, upon the successful implementation of the recommended soil erosion control plan include—at the county level—the Kenosha County Board and the Kenosha County Land Conservation Committee; at the state level—the Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the University of Wisconsin-Extension Office serving Kenosha County; and at the federal level—the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Soil Conservation Service, and Farmers Home Administration. The powers and programs of these agencies and units of government which may be brought to bear on soil erosion problems in the County are summarized below.

County Level

Kenosha County Land Conservation Committee: The Kenosha County Land Conservation Committee has broad authority and responsibilities for the conservation and protection of the soil and water resources of Kenosha County. The

Land Conservation Committee has authority to engage in technical assistance activities intended to facilitate implementation of resource conservation operations and works of improvement for flood prevention and for the conservation, development, utilization, and protection of soil and water resources. The Land Conservation Committee may conduct informational and educational programs and assist other agencies, including the University of Wisconsin-Extension, in implementing educational programs. The Land Conservation Committee is responsible for administering the soil erosion control requirements of the Wisconsin Farmland Preservation Program in the County. The Land Conservation Committee has the authority to administer cost-sharing programs, such as the Wisconsin Department of Natural Resources priority watershed program, and other incentive programs for improvements and practices relating to soil and water conservation.

Kenosha County Board: The Kenosha County Board determines the level of county funding of the Land Conservation Committee in carrying out its various responsibilities as described above. The County Board thus has ultimate authority over the types and levels of county-sponsored activities for the conservation and protection of the soil and water resources of Kenosha County. The Kenosha County Board also has authority under Section 92.11 of the Wisconsin Statutes to adopt ordinances for the regulation of land use and land management practices—including, potentially, ordinances controlling excessive soil erosion.

State Level

Wisconsin Department of Agriculture, Trade and Consumer Protection: The Wisconsin Department of Agriculture, Trade and Consumer Protection has a wide range of responsibilities for the conservation and protection of soil and water resources in the State. The Department is responsible for administration of the recently created state Soil and Water Resources Management Program. That program, created as part of the 1987-1989 state budget bill, represents a consolidation and restructuring of several previous programs—namely, the Wisconsin Farmers Fund, the Erosion Control Program, and the

Conservation Aids Program—into a single program intended to more effectively address soil and water conservation problems in the State. The consolidation represents a general shift away from direct financial assistance to landowners for implementation of soil and water conservation practices, with greater emphasis placed upon the financial support of county technical assistance activities. During the 1987-1989 biennium, first priority for the use of available soil and water resources management program funds is the continued provision of financial support to counties for the maintenance of county conservationist positions. A second priority is the provision of financial support for additional county staff working to implement key state soil and water conservation programs—including, in particular, county staff retained to assist farmers in their efforts to comply with the soil conservation requirements of the Wisconsin Farmland Preservation Program.

The Wisconsin Department of Agriculture, Trade and Consumer Protection is also the lead agency responsible for administering the Wisconsin Farmland Preservation Program in the State. That program combines planning and zoning provisions with tax incentives for the purpose of ensuring the long-term preservation of agricultural lands. Farmers participating in the program must comply with county-adopted soil conservation standards, so that soil erosion is kept at or below tolerable levels.

Finally, the Wisconsin Department of Agriculture, Trade and Consumer Protection is responsible for administering the soil erosion control planning program established under Section 92.10 of the Wisconsin Statutes. Under that section of the Statutes, each "priority" county in the State, including Kenosha County, is required to prepare a countywide soil erosion control plan, focusing on cropland soil erosion. The plan documented in this report is intended to fulfill that planning requirement for Kenosha County. All such plans must be submitted for review to the Wisconsin Land Conservation Board and the Department of Agriculture, Trade and Consumer Protection. The Department must act to approve or disapprove the plans after reviewing the recommendations of the Land Conservation Board.

Wisconsin Department of Natural Resources:
The Wisconsin Department of Natural Resources has broad authority and responsibility in the

area of natural resource protection and water quality control. The priority watershed program administered by the Department is designed to maintain and improve the quality of lakes and streams by reducing nonpoint sources of pollution, including cropland soil erosion. Many of the land management practices which the priority watershed program supports for improved water quality are aimed at reducing soil erosion.

In addition, the Department of Natural Resources is the lead agency in the State in carrying out the nonpoint source pollution abatement program established under Section 319 of the Water Quality Act of 1987 and administered at the federal level by the U. S. Environmental Protection Agency. In accordance with the Water Quality Act, the Department in 1988 must prepare an assessment report describing nonpoint source problems in the State, and a management report setting forth a four-year program addressing the nonpoint source problems. The management program would establish priorities for addressing nonpoint source pollution problems on a watershed-by-watershed basis in the State. Upon review and approval of the required reports by the U. S. Environmental Protection Agency, the Department of Natural Resources may apply for federal financial assistance to support implementation of the nonpoint source management program. Implementation activities which may be funded include technical assistance, information and education programs, demonstration projects, and others. Implementation funds are expected to be made available in federal fiscal year 1989.

University of Wisconsin-Extension: The UW-Extension office serving Kenosha County is a local component of a statewide educational network supported by the U. S. Department of Agriculture, the UW-Extension, and Kenosha County. The UW-Extension office, through its Crops and Soils Agent, is responsible for coordinating the County's educational program in soil and water conservation. The UW-Extension is available to organize educational programs and demonstration projects, and to provide individual assistance intended to increase the awareness among landowners of soil erosion problems and to assist them in evaluating the options available to remedy those problems.

Federal Level

U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service: The U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, administers two programs—the Agricultural Conservation Program and the Conservation Reserve Program—which can contribute directly to the reduction of cropland soil erosion problems in Kenosha County. The Agricultural Conservation Program provides grants to rural landowners throughout the County in partial support of carrying out approved soil, water, woodland, wildlife, and other conservation practices. Agricultural Conservation Program grants may be used in support of a variety of soil erosion control measures.

The Conservation Reserve Program provides annual payments to farmers for converting highly erodible land from cropland to a less intensive use, by establishing a permanent vegetative cover. The program also provides grants to farmers in partial support of establishing such cover.

U. S. Department of Agriculture, Soil Conservation Service: The U. S. Department of Agriculture, Soil Conservation Service, maintains a technical assistance program involving the provision of technical assistance—including the preparation of farm conservation plans and assistance in design and application of conservation practices—to landowners and the provision of soil and water conservation resource information to units of government.

The Soil Conservation Service, in conjunction with the Agricultural Stabilization and Conservation Service, is responsible for implementing the conservation compliance provisions of the Food Security Act of 1985. Under those provisions, farmers who produce crops on highly erodible land without an approved conservation plan may be ineligible for certain U. S. Department of Agriculture farm programs. The Soil Conservation Service, in conjunction with the Agricultural Stabilization and Conservation Service, is also responsible for administering related “sodbuster” and “swampbuster” provisions of the Food Security Act. The various conservation requirements of the Food Security Act of 1985 are described in more detail later in this chapter.

The Soil Conservation Service also conducts detailed soil surveys and provides interpretations as a guide to the use of the soil survey data. Within the Southeastern Wisconsin Region, including Kenosha County, detailed operational soil surveys were completed under a cooperative agreement between the Regional Planning Commission and the Soil Conservation Service negotiated in 1963, thereby providing modern standard soil surveys for the entire Region, together with interpretations for a wide range of rural and urban planning activities.

U. S. Department of Agriculture, Farmers Home Administration: The U. S. Department of Agriculture, Farmers Home Administration, administers a number of loan programs for farm and nonfarm enterprises in rural areas which are unable to obtain credit from other sources. One such program, the Soil and Water Loan Program, represents a potential source of credit for a variety of soil and water conservation improvements, including soil erosion control improvements.

PLAN ADOPTION

Adoption, endorsement, and formal integration of the county soil erosion control plan by the County Board of Supervisors and the state and federal agencies concerned is highly desirable, if not absolutely essential, to ensure a common understanding among the several government levels and to enable their staffs to program the necessary plan implementation work. Recommendations regarding adoption and endorsement of the soil erosion control plan are presented below.

County Level

1. It is recommended that the Kenosha County Board of Supervisors, upon the recommendation of the Kenosha County Land Conservation Committee, formally adopt the erosion control plan set forth in this report as a guide for addressing cropland soil erosion problems in the County, and direct the Kenosha County Land Conservation Office to integrate the plan into the various county conservation programs and activities.

State Level

1. It is recommended that the Wisconsin Department of Agriculture, Trade and Consumer Protection endorse the soil

erosion control plan and utilize it in carrying out the Soil and Water Resources Management Program and its other soil and water conservation responsibilities, after review and certification by the Wisconsin Land Conservation Board that the plan meets the standards of Section 92.10 of the Wisconsin Statutes and Chapter Ag 160 of the Wisconsin Administrative Code.

2. It is recommended that the Wisconsin Department of Natural Resources endorse the soil erosion control plan and integrate the plan into its broad range of agency responsibilities, including, importantly, administration of the state priority watershed program and of the federal nonpoint source pollution abatement program—established under Section 319 of the Water Quality Act of 1987—within Wisconsin.
3. It is recommended that the University of Wisconsin-Extension office serving Kenosha County endorse the soil erosion control plan and utilize the plan recommendations as appropriate in the development and direction of its work program.

Federal Level

1. It is recommended that the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, formally acknowledge the soil erosion control plan, and utilize the plan recommendations in its administration of the Agricultural Conservation Program and the Conservation Reserve Program. It should be noted, in this regard, that all Agricultural Stabilization and Conservation Service county offices in Wisconsin have been directed to consider county soil erosion control plans, where available, in the administration of their conservation programs (see Appendix A).
2. It is recommended that the U. S. Department of Agriculture, Soil Conservation Service, formally acknowledge the soil erosion control plan, and utilize the plan recommendations in carrying out its continuing technical assistance program, as well as in the administration of the conservation compliance provisions of the federal Food Security Act of 1985.

