COMMUNITY ASSISTANCE
PLANNING REPORT NO. 170

WASHINGTON COUNTY AGRICULTURAL SOIL EROSION CONTROL PLAN

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COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 170

WASHINGTON COUNTY AGRICULTURAL SOIL EROSION CONTROL PLAN

Prepared by the

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

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

March 1989

Inside Region $2.50
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SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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March 1, 1989

Chairman and Members
Land Conservation Committee
Washington County Board
Washington County Courthouse
432 E. Washington Street
West Bend, Wisconsin 53095

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 Washington County Board in 1985 determined to prepare a cropland soil erosion control plan. The County Board requested the assistance of the Southeastern Wisconsin Regional Planning Commission in the preparation of the plan. This report presents the requested plan.

The soil erosion control plan as documented in this report identifies the agricultural soil erosion control problems existing in the County; recommends an agricultural soil erosion control objective and related standards; identifies the types and amounts of soil erosion control practices needed to reduce agricultural soil erosion to tolerable levels within the County; and recommends a long-range implementation strategy to guide the concerned agencies and units of government in their efforts to assist farmers in the application of the needed erosion control practices.

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, including Washington County, are required to prepare such a plan. Chapter 92 requires that an erosion control plan: 1) specify maximum acceptable rates of erosion; 2) identify the parcels where soil erosion standards are not being met; 3) identify the land use changes or management practices 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 WASHINGTON COUNTY SOIL EROSION CONTROL PLAN

Recognizing the need for increased efforts to control soil erosion in Washington County, and in an effort to comply with the planning requirements of Chapter 92 of the Wisconsin Statutes, the Washington County Board in 1985 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 planning program was cooperatively undertaken by the Regional Planning Commission and the Washington County Land Conservation Department, and was carried out under the authorization of the Washington County Land Conservation Committee. The Land Conservation Department 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 Washington County Land Use and Park Department, the Wisconsin Department of Natural Resources, the University of Wisconsin-Extension, and the U. S. Department of Agriculture. A full committee membership list is set forth in the inside front cover of this report.

The soil erosion control planning program was undertaken simultaneously with, and fully coordinated with, a detailed nonpoint source water pollution abatement planning program for the Milwaukee River watershed, referred to as the Milwaukee River Priority Watersheds Program. Among the nonpoint sources of pollution

addressed in the priority watersheds program is cropland soil erosion. Inventory data for cropland within the Milwaukee River watershed collected under that program were incorporated directly into the county soil erosion control planning program. Cropland inventory data for portions of the Oconomowoc River watershed, collected as part of a priority watershed program for the Oconomowoc River, were also used in the county soil erosion control planning program.

SCHEME OF PRESENTATION

The Washington County soil erosion control plan is presented in eight chapters. Following this introductory chapter, Chapter II, "Description of the County," describes those aspects of the natural resource base and man-made environment of Washington 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, "Soil Erosion Control Practice Needs," identifies the types and amounts of soil erosion control practices that would effectively address soil erosion problems in the County. Chapter VI, "Agencies and Programs Concerned with the Control of Cropland Soil Erosion," identifies the agencies and units of government that are concerned with the control of soil erosion and describes the various government-sponsored programs that have been established to address soil erosion problems. Chapter VII, "Implementation Strategy," sets forth an overall framework to guide the erosion control activities of the concerned agencies and units of government from 1989 through the year 1999. Chapter VIII, "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 Washington 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, geology, soils, and surface water resources of the County. The second portion of the chapter describes trends in population, land use, and cropping patterns in Washington County.

NATURAL RESOURCE BASE

Physiographic and Topographic Features

Glaciation has largely determined the physiography and topography of southeastern Wisconsin, including Washington County. The physiographic features or surficial land forms of southeastern Wisconsin are shown on Map 1, whereas the regional topography or variation in elevation is depicted in a generalized manner on Map 2. The dominant physiographic and topographic feature is the Kettle Moraine, an interlobate glacial deposit, or moraine, formed between the Green Bay and Lake Michigan tongues, or lobes, of the continental glacier which moved in a generally southerly direction from its point of origin in what is now Canada. The Kettle Moraine, which is oriented in a general northeast-southwest direction across western Washington, Waukesha, and Walworth Counties, is a complex system of kames, or crudely stratified conical hills; kettle holes marking the site of glacial ice blocks that became separated from the ice mass and melted to form depressions; and eskers, consisting of long, narrow ridges of drift deposited in abandoned drainageways. Most of the remainder of the County is covered by other glacial land forms and features—including gently sloping and rolling ground moraine, or heterogeneous material deposited beneath the ice; outwash plains formed by the action of flowing glacial meltwater; and glacial lake basin deposits.

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.

Geology

The bedrock formations underlying the unconsolidated surficial deposits in the County include, from oldest to youngest, Precambrian crystalline rock, Cambrian sandstone, Ordovician sedimentary rock, and Silurian dolomite. The bedrock geology of the County is shown in Figure 1 by means of a map of the surface of the bedrock supplemented with representative vertical sections.

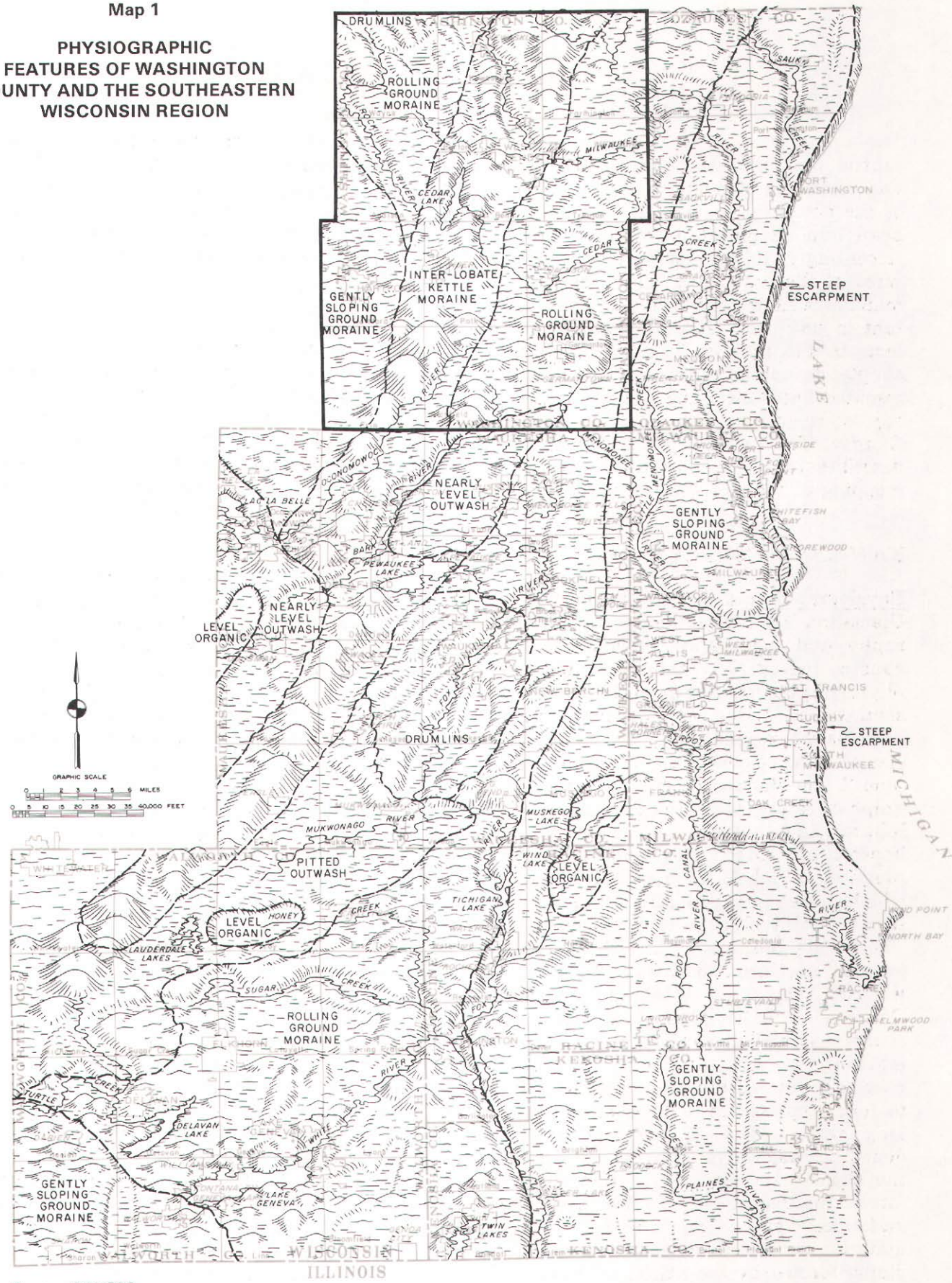
The bedrock of the County is, for the most part, covered by unconsolidated glacial deposits. As shown on Map 3, the thickness of such deposits ranges from zero in certain areas where bedrock crops out, to more than 600 feet, with the greatest thickness occurring where glacial materials fill bedrock valleys and in areas of topographic highs created by end moraines. Shallow drift areas and bedrock outcrops occur primarily in the southeastern portion of the County. Agricultural activities in such areas can lead to contamination of groundwater, principally with nitrate and pesticides. The potential for groundwater contamination at a given location, however, depends upon site characteristics, including subsurface conditions, characteristics of individual pollutants, and agronomic practices.

