



# RACINE COUNTY AGRICULTURAL SOIL EROSION CONTROL PLAN

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Special acknowledgement is due Mr. William J. Stauber, SEWRPC  
Principal Planner, for his contribution to this report.

**COMMUNITY ASSISTANCE PLANNING REPORT  
NUMBER 160**

**RACINE 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

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# SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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July 30, 1988

Chairman and Members  
Planning and Development  
Committee Acting as the  
Land Conservation Committee  
Racine County Board  
Racine County Courthouse  
730 Wisconsin Avenue  
Racine, Wisconsin 53403

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 Racine County Board in 1986 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 a 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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## 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 agriculture 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 soil away 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 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, 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 generally the southern two-thirds of the State, includ-

ing Racine County, are required to prepare such a plan. Chapter 92 requires that an erosion 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 which 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 RACINE COUNTY SOIL EROSION CONTROL PLAN

Recognizing the need for increased efforts to control soil erosion in Racine County, and in an effort to comply with the planning requirements of Chapter 92 of the Wisconsin Statutes, the Racine County Board in 1986 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 Racine County Land Conservation Office. The planning effort was carried out under the guidance of the Racine County Planning and Development Committee acting as the 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 Racine 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. A full committee membership list is set forth in the inside front cover of this report.

## SCHEME OF PRESENTATION

The Racine County soil erosion control plan is presented in seven chapters. Following this introductory chapter, Chapter II, "Description of the County," describes those aspects of the natural resource base and man-made environment of Racine County that 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 the cropland soil

erosion control objective, 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 the conservation practices required to reduce cropland soil erosion problems. Chapter VI, "Plan Implementation," identifies measures which should be undertaken by the County and the concerned state and federal agencies to 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 Racine County requires an understanding of the natural resource base and of the pattern of human activities which have been superimposed on that resource base. Accordingly, this chapter describes those features of the natural resource base and of the man-made environment that 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 Racine 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 Racine County. The physiographic features or surficial land forms of southeastern Wisconsin are shown on Map 1, and 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 Racine County is covered by gently sloping or rolling ground moraine—that is, heterogeneous material deposited beneath the ice. Elevations in Racine 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 Racine 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 proportional 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 Racine County, along with their distribution within the County, is presented on Map 3.

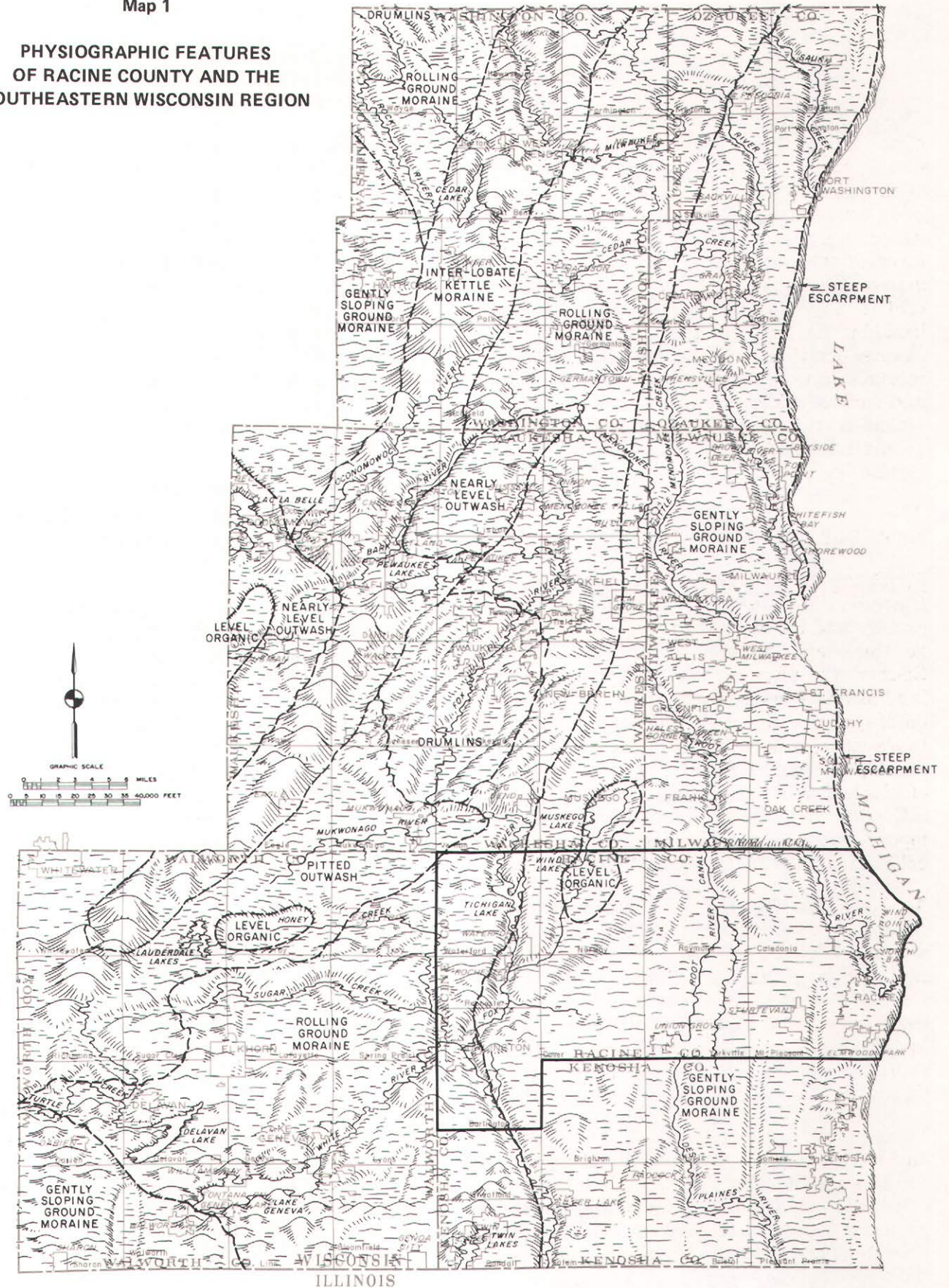
Soils vary in their potential erosiveness owing primarily to differences in physical characteristics, including soil texture, soil structure, organic matter, and permeability. In order to provide insight into the potential for cropland soil erosion in Racine County, the soils of the County have been 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.<sup>1</sup> The rating indicates the potential for both water and wind erosion. It is emphasized that the rating is based solely on soil characteristics that affect a soil's response to management and

---

<sup>1</sup>*Following procedures set forth in Soil Erosion Control Planning Manual, prepared by the Wisconsin Department of Agriculture, Trade and Consumer Protection, soils in capability classes/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, entitled Land Capability Classification, September 1961.*

Map 1

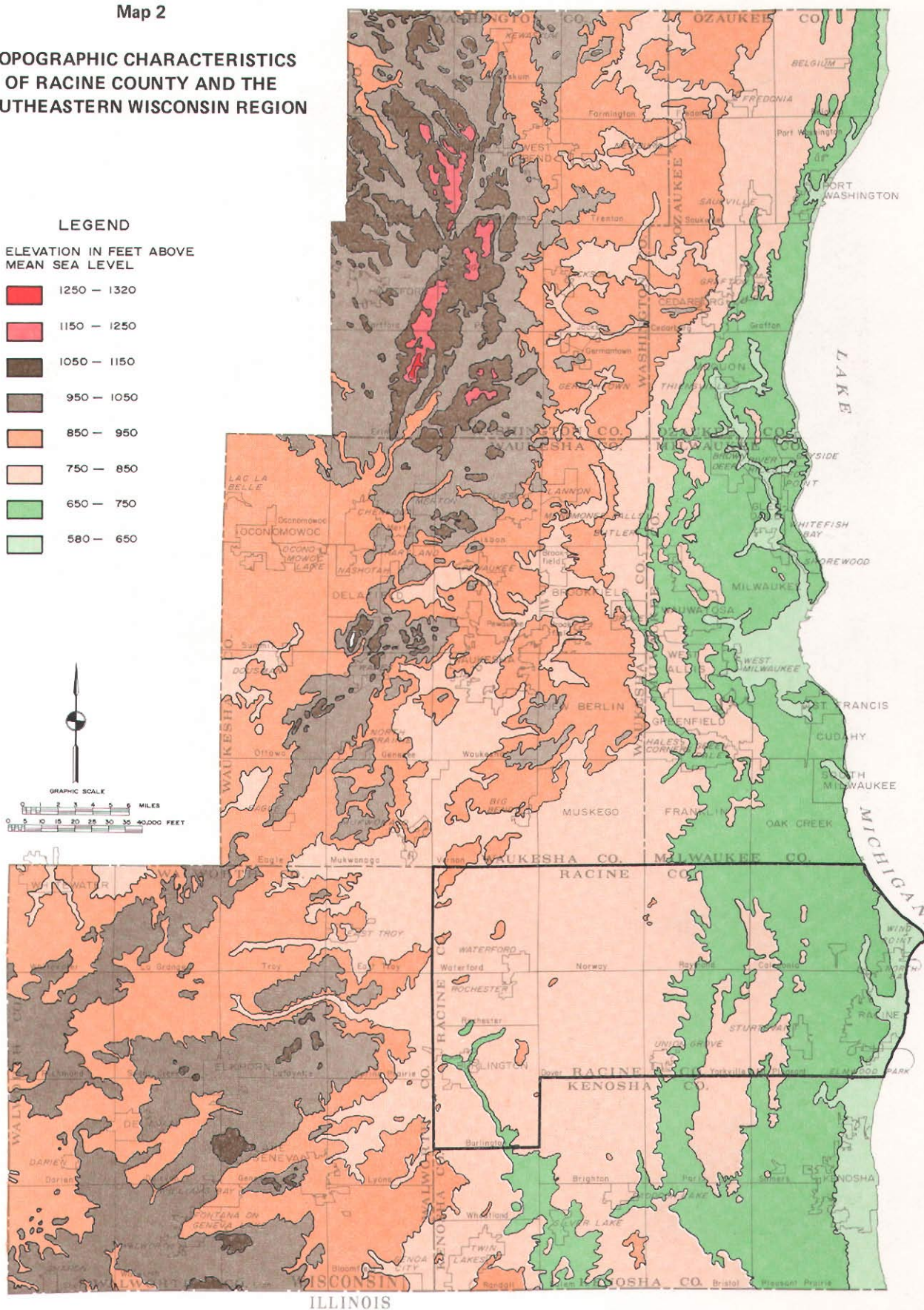
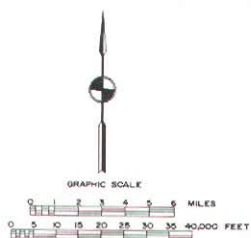
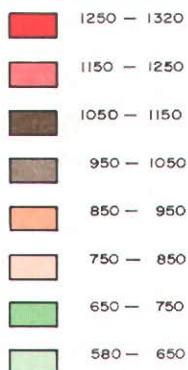
**PHYSIOGRAPHIC FEATURES  
OF RACINE COUNTY AND THE  
SOUTHEASTERN WISCONSIN REGION**



Source: SEWRPC.