3. It is recommended that the U. S. Department of Agriculture, Farmers Home Administration, formally acknowledge the soil erosion control plan, and utilize the plan recommendations in its administration of the Soil and Water Loan Program.

PLAN IMPLEMENTATION MEASURES

It is envisioned that the major programs and activities to be carried out by the concerned county, state, and federal agencies in an effort to implement the county soil erosion control plan would include the provision of financial and technical assistance to farmers; the administration of state and federal conservation compliance requirements; and the conduct of information and education programs. Recommendations regarding these programs and activities, developed to foster implementation of the county soil erosion control plan, are set forth in this section. Also discussed herein are land management regulations for the control of cropland soil erosion, although such regulations are not herein recommended for adoption in Kenosha County. Finally, this section includes recommendations for a system to help monitor progress in the overall effort to reduce cropland soil erosion in Kenosha County.

Financial Assistance

Financial assistance is available to farmers under certain state and federal "cost-sharing" programs. A description of those programs and recommendations for the administration of those programs to facilitate implementation of the soil erosion control plan are set forth herein.

State Financial Assistance Programs: Financial assistance in support of management practices addressing soil erosion problems which adversely affect water quality is available to certain farmers in Wisconsin under the Wisconsin Department of Natural Resources priority watershed program. Such assistance has been made available to farmers in the small portion of the Root River watershed located in Kenosha County—although the project sign-up phase of that program has ended. The Wisconsin Department of Natural Resources and the Department of Agriculture, Trade and Consumer Protection are currently in the process of reevaluating the criteria used in the selection of eligible watersheds, and there is a possibility that other

watersheds in the County may be designated as candidates for a priority watershed program.

The priority watershed program provides financial assistance in an amount of up to 70 percent of the cost of installing such improvements as terrace systems, grassed waterways, and grade stabilization structures, and provides financial assistance on a per-acre basis for the adoption of such practices as contour farming, contour strip-cropping, and conservation tillage. The assistance rate is \$6.00 per acre for contour farming and \$12 per acre for contour strip-cropping. For conservation tillage, the assistance rate is \$45 per acre, over a three-year period, for continuous row crop fields, and \$15 per acre, for one year, for fields with hay rotations.

Limited financial assistance in support of needed land management practices may eventually be available under the "innovative project" provisions of the Soil and Water Resource Management Program administered by the Wisconsin Department of Agriculture, Trade and Consumer Protection. Under those provisions, a county land conservation committee may seek state funding in support of innovative approaches for implementation of county soil erosion plans involving the provision of financial and technical assistance to farmers and other measures. State funds in support of such innovative projects were made available for the first time in 1988.

Federal Financial Assistance Program: Financial assistance is available to farmers throughout Kenosha County for soil erosion control practices and other conservation practices under the Agricultural Conservation Program administered by the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service. Under that program, a farmer may receive assistance in partial support of the cost of installing such improvements as terrace systems and grassed waterways, up to a maximum of \$3,500. Assistance to individual farmers may exceed \$3,500 under certain circumstances as provided for in long-term agreements between the Agricultural Stabilization and Conservation Service and the farmer. Under the Agricultural Conservation Program, financial assistance is available in support of conservation tillage, including no-till and reduced tillage systems, on a per-acre basis, for up to a maximum of 40 acres of cropland. The rate of assistance for no-till was

\$26.25 per acre in Kenosha County in 1988. The rate of assistance for reduced tillage was \$9.75 per acre.

As previously noted, the Conservation Reserve Program, administered by the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, provides financial assistance to farmers as incentive to retire highly erodible farm fields from crop production. Under this program, a field is considered to be highly erodible if at least two-thirds of the field is covered by soils having the potential to erode at a rate of more than eight times T-value. Under the Conservation Reserve Program, annual payments are made to the farmer over a period of 10 years on a per-acre basis for highly erodible cropland taken out of production. The program also provides financial assistance in an amount of up to 50 percent of the normal costs of establishing permanent vegetative cover. In 1988 the program was revised to include land adjacent to surface waters. Such land does not have to be highly erodible; rather, it must be adjacent and parallel to a perennial stream, intermittent stream, or other permanent water body—pond or lake—of at least five acres. As of the end of 1988, 2,045 acres of cropland in Kenosha County had been enrolled in the Conservation Reserve Program through 62 farmer contracts. The total amount of farmland eligible for inclusion in the program is estimated to be 42,000 acres.

As also previously noted, the Soil and Water Loan Program administered by the U. S. Department of Agriculture, Farmers Home Administration, represents a potential source of credit to farmers in financing the installation of grassed waterways, terraces, and other soil erosion control improvements. Applicants must be unable to obtain credit from other sources under reasonable terms and conditions. Loans may be repaid over a period of up to 40 years.

Recommendations for Use of Financial Assistance Programs: It is recommended that, to the extent possible given existing program regulations, the financial assistance programs described above, and other financial assistance programs which may become available, be used to address soil erosion problems in Kenosha County in general conformance with the priority area recommendations and related time frame proposed under the county soil erosion control plan, as documented in the previous

chapter of this report. In this manner, emphasis would be placed on the use of available financial assistance programs to address soil erosion control problems in Priority Area A from 1988 through 1990; in Priority Area B from 1991 through 1993; in Priority Area C from 1994 through 1996; and in Priority Area D from 1997 through 1999.

It is also recommended that the Wisconsin Department of Natural Resources and the Wisconsin Department of Agriculture, Trade and Consumer Protection appropriately coordinate administration of the priority watershed program with the county soil erosion control plan, giving due consideration to the cropland soil erosion problems and potential water quality impacts in Kenosha County in its determination of watershed eligibility for purposes of the priority watershed program.

In deliberating on financial incentives to foster plan implementation, the Kenosha County Soil Erosion Control Planning Program Technical Advisory Committee also considered the impacts that land assessment practices may have on the willingness of farmers to implement soil conservation measures. In these deliberations, the Committee emphasized the importance of consistent, uniform land assessment practices which take into account the actual agricultural value of the land. The Committee cited prompt adjustment of the assessed value of excessively eroding land which has been retired from production on a long-term basis as one example of how assessment practices may promote soil conservation. The Committee also emphasized that, in areas where farmers have demonstrated a long-term commitment to farming and where that commitment has been confirmed through exclusive agricultural zoning, land assessments should reflect only the agricultural use of the land and the capability of the soil for crop production.

Technical Assistance Programs

As previously indicated, the U. S. Department of Agriculture, Soil Conservation Service, maintains a program of technical assistance to farmers as well as to governmental units. The Kenosha County Land Conservation Office also provides technical assistance to farm operators in an effort to promote land management practices. Technical assistance to farmers provided by the Soil Conservation Service and the County Land Conservation Office includes the preparation of farm conservation plans—which indicate

desirable tillage practices and cropping patterns, considering the characteristics of the land and the resources and objectives of the farm operator—and the design of conservation measures.

Recommendations Regarding Technical Assistance Programs: As indicated in Chapter V, the reduction of cropland soil erosion to tolerable levels throughout Kenosha County will require the preparation of new farm conservation plans for a majority of farms in the County. It is recommended that in planning their respective work programs, the County Land Conservation Office and the Soil Conservation Service, to the extent practicable, allocate staff time for preparing farm conservation plans in accordance with the priority area recommendations and related time frame proposed under the county soil erosion control plan.¹ Estimated staff requirements attendant to the proposed farm conservation planning and related plan implementation work within each priority area and for the county overall are set forth in Table 20. As indicated in that table, the conservation planning requirements envisioned under the county soil erosion control plan would require a commitment of time by conservation technicians of an estimated 20,000 man-hours, or about 10 man-years. Total salary and fringe benefit costs attendant to such conservation planning, expressed in 1988 dollars, would approximate \$400,000 through the year 1999, or an average of \$33,300 per year for 12 years.

As indicated in Chapter V, for purposes of estimating staff requirements for farm conservation planning in Kenosha County, it was assumed that conservation plans would be prepared for the approximately 500 farms in the County which either have conservation plans that are outdated or have no conservation plans

¹*It is recognized that the County Land Conservation Office and U. S. Soil Conservation Service will not be able to adhere strictly to the recommended time frame for addressing priority areas in Kenosha County because of other agency responsibilities, including implementation of the soil conservation requirements of the Wisconsin Farmland Preservation Program and the conservation compliance requirements of the Food Security Act of 1985.*

Table 20

**FARM CONSERVATION PLANNING AND IMPLEMENTATION
REQUIREMENTS UNDER THE KENOSHA COUNTY SOIL EROSION CONTROL PLAN**

Priority Area	Time Period	Farm Conservation Plan Preparation and Implementation		
		Number of Plans	Staff Requirements	
			Hours ^a (conservation technician)	Costs ^b
A	1988-1990	125	5,000	\$100,000
B	1991-1993	125	5,000	100,000
C	1994-1996	150	6,000	120,000
D	1997-1999	100	4,000	80,000
Total	--	500	20,000	\$400,000

^aIncludes time required for preparation of farm conservation plans, assistance in design and installation of needed improvements, and follow-up.

^bIncludes salary and fringe benefits, based upon 1988 salary levels.

Source: U. S. Soil Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

whatsoever. It should be noted that the soil erosion inventory data, developed on a field-by-field basis under the soil erosion control planning program, have not identified individual farming operations. Accordingly, the number of farms having excessively eroding cropland—and the number of detailed farm conservation plans required—can only be approximated. The staff time requirements for conservation planning and practice implementation presented herein, which are based upon the assumption that complete conservation plans would be prepared for 500 farms, should be construed to represent the maximum which may be required.