Soils

The soils in Washington County range from very poorly drained organic soils to excessively drained mineral soils. Seven 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 seven soil associations in Washington County, along

Map 1

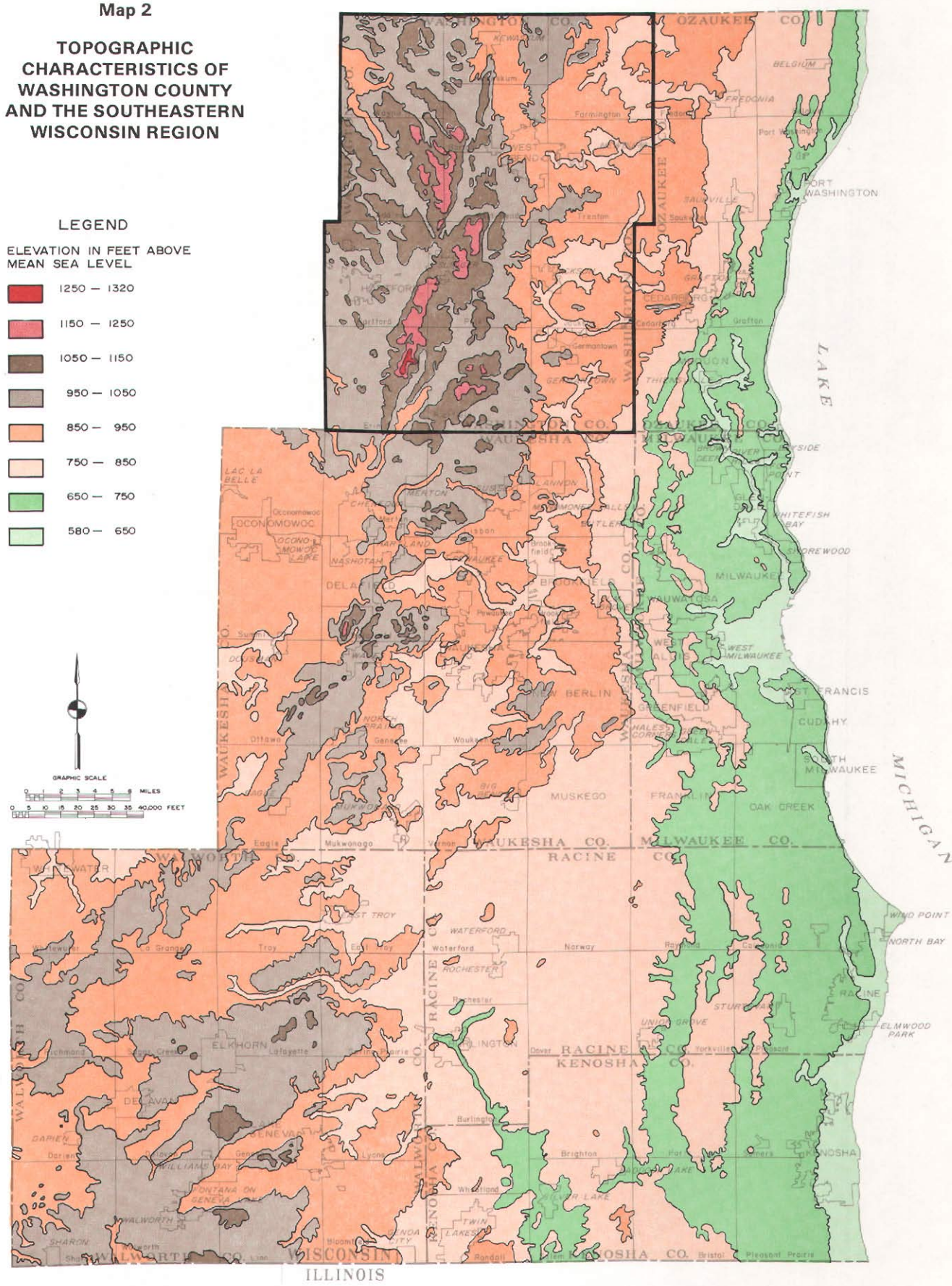
PHYSIOGRAPHIC FEATURES OF WASHINGTON COUNTY AND THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Map 2

TOPOGRAPHIC CHARACTERISTICS OF WASHINGTON COUNTY AND THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Figure 1

MAP AND CROSS-SECTION OF BEDROCK GEOLOGY IN OZAUKEE AND WASHINGTON COUNTIES

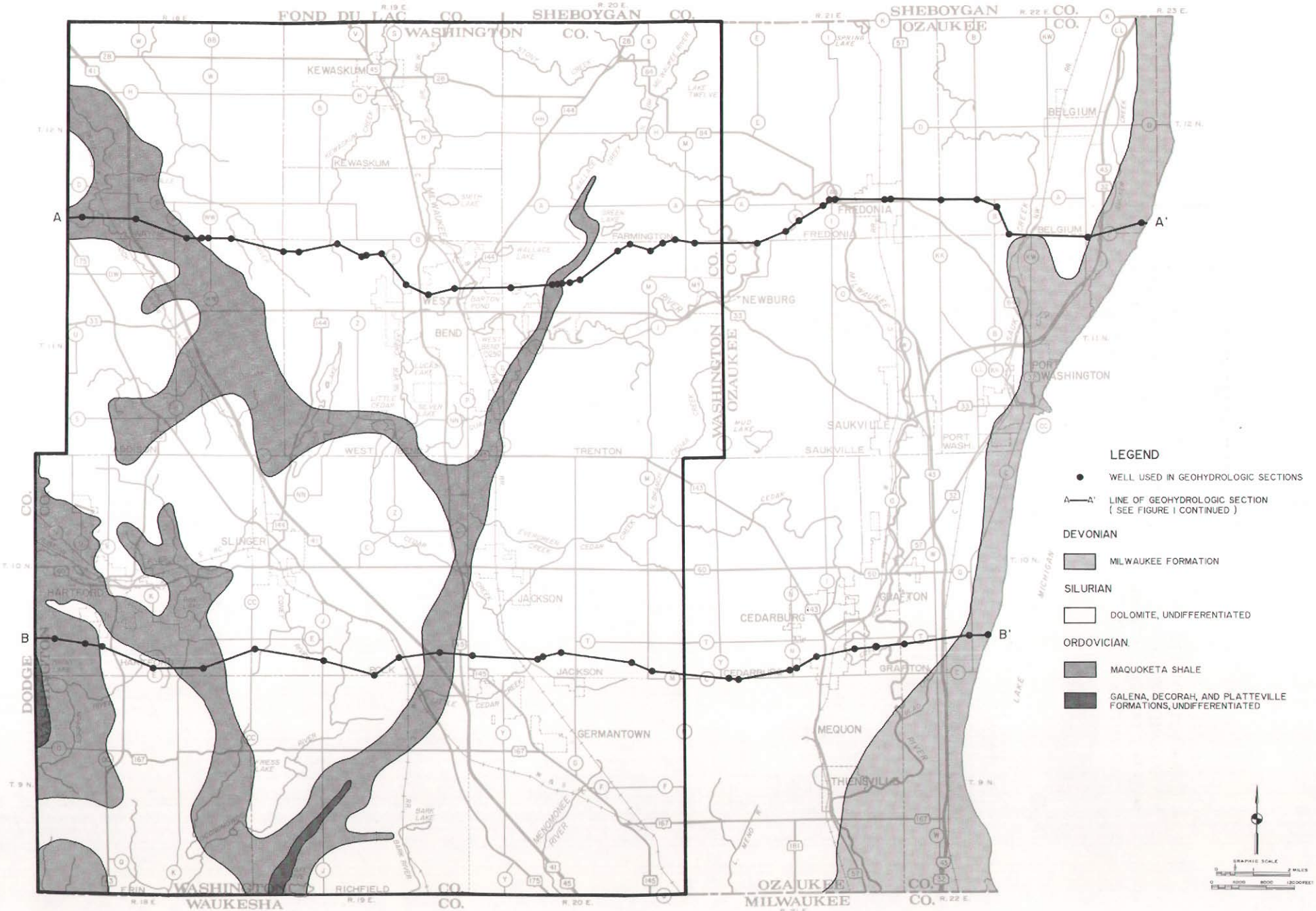
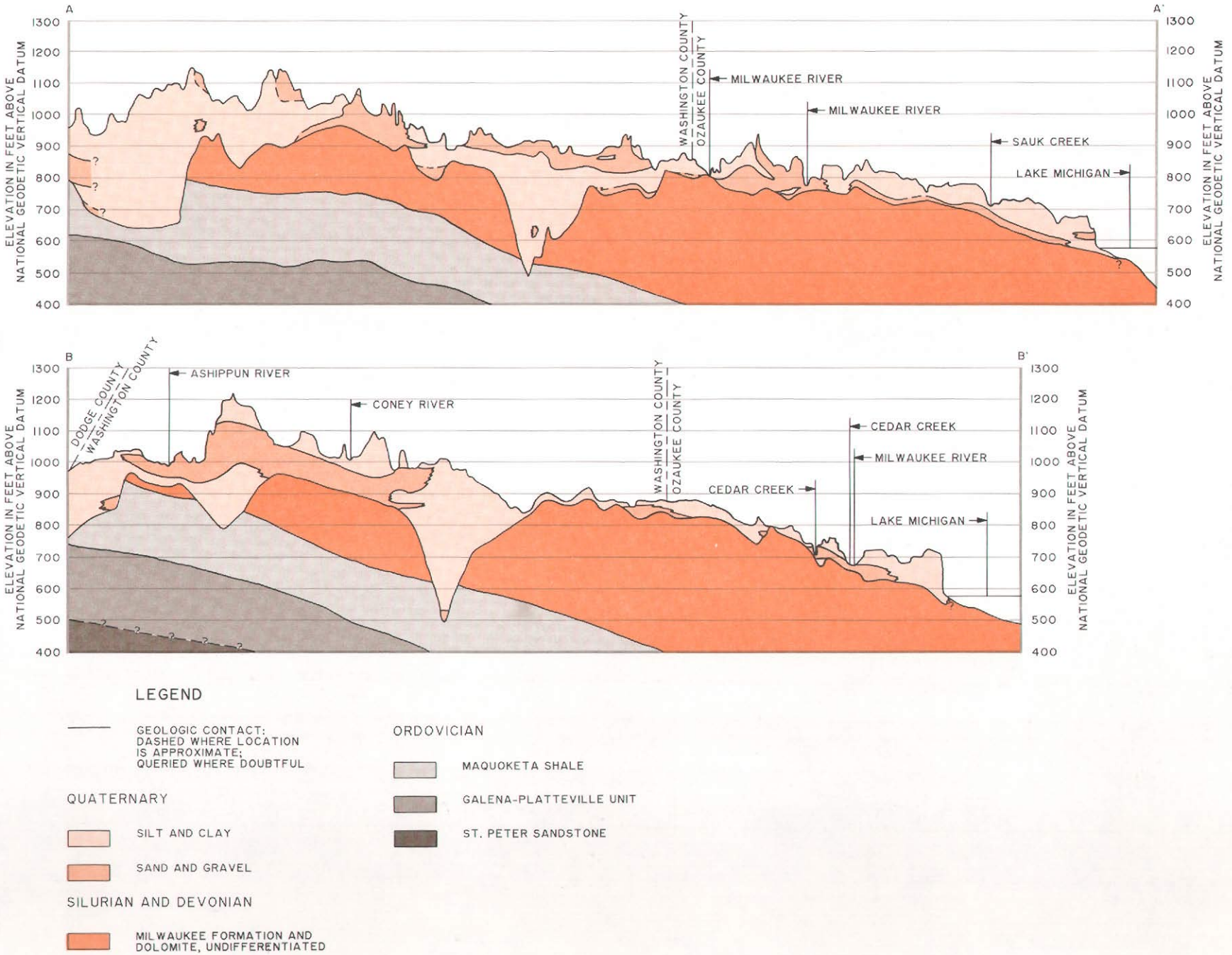