# TOPOGRAPHIC CHARACTERISTICS OF RACINE COUNTY AND THE SOUTHEASTERN WISCONSIN REGION

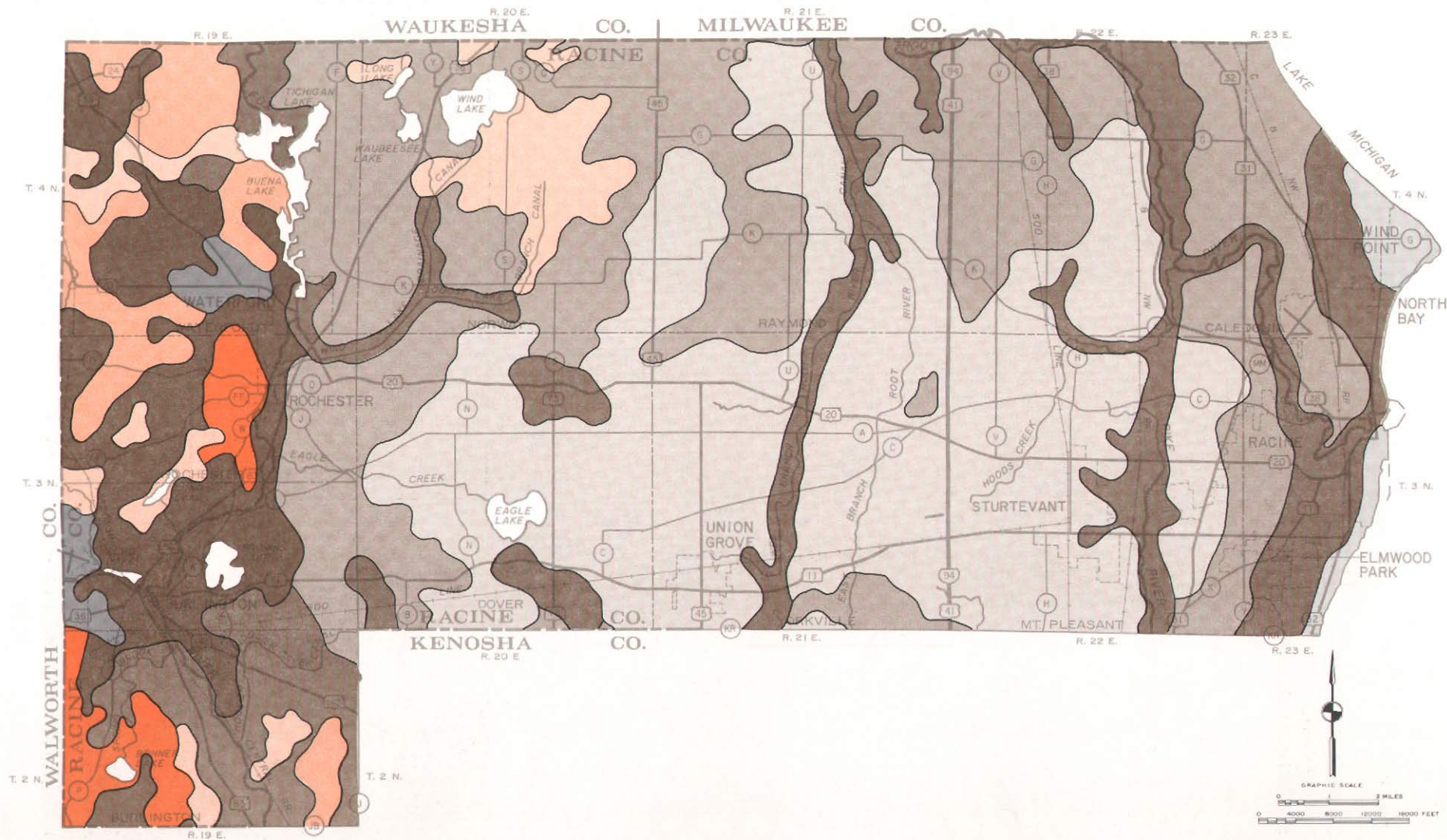


5



Map 3

# GENERAL SOIL ASSOCIATIONS IN RACINE 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

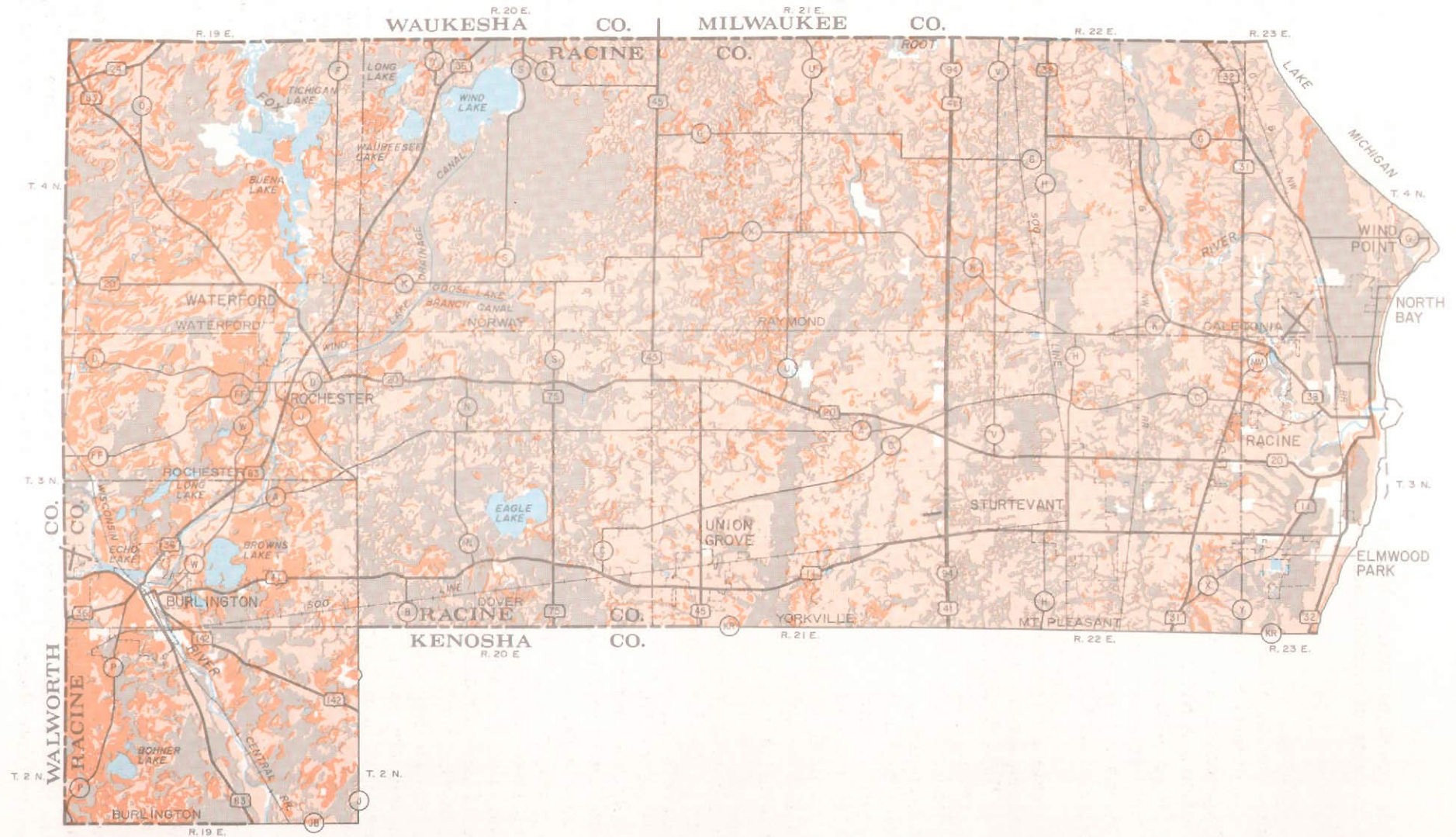
- FOX-CASCO ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A CLAY LOAM AND SILTY CLAY LOAM SUBSOIL; MODERATELY DEEP TO SHALLOW OVER SAND AND GRAVEL, ON STREAM TERRACES
- HOUGHTON-PALMS ASSOCIATION: VERY POORLY DRAINED ORGANIC SOILS; IN BASINS AND DEPRESSIONS
- MIAMI ASSOCIATION: WELL-DRAINED SOILS THAT HAVE 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



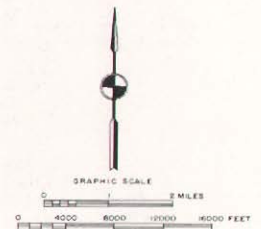
Map 4

CROPLAND SOIL EROSION POTENTIAL IN RACINE COUNTY



LEGEND

- SLIGHT EROSION POTENTIAL
- MODERATE EROSION POTENTIAL
- SEVERE EROSION POTENTIAL
- EROSION POTENTIAL NOT CLASSIFIED



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



treatment. Farming practices, which have a direct bearing on the rate of erosion, are not taken into account.

### Surface Water Resources

Lakes and streams constitute an extremely valuable part of the natural resource base of Racine 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 Racine County are 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 waterways. 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, seven of which are located wholly or partially within Racine County. As shown on Map 5, two of these seven watersheds—the Pike River and the Root River watersheds—are located east of the subcontinental divide and are part of the Great Lakes-St. Lawrence River drainage area. The other five watersheds—the Des Plaines River, Honey Creek/Sugar Creek, Lower Fox River, Middle Fox River, and White River watersheds—are located west of the subcontinental divide and are part of the Mississippi River drainage area. In addition, as shown on Map 5, portions of the County are drained either directly, or by minor tributaries, to Lake Michigan.

### Primary Environmental Corridors

Primary environmental corridors are linear areas in the landscape that 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 Racine County, by

the Regional Planning Commission by overlaying all of the appropriate land use and natural resource data to determine the location of significant concentrations of such resources. The preservation of these corridors 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 Racine County in 1985. These corridors encompass about 23,600 acres, or about 11 percent, of the area of Racine County. Of this total, 4,600 acres, or just over 19 percent, consist of surface water; 9,600 acres, or 41 percent, consist of wetlands; 5,600 acres, or 24 percent, consist of upland woodlands; 2,800 acres, or 12 percent, consist of other open lands; and 1,000 acres, or 4 percent, consist of isolated urban enclaves within the corridor configuration.

## MAN-MADE ENVIRONMENT

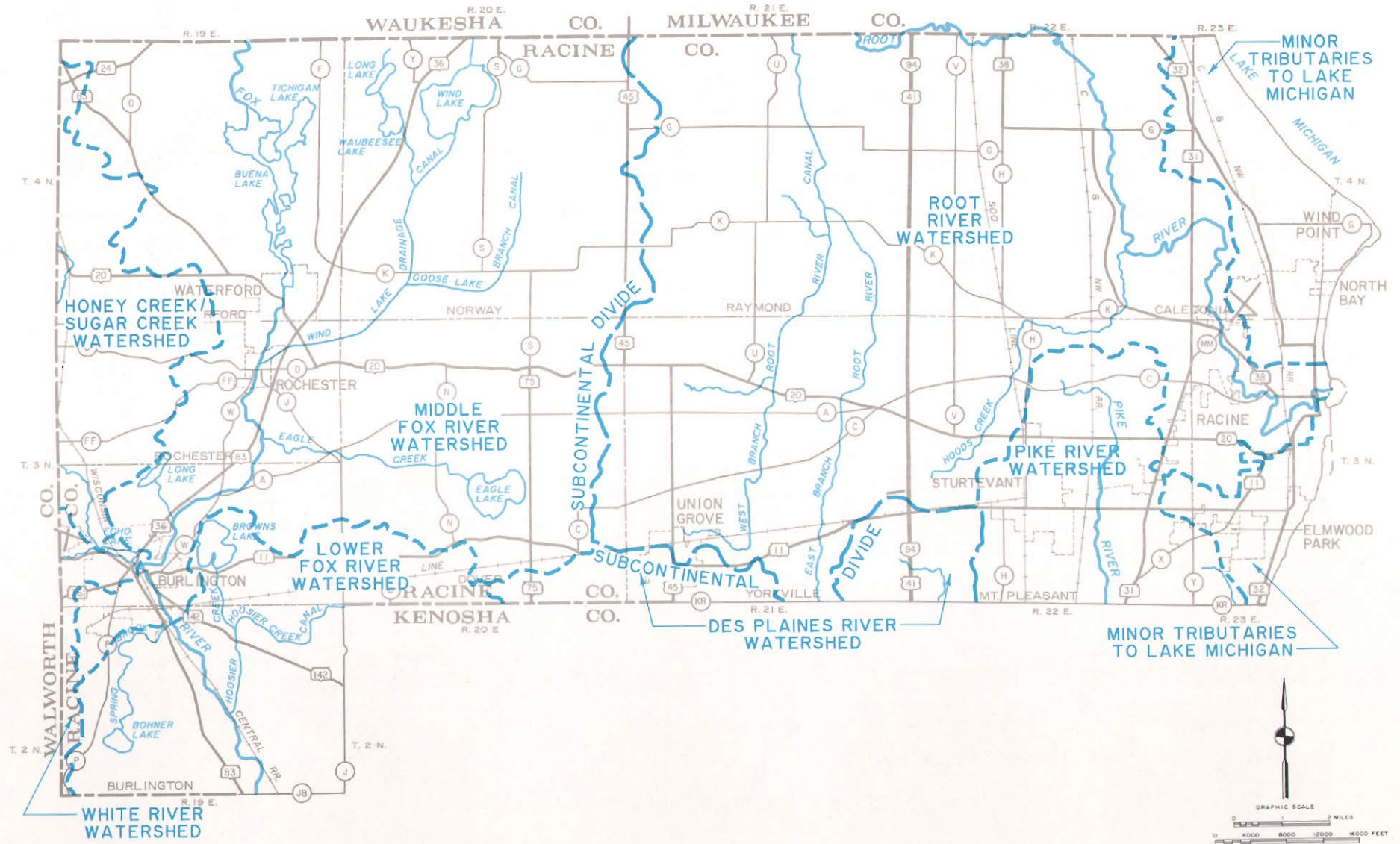
### Population Trends

The population of Racine County stood at about 109,600 persons in 1950, having increased from about 15,000 persons in 1850 and 45,600 persons in 1900 (see Table 1). The county population increased substantially between 1950 and 1970—increasing by about 32,200 persons, or 29 percent, during the 1950's, and by an additional 29,100 persons, or 21 percent, during the 1960's. A very modest increase in the county population of about 2,300 persons, or just over 1 percent, occurred during the 1970's—so that by 1980, the county population stood at about 173,100 persons. Population estimates prepared by the Wisconsin Department of Administration indicate that the county population has declined somewhat during the 1980's—the estimated 1987 county population of about 170,000 persons being about 2 percent lower than the 1980 population level.

Population projections have been prepared by the Regional Planning Commission for Racine County and the Southeastern Wisconsin Region through the year 2010, and are presented in

Map 5

SURFACE WATER RESOURCES IN RACINE COUNTY



Source: SEWRPC.

Map 6

## PRIMARY ENVIRONMENTAL CORRIDORS IN RACINE COUNTY

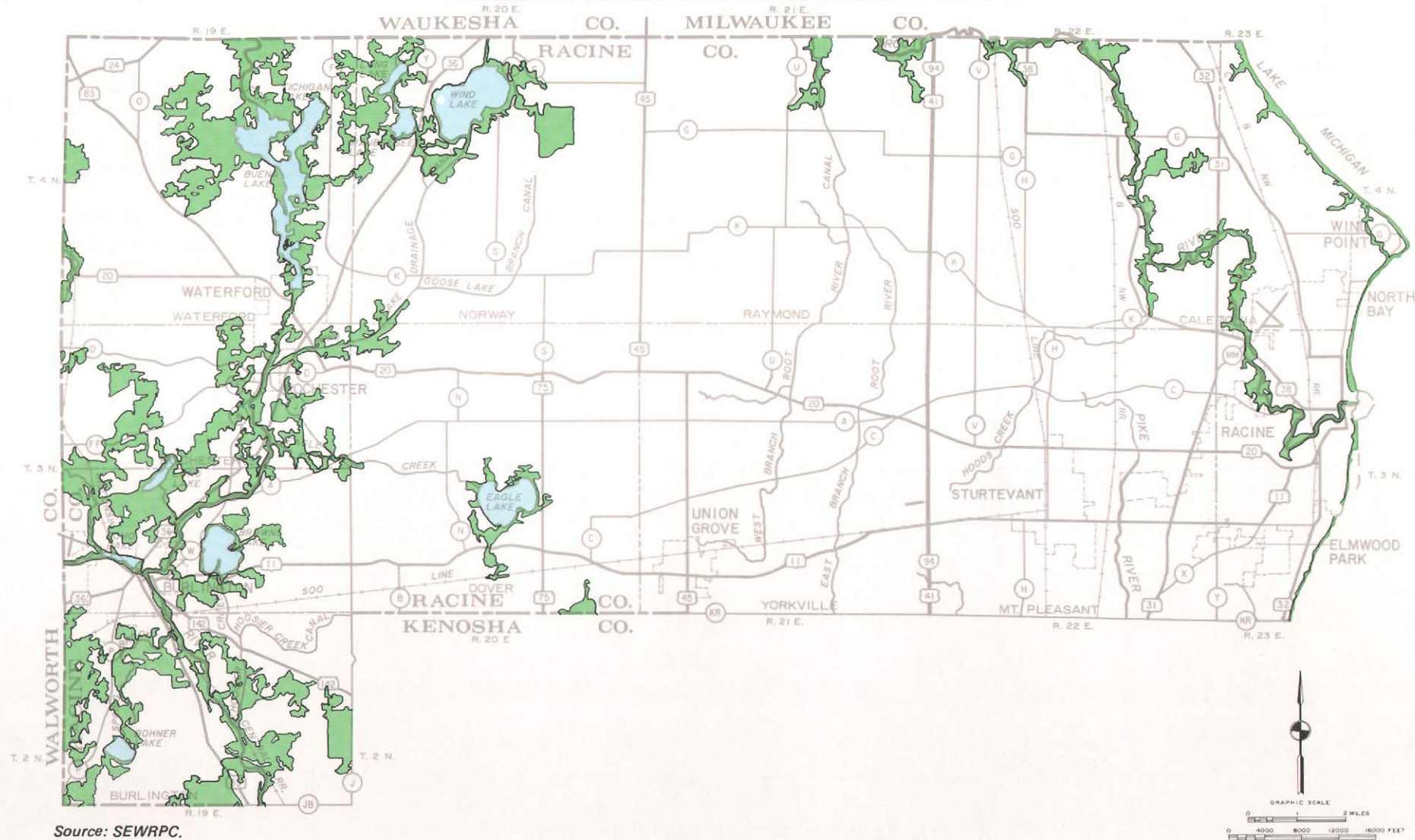




Table 1

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

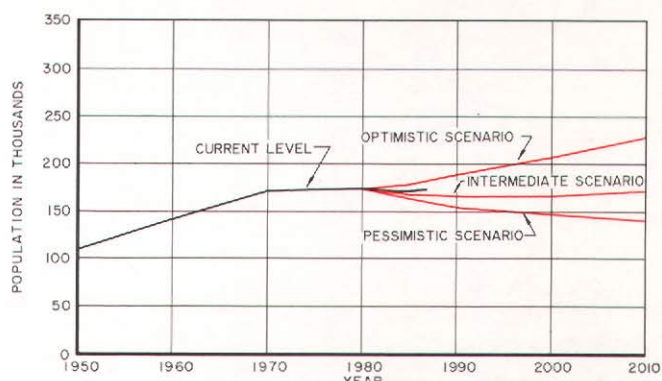
Year	Total Population		
	Number	Change from Preceding Time Period	
		Absolute	Percent
1850	14,973	--	--
1860	21,360	6,387	42.7
1870	26,740	5,380	25.2
1880	30,922	4,182	15.6
1890	36,268	5,346	17.3
1900	45,644	9,376	25.9
1910	57,424	11,780	25.8
1920	78,961	21,537	37.5
1930	90,217	11,256	14.3
1940	94,047	3,830	4.2
1950	109,585	15,538	16.5
1960	141,781	32,196	29.4
1970	170,838	29,057	20.5
1980	173,132	2,294	1.3
1987	169,976	-3,156	-1.8

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

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 mortality, birth, 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. 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 pessimis-

Figure 1

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



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

tic” scenario was provided by similarly combining all factors that would create unfavorable conditions for population growth in the Region.