Inventory work conducted under the soil erosion control planning program indicated that 54 percent of all cropland in Kenosha County is eroding in excess of T-value. While higher percentages of excessively eroding cropland occur in Priority Areas A and B, excessively eroding farm fields are located throughout the County. In this regard, the soil erosion inventory indicated that most U. S. Public Land Survey sections in Kenosha County have at least some

excessively eroding cropland. To ensure that soil erosion is reduced to tolerable levels on all cropland, as implementation of the plan proceeds, each farm operation will be screened for soil loss in excess of T-value, as well as for any erosion-related water quality problems. This screening process would refine certain inventory data developed under the soil erosion control planning program, including information on crop history and tillage practices. Through this screening process, it may be determined that some farms do not require detailed farm conservation plans, while plans for certain other farms may be prepared through minimal staff efforts—particularly, in Priority Areas C and D. To the extent that this occurs, staff time needed for conservation planning and practice implementation may be less than indicated in Table 20.

It should be noted that the staff requirements set forth herein pertain to time required for the preparation of detailed farm conservation plans, assistance in applying needed practices, and follow-up efforts to ensure that the practices are being carried out. While an average rate of

40 hours per farm was assumed, the actual amount of time required may be expected to vary from farm to farm, depending upon, among other factors, the extent of erosion problems, the types of conservation practices utilized, and the responsiveness and cooperation of the farmer. As noted above, less time would be needed where only an initial screening is undertaken and no additional work is required. Conversely, more than 40 hours may be required on large farms with many problem fields or in situations where numerous farmer contacts are needed.

Conservation Compliance Requirements

In recent years, both the state and federal government have added conservation compliance requirements for participation in certain government-sponsored farm programs to encourage sound land management. Such conservation requirements, as described below, provide additional incentive for many farmers to control cropland soil erosion within tolerable levels.

Wisconsin Farmland Preservation Program Soil Conservation Requirements: Created in 1977, the Wisconsin Farmland Preservation Program provides property tax relief in the form of state income tax credits to eligible owners of farmland who decide to participate. In southeastern Wisconsin, owners of farmland are eligible to participate in the program only if their land has been placed in a state-certified exclusive agricultural zoning district and if certain other program eligibility requirements are met.² As a result of legislation contained in the 1985-1987 state budget bill, all participants in the Farmland Preservation Program are required to adhere to

²Until recently, farmers in "urban" counties, including all counties in southeastern Wisconsin, could participate in the Farmland Preservation Program only if their lands were zoned for agricultural use under an exclusive agricultural zoning district. Program changes enacted in 1988 allow farmers in urban counties to participate on the basis of long-term agreements with the State that limit the use of their land to agricultural use. Farmers in urban counties may apply for such agreements between July 1, 1988, and June 30, 1991. After that period, the requirement for exclusive agricultural zoning for tax credit eligibility in urban counties will be restored.

sound soil conservation practices so that cropland soil erosion is kept at or below tolerable levels. In tax year 1986, the soil conservation compliance requirements applied to "new" participants—landowners who had not claimed a farmland preservation tax credit for tax year 1984 or any prior year. In tax year 1988 the requirements applied as well to past participants—landowners who had claimed a farmland preservation tax credit for tax year 1984 or any prior year. Since the enactment of the soil conservation requirements of the Wisconsin Farmland Preservation Program, the Kenosha County Land Conservation Office has completed farm conservation plans for 20 farms, or just over one-half of the 37 farms in Kenosha County whose owners participate in the Farmland Preservation Program.

Participation in the Farmland Preservation Program in Kenosha County has been relatively low despite the fact that four of the eight civil towns in the County—the Towns of Pleasant Prairie, Randall, Somers, and Wheatland—have adopted exclusive agricultural zoning. The overall low level of participation may be due, in part, to landowner perceptions and expectations regarding the potential for urban development, particularly in the eastern portions of the County.

The 37 farms enrolled in the Farmland Preservation Program for tax year 1987 encompassed about 5,200 acres. Of that total, about 4,600 acres, or 88 percent, was located in the Towns of Randall and Wheatland—areas strongly committed to agriculture. For participating landowners residing in Kenosha County, the average tax credit for tax year 1987 was \$1,572. The average property tax on their land was \$3,924.³

It should be noted that the level of participation in the Farmland Preservation Program in Kenosha County was relatively low even before the establishment of soil conservation requirements

³Information regarding the amount of Farmland Preservation Program tax credits is available only by place of residence of program participants. Accordingly, these data pertain to program participants residing in Kenosha County regardless of where their farmland is located.

for participation through exclusive agricultural zoning. Participation levels do not appear to have been significantly affected by the soil conservation requirements. Many of the participating farms are dairy operations which typically do not require major changes in management practices to remain eligible.

Participation in the Farmland Preservation Program may increase as a result of the new provisions for participation through long-term contracts in urban counties. The County Land Conservation Office has noted an increase in farmer interest in the program since the enactment of the long-term contract provisions, with four landowners applying for long-term farmland preservation contracts as of the end of 1988.

Conservation Requirements of the Food Security Act of 1985: The Food Security Act of 1985 established "conservation compliance" requirements for farmers participating in a number of U. S. Department of Agriculture farm programs, including price and income support programs, crop insurance programs, Farmers Home Administration loan programs, the Conservation Reserve Program, and others. The conservation compliance provisions require that producers farming highly erodible fields develop and be applying a conservation plan for such fields by 1990, and that such plan be fully implemented by 1995. Under the conservation compliance provisions, a field is considered to be highly erodible if at least one-third of the field is covered by soil having the potential to erode at a rate of more than eight times tolerable levels. The U. S. Department of Agriculture, Soil Conservation Service, is responsible for the identification of highly erodible lands in Kenosha County. The required conservation plans may be prepared by specialists in the Soil Conservation Service, the County Land Conservation Office, and the Extension Service; vocational agriculture instructors; and other qualified technicians. As a practical matter, it is anticipated that most of the required plans will be prepared by the U. S. Soil Conservation Service or County Land Conservation Office.

In Kenosha County, highly erodible farm fields encompass about 14,000 acres. An estimated 190 farms in the County may be affected by the conservation compliance provisions of the Food Security Act and, accordingly, may require a conservation plan for at least a portion of the farm. About 70 percent of the required planning

work was completed by the end of 1988. It should be recognized, in this regard, that the conservation compliance provisions of the Food Security Act pertain only to lands identified as highly erodible. Other lands farmed by participants in federal farm programs are not subject to the Food Security Act conservation compliance provisions, even though they may be eroding above established tolerances. It should also be noted that under the "alternative conservation systems" provisions of the Food Security Act, a farmer may remain eligible to participate in federal farm programs while using management practices which result in soil erosion above established tolerances on highly erodible land. Under these provisions, a farmer is generally required to achieve a substantial reduction in soil erosion, but is not required to reduce soil loss to T-value—the intent being the avoidance of situations where reduction to T-value would result in economic hardship. On many farms in Kenosha County, the farm planning work conducted in conjunction with the Food Security Act has been limited to fields identified as highly erodible, with many of those fields being treated under the alternative conservation systems provisions—thus providing no assurance that soil erosion will be reduced to T-value on those farms.

The Food Security Act of 1985 also included "sodbuster" provisions intended to discourage the conversion of highly erodible land from grassland or woodland to cropland. The sodbuster provisions apply, in particular, to highly erodible land, as defined above, which was not planted to annually tilled crops during the period 1981-1985. Under the Food Security Act, farmers desiring to remain eligible for basic U. S. Department of Agriculture programs may convert such land to cropland only by developing and applying a conservation plan, in cooperation with the U. S. Department of Agriculture, Soil Conservation Service.

In addition to the foregoing, the Food Security Act of 1985 included "swampbuster" provisions intended to discourage the conversion of wetland areas to cropland. Under the swampbuster provisions, a farmer who converts a wetland to cropland use generally loses eligibility for basic U. S. Department of Agriculture programs, although certain exceptions are provided.

Recommendations Regarding Conservation Compliance Requirements: As previously indicated, the Kenosha County Land Conservation

Office has completed farm conservation plans for 20 of the 37 current participants in the Wisconsin Farmland Preservation Program. It is anticipated that the Land Conservation Office will prepare farm conservation plans for the remaining farms requiring such plans under the Farmland Preservation Program and for additional participants in the Wisconsin Farmland Preservation Program as participation in that program increases over time. It is recognized that the farm conservation planning activities required for compliance with the Wisconsin Farmland Preservation Program may not be able to be undertaken in strict conformance with the priority area recommendations and related time frame proposed under the county soil erosion control plan.

It is also anticipated that by 1990, the U. S. Department of Agriculture, Soil Conservation Service, possibly assisted by cooperating agencies, will prepare conservation plans for highly erodible cropland for farmers participating in U. S. Department of Agriculture programs, in accordance with the provisions of the Food Security Act of 1985. While the Food Security Act requires the preparation of a conservation plan for highly erodible farm fields, it is recommended that, to the extent practicable, the Soil Conservation Service and cooperating agencies prepare comprehensive farm plans for the entire farm concerned, rather than exclusively for highly erodible farm fields. At a minimum, this approach should be followed in implementing the conservation planning requirements of the Food Security Act within Priority Area A.

Information and Education Program

An effective information and education program can increase the awareness among farmers of soil erosion problems, of the types of practices that may be used to address those problems, and of the public financial and technical resources that are available to help in implementation of those practices.

Recommendations for an Information and Education Program: It is recommended that the Kenosha County Land Conservation Office take the lead role in developing and implementing an information and education program focusing on cropland soil erosion in Kenosha County. In developing and implementing the program, the Land Conservation Office should draw upon the expertise and resources of the University of

Wisconsin-Extension and the U. S. Department of Agriculture, Soil Conservation Service.

It is recommended that Kenosha County consider the creation of a committee to oversee the proposed information and education program or designation of an existing committee for that purpose. Such a committee should consist of individuals who are familiar with existing soil erosion problems and with the resources available to address those problems. The committee should include representatives of the County Land Conservation Office, University of Wisconsin-Extension, U. S. Soil Conservation Service, U. S. Agricultural Stabilization and Conservation Service, and U. S. Farmers Home Administration, along with representatives of the concerned county departments.