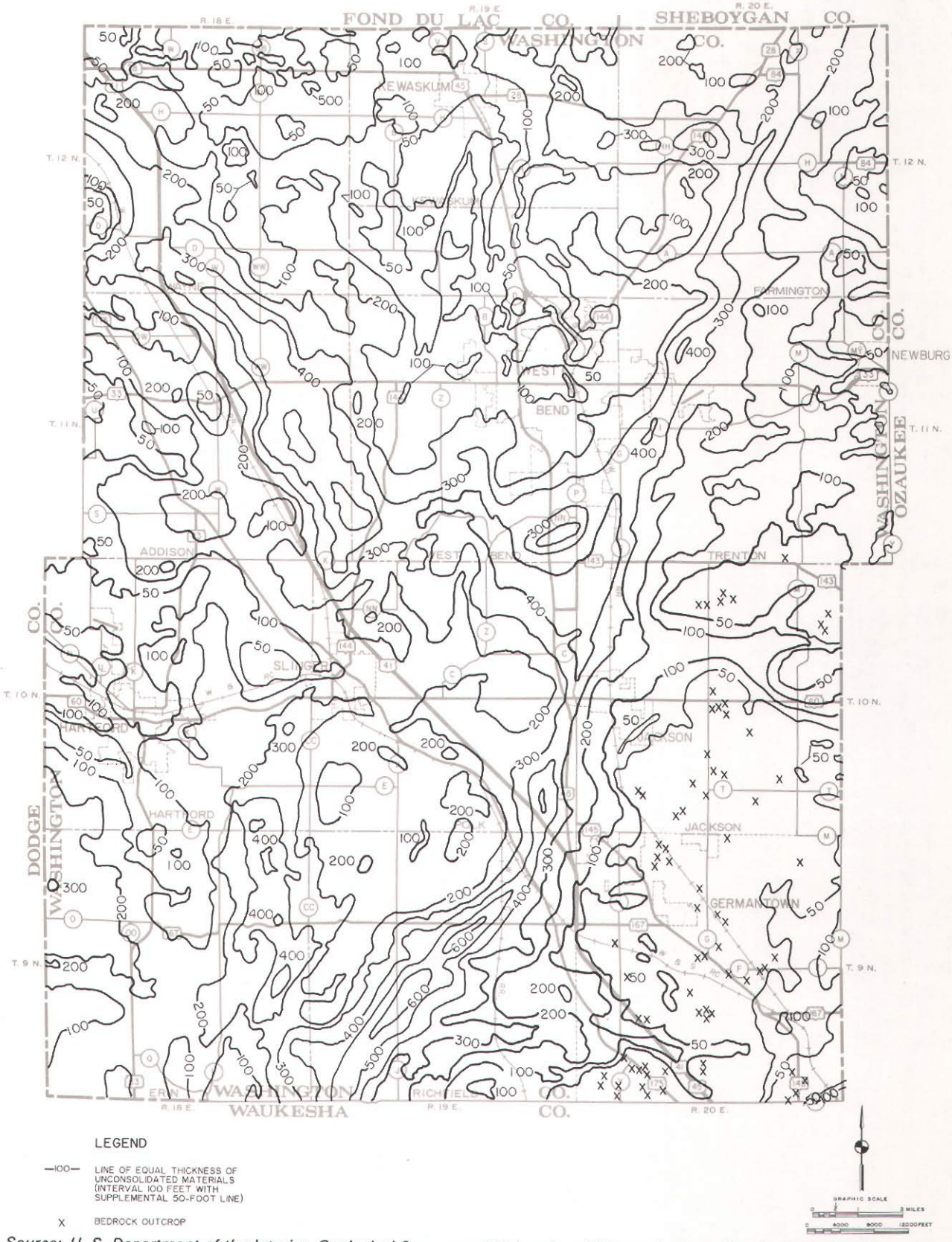
Figure 1 (continued)



Source: U. S. Department of the Interior, Geological Survey; and University of Wisconsin-Extension, Geological and Natural History Survey.

Map 3

THICKNESS OF UNCONSOLIDATED MATERIALS AND THE LOCATION OF BEDROCK OUTCROPS IN WASHINGTON COUNTY



Source: U. S. Department of the Interior, Geological Survey; and University of Wisconsin-Extension, Geological and Natural History Survey.

with their distribution within the County, is presented on Map 4.

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 Washington County, the soils of the County have been categorized as having slight, moderate, and severe erosion potential, and mapped accordingly. The rating for each soil is based upon its capability class and subclass as assigned under the U. S. Soil Conservation Service agricultural land capability system.[1] The rating indicates the potential for both water and wind erosion. It is emphasized that the rating is based solely on soil characteristics that affect a soil's response to management and treatment. Farming practices, which have a direct bearing on the rate of erosion, are not taken into account. The erosion potential for soils covering agricultural lands in Washington County is shown on Map 5.[2]

Surface Water Resources

Lakes and streams constitute an extremely valuable part of the natural resource base of Washington 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 Washington County are shown on Map 6.

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, 10 of which are located wholly or partially within Washington County. As shown on Map 6, four of these 10 watersheds—the Cedar Creek, Milwaukee River East-West Branches, Menomonee River, and Milwaukee River North Branch watersheds—are located east of the subcontinental divide and are part of the Great Lakes-St. Lawrence River drainage area. The other six watersheds—the Ashippun River, Bark River, Rock River East Branch, Oconomowoc River, Rubicon River, and Upper Fox River watersheds—are located west of the subcontinental divide and are part of the Mississippi River drainage area.