As indicated in Figure 1, Racine County’s population would increase by approximately 51,600 persons by the year 2010 under the optimistic scenario—from a 1980 level of 173,100 persons to a 2010 level of 224,700 persons. This represents a 30 percent increase over 30 years. The intermediate scenario calls for virtual stability in population from 1980 to 2010 (less than 1 percent change), while the pessimistic scenario envisions a population loss of approximately 33,500 persons. This population loss represents a 19 percent decrease from the 1980 population level. As further indicated in Figure 1, population levels in Racine County between 1980 and 1987 most closely approximated the trend envisioned under the intermediate growth scenario.

#### Land Use

Although Racine County is considered to be a relatively urbanized county, about four-fifths of the area of the County was still devoted to rural uses in 1985, while about one-fifth was devoted to urban uses. As indicated in Table 2, in 1985 urban lands—consisting of lands devoted to residential, commercial, industrial, governmental and institutional, recreational, and transportation, communication, and utility uses—encompassed about 40,300 acres in Racine County, or

Table 2

## LAND USE IN RACINE COUNTY: 1963 AND 1985

Land Use Category	1963		1985		Change: 1963-1985	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent
<b>Urban</b>						
Residential . . . . .	13,144	6.0	19,441	8.9	6,297	47.9
Commercial . . . . .	527	0.2	906	0.4	379	71.9
Industrial . . . . .	664	0.3	1,416	0.6	752	113.3
Transportation, Communication, and Utilities . . . . .	10,768	4.9	12,973	6.0	2,205	20.5
Governmental and Institutional . . . . .	1,271	0.6	1,813	0.8	542	42.6
Recreational . . . . .	1,628	0.7	2,391	1.1	763	46.9
Unused Urban . . . . .	1,576	0.7	1,400	0.6	-176	-11.2
Subtotal	29,578	13.4	40,340	18.4	10,762	36.4
<b>Rural</b>						
Agricultural						
Cropland . . . . .	130,916	60.1	123,960	56.9	-6,956	-5.3
Orchards and Nurseries . . . . .	640	0.3	661	0.3	21	3.3
Pasture and Other . . . . .	17,163	7.9	12,575	5.8	-4,588	-26.7
Subtotal	148,719	68.3	137,196	63.0	-11,523	-7.7
Wetlands . . . . .	15,442	7.1	15,056	6.9	-386	-2.5
Woodlands . . . . .	13,699	6.3	12,873	5.9	-826	-6.0
Extractive and Landfill Sites . . . . .	1,194	0.6	1,240	0.6	46	3.9
Unused Rural and Other Open Lands . . . . .	4,550	2.1	6,031	2.8	1,481	32.5
Surface Water . . . . .	4,772	2.2	5,177	2.4	405	8.5
Subtotal	188,376	86.6	177,573	81.6	-10,803	-5.7
Total	217,954	100.0	217,913	100.0	-41	- . <sup>a</sup>

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

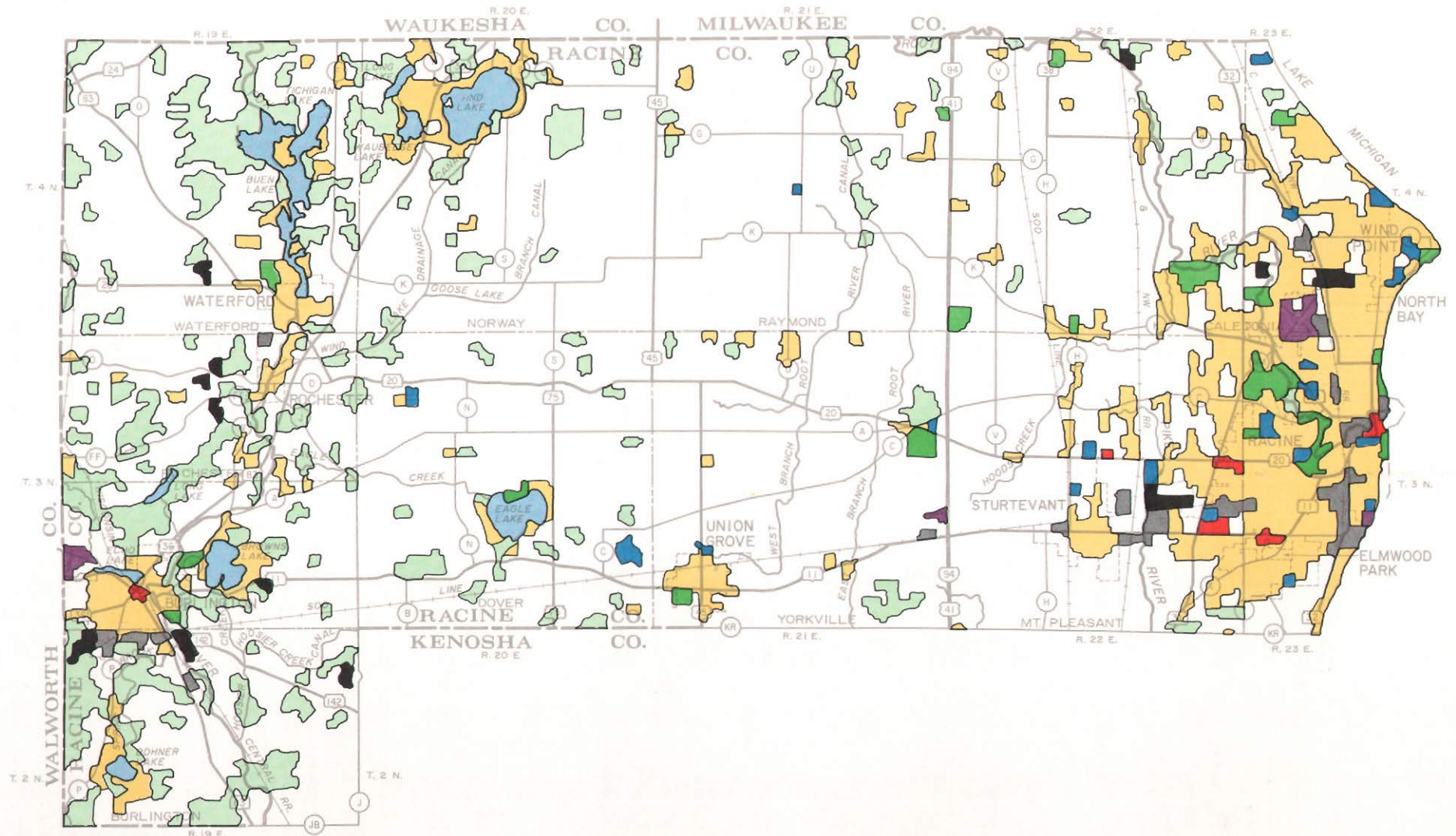
Source: SEWRPC.

about 18 percent of the total area of the County. Lands in residential use comprised the largest share of the urban land area—about 19,400 acres—representing about 48 percent of the urban land area and about 9 percent of the total area of the County. As shown on Map 7, urban land development within Racine County has occurred both within expanding urban centers and within isolated enclaves in outlying areas of the County.

As further indicated in Table 2, in 1985 rural land uses accounted for about 177,600 acres, or 82 percent of the area of the County. Agricultural lands encompassed about 137,200 acres, about 77 percent of all rural land in the County, and 63 percent of the total area of the County. The agricultural acreage included about 124,000 acres of cropland, 12,600 acres of pasture and unused agricultural land, and just over 600 acres of orchards and nurseries. Other major rural













## EXISTING LAND USE IN RACINE COUNTY: 1985



## LEGEND

## PREDOMINANT LAND USE

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

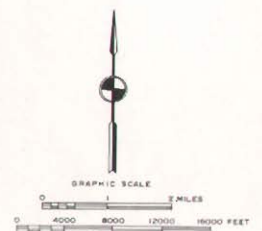
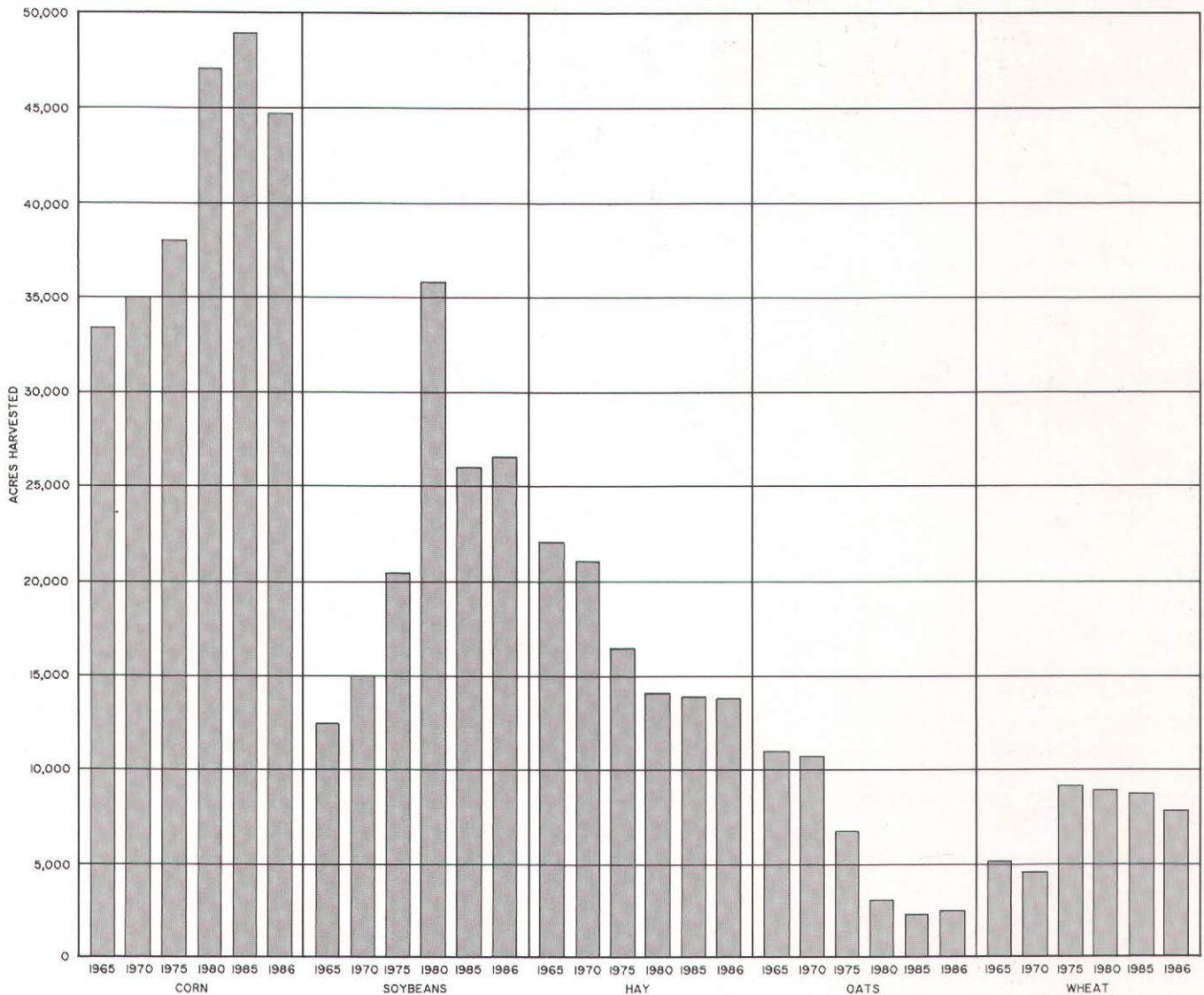


Figure 2

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



Source: Wisconsin Agricultural Reporting Service and SEWRPC.

land use categories in Racine County include wetlands—which in 1985 encompassed about 15,100 acres, or about 7 percent of the total area of the County—and woodlands—which encompassed about 12,900 acres, or about 6 percent of the total area of the County.

The change in land use in Racine 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 time, the urban land area of Racine County increased by about 10,800 acres, or 36

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 Racine 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 combined acreage of corn grown for grain and corn grown for silage increased by 11,400 acres, or 34 percent—from 33,400 acres in 1965 to 44,800 acres in 1986. Soybeans totaled 26,500 acres in 1986—about 14,000 acres, or 112 percent, more than the 1965 acreage of 12,500 acres. It should be noted that the average acreage in soybeans from 1980 through 1984 was about 35,400 acres—about 22,900 acres, or 183 percent, more than the 1965 acreage.

As further indicated in Figure 2, the acreage in hay decreased by 8,200 acres, or 37 percent—from 22,100 acres in 1965 to 13,900 acres in 1986. The acreage in oats also decreased substantially—from 11,000 acres in 1965 to 2,400 acres in 1986, a decrease of 8,600 acres, or 78 percent.

In addition to the above, vegetable crops and sod production constitute an important component of the agricultural base of Racine County. About 9,000 acres were devoted to vegetable crops in 1986, consisting primarily of cabbage and sweet corn, but also including broccoli, cauliflower, potatoes, onions, and other vegetables. While it is generally agreed that the production of vegetable crops has increased somewhat during the past decade, historical records on vegetable crop production in the County are not available.

Land devoted to the production of sod totaled about 3,500 acres in 1975, the most recent year for which data are available. This represented just under 3 percent of all cropland in the County. The acreage devoted to sod production is not believed to have changed significantly since that time. Flat, low-lying areas covered by organic soils that are devoted to sod production

may be susceptible to wind erosion in the absence of adequate windbreaks.

The trends shown in Figure 2 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 Racine County decreased from 149 in 1977 to 113 in 1987, or by 24 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 described those features of the natural resource base and the man-made environment of Racine County that are important in any consideration of soil erosion problems in the County. Natural resource base features considered in this chapter included the 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 are the increase in erosion-prone crops, particularly corn and soybeans, and the decrease in crops that are less susceptible to erosion, including oats and hay—a reflection of a general shift away from dairy farming and traditional crop rotations toward continuous row cropping. The next chapter of this report presents the results of data collection and analysis work undertaken as part of the county soil erosion control planning program to identify the extent and severity of soil erosion attendant to current farming practices in Racine County.

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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 Racine 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 Racine 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 windbreaks. In Racine County, areas covered by soils considered to be highly susceptible to wind erosion encompass about 14,700 acres, or 7 percent of the total area of the County. About 8,000 acres, or 54 percent of this total, are in agricultural use.

The inventory and analysis work conducted as part of the Racine 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 Racine 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 model 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:

$$A = R \cdot K \cdot LS \cdot C \cdot P$$

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 condition 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.<sup>1</sup> 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 Racine 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 Racine 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 5,268 cropland fields were identified—having a combined area of about 122,200 acres, or an average of 23.2 acres per field. The data required for application of the universal soil loss equation were developed as described below.<sup>2</sup>

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 Racine County is 130, 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 Racine County cropland soil erosion inventory, the soil erodibility factor for each farm field was determined from U. S. Soil Conservation Service 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.