The Kenosha County Land Conservation Office, working cooperatively with the University of Wisconsin-Extension and the U. S. Soil Conservation Service, would be responsible for identifying the specific activities to be pursued and the type of resource materials to be prepared under the information and education program. The following general guidelines should be considered in developing that program:

1. The information and education program should foster an awareness of the environmental impacts of all forms of cropping practices—including both conventional practices and alternative practices intended to reduce soil erosion. In particular, the program should emphasize the dissemination of information on the judicious use of agricultural chemicals, particularly when conservation tillage systems are adopted to reduce cropland soil erosion. In this regard, information and education programs should promote an awareness of integrated pest management programs which attempt to minimize the application of pesticides, as well as similar programs intended to minimize the application of fertilizers.
2. It is recommended that the information and education program be undertaken in general conformance with the priority area recommendations and related time frame proposed under the county soil erosion control plan as documented in the previous chapter of this report. In this manner,

information and education activities would be directed primarily toward farmers in Priority Area A from 1988 through 1990; in Priority Area B from 1991 through 1993; in Priority Area C from 1994 through 1996; and in Priority Area D from 1997 through 1999. Focusing on the priority areas in this manner, however, should not preclude countywide activities, such as the preparation and dissemination of fact sheets and other informational materials, intended to increase the understanding of soil erosion problems and solutions in the County.

3. It is recommended that as a first step in the information and education program, a meeting be held for farmers in Priority Area A—the highest priority area for cropland soil erosion control—in order to explain the findings and recommendations of the soil erosion control plan, to describe soil loss rates within that area, and to describe the types of practices recommended for adoption by the farmers concerned to remedy soil erosion problems. Written notice of the meeting should be sent to each farmer within Priority Area A. It is anticipated that such a meeting will be held in the winter of 1988-89. Additional meetings may be held with Priority Area A farmers over the next three years, as deemed appropriate by the Land Conservation Office.

While the staff requirements attendant to the county soil erosion control information and education program depend on the types of activities undertaken, it is anticipated that such a program will require a commitment of time of about 7,200 man-hours over the 12-year plan implementation period, including about 800 man-hours per year from 1988 through 1993; 500 man-hours per year from 1994 through 1996; and 300 man-hours per year from 1997 through 1999. Attendant salary and fringe benefit costs, expressed in 1988 dollars, would approximate \$144,000 over 12 years, including about \$16,000 per year from 1988 through 1993; about \$10,000 per year from 1994 through 1996; and about \$6,000 per year from 1997 through 1999.

Regulatory Measures for Erosion Control

Government activities intended to achieve a reduction in cropland soil erosion have traditionally relied upon voluntary cooperation by the

farmer, with financial and technical assistance programs and educational programs used to promote farmer cooperation. As indicated above, both the state and federal governments have recently established certain conservation requirements for participation in basic farm programs. Other than those program compliance requirements, regulatory approaches for controlling cropland soil erosion have not gained legislative support.

It should be noted, however, that counties as well as cities and villages in Wisconsin have been granted the authority under Section 92.11 of the Wisconsin Statutes to adopt ordinances prohibiting land uses and land management practices which cause excessive soil erosion, sedimentation, nonpoint source water pollution, or stormwater runoff. Upon adoption of such an ordinance by the governing body, the ordinance provisions become effective only upon approval by a majority of voters in a referendum in the affected area. At the end of 1987, regulations governing cropland soil erosion adopted under Section 92.11 of the Wisconsin Statutes were in effect in only one municipality in Wisconsin—the Town of Sterling in Vernon County.

After deliberating on this matter, the Kenosha County Soil Erosion Control Planning Program Technical Advisory Committee determined that efforts to address cropland soil erosion in Kenosha County should continue to emphasize a basically voluntary approach, supported by available technical and financial assistance and information and education programs as well as by the conservation compliance provisions of state and federal farm programs.

While the focus of the soil erosion control planning program has been on the control of cropland soil erosion, this report has also pointed out the potential for serious construction site erosion problems in Kenosha County as the County continues to urbanize. As indicated in Chapter III, construction site erosion can contribute to problems on the construction site itself—including rilled and gullied slopes and washed out roads—and to offsite problems—including water quality degradation and clogging of culverts and roadside ditches and other watercourses. Construction site erosion can be effectively controlled through adoption and enforcement by local units of government of appropriate construction site erosion control

regulations. Counties in Wisconsin have been granted authority to adopt such regulations throughout their unincorporated areas under Section 59.974 of the Wisconsin Statutes. Cities and villages have been granted such authority within their incorporated areas under Sections 62.234 and 61.354, respectively, of the Wisconsin Statutes. As indicated in Chapter III, the Wisconsin Department of Natural Resources, in conjunction with the League of Wisconsin Municipalities, has developed model regulations which may be adapted by counties, cities, and villages in Wisconsin for the purpose of controlling construction site soil erosion.

After deliberating on this matter, the Kenosha County Soil Erosion Control Planning Program Technical Advisory Committee recommended that Kenosha County adopt construction site erosion control regulations applicable to the entire unincorporated area of Kenosha County, and that the City of Kenosha and the Villages of Paddock Lake, Silver Lake, and Twin Lakes similarly adopt construction site erosion control regulations applicable to their incorporated areas. Each of the units of government concerned should review the existing framework of land use regulations and determine how that framework should be revised in order to incorporate the desired construction site erosion control regulations and how those regulations should be administered. In considering potential administrative arrangements, the units of government concerned should determine whether the construction site erosion control regulations could be administered through existing staff or whether additional staff services would be needed.

Program Monitoring and Evaluation

Chapter Ag 160 of the Wisconsin Administrative Code, which governs the preparation of county soil erosion control plans, requires that such plans set forth a method by which the County Land Conservation Committee can evaluate the effectiveness of the county soil erosion control program. In this regard, the Wisconsin Department of Agriculture, Trade and Consumer Protection recommends a structured evaluation system providing for an annual evaluation of erosion control efforts within the County.

Recommendations for Monitoring and Evaluation: The following recommendations are intended to assist the Kenosha County Land Conservation Committee in a structured evalua-

tion of the effectiveness of soil control efforts within the County:

1. It is recommended that the County Land Conservation Office routinely update the soil erosion inventory file created during the preparation of the county soil erosion control plan to reflect additional conservation practices as they are implemented. With the file updated in this manner, average cropland soil erosion rates could be recalculated for the County overall and for appropriate subareas of the County. This procedure could be used to estimate the effect on the overall soil loss rate of conservation practices implemented each year—assuming that there is no change in the rate of soil erosion on other cropland in the County.
2. It is recommended that each year the County Land Conservation Office prepare a report briefly summarizing the types and levels of soil erosion control activities undertaken by the Land Conservation Office, as well as by other cooperating agencies, including the U. S. Department of Agriculture, Soil Conservation Service, and the University of Wisconsin-Extension. The report should appropriately document technical assistance activities, information and education activities, and any other activities undertaken to achieve a reduction in cropland soil erosion in the County.
3. It is recommended that each year the County Land Conservation Committee evaluate the soil erosion control activities as documented above, considering, among other factors, the estimated impact on soil loss rates in the County, in order to identify any areas in which the soil erosion control efforts might be improved.

STAFF AND COST-SHARE ASSISTANCE NEEDS

Staff Needs

The staff requirements for the farm conservation planning activities and the information and education activities envisioned under the soil erosion control plan, presented in previous sections of this chapter, are summarized in

Table 21

**STAFFING REQUIREMENTS FOR IMPLEMENTATION OF
THE KENOSHA COUNTY SOIL EROSION CONTROL PLAN^a**

Priority Area	Time Period	Farm Conservation Planning/ Implementation		Information and Education Activities		Administration ^b		Total	
		Hours	Costs ^c	Hours	Costs ^c	Hours	Costs ^c	Hours	Costs
A	1988-1990	5,000	\$100,000	2,400	\$ 48,000	2,960	\$ 65,100	10,360	\$213,100
B	1991-1993	5,000	100,000	2,400	48,000	2,960	65,100	10,360	213,100
C	1994-1996	6,000	120,000	1,500	30,000	3,000	66,000	10,500	216,000
D	1997-1999	4,000	80,000	900	18,000	1,960	43,100	6,860	141,100
Total	--	20,000	\$400,000	7,200	\$144,000	10,880	\$239,300	38,080	\$783,300

^aIncludes professional staff only.

^bIncludes administrative work attendant to farm conservation planning and information and education activities, as well as administrative work attendant to cost-share assistance programs.

^cIncludes salary and fringe benefits, based upon 1988 salary levels.

Source: U. S. Soil Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

Table 21, along with related administrative staff requirements. As indicated in that table, the soil erosion control plan envisions that farm conservation planning and related implementation activities would involve the commitment of about 20,000 man-hours; that the information and education activities would involve the commitment of about 7,200 man-hours; and that administrative activities would involve the commitment of about 10,900 man-hours through the year 2000. Implementation of the soil erosion control plan would thus involve a commitment of about 38,100 man-hours, or about 19 man-years, through the year 2000. Staff requirements would average almost 3,500 man-hours per year from 1988 through 1996 and about 2,300 man-hours per year from 1997 through 1999.

At the present time, there are three staff members—one in the Kenosha County Land Conservation Office and two in the U. S. Soil Conservation Service—available on a part-time basis for the farm conservation planning work,

the information and education activity, and the administrative work envisioned under the soil erosion control plan. The aforementioned U. S. Soil Conservation Service staff, it should be noted, serve both Kenosha and Racine Counties. In addition, some staff support for the information and education activity may be expected to be provided through the University of Wisconsin-Extension office serving Kenosha County. It is envisioned that the County Land Conservation Office staff would be able to devote one-third of currently available staff time—about 667 man-hours per year—to plan implementation activities; and that the staff of the U. S. Soil Conservation Service would each be able to devote one-fourth of their time—about 500 man-hours each per year. It is further envisioned that the staff of the University of Wisconsin-Extension would be able to devote approximately 120 man-hours per year to the information and education program proposed in the plan. Existing staff may thus be expected to commit about 1,787 man-hours each year to soil

erosion control plan implementation activities. Between 1988 and 1996, the available staff time is about 1,700 man-hours per year less than the required staff time, and between 1997 and 1999, the available staff time is about 500 man-hours per year less than the required staff time. This suggests the need for one additional conservationist for most of the plan implementation period. The additional conservationist position could be in the County Land Conservation Office or the U. S. Soil Conservation Service.