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 Washington 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

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[1] *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.*

[2] *The agricultural lands shown on Map 5 include cropland, including some which may be temporarily idle; pastureland; and orchards and nurseries.*

Map 4

GENERAL SOIL ASSOCIATIONS IN WASHINGTON COUNTY

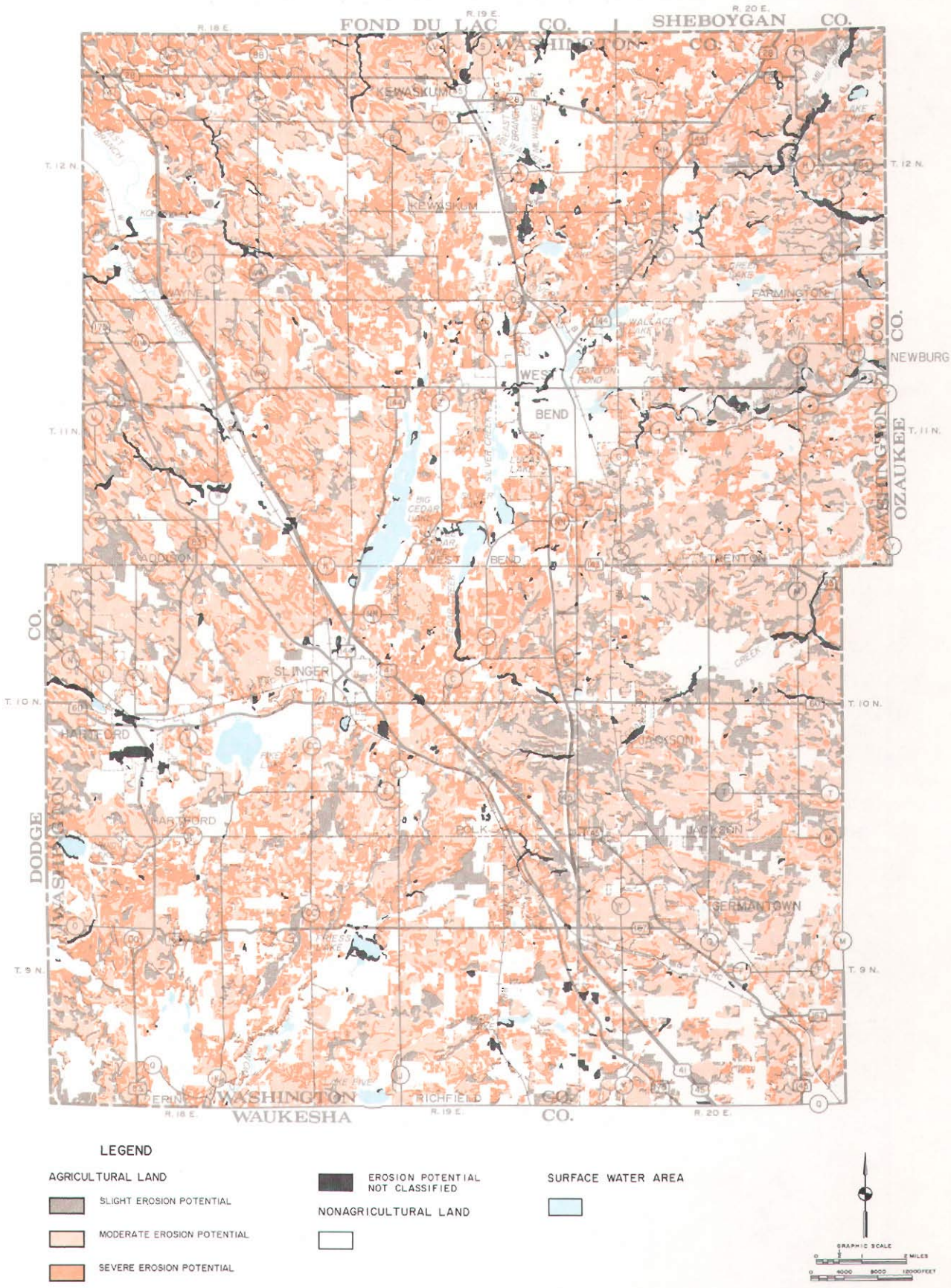
LEGEND

- CASCO-FOX-RODMAN ASSOCIATION: WELL-DRAINED TO EXCESSIVELY DRAINED SOILS THAT HAVE A SUBSOIL OF GRAVELLY SANDY LOAM TO CLAY LOAM; VERY SHALLOW TO MODERATELY DEEP OVER GRAVEL AND SAND, ON OUTWASH TERRACES
- HOCHHEIM-THERESA ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A SUBSOIL OF CLAY LOAM; FORMED IN LOESS AND THE UNDERLYING SANDY LOAM TO LOAM GLACIAL TILL, ON UPLANDS
- OZAUKEE-MARTINTON-SAYLESVILLE ASSOCIATION: WELL-DRAINED AND SOMEWHAT POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF SILTY CLAY LOAM TO CLAY; OVER SILTY CLAY LOAM GLACIAL TILL OR LAKE-LAID SILT AND CLAY, ON GROUND MORAINES AND LACUSTRINE BASINS
- CASCO-HOCHHEIM-SISSON ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A SUBSOIL OF LOAM TO CLAY LOAM; OVER LAKE-LAID SILT AND FINE SAND, IN GRAVEL AND SAND OUTWASH, OR IN SANDY LOAM GLACIAL TILL, ON UPLANDS
- COLWOOD-BOYER-SISSON ASSOCIATION: WELL-DRAINED AND POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF SANDY LOAM OR SILTY CLAY LOAM; OVER LAKE-LAID SILT AND FINE SAND OR GRAVEL AND SAND OUTWASH, ON PLAINS AND DISSECTED TERRACES
- BROOKSTON-PELLA-LAMARTINE ASSOCIATION: SOMEWHAT POORLY DRAINED AND POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF CLAY LOAM OR SILTY CLAY LOAM; FORMED IN LOESS AND UNDERLYING LOAM TO SANDY LOAM GLACIAL TILL
- HOUGHTON-PALMS-ADRIAN ASSOCIATION: VERY POORLY DRAINED ORGANIC SOILS ALONG DRAINAGEWAYS, IN DEPRESSIONS, AND IN OLD LAKEBEDS

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

Map 5

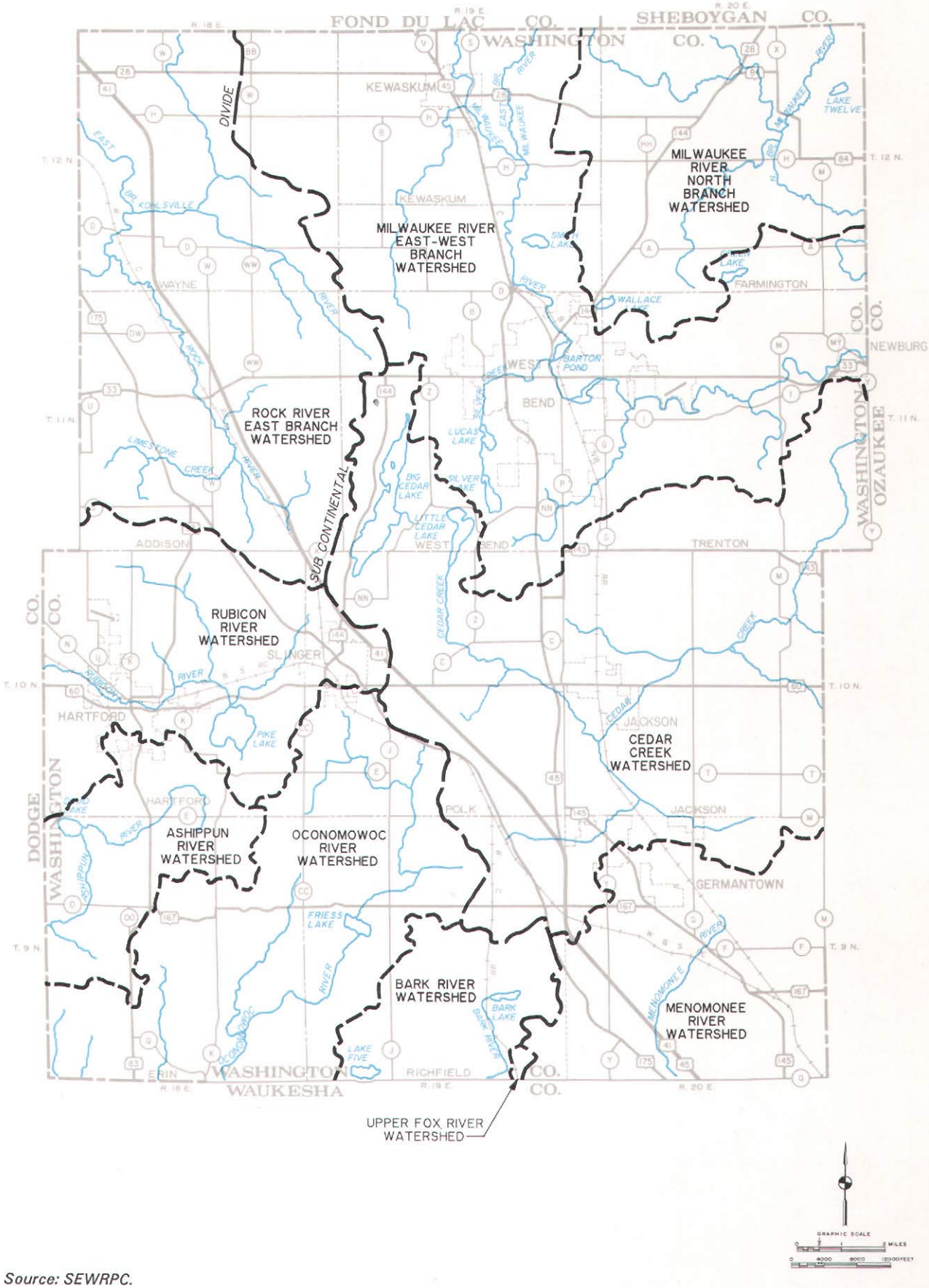
SOIL EROSION POTENTIAL FOR AGRICULTURAL LANDS IN WASHINGTON COUNTY



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

Map 6

SURFACE WATER RESOURCES IN WASHINGTON COUNTY



Source: SEWRPC.