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

<sup>2</sup>The aerial photographs identifying farm fields and the attendant soil erosion inventory data developed under the soil erosion control planning program are on file at the County Land Conservation Office.

**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 slope gets longer and steeper. The LS-factor is a reflection of both the length and steepness of slope.

The following procedures were followed in developing LS-factors for farm fields under the Racine 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 Racine 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 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 Racine County Land Conservation Office and U. S. Soil Conservation Service staff members with extensive experience in farm planning in Racine County, and therefore knowledgeable about the topographic characteristics of the County. For each slope length-steepness combination, an LS-factor was calculated according to the formula set forth in U. S. Department of Agriculture, Agriculture Handbook Number 537.<sup>3</sup>

**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.

<sup>3</sup>U. S. Department of Agriculture, *Agricultural Handbook Number 537, Predicting Rainfall Erosion Losses, A Guide to Conservation Planning*, 1978.

Table 3

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

Area	Typical Agricultural Activity	C-Factor
<u>Western Racine County</u> Towns of Burlington, Rochester, and Waterford . . . .	Dairying	0.17
<u>Central Racine County</u> Towns of Dover, Norway, Raymond, and Yorkville . . . . .	Cash cropping, with some dairying	0.25
<u>Eastern Racine County</u> Towns of Caledonia and Mt. Pleasant . . . . .	Cash cropping	0.30

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

In the absence of field-specific information regarding cropping patterns and tillage practices for Racine 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 Racine County Land Conservation Office and the U. S. 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 in each area. The C-factors attempt to take into account the level of conservation tillage. It should be noted in this regard that while chisel tillage is not uncommon in Racine County, much of the chisel tillage is accomplished without leaving sufficient residue for erosion control purposes. In such cases, the erosion rates may not be much different from those experienced under conventional moldboard plowing. Available data indicate that use of effective conservation tillage is very limited in Racine County. In this regard, it is estimated that just over 4 percent of the corn acreage and just over 1 percent of the soybean acreage in Racine County was in conservation tillage in 1986.<sup>4</sup>

<sup>4</sup>Conservation Tillage Information Center, *1986 National Survey of Conservation Tillage Practices—Wisconsin County Summary*.

**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."<sup>5</sup> The following procedures were utilized in determining P-factors for cropland fields in Racine 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 Racine County Land Conservation Office and U. S. Soil Conservation Service staff members familiar with farming practices within the County. It should be noted that this inventory indicated that contour strip-cropping and terracing were practiced on a very limited basis in Racine County. Contour strip-cropping was identified on farm fields encompassing a total area of only 538 acres, or about 0.4 percent of all cropland in the County. Terracing was identified on farm fields encompassing an area of 284 acres, about 0.2 percent of all cropland. Minimal contour cropping exists that meets U. S. Soil Conservation Service practice specifications.
2. A P-factor value of less than 1.0 was subsequently assigned for each farm field for which 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 were assigned a P-factor of 1.0.

#### **Cropland Soil Erosion Rates**

The rate of sheet and rill erosion was calculated for cropland fields in Racine 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

<sup>5</sup>The effects of terracing are also reflected in the universal soil loss equation in the LS-factor.

Table 4

#### **CROPLAND SOIL EROSION RATES IN RACINE COUNTY: 1985**

Soil Loss Rate (tons per-acre per year)	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
Less than 3.0	1,882	44,741	36.6
3.0 - 3.9	894	23,545	19.3
4.0 - 4.9	864	21,579	17.6
5.0 - 5.9	497	11,492	9.4
6.0 - 6.9	385	8,477	6.9
7.0 - 7.9	242	4,618	3.8
8.0 - 8.9	120	2,037	1.7
9.0 - 9.9	135	2,410	2.0
10.0 - 14.9	218	3,035	2.5
15.0 or More	31	304	0.2
Total	5,268	122,238	100.0
Average Soil Loss Rate	4.1 Tons/Acre/Year		

Source: SEWRPC.

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.

As indicated in Table 4, the average rate of sheet and rill erosion in Racine County in 1985 was 4.1 tons per acre per year. The soil loss rate was less than 3.0 tons per acre per year on about 44,700 acres of cropland, representing about 37 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 3,300 acres, representing just under 3 percent of all cropland. As shown on Map 8, there was considerable variation in the rate of cropland soil erosion within the County, with the north-central and northeastern areas generally having the highest erosion rates.

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 66,900 acres of cropland, or about 55 percent of all cropland in Racine County, the soil loss rate was less than or equal to T-value. Conversely, about 43,000 acres, or about 35 percent of all cropland, was eroding at rates between 1.1 and 2.0 times T-value; about 8,400 acres, or about 7 percent, was eroding at rates between 2.1 and 3.0 times T-



Table 5

## CROPLAND SOIL EROSION RATES IN RACINE 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	
2 North, 19 East (Burlington) . . . . .	4,564	63.8	1,333	18.6	829	11.6	430	6.0	7,156	100.0	3.0
3 North, 19 East (Burlington- Rochester) . . . . .	5,199	55.9	1,675	18.0	1,259	13.5	1,173	12.6	9,306	100.0	3.6
3 North, 20 East (Dover) . . . . .	9,142	54.8	6,054	36.3	644	3.9	833	5.0	16,673	100.0	3.5
3 North, 21 East (Yorkville) . . . . .	6,114	36.8	7,188	43.3	2,544	15.3	760	4.6	16,606	100.0	3.9
3 North, 22 East (Mt. Pleasant) . . . . .	1,432	10.5	9,194	67.2	2,048	15.0	1,003	7.3	13,677	100.0	4.4
3 North, 23 East (Mt. Pleasant) . . . . .	591	78.2	149	19.7	16	2.1	0	0.0	756	100.0	2.4
4 North, 19 East (Waterford) . . . . .	5,963	47.4	3,156	25.1	2,585	20.6	863	6.9	12,567	100.0	3.6
4 North, 20 East (Norway) . . . . .	6,611	46.8	4,153	29.4	1,861	13.2	1,504	10.6	14,129	100.0	3.4
4 North, 21 East (Raymond) . . . . .	3,425	21.8	6,607	42.0	2,965	18.9	2,724	17.3	15,721	100.0	4.9
4 North, 22 East (Caledonia) . . . . .	919	6.7	5,148	37.6	4,671	34.1	2,947	21.6	13,685	100.0	5.6
4 North, 23 East (Caledonia) . . . . .	781	39.8	467	23.8	547	27.9	167	8.5	1,962	100.0	4.2
County Total	44,741	36.6	45,124	36.9	19,969	16.3	12,404	10.2	122,238	100.0	4.1

Source: SEWRPC.

value; and the balance—just over 3,900 acres, or just over 3 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, soil loss rates greater than the average rates presented herein may be expected to be identified for portions of individual farm fields.

## NONCROPLAND SOIL EROSION

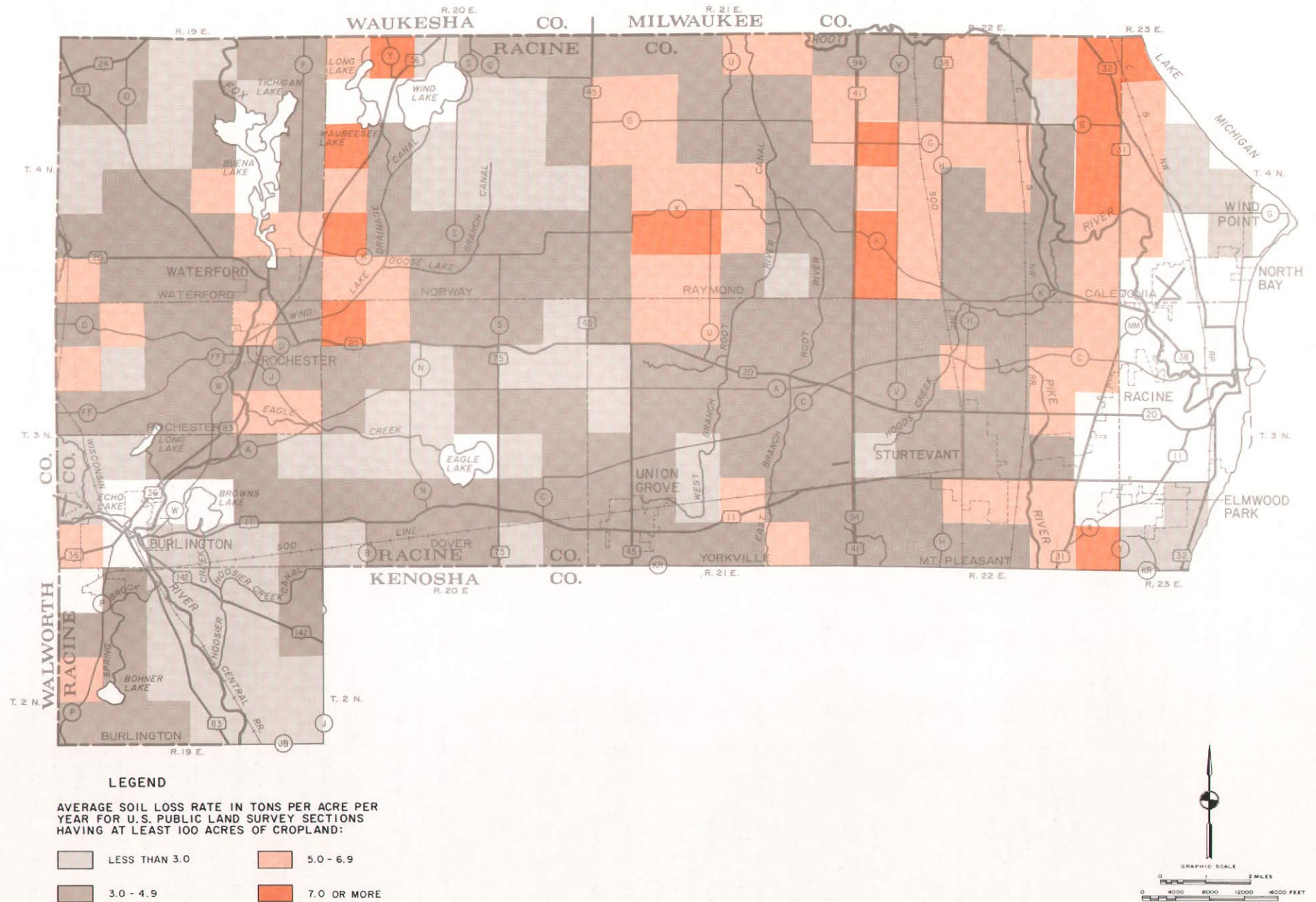
As already noted, under the county soil erosion control planning program, primary data collection activity focused on cropland soil erosion. A general description of soil erosion attendant to other selected land uses is presented below.

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 are not available for Racine County. 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 generally the western one-third of Racine

Map 8

## CROPLAND SOIL EROSION RATES IN RACINE COUNTY: 1985



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 year.<sup>6</sup> 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 110—which as shown on Map 10 includes generally the eastern two-thirds of Racine County and portions of Kenosha and Milwaukee Counties—the estimated average rate of sheet and rill erosion on pastureland was 0.1 ton per acre per year. Under the National Resources Inventory, 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

<sup>6</sup>The 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.

Table 6

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

Soil Loss Rate in Multiples of T-Value	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
1.0 or Less	2,721	66,891	54.7
1.1 - 1.5	1,129	27,545	22.5
1.6 - 2.0	678	15,423	12.6
2.1 - 3.0	456	8,423	6.9
3.1 - 4.0	194	2,802	2.3
4.1 - 5.0	61	812	0.7
5.0 or More	29	342	0.3
Total	5,268	122,238	100.0

Source: SEWRPC.

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 Racine 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 the clogging of culverts, roadside ditches, channels, and bays. Upon completion of the construction, increased runoff from impervious pavements, building roofs, and compacted soil 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 topo-

Table 7

## CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN RACINE 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	
2 North, 19 East (Burlington) . . . . .	5,133	71.7	1,138	15.9	547	7.7	338	4.7	7,156	100.0	0.7
3 North, 19 East (Burlington- Rochester) . . . . .	6,119	65.8	1,141	12.3	1,009	10.8	1,037	11.1	9,306	100.0	0.9
3 North, 20 East (Dover) . . . . .	11,800	70.8	3,422	20.5	712	4.3	739	4.4	16,673	100.0	0.9
3 North, 21 East (Yorkville) . . . . .	10,498	63.2	3,817	23.0	1,536	9.3	755	4.5	16,606	100.0	1.0
3 North, 22 East (Mt. Pleasant) . . . . .	6,567	48.0	4,735	34.6	1,631	11.9	744	5.5	13,677	100.0	1.1
3 North, 23 East (Mt. Pleasant) . . . . .	727	96.2	29	3.8	0	0.0	0	0.0	756	100.0	0.5
4 North, 19 East (Waterford) . . . . .	7,847	62.4	2,445	19.5	1,638	13.0	637	5.1	12,567	100.0	0.9
4 North, 20 East (Norway) . . . . .	8,333	59.0	2,496	17.6	1,832	13.0	1,468	10.4	14,129	100.0	1.0
4 North, 21 East (Raymond) . . . . .	5,647	35.9	4,415	28.1	2,755	17.5	2,904	18.5	15,721	100.0	1.4
4 North, 22 East (Caledonia) . . . . .	3,208	23.4	3,639	26.6	3,560	26.0	3,278	24.0	13,685	100.0	1.6
4 North, 23 East (Caledonia) . . . . .	1,012	51.6	268	13.7	203	10.3	479	24.4	1,962	100.0	1.0
County Total	66,891	54.7	27,545	22.5	15,423	12.6	12,379	10.2	122,238	100.0	1.1

Source: SEWRPC.

graphy of the site; soil characteristics; the construction methods utilized; and the ameliorative 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, Racine County has experienced a substantial increase in lands devoted to intensive urban uses. Such lands increased by about 10,800 acres, or 36 percent, between 1963 and 1985, with residential lands accounting for about 6,300 acres, or about 58 percent, of the total increase. A total of 9,040 residential lots were platted during this time period, an average of 411 lots per year. From 1985 through 1987, a total of 171 residential lots were platted, an average of 57 lots per year. Within Racine 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.<sup>7</sup> 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

<sup>7</sup>"A Model Ordinance," *The Municipality*, Volume 82, No. 1, January 1987.

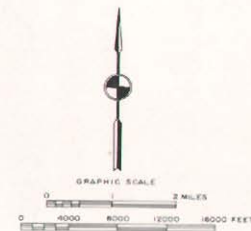


This is a detailed map of Racine County, Wisconsin, showing its various towns and villages. The map is color-coded with a checkerboard pattern of orange and grey. It includes major roads, water bodies like Lake Michigan and various lakes, and geographical features like the Root River and the Root Canal. The map is bounded by coordinates: R. 19 E. to R. 23 E. and T. 2 N. to T. 4 N. The surrounding counties are Waukesha, Milwaukee, Kenosha, and Walworth.