Cost-Share Assistance Needs

Previous sections of this chapter have described the types of cost-share assistance programs available to farmers in reducing cropland soil erosion. This section presents an estimate of the amount of cost-share assistance required to reduce cropland soil erosion to tolerable levels, assuming that all farm operators with excessively eroding cropland are eligible for, and amenable to, such assistance.

Cost-share assistance requirements attendant to the management practices recommended in the soil erosion control plan are set forth in Table 22. As indicated in that table, cost-share assistance requirements through the year 2000 total about \$1,438,900—including \$586,100 in Priority Area A, \$444,600 in Priority Area B, \$312,000 in Priority Area C, and \$96,200 in Priority Area D. As indicated in Table 23, the amount of cost-share assistance required is substantially greater than the amount which may be expected to be provided through the existing cost-share assistance programs, including assistance for a variety of erosion control measures under the federal Agricultural Conservation Program and assistance for establishing permanent vegetative cover under the federal Conservation Reserve Program.⁴ The additional amount of cost-share funds required—beyond the amounts which may be expected to be provided through existing programs—approximates \$852,600. Additional cost-share funds may eventually be available within Kenosha County under the innovative projects provisions of the state Soil and Water Resources Management Program.

⁴*It is anticipated that assistance under the Conservation Reserve Program will not be available after 1990.*

SUMMARY

This chapter has recommended the specific actions that should be taken by various units and agencies of government in order to implement the Kenosha County soil erosion control plan. The most important recommendations are summarized below by agency or unit government.

County Level

Kenosha County Board of Supervisors: It is recommended that, upon the recommendation of the Kenosha County Land Conservation Committee, the Kenosha County Board of Supervisors:

1. Formally adopt the erosion control plan set forth in this report as a guide for addressing cropland soil erosion problems in the County, and direct the Kenosha County Land Conservation Office to integrate the plan into various county conservation programs and activities.

Kenosha County Land Conservation Committee:

It is recommended that the Kenosha County Land Conservation Committee, through its staff in the County Land Conservation Office:

1. In conjunction with the U. S. Department of Agriculture, Soil Conservation Service, maintain a technical assistance program for farmers in Kenosha County, emphasizing, in particular, the preparation or revision of farm conservation plans to identify field-specific measures for addressing cropland soil erosion in Kenosha County.
2. In cooperation with the University of Wisconsin-Extension, develop and carry out an information and education program to foster an awareness of soil erosion problems, of the types of practices that may be used to address those problems, and of the public financial and technical resources available to help in implementation of those practices.
3. Conduct an annual evaluation of erosion control efforts in the County, considering, among other factors, the estimated impact on soil loss rates in the County, in order to identify any areas in which the soil erosion control efforts might be improved.

Table 22

**COST-SHARE REQUIREMENTS FOR IMPLEMENTATION
OF THE KENOSHA COUNTY SOIL EROSION CONTROL PLAN**

Management Practice	Units/Cost-Share Requirement ^a	Priority Area A (1988-1990)	Priority Area B (1991-1993)	Priority Area C (1994-1996)	Priority Area D (1997-1999)	Total
Reduced Tillage	Acres required Cost-share funds required ^b . . .	12,650 \$370,000	10,800 \$315,900	7,310 \$213,800	1,930 \$56,500	32,690 \$ 956,200
Contour Plowing	Acres required Cost-share funds required ^c . . .	840 \$ 6,300	490 \$ 3,700	390 \$ 2,900	190 \$ 1,400	1,910 \$ 14,300
Contour Strip-cropping	Acres required Cost-share funds required ^d . . .	700 \$ 7,900	410 \$ 4,600	320 \$ 3,600	150 \$ 1,700	1,580 \$ 17,800
Permanent Vegetative Cover	Acres required Cost-share funds required ^e . . .	2,270 \$ 85,100	510 \$ 19,100	410 \$ 15,400	420 \$15,800	3,610 \$ 135,400
Grassed Waterways	Linear feet required Cost-share funds required ^f . . .	46,700 \$116,800	40,500 \$101,300	30,500 \$ 76,300	8,300 \$20,800	126,000 \$ 315,200
Total Cost Share Required		\$586,100	\$444,600	\$312,000	\$96,200	\$1,438,900

^aBased upon 1988 cost-share rates.

^bBased upon a cost-share rate of \$9.75 per acre per year for three years, as provided under the Agricultural Conservation Program.

^cBased upon a cost-share rate of \$7.50 per acre, as provided under the Agricultural Conservation Program.

^dBased upon a cost-share rate of \$11.25 per acre, as provided under the Agricultural Conservation Program.

^eBased upon a cost-share rate of 50 percent of the actual cost, as provided under the Conservation Reserve Program—with the cost assumed to be \$75 per acre.

^fBased upon a cost-share rate of 75 percent of the actual cost, as provided under the Agricultural Conservation Program—with the cost assumed to be \$3.00 per foot plus 10 percent for required design work.

Source: U. S. Agricultural Stabilization and Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

Table 23

COMPARISON OF COST-SHARE FUNDS REQUIRED AND COST-SHARE FUNDS WHICH MAY BE PROVIDED THROUGH EXISTING COST-SHARE ASSISTANCE PROGRAMS IN KENOSHA COUNTY

	Priority Area A (1988-1990)	Priority Area B (1991-1993)	Priority Area C (1994-1996)	Priority Area D (1997-1999)	Total
Cost-Share Funds Required	\$586,100	\$444,600	\$312,000	\$96,200	\$1,438,900
Cost-Share Funds Which May be Provided Through Existing Programs:					
Federal Agricultural Conservation Program	\$135,000	\$135,000	\$135,000	\$96,200	\$501,200
Federal Conservation Reserve Program	85,100	--	--	--	85,100
Total	\$220,100	\$135,000	\$135,000	\$96,200	\$586,300
Additional Cost-Share Funds Needed—Beyond the Amounts Which May be Provided Through Existing Programs	\$366,000	\$309,600	\$177,000	\$ 0	\$852,600

Source: U. S. Agricultural Stabilization and Conservation Service, Kenosha County Land Conservation Office, and SEWRPC.

State Level

Wisconsin Department of Agriculture, Trade and Consumer Protection: It is recommended that the Wisconsin Department of Agriculture, Trade and Consumer Protection:

1. Endorse the Kenosha County soil erosion control plan and utilize it in carrying out the Soil and Water Resources Management Program and its other soil and water conservation responsibilities, after review

and certification by the Wisconsin Land Conservation Board that the plan meets the standards of Section 92.10 of the Wisconsin Statutes and Chapter Ag 160 of the Wisconsin Administrative Code.

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

1. Endorse the soil erosion control plan and integrate the plan into its broad range of agency responsibilities in the area of natural resource protection and water quality control.
2. Appropriately coordinate the administration of the priority watershed program with the county soil erosion control plan.
3. Give due consideration to the county soil erosion control plan in the administration of the federal nonpoint source water pollution abatement program—established under Section 319 of the Water Quality Act of 1987—within Wisconsin.

University of Wisconsin-Extension: It is recommended that the University of Wisconsin-Extension office serving Kenosha County:

1. Endorse the soil erosion control plan and utilize the plan recommendations, as appropriate, in the development and direction of its work program.
2. Assist the Kenosha County Land Conservation Office in developing and carrying out an effective erosion control information and education program for farmers in Kenosha County.

Federal Level

U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service: It is recommended that the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service:

1. Formally acknowledge the soil erosion control plan and consider the plan recommendations in its administration of related federal financial assistance programs. In particular, it is recommended that in the

administration of the Agricultural Conservation Program and the Conservation Reserve Program, the Agricultural Stabilization and Conservation Service, to the extent practicable, allocate financial assistance in accordance with the priority area recommendations and related time frame proposed under the county soil erosion control plan.

U. S. Department of Agriculture, Soil Conservation Service: It is recommended that the U. S. Department of Agriculture, Soil Conservation Service:

1. Formally acknowledge the soil erosion control plan and work cooperatively with the Kenosha County Land Conservation Office in efforts to implement that plan.
2. In cooperation with the Kenosha County Land Conservation Office, maintain a technical assistance program for farmers in Kenosha County, emphasizing, in particular, the preparation of detailed farm conservation plans addressing cropland soil erosion problems.
3. Coordinate its activities in carrying out the conservation compliance provisions of the Food Security Act of 1985 with the county soil erosion control plan. In this regard, conservation planning activity undertaken by the Soil Conservation Service in conjunction with the conservation compliance provisions should, to the extent practicable, address entire farm operations, rather than highly erodible farm fields exclusively—particularly within Priority Area A.
4. Assist the Kenosha County Land Conservation Office in developing and carrying out an effective erosion control information and education program for farmers in Kenosha County.

U. S. Department of Agriculture, Farmers Home Administration: It is recommended that the U. S. Department of Agriculture, Farmers Home Administration:

1. Formally acknowledge the soil erosion control plan, and consider the plan recommendations in its administration of the Soil and Water Loan Program.