Table 1

POPULATION IN WASHINGTON COUNTY: CENSUS YEARS 1850-1980, AND ESTIMATED 1988

Year	Total Population		
	Number	Change from Preceding Time Period	
		Absolute	Percent
1850	19,485	--	--
1860	23,622	4,137	21.2
1870	23,919	297	1.3
1880	23,442	-477	-2.0
1890	22,751	-691	-2.9
1900	23,589	838	3.7
1910	23,784	195	0.8
1920	25,713	1,929	8.1
1930	26,551	838	3.3
1940	28,430	1,879	7.1
1950	33,902	5,472	19.2
1960	46,119	12,217	36.0
1970	63,839	17,720	38.4
1980	84,848	21,009	32.9
1988	89,936	5,088	6.0

NOTE: Portions of Washington County were detached to form Ozaukee County in 1853. The 1850 population of that land area identified as Washington County in all subsequent census years was 11,204.

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

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 7 shows the pattern of primary environmental corridors in Washington County in 1985. These corridors encompass about 60,300 acres, or about 22 percent, of the area of Washington County. Of this total, 3,900 acres, or about 6 percent, consist of surface water; 34,900 acres, or 58 percent, consist of wetlands; 14,800 acres, or 25 percent, consist of upland woodlands; 6,000 acres, or 10 percent, consist of other open lands; and 700 acres, or 1 percent, consist of isolated urban enclaves within the corridor configuration.

MAN-MADE ENVIRONMENT

Population Trends

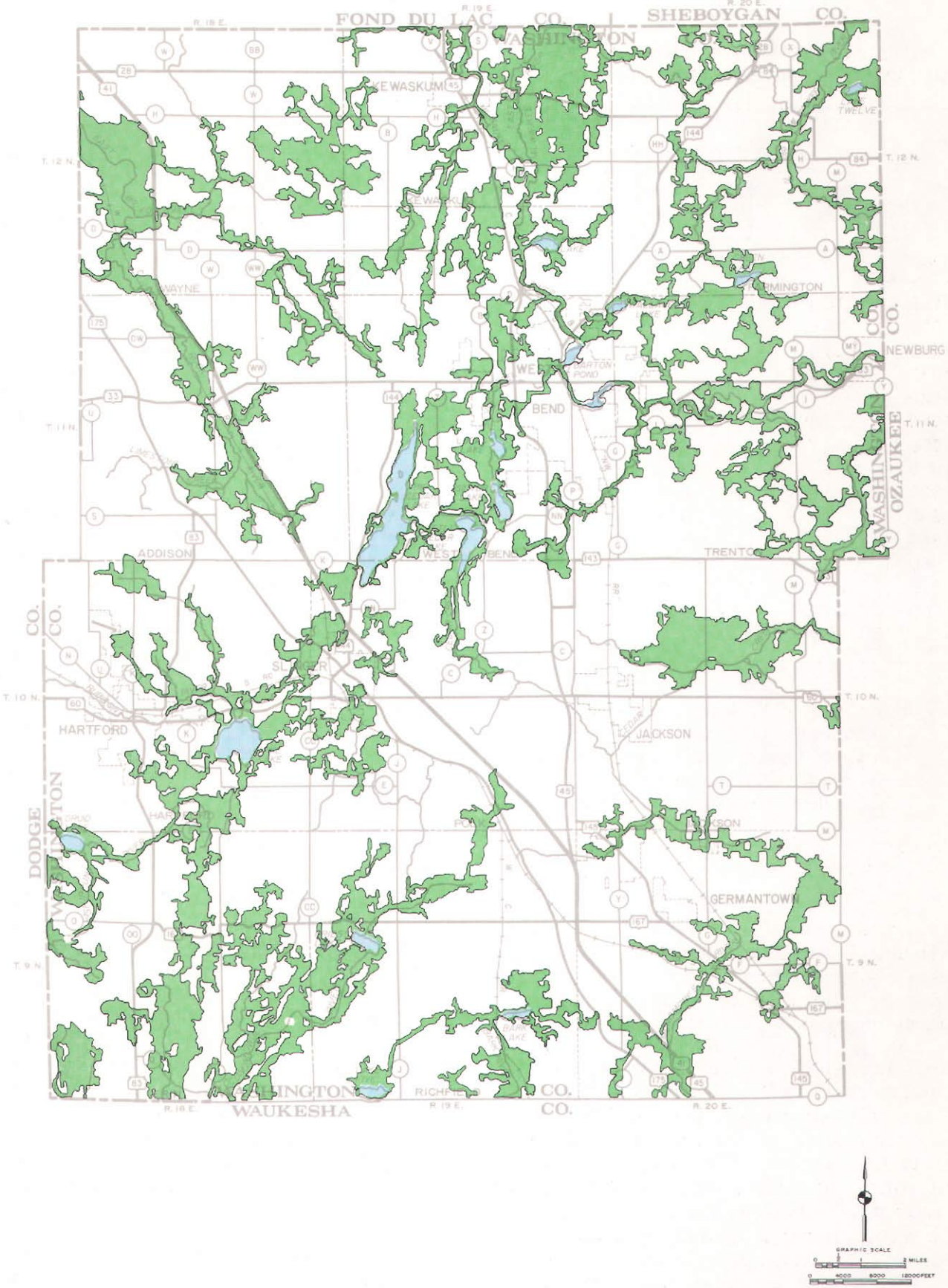
The population of Washington County stood at about 33,900 persons in 1950, having increased by about 10,300 persons, or 44 percent, since 1900 (see Table 1). During each of the three decades after 1950, the county population increased substantially—by about 12,200 persons, or 36 percent, during the 1950's; about 17,700 persons, or 38 percent, during the 1960's; and about 21,000 persons, or 33 percent, during the 1970's—so that by 1980, the county population had reached about 84,800 persons. Relative to the three preceding decades, growth in the county population has been comparatively modest since 1980. The 1988 county population estimate of about 89,900 persons represents an increase of about 5,100 persons, or 6 percent, since 1980.

Population projections have been prepared by the Regional Planning Commission for Washington County and the Southeastern Wisconsin Region through the year 2010, and are presented in SEWRPC Technical Report No. 11 (2nd Edition), The Population of Southeastern Wisconsin. Because of the uncertainty entailed in any projection of future population levels in times of great social and economic change, such as are being experienced at the present time, 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 pessimistic" scenario was provided by similarly combining all factors that would create unfavorable conditions for population growth in the Region.

As indicated in Figure 2, under the optimistic scenario for population change, the population of Washington County would be expected to

Map 7

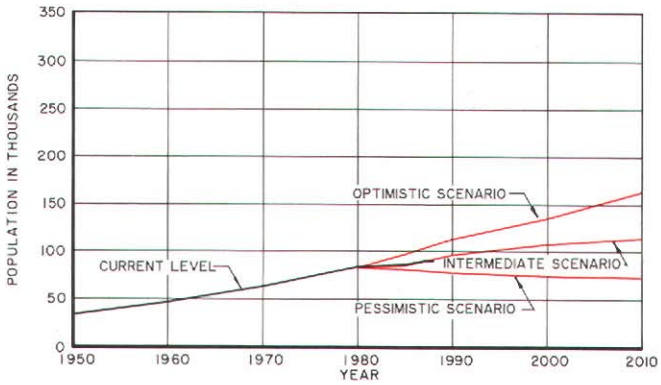
PRIMARY ENVIRONMENTAL CORRIDORS IN WASHINGTON COUNTY



Source: SEWRPC.

Figure 2

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



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

increase by about 79,600 person, or 94 percent—from about 84,800 persons in 1980 to about 164,400 persons in the year 2010. Under the intermediate scenario, the county population would be expected to increase by about 31,200 persons, or 37 percent, to a level of about 116,000 persons in the year 2010. Under the pessimistic scenario, the county population would be expected to decrease by about 10,400 persons, or 12 percent, resulting in a population level of about 74,400 persons in the year 2010. As further indicated in Figure 2, population levels in Washington County between 1980 and 1988 have most closely approximated the trend envisioned under the intermediate growth scenario.

Land Use

Although Washington County is considered to be a relatively urbanized county, about 88 percent of the area of the County was still devoted to rural uses in 1985, while about 12 percent 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 33,700 acres in Washington County, or about 12 percent of the total area of the County. Lands in residential use comprised the largest share of the urban land area—about 16,100 acres—representing about 48 percent of the urban land area and about 6 percent of the total area of the County. As shown on Map 8, urban land development within Washington 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 245,200 acres in Washington County, or 88 percent of the area of the County. Agricultural lands encompassed about 168,100 acres, about 69 percent of all rural land in the County, and 60 percent of the total area of the County. The agricultural acreage included about 141,100 acres of cropland, 26,700 acres of pasture and unused agricultural land, and about 300 acres of orchards and nurseries. Other major rural land use categories in Washington County include wetlands—which in 1985 encompassed about 41,300 acres, or about 15 percent of the total area of the County—and woodlands—which encompassed about 21,800 acres, or about 8 percent of the total area of the County.