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

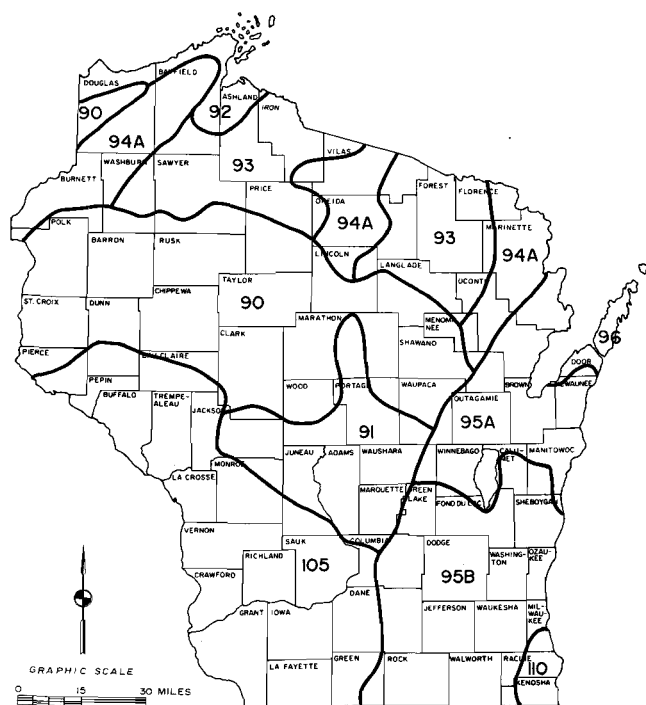


Source: SEWRPC.



Map 10

# MAJOR LAND RESOURCE AREAS



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

practices. Neither Racine County nor any of the local units of government in the County have adopted such an ordinance to date.

## Shoreline Erosion and Bluff Recession

The erosion and recession of Lake Michigan coastal bluffs in Racine County constitutes a serious threat to valuable natural resources and to real property and real property improvements located near the bluff edge. Bluff recession threatens human safety, private residences, commercial buildings, streets, parkland, and open natural areas.

Bluff recession is caused by the sliding and slumping, as well as the surface erosion, of bluff slopes. Factors affecting bluff erosion include wave action at the bluff toe; lake levels; the physical characteristics of the beach and bluff, including soil types; ice activity; groundwater seepage; and surface runoff. The rate of bluff recession in Racine County has been documented in several studies—most recently in a study conducted by the Regional Planning

Commission at the request of Racine County in 1982 and documented in SEWRPC Community Assistance Planning Report No. 86. A Lake Michigan Coastal Erosion Management Study for Racine County, Wisconsin. During the period 1963 through 1980, bluff recession along the unprotected reaches of shoreline, as measured by the Regional Planning Commission, averaged 1.5 feet per year. About 38 percent of the unprotected reaches of shoreline had a bluff recession rate equal to or less than 0.5 foot per year. The highest recession rate measured by the Regional Planning Commission for the period 1963 through 1980 was 10.2 feet per year. During periods of high water elevation, recession rates as high as 14 feet per year have been measured in Racine County.

Shoreline erosion problems may be mitigated or prevented through the installation of structural shore protection measures and the use of regulatory approaches. Structural measures—including revetments, seawalls, groins, and breakwaters, and measures to stabilize coastal bluffs—are particularly important where erosion threatens public and private development. Major structural shore protection measures proposed in Racine County include a proposal by the City of Racine to install stone revetment along the Lake Michigan shoreline from approximately 17th Street to 13th Street, and a proposal by the Town of Caledonia to protect a shoreline reach of approximately 1,500 feet adjacent to Town of Caledonia Lake Michigan Park. The Town of Caledonia has been seeking U. S. Army Corps of Engineers approval of the latter project for several years. The Town has installed a drainage system to intercept surface runoff and to alleviate the groundwater seepage conditions of the bluff face. In addition, the Town is seeking to install stone revetment and a groin system and to regrade the bluff.

Land use regulations can be used to protect development from excessive shoreline erosion and bluff recession by establishing setback provisions which restrict the location of buildings and other land uses that are vulnerable to damage or destruction from erosion. In accordance with recommendations set forth in the above-mentioned coastal erosion management study, regulations intended to protect people and property from shoreline erosion have been incorporated into the Racine County zoning ordinance. That ordinance establishes setbacks governing new structures within shoreland

areas that are intended to be protected by shore protection structures and within areas that are not intended to be so protected. These provisions of the Racine County zoning ordinance, in effect within the Lake Michigan shoreland areas of the Towns of Caledonia and Mt. Pleasant, help to ensure that new structures are safely sited in relation to erosion hazards.

## CONCLUDING REMARKS

This chapter has described the methodology and findings of an inventory and analysis of cropland soil erosion in Racine County. That work indicated that the average rate of sheet and rill erosion on cropland in Racine County was 4.1 tons per acre per year in 1985. The soil loss rate was less than 3.0 tons per acre per year on about 44,700 acres of cropland, or about 37 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 3,300 acres, representing just under 3 percent of all cropland. About 55,300 acres, or 45 percent of all cropland in the County, was identified as having a soil loss rate in excess of soil loss tolerances, or "T-values," established by the U. S. Soil Conservation Service. Specifically, about 43,000 acres, or 35 percent of all cropland, was eroding at rates between 1.1 and 2.0 times T-value; about 8,400 acres, or about 7 percent, was eroding at rates between 2.1 and 3.0 times T-value; and the balance—just over 3,900 acres, or just over 3 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 the north-central and northeastern areas generally having the highest erosion rates. Subsequent chapters of this report establish a cropland 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 are not available for Racine County. 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-third of Racine 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 two-thirds of Racine 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 Racine County—will also be identified and addressed as part of the detailed farm planning activities.

This chapter also pointed out the potential for serious construction site erosion problems as Racine 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.

The erosion and recession of Lake Michigan bluffs constitutes a serious threat to land, buildings, and facilities along coastal reaches in Racine County. From 1963 through 1980, bluff recession along unprotected reaches of shoreline, as measured by the Regional Planning Commission, averaged 1.5 feet per year. During periods of high water levels, recession rates as high as 14 feet per year have been observed. Shoreline erosion problems may be mitigated or prevented through the installation of structural shore protection measures—such as revetments, seawalls, groins, and breakwaters, and measures to stabilize coastal bluffs—and through the use of regulatory approaches—such as the setback requirements in effect within the shoreland areas of the Towns of Caledonia and Mt. Pleasant under the Racine County zoning ordinance.

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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 Racine 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.<sup>1</sup>

#### 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 Racine County, T-values range from two to five tons per acre per year.

Chapter Ag 160 of the Wisconsin Administrative 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 Racine 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, they 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 Racine 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. Accelerated

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<sup>1</sup>For the 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.

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."<sup>2</sup> That report notes that soil productivity in terms of crop yield is declining 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 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 Racine 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 offsite damages.
- That the given amount of cropland—about 55,300 acres, or about 45 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.

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<sup>2</sup>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 Racine County. This chapter also identifies the detailed farm conservation planning activities that 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 targeted to ensure the maximum 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 implementation of soil erosion control measures is provided in the next chapter of this report, together with specific recommendations for the use of those programs in Racine County.

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

practices available and identifies those types and amounts needed to abate the soil erosion problems 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 Racine 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 problem 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 presented in Tables 10 and 11. As indicated in

Table 11, Priority Area A—the highest priority area for erosion control—included 58 U. S. Public Land Survey sections, which together encompassed about 20,801 acres of cropland in 1985. On the average, cropland in Priority Area A was eroding at 1.9 times T-value, and about 18,551 acres, or about 89 percent of all cropland in the 58 sections concerned, was eroding at rates exceeding T-value. Conversely, Priority Area D—the lowest priority area for erosion control—included 91 U. S. Public Land Survey sections, which together encompassed about 27,525 acres of cropland. On the average, cropland in Priority Area D was eroding at 0.7 times T-value, and about 4,425 acres, or about 16 percent of all cropland in the 91 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 that could have 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 approximately 18,500 acres of excessively eroding cropland in Priority Area A, about 14,700 acres, or about 79 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.

#### SOIL EROSION CONTROL PRACTICES

The major conservation practices that may be utilized in efforts to control cropland soil erosion

Table 9

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

Priority Area	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 1.1 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.

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 Racine 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.<sup>1</sup> There are many types of conservation tillage systems. The major types include mulch-till systems, no-till systems, and variations of no-till systems, including ridge-till and strip-till systems.

<sup>1</sup>Where 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.

RECOMMENDED PRIORITY AREAS FOR CROPLAND SOIL EROSION CONTROL IN RACINE COUNTY

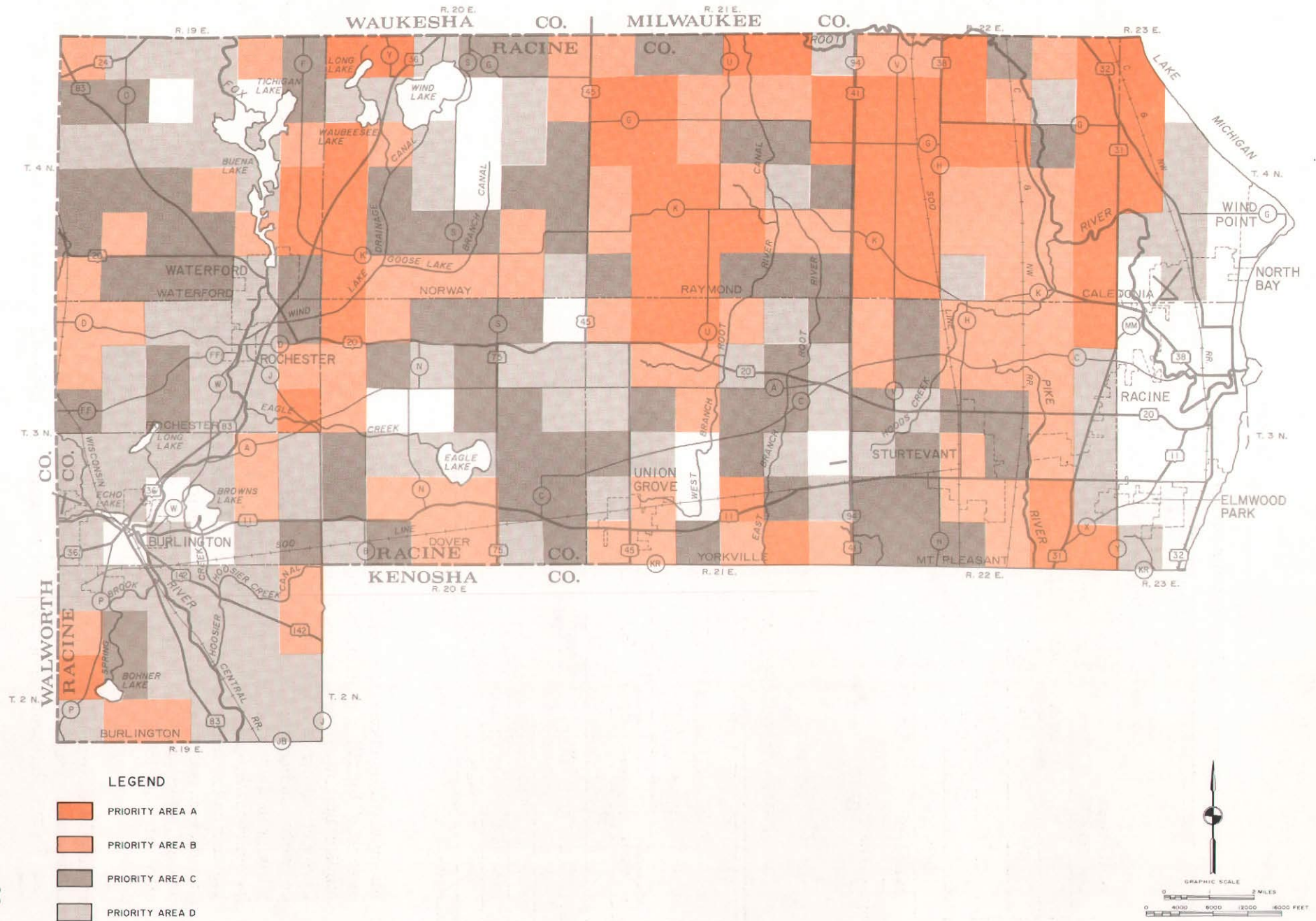


Table 10

## CROPLAND SOIL EROSION RATES IN RACINE 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	1,070	5.2	5,333	25.6	7,505	36.1	6,893	33.1	20,801	100.0	6.5
B	5,968	18.7	15,647	49.2	6,900	21.7	3,320	10.4	31,835	100.0	4.6
C	14,485	40.2	16,556	45.9	4,086	11.3	917	2.6	36,044	100.0	3.5
D	17,981	65.3	6,792	24.7	1,478	5.4	1,274	4.6	27,525	100.0	2.8
Other	5,237	86.8	796	13.2	0	--	0	--	6,033	100.0	1.9
County Total	44,741	36.6	45,124	36.9	19,969	16.3	12,404	10.2	122,238	100.0	4.1

Source: SEWRPC.

Table 11

## CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN RACINE 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	2,250	10.8	4,336	20.8	6,584	31.7	7,631	36.7	18,551	89.2	20,801	100.0	1.9
B	12,630	39.7	10,920	34.3	5,367	16.8	2,918	9.2	19,205	60.3	31,835	100.0	1.2
C	22,878	63.5	9,887	27.4	2,479	6.9	800	2.2	13,166	36.5	36,044	100.0	0.9
D	23,100	83.9	2,402	8.7	993	3.6	1,030	3.8	4,425	16.1	27,525	100.0	0.7
Other	6,033	100.0	0	--	0	--	0	--	0	--	6,033	100.0	0.5
Total	66,891	54.7	27,545	22.5	15,423	12.6	12,379	10.2	55,347	45.3	122,238	100.0	1.1

Source: SEWRPC.

In 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 herbicide use 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.

In 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.

A ridge-till system is a variation of the no-till system 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 herbicide use 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



Table 12

**CRITERIA UTILIZED TO IDENTIFY FARM FIELDS HAVING POTENTIAL ADVERSE IMPACTS  
ON SURFACE WATER 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
<ol style="list-style-type: none"> <li>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</li> <li>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<sup>a</sup></li> </ol>	<ol style="list-style-type: none"> <li>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</li> <li>2. The runoff from the farm field drains to a depression or flat area with organic soils</li> <li>3. The runoff from the farm field drains to an internally drained wetland</li> <li>4. The runoff from the farm field drains to a small pond with no outlet</li> </ol>

<sup>a</sup>The 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 TILLAGE**

Source: Racine County Land Conservation Office.

Figure 4

**NO-TILL PLANTING**

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

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.

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, in comparison 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 provided 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 of small grain in which new meadow is estab-

Table 14

# ESTIMATED EFFECTIVENESS OF EROSION CONTROL PRACTICES

Primary Practices	Approximate Soil Loss Reduction <sup>a</sup> (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 <sup>b</sup>
Grassed Waterways	Up to 99 in grassed channel
Permanent Vegetative Cover	Up to 99

<sup>a</sup>In comparison to soil loss assuming continuous corn and moldboard plowing up and down the slope.

<sup>b</sup>Depends upon type and sequence of crops grown.

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

lished—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.

**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 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 the crop that preceded the cover crop, the time that the cover crop was planted, and the type of cover crop utilized.

**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 type of terrace system selected is determined by the inherent soil and slope conditions and the 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).