Chapter VII

SUMMARY

Soil erosion takes place when water or wind carries away soil from inadequately protected land surfaces. Erosion causes serious problems. The loss of topsoil from agricultural land means that the land loses part of its productive capacity. Eventually, no amount of fertilizer can, as a practical matter, replace this loss, and the ability of the land to produce crops may be jeopardized. Thus, the land and the people who occupy and work it both become poorer. Downstream sites—the places to which the eroded soil is carried—experience a different but also very costly set of problems. These include the clogging of culverts and drainageways, and diminished water quality, and in some cases interference with commercial as well as recreational navigation. Soil erosion contributes to the water quality problems of lakes and streams, the soil particles constituting a form of pollution per se being directly injurious to various desirable forms of aquatic life, destroying fish and wildlife habitat and rendering recreational areas undesirable, and carrying adsorbed conventional and toxic pollutants.

The dust bowl experience of the 1930's generated a national interest in the wise use of the soil. More recently, concern about soil erosion has increased in southeastern Wisconsin owing in part to a shift away from dairy farming and traditional crop rotation patterns generally compatible with long-term resource protection, in favor of continuous row cropping that tends to exacerbate soil erosion and associated problems. Such a shift is occurring in Kenosha County. In general, there has been an increase in erosion-prone crops, particularly corn and soybeans, and a decrease in crops that are less susceptible to erosion, including oats and hay. The acreage in corn increased by 13,000 acres, or 47 percent—from about 27,700 acres in 1965 to about 40,700 acres in 1986. The acreage in soybeans increased by 9,800 acres, or 132 percent—from about 7,400 acres in 1965 to about 17,200 acres in 1986. Conversely, the acreage in hay decreased by 8,950 acres, or 46 percent—from about 19,300 acres in 1965 to about 10,350 acres in 1986. The acreage in oats also decreased substantially—from about 9,100 acres in 1965, to about 1,700 acres in 1986, a decrease of 7,400 acres, or 81 percent.

Because of the increasing concern over soil erosion, the Wisconsin Legislature in 1982 revised Chapter 92 of the Wisconsin Statutes, the state soil and water conservation law, to require the preparation of county soil erosion control plans focusing on the control of cropland soil erosion. A total of 55 counties located in approximately the southern two-thirds of the State, including Kenosha County, are required to prepare such a plan.

Recognizing the need for soil erosion control, and in an effort to comply with the requirements of Chapter 92 of the Wisconsin Statutes, the Kenosha County Board in 1987 determined to prepare a county soil erosion control plan. The Board requested the assistance of the Southeastern Wisconsin Regional Planning Commission in the preparation of such a plan. The County received a planning grant from the Wisconsin Department of Agriculture, Trade and Consumer Protection in partial support of the required work. The plan presented herein was prepared by the Regional Planning Commission in cooperation with the Kenosha County Land Conservation Office. The planning effort was carried out under the guidance of the Kenosha County Land Conservation Committee. The Land Conservation Office and the Commission staff were assisted in the preparation of the plan by a technical advisory committee consisting of county farmers, representatives of the Kenosha County Planning and Development Department, the Wisconsin Department of Natural Resources, the University of Wisconsin-Extension, and the U. S. Department of Agriculture, Soil Conservation Service and Agricultural Stabilization and Conservation Service.

The soil erosion control plan presented herein is intended to serve as a guide for use in controlling cropland soil erosion in Kenosha County. The plan recommends a cropland soil erosion control objective and related erosion control standards; recommends a rank ordering of areas of the County for the application of erosion control measures; identifies the types and amounts of soil erosion control practices that may be used to reduce soil erosion to tolerable levels; and identifies the actions that should be taken by the various units and agencies of

government concerned in implementing the plan. The major findings and recommendations of the plan are summarized below.

SOIL EROSION CONTROL OBJECTIVE

The primary objective of the cropland soil erosion control plan, as recommended by the Technical Advisory Committee, is the maintenance of the long-term productivity of soils within the County through the prevention of "excessive" cropland soil erosion. "Excessive" erosion is defined as erosion in excess of soil tolerances—or T-value—as determined by the U. S. Department of Agriculture, Soil Conservation Service. The related standards recommended by the Technical Advisory Committee incorporate the minimum standards for erosion control prescribed in Chapter Ag 160 of the Wisconsin Administrative Code—including, importantly, the reduction of soil erosion on all cropland to no more than T-value by the year 2000 (see Table 8 in Chapter IV of this report).

Soil loss tolerance, or T-value, refers to the maximum level of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely. For soils in Kenosha County, T-values generally range between two and five tons per acre per year. It should be noted that while the concept of the T-value enjoys widespread use as a basis for soil conservation planning, T-values are not universally accepted as goals for cropland soil erosion control. There is some concern that T-values have been set too high to adequately protect the long-term productivity of the soil. It should also be recognized, in this respect, that the established T-values do not take into account offsite impacts attendant to cropland soil erosion. Nevertheless, in developing the soil erosion control plan, the Technical Advisory Committee determined that, despite limitations, soil loss tolerances, or T-values, established by the U. S. Soil Conservation Service currently provide the best available basis for establishing cropland soil erosion objectives and standards—although continuing research of those tolerances is required.

SOIL EROSION INVENTORY AND ANALYSIS

The rate of soil erosion on cropland for any given set of climatic conditions varies considerably, depending upon the cropping system,

management practices, soil characteristics, and topographic features of the individual farm fields. Under the Kenosha County soil erosion control planning program, an inventory and analysis of existing cropland was undertaken in order to determine the extent and severity of cropland soil erosion problems within the County, focusing, in particular, on "sheet" and "rill" erosion. Sheet erosion is characterized by the removal of a relatively uniform, thin layer of soil from the land surface, the result of runoff in the form of shallow sheets of water flowing over the ground. Such shallow surface flow typically does not move more than a few feet before collecting in surface depressions. Rill erosion occurs when sheet runoff begins to concentrate in surface depressions and, gaining in velocity, cuts small but well-defined channels termed "rills." Sheet and rill erosion is a widespread problem causing massive amounts of soil to be moved about on, and, in many cases, completely off inadequately protected cropland. Though often not perceived as a problem by the farm operator, sheet and rill erosion can seriously impair soil productivity in the long term, and can cause serious and costly offsite damages and environmental problems.

Estimates of the amount of sheet and rill erosion on individual farm fields in Kenosha County were developed through application of the universal soil loss equation. This equation, the attendant data requirements, and the manner in which the required data were developed for cropland in Kenosha County are described in Chapter III of this report.

The inventories conducted under the planning program indicated that the average rate of sheet and rill erosion in Kenosha County in 1985 was 4.5 tons per acre per year. The soil loss rate was less than 3.0 tons per acre per year on about 22,600 acres of cropland, representing about 25 percent of all cropland in the County in 1985. At the other extreme, the soil loss rate was 10 tons per acre per year or more on about 3,600 acres, representing about 4 percent of all cropland.

In order to provide perspective on the severity of the soil erosion problem, soil loss rates, as estimated by the universal soil loss equation, are frequently expressed in multiples or fractions of T-value. About 50,000 acres of cropland in Kenosha County, representing about 54 percent of all cropland in the County, was found to be eroding at rates exceeding T-value in 1985—

including about 37,500 acres, or just over 40 percent of all cropland, eroding at rates between 1.1 and 2.0 times T-value; about 9,000 acres, or about 10 percent, eroding at rates between 2.1 and 3.0 times T-value; and about 3,500 acres, or about 4 percent, eroding at rates of more than 3.0 times T-value. The remaining cropland—totaling about 41,900 acres, or about 46 percent of all cropland in the County—was eroding at rates less than T-value.

RECOMMENDED SOIL EROSION CONTROL PRACTICES

A variety of conservation practices are available to farmers for the control of cropland soil erosion. These practices range from structural approaches, such as the installation of terraces and the construction of grassed waterways, to management approaches, such as conservation tillage and contour plowing. An important objective of the county soil erosion control planning program was the identification of those practices which would most effectively address soil erosion problems within the County.

It is the intent of the county soil erosion control plan to resolve cropland soil erosion problems through management practices involving conventional moldboard plowing—including rotation changes, contouring, or contour strip-cropping—rather than conservation tillage, where practicable. Despite the high priority given to erosion control practices involving conventional tillage under the plan, however, only a relatively small portion of the excessively eroded cropland was found to be able to be effectively treated in this manner. This is primarily due to the irregularity of the topography in the County, which causes much of the excessively eroding cropland to be unsuitable for contour cropping or contour strip-cropping in accordance with U. S. Soil Conservation Service standards.

The plan recommends that management practices involving conventional moldboard plowing—including rotation changes, contouring, or contour strip-cropping—be implemented on about 13,750 acres, or about 28 percent of the excessively eroding cropland in the County. This includes 10,600 acres proposed to be treated through basic rotation changes; 1,540 acres proposed to be treated through contouring or contour strip-cropping; and 1,610 acres proposed

to be treated through a rotation change in conjunction with contouring or contour strip-cropping.

The plan recommends that conservation tillage—primarily reduced tillage systems leaving a 30 percent crop residue after planting—be implemented on about 32,690 acres, or about 65 percent of the excessively eroding cropland in the County. The plan recommends conservation tillage as the sole management practice on about 21,310 acres, or just over 42 percent of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 11,380 acres, or about 23 percent.

Under the plan, the remainder of the excessively eroding cropland—about 3,610 acres, or 7 percent—would be placed in permanent vegetative cover. In addition, an estimated 126,000 feet of grassed waterways would be installed within the County.

It should be noted that conservation tillage systems—which are recommended on a widespread basis for use in controlling soil erosion under the plan—tend to require an intensive level of production management. Careful monitoring of all agricultural inputs is extremely important to minimize the detrimental effects of these inputs on the quality of the environment. Integrated pest management technologies are recommended for conservation tillage to prevent excessive application of pesticides. A similar integrated type of approach with soil testing can be used to ensure the judicious application of fertilizers.

Costs of Recommended Practices

Of the soil erosion control practices recommended herein, implementation costs may be readily estimated for two practices—namely, grassed waterways and establishment of a permanent vegetative cover. Costs associated with the installation of grassed waterways without tiles—including a 10 percent allowance for engineering—would approximate \$415,800 for the entire County. Costs associated with the establishment of permanent vegetative cover would approximate \$270,800.