The change in land use in Washington 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 Washington County increased by about 13,300 acres, or 65 percent. Lands developed for residential and transportation uses accounted for about 85 percent of the total increase in the urban area. As indicated in Table 2, much of the new development occurred in areas formerly in agricultural use.

Cropping Patterns

The trend in acreage levels for major crops in Washington County is shown in Figure 3. The most noteworthy change in cropping patterns shown on that figure is a decline in the acreage of oats harvested. The acreage in oats decreased by about 18,500 acres, or 58 percent—from about 31,700 acres in 1965 to about 13,200 acres in 1986. In comparison, the acreage levels for the other major crops were relatively stable during this time. Thus, the 1986 corn acreage of 37,100 acres was 2,300 acres, or 7 percent, greater than the 1965 level of 34,800 acres. The 1986 hay acreage of 44,800 acres was 5,300 acres, or 11 percent, lower than the 1965 level of 50,100 acres. While the land in wheat experienced a large relative increase, 77 percent, between 1965 and 1986, the 1986 wheat acreage of 5,500 acres was only 2,400 acres higher than the 1965 acreage.

Table 2

LAND USE IN WASHINGTON COUNTY: 1963 AND 1985

Land Use Category	1963		1985		Change: 1963-1985	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent
Urban						
Residential	7,342	2.6	16,076	5.8	8,734	119.0
Commercial	279	0.1	547	0.2	268	96.1
Industrial	289	0.1	690	0.2	401	138.8
Transportation, Communication, and Utilities	10,238	3.7	12,828	4.6	2,590	25.3
Governmental and Institutional	669	0.3	1,087	0.4	418	62.5
Recreational	939	0.3	1,874	0.7	935	99.6
Unused Urban	631	0.2	568	0.2	-63	-10.0
Subtotal	20,387	7.3	33,670	12.1	13,283	65.2
Rural						
Agricultural						
Cropland	152,656	54.8	141,135	50.6	-11,521	-7.5
Orchards and Nurseries	252	0.1	291	0.1	39	15.5
Pasture and Other	32,986	11.8	26,708	9.6	-6,278	-19.0
Subtotal	185,894	66.7	168,134	60.3	-17,760	-9.6
Wetlands	41,794	15.0	41,313	14.8	-481	-1.2
Woodlands	21,008	7.5	21,755	7.8	747	3.6
Extractive and Landfill Sites	939	0.3	1,232	0.4	293	31.2
Unused Rural and Other Open Lands	4,901	1.8	8,384	3.0	3,483	71.1
Surface Water	3,910	1.4	4,345	1.6	435	11.1
Subtotal	258,446	92.7	245,163	87.9	-13,283	-5.1
Total	278,833	100.0	278,833	100.0	0	0.0

Source: SEWRPC.

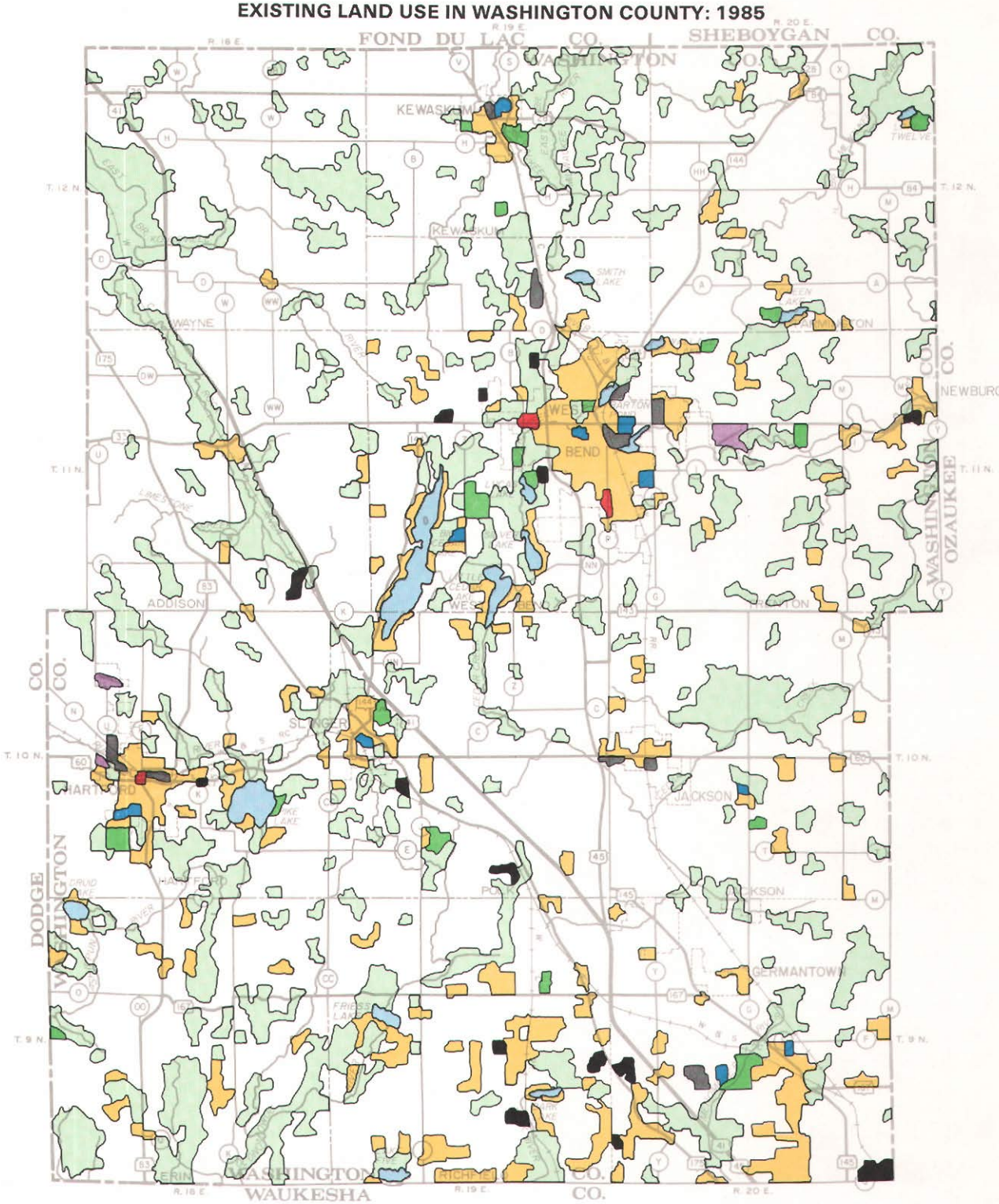
Vegetable crops also constitute an important part of the agricultural base of Washington County. An estimated 4,000 acres were devoted to vegetable crops in 1986, including vegetable crops grown for processing and for fresh market. While historical records regarding vegetable crop production in the County are not available, it is generally agreed that the acreage in vegetable crops has declined somewhat during the past decade.

Soybeans are not a major crop in Washington County. The soybean acreage in the County has increased over the past two decades but remains quite low. Thus, about 2,000 acres of soybeans were harvested in 1986, up from about 250 acres in 1965.

Dairy farming, characterized by traditional crop rotations typically including several years of hay, remains an important part of the agricultural base of Washington County. In 1986 there were 25,100 milk cows in Washington County, about 2,900 cows, or 10 percent, less than in 1965. It should be noted that, in contrast to the modest decline in the number of dairy cows, the number of dairy herds in Washington County decreased substantially, from 1,035 herds in 1965 to 433 in 1986—a decrease of 602 herds, or 58 percent.