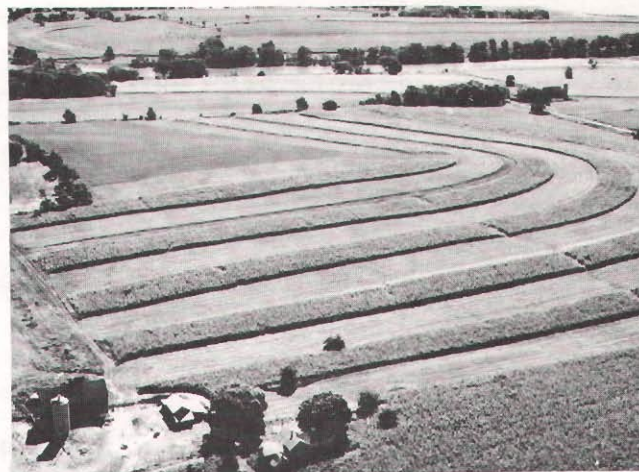
The vegetated ridge terrace is used on steep land. The ridges of this type of terrace system have steep front and back slopes. The ridges and channels are not farmable and are maintained in erosion-resistant vegetation (see Figure 7).

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

Figure 5

#### CONTOUR STRIP-CROPPING



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

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.

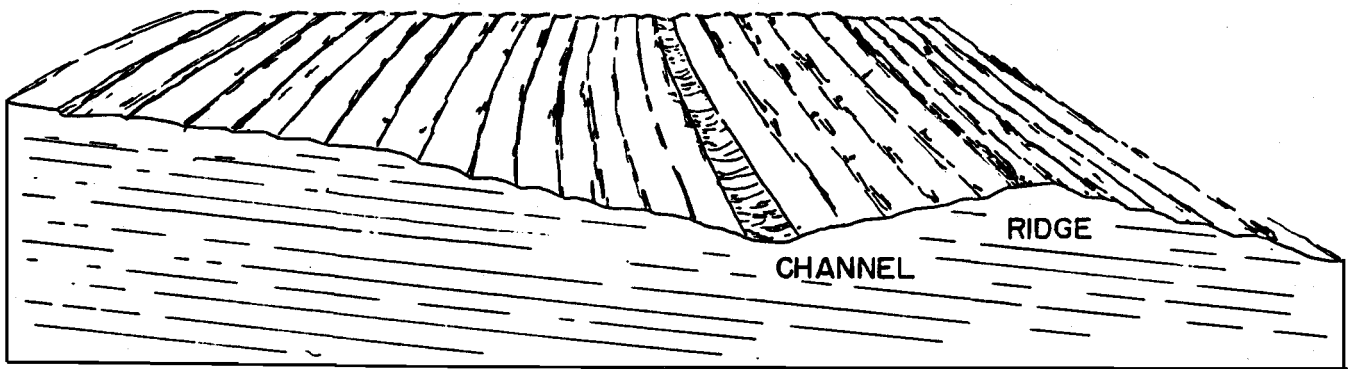
**Permanent Vegetative Cover:** Permanent vegetative cover refers to the conversion of very erodible cropland to a less intensive use, involving the establishment of a permanent vegetative cover, such as perennial grasses, legumes, forbs, shrubs, or trees. The soil loss reduction from permanent vegetative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

**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 Racine County. This systems level planning required the establishment of a general ordering of conservation practices for assignment to excessively eroding farm fields. Based



Figure 6

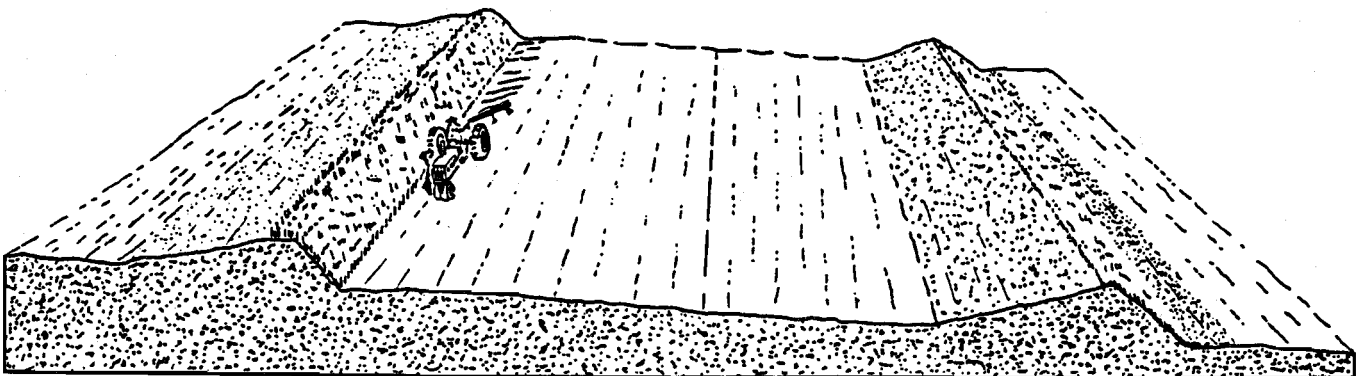
FARMABLE TERRACE



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

Figure 7

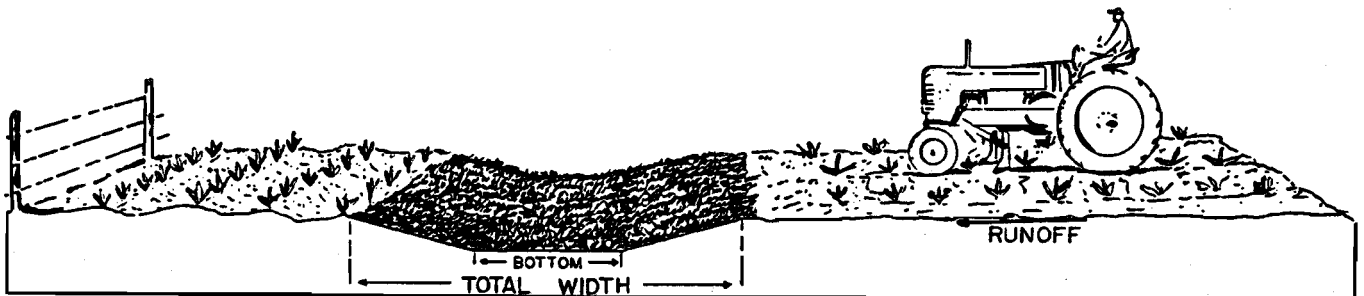
VEGETATED RIDGE TERRACE



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.

upon consultation with the Racine 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 lower ranked practices were considered. 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 Racine 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 fall of 1987 to help identify appropriate erosion control practices. The universal soil loss equation was utilized to ensure the identification of practices which

Table 15

**TYPICAL SELECTION OF SOIL EROSION CONTROL PRACTICES UNDER THE RACINE 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, Racine County Land Conservation Office, and SEWRPC.

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 3,039 acres, or about 16 percent, of the excessively eroding cropland in Priority Area A. It is important to note that despite the high priority given in the plan to erosion control practices involving conventional tillage, only a relatively small portion of the excessively eroding cropland 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.

As further indicated in Table 16, of the 3,039 acres of cropland recommended to be treated using conventional moldboard plowing, 485 acres would be designated for contouring or contour strip-cropping practices; 2,196 acres would undergo a "basic" rotation change; and 358 acres would undergo 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.

Table 16

**RECOMMENDED SOIL EROSION CONTROL PRACTICES FOR CROPLAND HAVING A  
SOIL LOSS RATE GREATER THAN T-VALUE BY PRIORITY AREA IN RACINE 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
<b><u>Conventional Tillage</u></b> <b><u>(Moldboard Plowing)</u></b>										
Basic Rotation Change . . . . .	2,196	11.8	4,433	23.1	4,656	35.4	1,129	25.5	12,414	22.4
Contouring or Contour Strip-cropping . . . . .	485	2.6	447	2.3	301	2.3	80	1.8	1,313	2.4
Basic Rotation Change Along with Contouring or Contour Strip-cropping . . . . .	358	1.9	332	1.7	215	1.6	133	3.0	1,038	1.9
Subtotal	3,039	16.3	5,212	27.1	5,172	39.3	1,342	30.3	14,765	26.7
<b><u>Conservation Tillage</u></b>										
Conservation Tillage Combined with Other Practices:										
Basic Rotation Change . . . . .	2,553	13.8	2,362	12.3	1,347	10.2	614	13.9	6,876	12.4
Contouring or Contour Strip-cropping . . . . .	250	1.3	263	1.4	140	1.1	170	3.8	823	1.5
Basic Rotation Change Along with Contouring or Contour Strip-cropping . . . . .	122	0.7	131	0.7	68	0.5	75	1.7	396	0.7
Major Rotation Change . . . . .	3,374	18.2	1,867	9.7	1,095	8.3	576	13.0	6,912	12.5
Conservation Tillage Alone . . . . .	7,263	39.2	7,960	41.5	4,731	35.9	1,060	24.0	21,014	38.0
Subtotal	13,562	73.2	12,583	65.6	7,381	56.0	2,495	56.4	36,021	65.1
<b><u>Permanent Vegetative Cover</u></b>	1,950	10.5	1,410	7.3	613	4.7	588	13.3	4,561	8.2
<b>Total Acres Exceeding T-Value</b>	<b>18,551</b>	<b>100.0</b>	<b>19,205</b>	<b>100.0</b>	<b>13,166</b>	<b>100.0</b>	<b>4,425</b>	<b>100.0</b>	<b>55,347</b>	<b>100.0</b>

NOTES: For cash cropping operations, it is anticipated that contour buffer strip-cropping will 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 constitute one-half of the rotation.

Recommended practices for Priority Areas B, C, and D are estimates based upon the recommended sequence for the 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: Racine County Land Conservation Office, U. S. Soil Conservation Service, and SEWRPC.

The plan recommends that conservation tillage be implemented on about 13,562 acres, or 73 percent, of all excessively eroding cropland in Priority Area A (see Table 16). The plan envisions that conservation tillage will primarily involve reduced tillage systems—typically involving fall chisel 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 7,263 acres, or 39 percent, of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 6,299 acres, or 34 percent, of the excessively eroding cropland. It should be noted that conservation tillage in conjunction with a "major" rotation change is recommended for about 3,374 acres, or 18 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 the rotation.

Under the plan, the remainder of the excessively eroding cropland in Priority Area A—1,950 acres, or just over 10 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 the fields, thereby preventing gully erosion. The need for 35,700 feet of such waterways on a 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, and in the County overall, were determined based upon the established sequence for the 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. 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 14,765 acres, or about 27 percent, of excessively eroding cropland in the County. Specifically, 12,414 acres would undergo basic rotation changes; 1,313 acres would be designated for contouring or contour strip-cropping practices; and 1,038 acres would undergo 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 36,021 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 21,014 acres, or 38 percent, of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 15,007 acres, or about 27 percent.

As further indicated in Table 16, under the plan, the remainder of the excessively eroding cropland—about 4,561 acres, or 8 percent—would be placed in permanent vegetative cover.

In addition to the management practices described above, an estimated 106,000 feet of grassed waterways would be installed within the County.

It should be noted that while the erosion control plan identifies general types and amounts of practices that 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: grassed waterways and the establishment of permanent vegetative cover. The cost of installing grassed waterways without tiles, including a 10 percent allowance for required design work, would approximate \$350,000 for the County overall, including \$118,000 in Priority Area A, \$122,100 in Priority Area B, \$82,500 in Priority Area C, and \$27,400 in Priority Area D. The cost of establishing permanent vegetative cover would approximate \$342,000 countywide, including \$146,200 in Priority Area A, \$105,700 in Priority Area B, \$46,000 in Priority Area C, and \$44,100 in Priority Area D.

The costs of implementing 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 might be adversely affected by decreased yields, although in some cases yields could actually increase; by greater use of pesticides; and by an initial capital outlay for the specialized equipment used in some conservation tillage systems. On the other hand, net return might 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 might 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 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 that 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. Farm conservation plans have been prepared in the recent past by the Racine County Land Conservation Office for about 30 farms, or about 4 percent of the total of 800 farm operations in Racine County, to assist farmers in meeting the soil erosion compliance requirements of the Wisconsin Farmland Preservation Program. Moreover, substantial progress has been made by the U. S. Soil Conservation Service toward completion of farm conservation plans for about

70 additional farms, or about 9 percent of all farms in the County, in an effort to assist farmers in meeting the conservation compliance requirements established under the federal Food Security Act of 1985.<sup>2</sup>

The remaining 700 farms, representing just over 87 percent of all farms in the County, either have conservation plans that are outdated or have no conservation plans whatsoever. It is anticipated that farm plans will be prepared for these farms during implementation of the county soil erosion control plan.<sup>3</sup>

The farm conservation planning activities that are anticipated to be 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 was proportional to the total cropland acreage of each priority area.

As indicated in Chapter III of this report, wind erosion and stream bank erosion are generally not considered to be significant problems in Racine 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 will address any apparent wind erosion or stream bank erosion problems.

<sup>2</sup>The soil erosion compliance requirements of the Wisconsin Farmland Preservation Program and the conservation compliance requirements of the federal Food Security Act of 1985 are described in Chapter VI of this report.

<sup>3</sup>For 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 700 farms in Racine 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 at least 5 percent of the 700 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 RACINE  
COUNTY SOIL EROSION CONTROL PLAN

Priority Area	Farms Requiring the Preparation of New Conservation Plans
A	125
B	190
C	220
D	165
Total	700

Source: Racine County Land Conservation Office and SEWRPC.

### 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 Racine 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.

A summary of cropland soil erosion rates in Racine 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 excessively eroding cropland from about 55,300 acres, or 45 percent of all cropland in the County, in 1985, to 36,800 acres, or 30 percent of all cropland, by the end of 1990; to 17,600 acres, or 14 percent of all cropland, by the end of 1993; to 4,400 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

Table 18

**CROPLAND SOIL EROSION RATES IN RACINE 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 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	
Existing Conditions: 1985	44,741	36.6	45,124	36.9	19,969	16.3	12,404	10.2	122,238	100.0	4.1
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Area A—by 1990	45,230	37.0	59,033	48.3	12,464	10.2	5,511	4.5	122,238	100.0	3.5
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A and B—by 1993	45,349	37.1	68,656	56.2	6,042	4.9	2,191	1.8	122,238	100.0	3.5
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A, B, and C—by 1996	45,479	37.2	73,359	60.0	2,126	1.7	1,274	1.1	122,238	100.0	3.0
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A, B, C, and D—by 1999	45,494	37.2	75,757	62.0	987	0.8	0	--	122,238	100.0	3.0

Source: SEWRPC.

Table 19

**CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN RACINE 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	66,891	54.7	27,545	22.5	15,423	12.6	12,379	10.2	55,347	45.3	122,238	100.0	1.1
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Area A—by 1990	85,442	69.9	23,209	19.0	8,839	7.2	4,748	3.9	36,796	30.1	122,238	100.0	0.9
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A and B—by 1993	104,647	85.6	12,289	10.1	3,472	2.8	1,830	1.5	17,591	14.4	122,238	100.0	0.8
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A, B, and C—by 1996	117,813	96.4	2,402	2.0	993	0.8	1,030	0.8	4,425	3.6	122,238	100.0	0.8
Conditions upon Imple- mentation of Soil Ero- sion Control Practices in Priority Areas A, B, C, and D—by 1999	122,238	100.0	0	--	0	--	0	--	0	--	122,238	100.0	0.8

Source: SEWRPC.

erosion control practices necessary to reduce cropland soil erosion in Racine County to tolerable levels; identifies priority areas for cropland soil erosion within the County; identifies the detailed farm conservation planning activities required to 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, and contour strip-cropping—be implemented on about 14,765 acres, or about 27 percent, of the excessively eroding cropland in the County. This includes 12,414 acres proposed to undergo basic rotation changes; 1,313 acres proposed to be designated for contouring or contour strip-cropping; and 1,038 acres proposed to undergo 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 36,021 acres, or 65 percent, of the excessively eroding cropland in the County. The plan recommends conservation tillage as the sole management practice on about 21,014 acres, or 38 percent, of the excessively eroding cropland, and conservation tillage in conjunction with other management practices on about 15,007 acres, or about 27 percent.