The costs associated with the implementation of the other recommended practices—including the conservation tillage systems—are more difficult

to estimate. Of concern to the farmer is the difference in net return as the farmer shifts from conventional cropping to a form of conservation tillage. Net return may be adversely affected by potentially decreased yields; by potentially greater use of pesticides; and by the capital outlay required for specialized equipment used in some conservation tillage systems. Net return may also be positively affected by lower fuel consumption and lower operation and maintenance costs, because conservation tillage systems involve fewer tillage operations. The impacts on net return of shifting from conventional to conservation tillage may be expected to vary from farm to farm, depending upon the size of operation; the physical characteristics of the farm, including soil and topographic characteristics; the types of crops grown; and the type and condition of existing farm machinery.

CONSERVATION PLANNING REQUIREMENTS

While the county soil erosion control plan identifies the general types of practices that may be utilized to control soil erosion, detailed farm conservation plans will be required to adapt and refine those recommendations for individual farm units. Conservation plans are detailed plans, generally prepared with the assistance of the U. S. Soil Conservation Service or County Land Conservation Department staffs, intended to guide agricultural activity in a manner which conserves soil and water resources. The conservation plan recommends site-specific desirable tillage practices, cropping patterns, and rotation cycles, considering the topography, hydrology, and soil characteristics of the farm, together with the resources of the farm operator and the operator's objectives as owner or manager of the land.

It is estimated that 60 farm operations, representing about 11 percent of the total of 560 farm operations in Kenosha County, have sound, up-to-date farm conservation plans. The remaining 500 farms, representing about 89 percent of all farms in the County, either have conservation plans which are outdated or have no conservation plans whatsoever. It is anticipated that farm plans will be prepared for these farms during the implementation of the county soil erosion control plan, with most of the farm conservation planning work being cooperatively undertaken by the Kenosha County Land

Conservation Office and the U. S. Department of Agriculture, Soil Conservation Service. It is anticipated that the detailed farm conservation planning would address any apparent wind erosion or stream bank erosion problems, as well as cropland sheet and rill erosion and gully erosion.

The conservation planning activity envisioned under the soil erosion control planning program would require a commitment of time by conservation technicians of an estimated 20,000 man-hours, or about 10 man-years. For purposes of estimating staff requirements for farm conservation planning in Kenosha County, it was assumed that plans would be prepared for the approximately 500 farms in the County which either have conservation plans that are outdated or have no conservation plans whatsoever, as indicated above. It should be noted that the soil erosion inventory data, developed on a field-by-field basis under the soil erosion control planning program, have not identified individual farming operations. Accordingly, the number of farms having excessively eroding cropland—and the number of detailed farm conservation plans required—can only be approximated. The staff time requirements for conservation planning and practice implementation presented herein, which are based upon the assumption that complete conservation plans would be prepared for 500 farms, should be construed to represent the maximum which may be required.

Inventory work conducted under the soil erosion control planning program indicated that 54 percent of all cropland in Kenosha County is eroding in excess of T-value. The soil erosion inventory indicated that most U. S. Public Land Survey sections in Kenosha County have at least some excessively eroding cropland. To ensure that soil erosion is reduced to tolerable levels on all cropland as implementation of the plan proceeds, each farm operation will be screened for soil loss in excess of T-value, as well as for evidence of any erosion-related water quality problems. This screening process would refine certain inventory data developed under the soil erosion control planning program, including information on crop history and tillage practices. Through this screening process, it may be determined that some farms do not require detailed farm conservation plans, while plans for certain other farms may be prepared through minimal staff efforts. To the extent that this

occurs, staff time needed for conservation planning and practice implementation may be less than indicated above.

It should be noted that the staff requirements set forth herein pertain to time required for the preparation of detailed farm conservation plans, assistance in applying needed practices, and follow-up efforts to ensure that the practices are being carried out. While an average rate of 40 hours per farm was assumed, the actual amount of time required may be expected to vary from farm to farm, depending upon, among other factors, the extent of erosion problems, the types of conservation practices utilized, and the responsiveness and cooperation of the farmer. As noted above, less time would be needed where only an initial screening is undertaken and no additional work is required. Conversely, more than 40 hours may be required on large farms with many problem fields or in situations where numerous farmer contacts are needed.

EROSION CONTROL PRIORITY AREAS

The rank ordering of subareas of the County for soil erosion control purposes is a key aspect of the county soil erosion control plan. Such a rank ordering could be accomplished in a number of ways. The Kenosha County Soil Erosion Control Planning Program Technical Advisory Committee determined that the rank ordering of areas for erosion control should be based primarily upon the soil loss rate and the amount of excessive soil erosion occurring, with those areas having the highest soil loss rate and greatest amount of excessive soil loss assigned the highest priority for erosion control. The Committee further determined that U. S. Public Land Survey sections, each approximating 640 acres in area, should serve as the basic geographic unit for the rank ordering—and that the U. S. Public Land Survey sections should be classified into priority categories based upon the average soil loss rate and the amount of excessive erosion occurring. The approach recommended by the Advisory Committee was intended to address the most serious soil erosion problems first, and to achieve the maximum reduction in soil erosion as quickly as possible with the limited resources available.

The specific criteria for grouping and ranking U. S. Public Land Survey sections for erosion

control, developed under the guidance of the Technical Advisory Committee, are set forth in Table 9 in Chapter V of this report. Based upon those criteria, each U. S. Public Land Survey section containing cropland eroding at excessive rates was assigned to one of four priority categories, as shown on Map 11 in Chapter V. Priority Area A—the highest priority area for erosion control—included 65 U. S. Public Land Survey sections, which together encompassed about 21,300 acres of cropland in 1985. On the average, cropland in Priority Area A was eroding at 1.9 times T-value, and about 18,500 acres, or about 87 percent of all cropland in the 65 sections concerned, was eroding at rates exceeding T-value. Conversely, Priority Area D—the lowest priority area for erosion control—included 68 U. S. Public Land Survey sections, which together encompassed about 16,700 acres of cropland. On the average, cropland in Priority Area D was eroding at 0.8 times T-value, and about 3,300 acres, or about 20 percent of all cropland in the 68 sections concerned, was eroding at rates exceeding T-value.

As previously indicated, the long-range objective of the county soil erosion control plan is the reduction of soil erosion on all cropland in Kenosha County to tolerable levels by the year 2000. In order to meet this objective, it is recommended that, to the extent practicable, available public soil erosion control resources be directed toward the resolution of soil erosion problems in Priority Area A during the years 1988 through 1990; in Priority Area B during the years 1991 through 1993; in Priority Area C during the years 1994 through 1996; and in Priority Area D during the years 1997 through 1999.

Water Quality Considerations

The county soil erosion control planning program included an identification of farm fields within Priority Area A having potential adverse impacts on surface water or groundwater as a result of excessive soil erosion. The identification of potential surface water problems was based upon an analysis of the existing drainage pattern, the proximity of the eroding field to the surface water network, and the extent of effective buffering between the eroding field and the surface water, as determined from a review of topographic maps and aerial photographs, and from field inspection. The identification of potential groundwater impacts was based upon

analysis of drainage patterns as well as the types of soils, the depth to groundwater and bedrock, and the vegetative cover of internally drained areas, as determined from a review of topographic maps, aerial photographs, and soil survey maps, as well as from field inspection. This analysis indicated that of the approximately 18,500 acres of excessively eroding cropland in Priority Area A, about 16,200 acres, or just over 87 percent, have the potential to contribute to surface- or groundwater pollution, with actual water quality impacts depending upon the intensity, duration, and frequency of rainfall, as well as agricultural practices.

PLAN IMPLEMENTATION

Implementation of the soil erosion control plan depends on the cooperative actions of a number of county, state, and federal units and agencies of government. Those units or agencies of government whose actions will have a significant effect, directly or indirectly, upon the successful implementation of the recommended soil erosion control plan include—at the county level—the Kenosha County Board and the Kenosha County Land Conservation Committee; at the state level—the Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the University of Wisconsin-Extension office serving Kenosha County; and at the federal level—the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Soil Conservation Service, and Farmers Home Administration. It is very important that the powers and programs of these agencies and units of government which bear on soil erosion problems be coordinated to achieve the maximum reduction in cropland soil erosion in Kenosha County.

It is envisioned that the major programs and activities to be carried out by the concerned county, state, and federal agencies in an effort to implement the county soil erosion control plan will include the provision of technical assistance to farmers, particularly in the preparation of farm conservation plans, as well as assistance in the design of soil erosion control improvements, as appropriate; the provision of financial assistance to farmers in the application of needed practices; the administration of state and federal farm program conservation compliance requirements; and the conduct of information and education programs to increase the aware-

ness among farmers of soil erosion problems, of the types of practices that may be used to address those problems, and of the public financial and technical resources available to help in the implementation of those practices. The plan recommends that, to the extent possible given existing program regulations, available technical, financial, and educational resources be used to address soil erosion problems in Kenosha County in general conformance with the priority area recommendations and related time frame as described above. Major plan implementations responsibilities are set forth by agency in Table 24.

In total, implementation of the soil erosion control plan would involve the commitment of about 38,100 man-hours, or about 19 man-years, through the year 2000—including about 20,000 man-hours required for farm conservation planning work; about 7,200 man-hours for the conduct of an erosion control information and education program; and about 10,900 man-hours for administrative activities. It is anticipated that, in addition to existing staff in the Kenosha County Land Conservation Office and in the U. S. Soil Conservation Service and University of Wisconsin-Extension offices serving Kenosha County, one additional conservationist will be needed for most of the plan implementation period to successfully carry out the plan. The additional conservationist position could be in the County Land Conservation Office or the U. S. Soil Conservation Service.