Map 8

EXISTING LAND USE IN WASHINGTON COUNTY: 1985



LEGEND

PREDOMINANT LAND USE

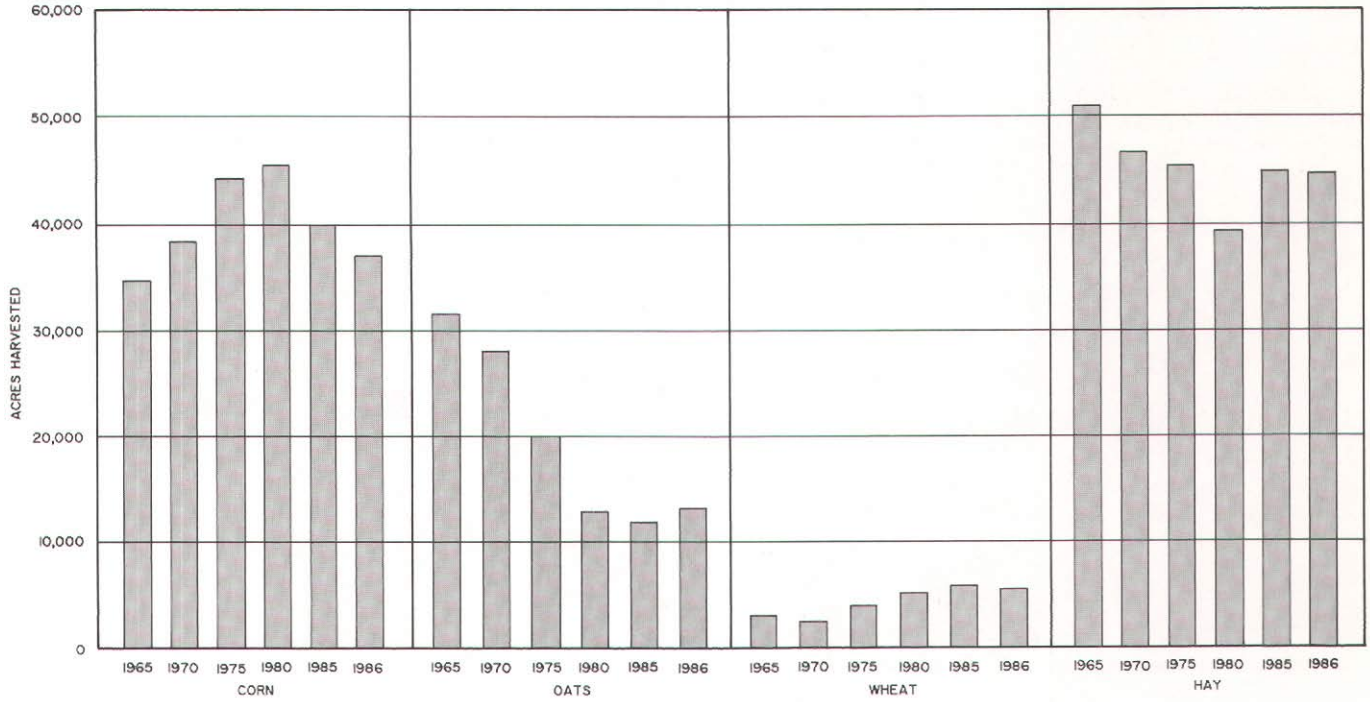
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- EXTRACTIVE AND LANDFILL
- TRANSPORTATION, COMMUNICATION, AND UTILITIES
- GOVERNMENTAL AND INSTITUTIONAL
- RECREATIONAL
- WOODLAND AND WETLAND
- MAJOR LAKE
- AGRICULTURE AND OPEN LAND

GRAPHIC SCALE

Source: SEWRPC.

Figure 3

ACREAGES FOR MAJOR CROPS IN WASHINGTON COUNTY



Source: Wisconsin Agricultural Reporting Service and SEWRPC.

Despite the relative stability in the pattern of agricultural activity for Washington County overall, changes in agricultural activity have been occurring in portions of the County. The southeastern portion of the County, in particular, has experienced a decrease in traditional crop rotations associated with dairy farming and an increase in the acreage devoted to the production of erosion-prone row crops.

CONCLUDING REMARKS

This chapter has described those features of the natural resource base and the man-made environment of Washington County that are important in any consideration of soil erosion problems in the County. Natural resource base features considered in this chapter include the topography, physiography, geology, soils, and surface water resources. Aspects of the man-made environment considered include population, land use, and cropping patterns.

Of particular importance in this chapter are data regarding trends in farming activity in Washington County. With the exception of a decline in land in oats, the acreages for major crops in Washington County—including corn, hay, and wheat—have been relatively stable over the past two decades. Dairy farming, characterized by traditional crop rotations, remains an important part of the agricultural base of the County. Although Washington County overall has not experienced a substantial increase in erosion-prone row crops, such a trend has been occurring within certain areas of the County, particularly the southeastern portion. A countywide inventory and analysis of cropland and related farming practices is required in order to determine the extent to which such practices are resulting in excessive soil erosion, and to identify the areas in which excessive erosion may be occurring. The methodology and findings of such an inventory, conducted in conjunction with the soil erosion control planning program, are described in the next chapter of this report.

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 Washington 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 Washington 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 Washington County, areas covered by soils considered to be highly susceptible to wind erosion encompass about 35,100 acres, or about 13 percent of the total area of the County. These areas include the flat, sandy areas in the Towns of Trenton and Farmington and areas of organic soils throughout the County. About 6,600 acres, or 19 percent of this total, are in agricultural use.

The inventory and analysis work conducted as part of the Washington 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. Any gully and wind erosion problems that may occur in Washington 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 continuously so as to be maintained free of vegetation and surface crusting—with a standard plot length of 72.6 feet and slope of 9 percent;

LS = slope length and steepness factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss expected from a plot 72.6 feet in length, with a slope of 9 percent;

C = vegetative cover factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss from a site in cultivated continuous fallow; and

P = erosion control practice factor, a dimensionless ratio of soil loss expected on the subject field to the soil loss from a site with no erosion control practices.

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

In order to provide perspective on the severity of the soil erosion problem, soil loss as estimated by the universal soil loss equation is often compared to the soil loss tolerance, or "T-value." The term "T-value" refers to the maximum annual average rate of soil loss that can be sustained without impairing the productivity of the soil. T-values have been determined for each soil type by the U. S. Soil Conservation Service. For soils in Washington 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 indicated in Chapter I, the county soil erosion control planning program was undertaken simultaneously with a nonpoint source pollution abatement planning program for the Milwaukee River watershed, referred to as the Milwaukee River Priority Watersheds Program. Inventory data collected for cropland within the Milwaukee River watershed under the priority watersheds program were incorporated directly into the county soil erosion control planning program. Cropland inventory data for portions of the Oconomowoc River watershed, collected as part of a priority watershed program for the Oconomowoc River, were similarly incorporated into the county soil erosion control plan. For the remaining areas of the County—areas for which cropland inventory data were not available from a priority watershed program—inventory data were collected as part of the county soil erosion control planning program, thereby providing a detailed cropland inventory for the entire County, facilitating a countywide analysis of cropland soil erosion.

As part of the aforementioned inventory efforts, each cropland field in Washington County was identified on Regional Planning 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 16,143 cropland fields were identified—having a combined area of about 135,823 acres, or an average of 8.4 acres per field. The data required for application of the universal soil loss equation were developed as described below.

Rainfall Erosion Index (R): The rainfall erosion index is an indicator of the erosive force of rainfall for an area during a normal year. The rainfall index established by the U. S. Soil Conservation Service for Washington County is

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

120, 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 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, the erodibility factor of the predominant soil was assigned.

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 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 Washington 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. For fields having a slope of 4 percent or more, the slope lengths were determined through field inspection. For fields having a slope of less than 4 percent, representative slope lengths for given percent slopes were determined by the Washington County Land Conservation Department and assigned to the fields concerned.

3. An LS-factor was assigned to each field according to its percent slope and slope length, following procedures set forth in the U. S. Soil Conservation Service technical guide.

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 land in continuous hay is 0.004.

For a majority of cropland in the County—including almost all of the cropland in the Milwaukee River watershed—field-specific information regarding crop rotations, tillage practices, and timing of field operations was obtained directly from the farm operator through personal interviews. Where farm operators were not contacted, cropland fields were observed collectively and assumed to have crop rotations typical of the rotations for the surrounding area and to be fall plowed; and conservation practices which affect the C-factor—importantly, conservation tillage—were identified by County Land Conservation Department staff familiar with farming operations in the County. Based upon the information regarding crop rotations, tillage practices, and timing of field operations, a C-factor was assigned to each field in accordance with the U. S. Soil Conservation Service technical guide.

The cropland inventory provided a basis for the quantification of the extent of conservation tillage practices applied in the County. In this regard, the inventory indicated that conservation tillage systems were utilized on 5,923 acres, representing just over 4 percent of all cropland in the County. It should be noted that chisel tillage is not uncommon in Washington County. However, much of the chisel tillage is accomplished without leaving the 30 percent crop residue generally required to be considered conservation tillage.

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."[2] Cropland on which such

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

practices are applied was identified through field inspection. A P-factor value of less than 1.0 was subsequently assigned for each farm field for which such practices were identified, in accordance with the methodology set forth in the U. S. Soil Conservation Service technical guide. In addition to the adjustment of the P-factor for cropland on which such practices were applied in accordance with U. S. Soil Conservation Service standards, the P-factor was also adjusted slightly—that is, reduced slightly below 1.0—for those fields which were farmed substantially on the contour, but which did not fully comply with Soil Conservation Service standards for contour plowing. The balance of cropland fields in the County were assigned a P-factor of 1.0.

With regard to the extent of contour plowing and contour strip-cropping within the County, the inventory indicated that contour plowing was practiced on 1,697 farm fields encompassing 14,665 acres, or about 11 percent of all cropland in the County; and that contour strip-cropping was practiced on 489 fields encompassing 7,067 acres, or about 5 percent of all cropland. Minimal use was made of terracing as a cropland soil erosion control measure.

In addition to the management practices described above, a total of 736 fields encompassing 6,995 acres of cropland, representing about 5 percent of all cropland, were identified in the inventory as being farmed substantially on the contour, although not in full compliance with U. S. Soil Conservation Service standards for contour plowing.

Cropland Soil Erosion Rates

The rate of sheet and rill erosion was calculated for cropland fields in Washington County through application of the universal soil loss equation, using the data developed under the cropland inventory described above. The resulting soil loss rates expressed in tons per acre per year are presented for the County overall, for U. S. Public Land Survey townships, and for U. S. Public Land Survey sections in Tables 3 and 4, and on Map 9. Soil loss rates for watersheds in Washington County are presented in Table 5.