Under the plan, the remainder of the excessively eroding cropland—about 4,561 acres, or 8 percent—would be placed in permanent vegetative cover. In addition, an estimated 106,000 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 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. 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 or manager of the land. It is anticipated that during implementation of the county soil erosion control plan, farm plans will be prepared for about 700 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 soil erosion control, providing a general framework to 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 of 1.1 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 Racine 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 and financial assistance programs of the concerned county, state, and federal agencies is set forth in the next chapter of this report, along with recommendations regarding the use of those programs in Racine County.



## 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 Racine County in an effort to reduce such 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 the plan 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 that 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 and 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 Racine County Board and the Racine County Planning and Development Committee, acting as the Land Conservation Committee; at the state level—the Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the Racine County office of the University of Wisconsin-Extension; 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

Racine County Planning and Development Committee (Land Conservation Committee): The Racine County Planning and Development Committee, acting as the Land Conservation

Committee, has broad authority and responsibility for the conservation and protection of the soil and water resources of Racine County.<sup>1</sup> 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 information and education programs and assist other agencies, including the University of Wisconsin system, 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.

Racine County Board: The Racine 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 Racine County. The Racine 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

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<sup>1</sup> *The Racine County Planning and Development Committee, acting as the Land Conservation Committee, will hereafter in this report be referred to as the Land Conservation Committee.*

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 administering 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 Racine 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 Racine 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 that 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 for 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 in Racine County is a local component of a statewide educational network supported by the U. S. Department of Agriculture, the UW-Extension, and Racine County. The UW-Extension office, through its Crops and

Soils Agent, is responsible for coordinating the County's educational program on 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 Racine 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 an extensive technical assistance program involving the provision of technical assistance to landowners—including the preparation of farm conservation plans and assistance in designing and applying conservation practices—and the provision of soil 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 Racine 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 that 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 Racine County Board of Supervisors, upon the recommendation of the Racine 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 Racine 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 Racine County office of the University of Wisconsin-Extension 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 administering 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 will 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, although such regulations are not herein recommended for adoption in Racine County. Finally, this section includes recommendations for a system to help monitor progress in the overall effort to reduce cropland soil erosion in Racine County.

#### Financial Assistance

Financial assistance is available to farmers under certain state and federal "cost-sharing" programs and under the recently created federal Conservation Reserve Program. A description of these programs and recommendations for the administration of these programs to facilitate implementation of the soil erosion control plan are set forth below.

State Financial Assistance Programs: Financial assistance in support of management practices addressing soil erosion problems that adversely affect water quality is available to certain farmers in Wisconsin under the Wisconsin Department of Natural Resources Priority Watersheds Program. Such assistance has been made available to farmers in the Root River watershed, although



the project sign-up phase of that program has ended. The Wisconsin Department of Natural Resources and Department of Agriculture, Trade and Consumer Protection are presently 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 will be designated as candidates for a priority watershed program.

The Priority Watersheds 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 to implementation of county soil erosion plans involving the provision of financial and technical assistance to farmers and other measures. It is anticipated that state funds in support of such innovative projects will be made available for the first time in 1988.

**Federal Financial Assistance Program:** Financial assistance is available to farmers throughout Racine 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 40 acres of cropland. The rate of assistance for no-till systems was \$26.25 per acre in Racine 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 for up to 50 percent of the normal costs of establishing permanent vegetative cover.

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 Racine County in general conformance with the priority area recommendations and related time frame proposed under the county soil erosion control plan, as documented in Chapter V 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 give due consideration to the designation of the Middle Fox River watershed for funding under the priority watershed program, and, upon such designation, undertake a nonpoint source pollution abatement plan for that watershed, appropriately coordinating the recommendations of that plan with the county soil erosion control plan.

#### Technical Assistance Programs

As previously indicated, the U. S. Department of Agriculture, Soil Conservation Service, maintains an extensive program of technical assistance to farmers as well as to governmental units. The Racine 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 Racine County will require the preparation of new farm conservation plans for a majority of farms in the County. In this regard, it was estimated that farm conservation plans will have to be prepared for about 700 farms. 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.<sup>2</sup> 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 envisioned under the county soil erosion control plan would require a commitment of time by conservation technicians of

about 28,000 man-hours, or about 14 man-years. Total salary and fringe benefit costs attendant to such conservation planning, expressed in 1988 dollars, would approximate \$476,000 through the year 1999, or an average of \$39,700 per year for 12 years.

#### 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.<sup>3</sup> As a result of

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<sup>2</sup>*It is recognized that the Land Conservation Office and Soil Conservation Service will not be able to adhere strictly to the recommended time frame for addressing priority areas in Racine 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.*

<sup>3</sup>*Until 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.*

Table 20

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

Priority Area	Time Period	Farm Conservation Plan Preparation and Implementation		
		Number of Plans	Staff Requirements	
			Hours <sup>a</sup> (conservation technician)	Costs <sup>b</sup>
A	1988-1990	125	5,000	\$ 85,000
B	1991-1993	190	7,600	129,200
C	1994-1996	220	8,800	149,600
D	1997-1999	165	6,600	112,200
Total	- -	700	28,000	\$476,000

<sup>a</sup>Includes time required for preparation of farm conservation plans, assistance in design and installation of needed improvements, and followup.

<sup>b</sup>Includes salary and fringe benefits, based upon 1988 salary levels.

Source: Racine County Land Conservation Office and SEWRPC.

legislation contained in the 1985-1987 State Budget Bill, all participants in the Farmland Preservation Program are required to adhere to sound soil conservation practices so that cropland soil erosion is kept at or below tolerable levels. The soil conservation compliance requirements first 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 1986. The requirements first apply to past participants—landowners who claimed a farmland preservation tax credit for tax year 1984 or any prior year—in tax year 1988. The Racine County Land Conservation Office has completed farm conservation plans for the 30 farms in Racine County whose owners participate in the Farmland Preservation Program and who are, accordingly, required to comply with the conservation requirements of that program.

Conservation Requirements of the Food Security Act of 1985: The Food Security Act of 1985 established "conservation compliance" require-

ments 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. Under the conservation compliance provisions, producers farming highly erodible fields must develop and be applying a conservation plan for the fields by 1990, and such plans must be fully implemented by 1995. A field is considered to be highly erodible under the conservation compliance provisions 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 identifying highly erodible lands in Racine County. The required conservation plans may be prepared by specialists in the Soil Conservation Service, the County Land Conservation Office, the University of Wisconsin-Extension, 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 the County Land Conservation Office.

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 Racine County Land Conservation Office has completed farm conservation plans for current participants in the Wisconsin Farmland Preservation Program. It is anticipated that the Land Conservation Office will prepare additional farm conservation plans as participation in the Farmland Preservation 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 other agencies, will prepare conservation plans for the highly erodible cropland of 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 which may be used to address those problems, and of the public financial and technical resources that are available to help in implementing those practices.

Recommendations for an Information and Education Program: It is recommended that the Racine County Land Conservation Office take the lead role in developing and implementing an information and education program focusing on cropland soil erosion in Racine 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 Racine County consider the creation of a committee to oversee the proposed information and education program or the designation of an existing committee for that purpose. Such a committee should consist of individuals who are familiar with existing soil erosion problems and the resources available to address those problems, as well as with farming practices and the attitudes and preferences of farmers in the County. The newly created farm program information and education committee—consisting of 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 and established for the purpose of promoting an understanding of the Food Security Act of 1985 and other farm programs—could perform the functions of the committee recommended herein.

The Racine County Land Conservation Office, working cooperatively with the University of Wisconsin-Extension and the U. S. Soil Conservation Service, would be responsible for identi-



ifying 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 followed 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 that are 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 would 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 would 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 \$122,400 over 12 years, including about \$13,600 per year from 1988 through 1993; about \$8,500 per year from 1994 through 1996; and about \$5,100 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 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 Racine County Soil Erosion Control Planning Program Technical Advisory Committee determined that efforts to address cropland soil erosion in Racine County should continue to emphasize a basically voluntary approach, supported by available technical and financial assistance and information and education programs and by the conservation compliance provisions of state and federal farm programs. If that combination of programs can be made to succeed, mandatory approaches will not be necessary. Only if the voluntary approach proposed fails should consideration be given to the enactment of mandatory requirements.

#### 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 Racine County Land Conservation Committee in a structured evaluation 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 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 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 will involve the commitment of about 28,000 man-hours; that the information and education activities will involve the commitment of about 7,200 man-hours; and that administrative activities will involve the commitment of about 8,800 man-hours through the year 2000. Implementation of the soil erosion control plan would thus involve a commitment of about 44,000 man-hours, or about 22 man-years, through the year 2000—an average of 3,667 man-hours, or 1.8 man-years, per year.

At the present time, there are three staff members—one in the Racine 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,

Table 21

**STAFFING REQUIREMENTS FOR IMPLEMENTATION OF  
THE RACINE COUNTY SOIL EROSION CONTROL PLAN**

Priority Area	Time Period	Farm Conservation Planning/ Implementation		Information and Education Activities		Administration		Total	
		Hours	Costs <sup>a</sup>	Hours	Costs <sup>a</sup>	Hours	Costs <sup>a</sup>	Hours	Costs <sup>a</sup>
A	1988-1990	5,000	\$ 85,000	2,400	\$ 40,800	1,850	\$ 37,000	9,250	\$162,800
B	1991-1993	7,600	129,200	2,400	40,800	2,500	50,000	12,500	220,000
C	1994-1996	8,800	149,600	1,500	25,500	2,575	51,500	12,875	226,600
D	1997-1999	6,600	112,200	900	15,300	1,875	37,500	9,375	165,000
Total	- -	28,000	\$476,000	7,200	\$122,400	8,800	\$176,000	44,000	\$774,400

<sup>a</sup>Includes salary and fringe benefits, based upon 1988 salary levels.

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

the information and education activity, and the administrative work envisioned under the soil erosion control plan. It should be noted that the U. S. Soil Conservation Service staff serves both Racine and Kenosha Counties. In addition, some staff support for the information and education activity may be expected to be provided through the Racine County University of Wisconsin-Extension. It is envisioned that the County Land Conservation Office staff person will be able to devote one-third of his or her time—about 667 man-hours per year—to plan implementation activities; and that each staff person of the U. S. Soil Conservation Service will 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 will 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—about 49 percent of the 3,667 man-hours per year needed. This suggests the need for one additional conservationist. 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 for 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 \$1,520,000—including \$569,300 in Priority Area A, \$523,400 in Priority Area B, \$307,500 in Priority Area C, and \$119,800 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

Table 22

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

Management Practice	Units/Cost-Share Requirement <sup>a</sup>	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 <sup>b</sup>	13,562 \$396,700	12,583 \$368,100	7,381 \$215,900	2,495 \$ 73,000	36,021 \$1,053,700
Contour Plowing	Acres required ..... Cost-share funds required <sup>c</sup>	913 \$ 6,800	881 \$ 6,600	544 \$ 4,100	344 \$ 2,800	2,682 \$ 20,100
Contour Strip-cropping	Acres required ..... Cost-share funds required <sup>d</sup>	302 \$ 3,400	292 \$ 3,300	180 \$ 2,000	114 \$ 1,300	888 \$ 10,000
Permanent Vegetative Cover	Acres required ..... Cost-share funds required <sup>e</sup>	1,950 \$ 73,100	1,410 \$ 52,900	613 \$ 23,000	588 \$ 22,100	4,561 \$ 171,100
Grassed Waterways	Linear feet required ..... Cost-share funds required <sup>f</sup>	35,700 \$ 89,300	37,000 \$ 92,500	25,000 \$ 62,500	8,300 \$ 20,800	106,000 \$ 265,100
Total Cost Share Required		\$569,300	\$523,400	\$307,500	\$119,800	\$1,520,000

<sup>a</sup>Based upon 1988 cost-share rates.

<sup>b</sup>Based upon a cost-share rate of \$9.75 per acre per year for three years, as provided under the Agricultural Conservation Program.

<sup>c</sup>Based upon a cost-share rate of \$7.50 per acre, as provided under the Agricultural Conservation Program.

<sup>d</sup>Based upon a cost-share rate of \$11.25 per acre, as provided under the Agricultural Conservation Program.

<sup>e</sup>Based 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.

<sup>f</sup>Based 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: Racine County Land Conservation Office, U. S. Agricultural Stabilization and Conservation Service, and SEWRPC.

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.<sup>4</sup> The additional amount of cost-share funds required—beyond the amounts which may be expected to be provided through existing programs—approximates \$922,000. Additional cost-share funds may eventually be available within Racine County under the innovative project provisions of the state Soil and Water Resources Management Program. Additional cost-share assistance may also become available under the state priority watershed program should the Middle Fox River watershed be designated as a priority watershed.

<sup>4</sup>It is anticipated that assistance under the Conservation Reserve Program will not be available after 1990.

## SUMMARY

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

### County Level

Racine County Board of Supervisors: It is recommended that upon the recommendation of the Racine County Land Conservation Committee, the Racine 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 Racine County Land Conservation Office to integrate the plan into various county conservation programs and activities.



Table 23

**COMPARISON OF COST-SHARE FUNDS REQUIRED AND COST-SHARE FUNDS WHICH MAY  
BE PROVIDED THROUGH EXISTING COST-SHARE ASSISTANCE PROGRAMS IN RACINE 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 .....	\$569,300	\$523,400	\$307,500	\$119,800	\$1,520,000
Cost-Share Funds Which May be Provided Through Existing Programs:					
Federal Agricultural Conservation Program ....	\$135,000	\$135,000	\$135,000	\$119,800	\$ 524,800
Federal Conservation Reserve Program .....	73,100	--	--	--	73,100
Total	\$208,100	\$135,000	\$135,000	\$119,800	\$ 597,900
Additional Cost-Share Funds Needed—Beyond the Amounts Which May be Provided Through Existing Programs .....	\$361,200	\$388,400	\$172,500	\$ 0	\$ 922,100

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

**Racine County Land Conservation Committee:**  
It is recommended that the Racine 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 Racine County, emphasizing, in particular, the preparation or revision of farm conservation plans to identify field-specific measures for addressing cropland soil erosion in Racine 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 that are available to help implement 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.

1. Endorse the Racine 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 of 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. In particular, the Department should give due consideration to the designation of the Middle Fox River watershed for funding under the priority watershed program, and, upon such designation, undertake a nonpoint source pollution abatement plan for that watershed, appropriately coordinating the recommendations of that plan with the county soil erosion control plan.
3. Give due consideration to the county soil erosion control plan in the administration

**State Level Agencies**

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

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 Racine County office of the University of Wisconsin-Extension:

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 Racine County Land Conservation Office in developing and carrying out an effective erosion control information and education program for farmers in Racine County.