CONSTRUCTION SITE EROSION CONTROL

While the focus of the soil erosion control planning program has been on the control of cropland soil erosion, this report has also pointed out the potential for serious construction site erosion problems in Kenosha County as the County continues to urbanize. Construction site erosion can contribute to problems on the construction site itself—including rilled and gullied slopes and washed out roads—and to offsite problems—including water quality degradation and clogging of culverts and roadside ditches and other watercourses. Construction site erosion can be effectively controlled through adoption and enforcement by local units of government of appropriate construction site erosion control regulations.

The plan recommends that Kenosha County adopt construction site erosion control regulations applicable to the entire unincorporated

Table 24

**SUMMARY OF PLAN IMPLEMENTATION RESPONSIBILITIES
FOR THE KENOSHA COUNTY SOIL EROSION CONTROL PLAN**

Plan Implementation Activity	Kenosha County Board of Supervisors	Kenosha County Land Conservation Committee/Land Conservation Office	Wisconsin Department of Agriculture, Trade and Consumer Protection	Wisconsin Department of Natural Resources	University of Wisconsin-Extension	U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service	U. S. Department of Agriculture, Soil Conservation Service	U. S. Department of Agriculture, Farmers Home Administration
Plan Adoption/Endorsement	X	X	X	X	X	X	X	X
Provision of Technical Assistance to Farmers in Preparation of Farm Conservation Plans and Design of Soil Erosion Control Practices		X					X	
Administration of Conservation Compliance Requirements of State and Federal Farm Programs		X				X	X	
Administration of Financial Assistance Programs to Assist Farmers in the Implementation of Erosion Control Practices		X	X	X		X		X
Coordination of State Nonpoint Source Pollution Abatement Program (Priority Watersheds Program) and Federal Nonpoint Source Pollution Abatement Program (Section 319 of the Water Quality Act of 1987) with the County Soil Erosion Control Plan				X				
Development and Implementation of a Soil Erosion Control Information and Education Program for Farmers in Kenosha County		X			X		X	

Source: SEWRPC.

area of Kenosha County, and that the City of Kenosha and the Villages of Paddock Lake, Silver Lake, and Twin Lakes similarly adopt construction site erosion control regulations applicable to their incorporated areas. Each of the units of government concerned should review the existing framework of land use regulations and determine how that framework should be revised in order to incorporate the desired construction site erosion control regulations and how those regulations should be administered. In considering potential administrative arrangements, the units of government concerned must determine whether the construction site erosion control regulations could be administered through existing staff or whether additional staff services would be needed.

PUBLIC REACTION TO THE PLAN

A public hearing was held on August 31, 1988, for the purpose of receiving comments on the soil

erosion control plan as summarized above. No objections to the findings and recommendations of the erosion control plan were expressed at the hearing. While the plan emphasizes a basically voluntary approach to soil conservation, a number of individuals did voice strong opposition to mandatory approaches to soil conservation in general, and expressed concern regarding the possibility of state or federal regulations beyond the conservation compliance requirements of existing farm programs. Concern was also expressed regarding what is perceived by some farmers to be a growing multiplicity of soil conservation standards under various farm programs, and the fact that a farmer could, for example, be in conformance with the conservation compliance requirements of the federal Food Security Act and still not be in conformance with the soil conservation requirements of the Wisconsin Farmland Preservation Program. Finally, concern was expressed regarding the need for additional cost-share assistance to farmers in support of their efforts in applying needed conservation practices.

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APPENDICES

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Appendix A

USDA AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE MEMORANDUM REGARDING USE OF COUNTY SOIL EROSION CONTROL PLANS

UNITED STATES
DEPARTMENT OF
AGRICULTURE

AGRICULTURAL
STABILIZATION AND
CONSERVATION SERVICE

WISCONSIN STATE ASCS OFFICE
4601 HAMMERSLEY ROAD
MADISON, WISCONSIN 53711

Date: 7-9-87
WI CONS. MEMO-154

To: All County ASCS Offices

From: Donald I. Wachter, Specialist
Conservation and Environmental Protection Programs

Subject: Use of County Soil Erosion Control Plans.

USDA is dead serious about halting excessive soil erosion. Farmers who continue to cause serious soil erosion while farming will soon lose many USDA program benefits.

The CRP attacks the erosion problem by removing highly erodible cropland from production and returning it to protective cover.

The ACP assists in solving erosion problems by sharing in the cost of installing needed conservation practices.

A perennial dilemma is identifying serious erosion problems so we can effectively target our program to solving them.

Erosion Control Plans are being compiled by 55 county Land Conservation Departments. Data supporting these Plans show the location of most critically eroding sites. These Plans will be useful to you in targeting your conservation programs.

Plans will not be developed for the following counties:

Ashland	Bayfield	Burnett	Douglas
Florence	Forest	Iron	Langlade
Marinette	Menominee	Oneida	Price
Rusk	Sawyer	Taylor	Vilas
Washburn			

Plans have been completed and approved for the following counties:

Adams	Buffalo	Calumet	Dunn
Green	Lafayette	Lincoln	Marquette
Oconto	Pepin	Pierce	Portage
Rock	Shawano	Trempealeau	Vernon

Plans are in various stages of development in many other counties. Even though a county's plan may not yet be approved, background data will be useful to you.

Contact your county Land Conservation Department to become acquainted with the Erosion Control Plan and its supporting data. It is expected that County ASCS Offices will use the Plan to further its conservation programs objective, where such Plan is available.

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Appendix B

PUBLIC INFORMATIONAL MEETING ON THE KENOSHA COUNTY SOIL EROSION CONTROL PLANNING PROGRAM

A countywide public informational meeting on the Kenosha County soil erosion control planning program was held in conjunction with the County Land Conservation Committee's annual planning meeting on March 24, 1987. The purpose of the meeting was to inform the public of the overall objectives of the planning program and to describe the general procedures to be followed in developing the plan. The meeting was announced in at least two area newspapers. Copies of the newspaper articles announcing the meeting are attached.

Appendix B-1

NEWSPAPER ANNOUNCEMENTS OF THE KENOSHA COUNTY SOIL EROSION CONTROL PLANNING PROGRAM PUBLIC INFORMATIONAL MEETING

Erosion control plan meet set

The Department of Agriculture, Trade and Consumer Protection has identified 55 counties, of which Kenosha is one, to prepare erosion control plans. County erosion control plans are the beginning of sound, successful erosion control programming at a county level.

The Kenosha County Erosion Control Plan will

- Describe and evaluate the soils and landscape features of the county;

- develop land use data, how much land is devoted to various uses and where the major uses are;

- describe and evaluate management of land, as identified in land use data;

- evaluate soil erosion rates under identified management and land uses; and

- provide recommendations to halt erosion through utilization of sound management of land (soil).

Some of the erosion control practices that will be identified for use on agricultural lands include: conservation tillage, strip cropping, diversions, terraces, grassed waterways, wind breaks, and permanent vegetative cover.

Land that is identified as in need of corrective conservation measures will

receive cost-sharing to install the conservation practices.

Kenosha County has begun working on preliminary data collection. The Kenosha County Land Conservation office working in conjunction with Southeastern Wisconsin Regional Planning Commission (the commission has contracted with Kenosha County and the state) will present an in-depth review of the planning process at an upcoming meeting to be held Tuesday, March 24, at Casa Capri Restaurant, 2129 Birch Road, Kenosha.

An important item of concern is that the erosion control planning project is not a regulatory program, but rather another means for landowners to receive cost-sharing if their land is eroding.

For further information or reservations, call Pam Wallis, Land Conservation Administrator, at 656-6853 by Monday, March 16.

WESTOSHA REPORT
WEDNESDAY, MARCH 11, 1987

Land Use annual meet set

Erosion Control Planning and the Farmland Preservation Policy are two items to be discussed at the annual meeting of the Kenosha County Land Use Committee on March 24.

The dinner meeting, which is open to the public, will be at the Casa Capri Restaurant, 2129 Birch Road, beginning with a buffet dinner at 5:30 p.m.

The program will center around the Erosion Control Plan which the county is under a state mandate to complete by the end of 1988.

It will also provide information on the Farmland Preservation Policy Standards and how they affect the farmer and the federal conservation programming and how it relates to the state program.

Pamela Wallis, Land Conservation administrator, said the Department of Agriculture, Trade and Consumer Protection has listed 55 counties, including Kenosha, which must prepare erosion control plans by 1988.

The Kenosha County Erosion Control Plan will:

- ✓ Describe and evaluate the soils and landscape features in the county.

- ✓ Develop land use data, including how much is devoted to various uses and where the major uses are.



- ✓ Describe and evaluate management of land, as identified in land use data.

- ✓ Evaluate soil erosion rates under identified management and land uses.

- ✓ Provide recommendations to halt erosion through utilization of sound management of soil.

"Some of the erosion control practices that will be identified for use on agricultural lands include conservation tillage, strip cropping, diversions, terraces, grassed waterways, windbreaks and permanent vegetative cover," Wallis said. "Land that is identified as in need of corrective conservation measures will receive cost-sharing funds to install the conservation practices," she said.

Wallis said Kenosha County

has already begun work on the preliminary data collection through the Kenosha County Land Conservation office working in conjunction with the Southeastern Wisconsin Regional Planning Commission. An in-depth review of the planning process will be presented at the March 24 annual meeting.

Wallis said the Farmland Preservation Program has undergone some recent changes at the state and county level.

"Previously, if you claimed a tax credit, you were required to receive proper verification that the land met program requirement, parcel size, use, and income," Wallis said. "Now, if you plan to sign an agreement to participate in the program, you must develop a conservation plan."

While a conservation plan has always been a portion of the program requirement, Wallis said, there are now other factors involved including mandatory standards, discretionary standards, schedule of compliance, monitoring compliance, and variances.

Wallis said anyone seeking more information regarding conservation compliance for farmland preservation should attend the annual meeting or contact her at 656-6853.

KENOSHA NEWS
TUESDAY, MARCH 17, 1987