Federal Level Agencies

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 Racine County Land Conservation Office in efforts to implement the plan.
2. In cooperation with the Racine County Land Conservation Office, maintain a technical assistance program for farmers in Racine 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 Racine County Land Conservation Office in developing and carrying out an effective erosion control information and education program for farmers in Racine 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 soil away 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 Racine 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 11,400 acres, or 34 percent—from about 33,400 acres in 1965 to about 44,800 acres in 1986. The acreage in soybeans increased by 14,000 acres, or 112 percent—from about 12,500 acres in 1965 to about 26,500 acres in 1986. Conversely, the acreage in hay decreased by 8,200 acres, or 37 percent—from about 22,100 acres in 1965 to about 13,900 acres in 1986. The acreage in oats also decreased substantially—from about 11,000 acres in 1965 to about 2,400 acres in 1986, a decrease of 8,600 acres, or 78 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 generally in the southern two-thirds of the State, including Racine 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 Racine County Board in 1986 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 Racine County Land Conservation Office. The planning effort was carried out under the guidance of the Racine 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 Racine 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 Racine 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 Racine 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 consider-

ably, depending upon the cropping system, management practices, soil characteristics, and topographic features of the individual farm fields. Under the Racine 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 Racine 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 Racine 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 Racine County in 1985 was 4.1 tons per acre per year. The soil loss rate was less than 3.0 tons per acre per year on about 44,700 acres of cropland, representing about 37 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 3,300 acres, representing just under 3 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 55,300 acres of cropland, representing about 45 percent of all cropland in Racine County, was found to be eroding at rates exceed-



ing T-value in 1985—including about 43,000 acres, or 35 percent of all cropland, eroding at rates between 1.1 and 2.0 times T-value; about 8,400 acres, or about 7 percent, eroding at rates between 2.1 and 3.0 times T-value; and just over 3,900 acres, or just over 3 percent, eroding at rates of more than 3.0 times T-value. The remaining cropland—totaling about 66,900 acres, or about 55 percent of all cropland in the County—was eroding at rates less than or equal to 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 that 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. However, 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 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, and contour strip-cropping—be implemented on about 14,765 acres, or 27 percent, of the excessively eroding cropland in the County. This includes 12,414 acres proposed for rotation changes; 1,313 acres proposed for contouring or contour strip-cropping; and 1,038 acres proposed

for 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 36,021 acres, or 65 percent, of the excessively eroding cropland in the County. The plan recommends conservation tillage as the sole management practice on about 21,014 acres, or 38 percent, of the excessively eroding cropland, and recommends conservation tillage in conjunction with other management practices on about 15,007 acres, or about 27 percent.

Under the plan, the remainder of the excessively eroding cropland—about 4,561 acres, or 8 percent—would be placed in permanent vegetative cover. In addition, an estimated 106,000 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 permanent vegetative cover. The costs of installing grassed waterways without tiles—including a 10 percent allowance for engineering—would approximate \$350,000 for the entire County. The establishment of permanent vegetative cover would similarly cost about \$342,000.

The costs of implementing 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 decreased yields; by greater use of pesticides; and by the capital outlay required for the 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 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 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.

Farm conservation plans have been prepared in the recent past by the Racine County Land Conservation Office for about 30 farms, or about 4 percent of the total of 800 farm operations in Racine County, to assist farmers in meeting the soil erosion compliance requirements of the Wisconsin Farmland Preservation Program. Moreover, substantial progress has been made by the U. S. Soil Conservation Service toward completion of farm conservation plans for about 70 additional farms, or about 9 percent of all farms in the County, in an effort to assist farmers in meeting the conservation compliance requirements established under the federal Food Security Act of 1985.

The remaining 700 farms, representing just over 87 percent of all farms in the County, either have conservation plans that are outdated or have no farm conservation plans whatsoever. Farm plans would be prepared for these farms during implementation of the county soil erosion control plan.

The conservation planning requirements envisioned under the county soil erosion control plan would require a commitment of time by conservation technicians of an estimated 28,000 man-hours, or about 14 man-years. Total salary and fringe benefit costs attendant to such planning, expressed in 1988 dollars, would approximate \$476,000 through the year 1999, or an average of \$39,700 per year for 12 years. Most of the farm conservation planning work would be cooperatively undertaken by the Racine County Land Conservation Office and the U. S. Department of Agriculture, Soil Conservation Service.

It is anticipated that the detailed farm conservation planning described above will address any apparent wind erosion or stream bank erosion problems, as well as cropland sheet and rill erosion and gully erosion. Wind erosion and stream bank erosion are generally not considered to be significant problems in Racine County, and such problems as may exist are localized in nature.

## 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 Racine 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—includes 58 U. S. Public Land Survey sections, which together encompassed about 20,801 acres of cropland in 1985. On the average, cropland in Priority Area A was eroding at 1.9 times T-value, and about 18,551 acres, or about 89 percent of all cropland in the 58 sections concerned, was eroding at rates exceeding T-value. Conversely, Priority Area D—the lowest priority area for erosion control—includes 91 U. S. Public Land Survey sections, which together encompassed about 27,525 acres of cropland. On the average, cropland in Priority Area D was eroding at 0.7 times T-value, and about 4,425 acres, or about 16 percent of all cropland in the 91 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 Racine 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 that could have 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 14,700 acres, or 79 percent, could contribute to surface water or groundwater pollution, with actual water quality impacts depending upon the intensity, duration, and frequency of rainfall, as well as the 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 and 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 Racine County Board and the Racine 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 Racine County Office of the University of Wisconsin-Extension; 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 that bear on soil erosion problems be coordinated to achieve the maximum reduction in cropland soil erosion in Racine 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 for use in applying needed practices; the administration of state and federal farm program conservation compliance requirements; and the conduct of information and education programs to 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 available to help in implementing 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 Racine County in general conformance with the priority area recommendations and related time frame as described above. Major plan implementation responsibilities are set forth by agency in Table 24.

In total, implementation of the soil erosion control plan would involve the commitment of about 44,000 man-hours, or about 22 man-years, through the year 2000—including about 28,000 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 8,800 man-hours for administration activities. It is anticipated that existing staff in the Racine County Land Conservation Office and the Racine County offices of the UW-Extension and U. S. Soil

Conservation Service will be able to meet about one-half of this requirement. It is envisioned that one additional conservationist will be needed during most of the 12-year implementation period in order 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.

## PUBLIC REACTION TO THE PLAN

A public hearing was held on July 20, 1988, for the purpose of receiving comments on the soil erosion control plan as summarized above. Copies of the public notice, news release, and newspaper article regarding the public hearing are set forth in Appendix C.

No objections to the recommendations set forth in the soil erosion control plan were raised at the hearing. There was, however, considerable discussion of the manner in which the plan would be implemented, with concern expressed regarding the lack of state cost-share assistance to farmers in support of needed management practices. It was agreed that the plan would provide a good basis for demonstrating the need for additional state financial assistance to farmers in the County as they attempt to resolve soil erosion problems. At the conclusion of the hearing, the Land Conservation Committee approved the erosion control plan and recommended approval of the plan by the Racine County Board.



Table 24

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

Plan Implementation Activity	Racine County Board of Supervisors	Racine 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 Racine County . . . . .		X			X		X	

Source: SEWRPC.

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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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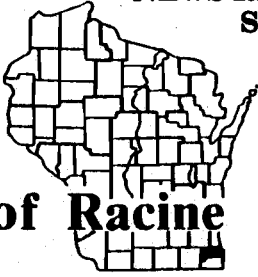
## **Appendix B**

### **PUBLIC INFORMATIONAL MEETING ON THE RACINE COUNTY SOIL EROSION CONTROL PLANNING PROGRAM**

A countywide meeting was held on June 3, 1987, at the Racine County Highway and Office building to provide information to the public concerning the county soil erosion control planning program. Although it was well publicized, the meeting was attended by just two individuals in addition to the study Advisory Committee. Copies of the news release regarding the meeting and of newspaper announcements of the meeting are included in this appendix.

Appendix B-1

NEWS RELEASE ANNOUNCING RACINE COUNTY  
SOIL EROSION CONTROL MEETING



**County of Racine . . . DIVISION OF PLANNING & DEVELOPMENT**

OFFICE OF LAND CONSERVATION

PRESS RELEASE

PUBLIC INFORMATIONAL MEETING REGARDING THE RACINE COUNTY  
SOIL EROSION CONTROL PLAN

Sturtevant, WI -- A public information meeting regarding the soil erosion control plan for Racine County has been scheduled for June 3, 1987. This meeting will be held at 9:30 a.m. in the auditorium of the Racine County Highway and Office Building at 14200 Washington Avenue.

In 1981, the Wisconsin Legislature created the Soil Erosion Control Program, s. 92.10, Stats. This program requires counties to develop a soil erosion plan. The plan will contain a general inventory of land uses, current soil erosion estimates and maximum acceptable rates of soil erosion on cropland. It will also identify areas with the highest soil erosion rates along with the types of conservation practices needed to reduce those high rates and the cost of installing those practices.

The goal of the soil erosion control program is to reduce the excessive soil erosion rates to acceptable rates for the purpose of conserving long term soil productivity and protecting the quality of related natural resources.

Press Release

-

Charles Seeger May 21, 1987

## Appendix B-2

### NEWSPAPER ANNOUNCEMENTS OF THE RACINE COUNTY SOIL EROSION CONTROL MEETING

#### County sets soil erosion meeting

IVES GROVE — Racine County is having an informational meeting June 3 on its soil erosion control plan.

The meeting will be at 9:30 a.m. in the auditorium of the county office building at 14200 Washington Ave.

Councils are required to develop

soil erosion plans that include a general inventory of land uses, current soil erosion estimates and maximum acceptable rates of soil erosion on cropland. The plan is also to identify areas with the highest soil erosion rates, conservation practices needed to reduce high rates, and the costs of various conservation measures.

RACINE JOURNAL TIMES  
MAY 22, 1987

#### Meetings

- Mount Pleasant Capital Improvements Committee, town hall, 6126 Durand Ave., 3 p.m. Wednesday.
- Racine City Council, room 205, city hall, 730 Washington Ave., 8 p.m. today.
- Redevelopment Authority of Racine, room 205, city hall, 730 Washington Ave., 4 p.m. Wednesday.
- Racine County's planning and development division's land conservation office, public informational meeting to discuss a county soil erosion plan, county offices, 14200 Washington Ave., 9:30 a.m. Wednesday.

RACINE JOURNAL TIMES  
JUNE 2, 1987

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## Appendix C

### RECORD OF NOTIFICATION OF PUBLIC HEARING ON RACINE COUNTY SOIL EROSION CONTROL PLAN

#### Appendix C-1

#### PUBLIC NOTICE OF THE RACINE COUNTY SOIL EROSION CONTROL PLAN PUBLIC HEARING

1st Pub. July 6, 12, 13  
Notice is hereby given that a public hearing will be held by the Land Conservation Committee (Sub-Committee) of the Planning and Development Committee of the Racine County Board of Supervisors at 7:30 p.m., July 20, 1988, in the auditorium of the Racine County Highway and Office Building, 14200 Washington Avenue, Sturtevant, Wisconsin, on the Soil Erosion Control Plan for Racine County.  
This plan is intended to meet the requirements of Chapter 92, of the Wisconsin Statutes, and related guidelines developed by the Wisconsin Department of Agriculture, Trade and Consumer Protection, under Section 92.05 and Ag 160. Copy of this plan may be examined during normal business hours at the Land Conservation Office, 14200 Washington Avenue.  
Written comments on the Soil Erosion Control Plan may be submitted to Charles Seeger, County Conservationist, 14200 Washington Avenue, Sturtevant, WI 53177, no later than 4:30 p.m., on July 22, 1988. Written comments will have the same weight and effect as oral statements presented at the hearing.  
Date: June 30, 1988  
Charles L. Seeger  
County Conservationist

STATE OF WISCONSIN  
COUNTY OF RACINE

SS.

Sally K. Holst ..... being first duly sworn, on oath says he is one of the chief clerks of Lee Enterprises, Incorporated, a foreign corporation, licensed to do business in Wisconsin, and which corporation is the publisher, printer, and owner of the Journal Times, a daily newspaper printed and published in the City of Racine, Racine County, Wisconsin; affiant further states that this affidavit on behalf of said corporation is made in compliance with Sec. 985.12 of the Wisconsin Statutes, and that the notice (or other legal publication), a true copy of which is hereto attached, was printed and published in the Journal Times once a week for 2..... successive weeks, the first publication having been made on July 6 ..... 1988 and the last publication on July 13 ..... 1988.

Subscribed and sworn to before me this

13 day of July, 1988

James E. Keller

Notary Public, Racine Co., Wisconsin

My Commission Expires 4-7-91

## Appendix C-2

### NEWS RELEASE ANNOUNCING THE RACINE COUNTY SOIL EROSION CONTROL PLAN PUBLIC HEARING



**County of Racine . . . DIVISION OF PLANNING & DEVELOPMENT**

**OFFICE OF LAND CONSERVATION**

#### PRESS RELEASE

#### **PUBLIC HEARING REGARDING THE RACINE COUNTY SOIL EROSION CONTROL PLAN**

Sturtevant, WI - A public hearing regarding the soil erosion control plan for Racine County has been scheduled for July 20, 1988. This meeting will be held at 7:30 p.m. in the auditorium of the Racine County Highway and Office Building at 14200 Washington Avenue.

Because of 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 cropland soil erosion. Recognizing the need for soil erosion control, and in an effort to comply with the planning requirements of Chapter 92, the Racine County Board in 1986 requested the assistance of the the Southeastern Wisconsin Regional Planning Commission in the preparation of an erosion control plan. The resulting plan will identify agricultural soil erosion control problems existing in the County, recommend a cropland soil erosion control objective and related erosion control standards, recommend a rank ordering of areas of the County for the application of erosion control measures, identify the types and amounts of soil erosion control practices which may be used to reduce soil erosion to tolerable levels, and identify the actions which should be taken by the various units and agencies of government concerned in implementing the plan.

The primary objective of the cropland soil erosion control plan 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 loss tolerances or "T-values." The soil erosion control plan seeks to reduce cropland soil erosion throughout the County to established soil loss tolerances by the year 2000.

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 or refine those recommendations for individual farm units. The soil erosion control plan anticipates that farm conservation plans will eventually be prepared or updated for the majority of the farms in Racine County.

### Appendix C-3

## NEWSPAPER ARTICLE REGARDING THE RACINE COUNTY SOIL EROSION CONTROL PLAN PUBLIC HEARING

# Soil erosion concerns spur meeting

(SP,WS) - A public hearing on the soil erosion control plan for Racine County has been scheduled for Wednesday, July 20, at 7:30 p.m. in the auditorium of the Racine County Highway and Office Building, 14200 Washington Ave.

Because of increasing concern over soil erosion, the Wisconsin Legislature in 1982 revised the state soil and water conservation law to require the preparation of county soil erosion control plans focusing on cropland soil erosion.

Recognizing the need for soil erosion control, and in an effort to comply with the planning requirements, the Racine County Board in 1986 requested the assistance of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in the preparation of an erosion control plan.

### IDENTIFY PROBLEMS

The plan will identify agricultural soil erosion control problems existing in the county; recommend a cropland soil erosion control objective and related erosion control standards; rank areas for the application of erosion control

measures; and identify the types and amounts of soil erosion control practices to reduce erosion to tolerable levels.

It will also identify the actions which should be taken by the units and agencies of government concerned in implementing the plan.

The primary objective of the plan is the maintenance of the longterm productivity of soils within the county through the prevention of excessive cropland soil erosion.

Excessive erosion is defined as an excess of soil loss tolerances or erosion throughout the county to established soil loss tolerances by the year 2000.

While the county plan identifies the general types of practices which may be utilized to control soil erosion, detailed farm conservation plans will be required to adapt or refine recommendations for individual farms.

### MOST WILL PARTICIPATE

The control plan anticipates that farm conservation plans will eventually be prepared or updated for the majority of the farms in Racine County.

BURLINGTON STANDARD PRESS  
JULY 11, 1988