As indicated in Table 3, the average rate of sheet and rill erosion on cropland in Washington County in 1987 was 2.8 tons per acre per year.[3] The soil loss rate was less than 3.0 tons per acre per year on about 96,200 acres of cropland, representing about 71 percent of all cropland. At the other extreme, the soil loss rate was 10 tons per acre per year or more on 3,900 acres, representing about 3 percent of all cropland. As shown on Map 9, there was considerable variation in the rate of cropland soil erosion within the County, with the central and northern areas generally having the highest erosion rates. Relatively high rates also occur in the southeastern-most area of the County. On a watershed basis, the highest loss rate—3.8 tons per acre per year—occurred on cropland within the Menomonee River watershed (see Table 5).

Actual soil loss rates within the County relative to "tolerable" soil loss rates, or "T-value," are presented in Tables 6, 7, and 8 and on Map 10. As indicated in Table 6, for about 106,300 acres of cropland, or about 78 percent of all cropland in Washington County, the soil loss rate was less than or equal to T-value. Conversely, for about 29,600 acres, representing about 22 percent of all

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[3] *The average soil loss rates identified under the county soil erosion control planning program are lower than those identified for a multi-county area that includes Washington County by the U. S. Soil Conservation Service as part of the 1982 National Resources Inventory. 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." Washington County is included in major land resource area 95B, along with all or portions of Calumet, Columbia, Dane, Dodge, Fond du Lac, Green, Green Lake, Jefferson, Kenosha, Manitowoc, Marquette, Milwaukee, Ozaukee, Racine, Rock, Sheboygan, Walworth, Waukesha, Waushara, and Winnebago Counties. The 1982 National Resources Inventory reported an average rate of sheet and rill erosion of 5.6 tons per acre per year for all cropland. For cultivated cropland, excluding horticultural land and hayland, the inventory reported an average rate of sheet and rill erosion of 5.9 tons per acre per year. In addition, the inventory reported a wind erosion rate of 2.1 tons per acre per year for all cropland and 2.2 tons per acre per year for cultivated cropland.*

Table 3

CROPLAND SOIL EROSION RATES IN WASHINGTON COUNTY: 1987

Soil Loss Rate (tons per acre per year)	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
Less than 3.0	11,191	96,222	70.8
3.0 - 3.9	1,522	13,246	9.7
4.0 - 4.9	1,123	9,092	6.7
5.0 - 5.9	678	5,418	4.0
6.0 - 6.9	438	3,345	2.5
7.0 - 7.9	270	2,039	1.5
8.0 - 8.9	213	1,655	1.2
9.0 - 9.9	140	951	0.7
10.0 - 14.9	339	2,408	1.8
15.0 or More	229	1,447	1.1
Total	16,143	135,823	100.0
Average Soil Loss Rate	2.8 Tons/Acre/Year		

Source: Washington County Land Conservation Department and SEWRPC.

cropland, soil erosion was occurring in excess of T-value—including about 19,400 acres, or about 14 percent of all cropland, eroding at rates between 1.1 and 2.0 times T-value; about 6,000 acres, or almost 5 percent, eroding at rates between 2.1 and 3.0 times T-value; and the balance—about 4,200 acres, or about 3 percent—eroding at rates of more than 3.0 times T-value. As shown on Map 10, the highest erosion rates relative to established soil loss tolerances also occurred within the central, northern, and southeastern areas of the County. Among the watersheds in the County, the highest average soil loss rate relative to T-value was also identified for the Menomonee River watershed (see Table 8).

As previously indicated, the primary concern of the county soil erosion control planning program is the reduction of cropland soil erosion in order to ensure the maintenance of soil productivity in the County. The information on soil loss rates presented in this section provides an indication of the nature and extent of cropland soil erosion problems in Washington County, providing a basis for formulating a plan to address those problems. While such estimates of soil loss are

Table 4

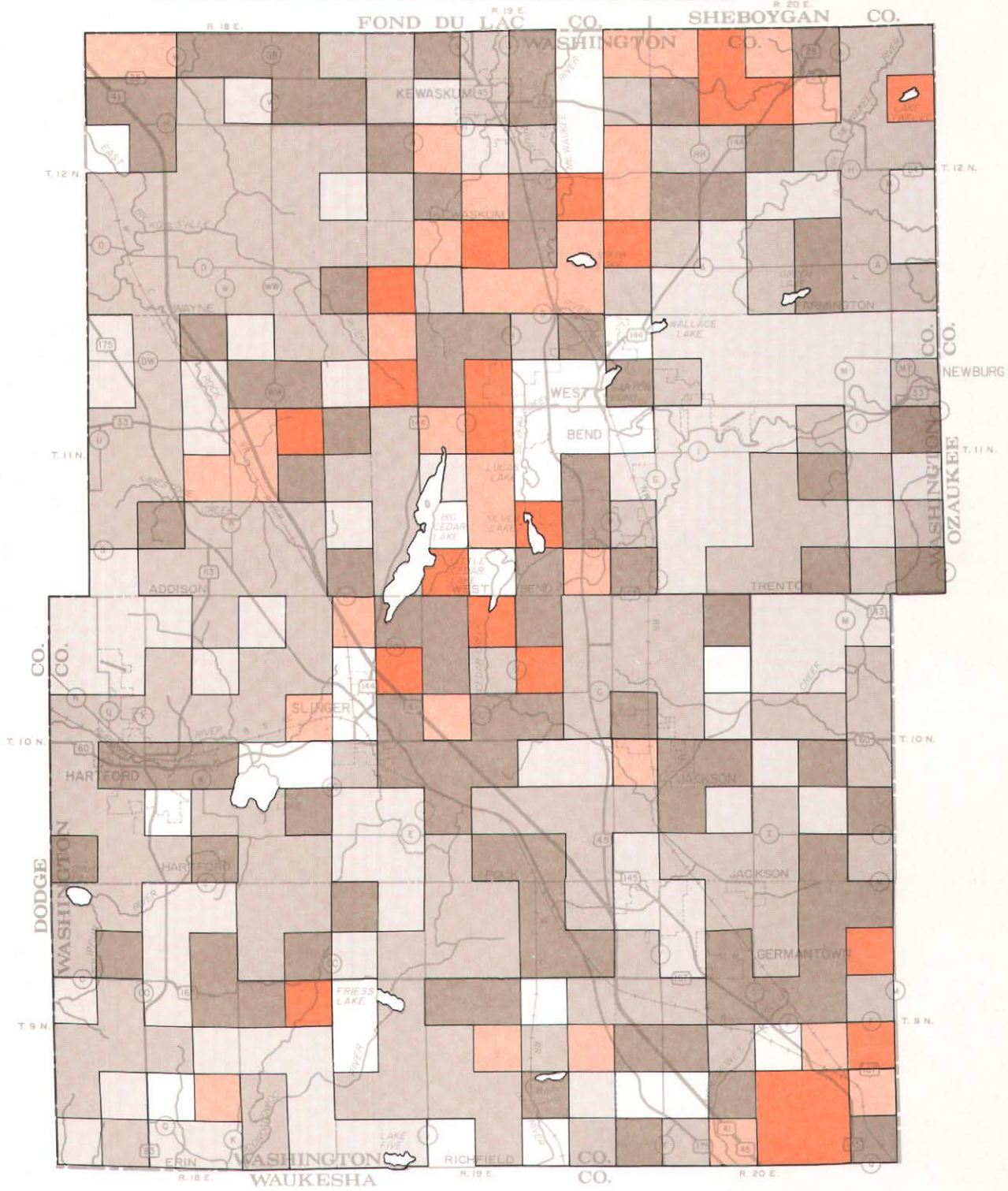
CROPLAND SOIL EROSION RATES IN WASHINGTON COUNTY BY TOWNSHIP: 1987

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 7.0-8.9 Tons/Acre/Year		Cropland Eroding at 9.0 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	Acres	Percent of Total	
9 North, 18 East (Erin)	7,122	78.4	1,333	14.7	355	3.9	127	1.4	145	1.6	9,082	100.0	2.3
9 North, 19 East (Richfield)	7,480	73.8	1,552	15.3	565	5.6	186	1.8	351	3.5	10,134	100.0	2.6
9 North, 20 East (Germantown)	6,294	60.4	1,754	16.8	1,094	10.5	588	5.7	691	6.6	10,421	100.0	3.5
10 North, 18 East (Hartford)	9,564	73.5	2,476	19.0	548	4.2	252	2.0	166	1.3	13,006	100.0	2.3
10 North, 19 East (Polk)	7,690	64.6	2,760	23.2	828	6.9	272	2.3	355	3.0	11,905	100.0	3.0
10 North, 20 East (Jackson)	9,336	72.3	2,394	18.6	908	7.0	124	1.0	144	1.1	12,906	100.0	2.5
11 North, 18 East (Addison)	11,667	72.5	2,447	15.2	974	6.0	460	2.9	546	3.4	16,094	100.0	2.6
11 North, 19 East (Barton-West Bend)	3,956	59.3	1,136	17.0	672	10.1	367	5.5	537	8.1	6,668	100.0	3.9
11 North, 20 East (Trenton)	9,124	84.8	1,039	9.7	239	2.2	221	2.1	130	1.2	10,753	100.0	1.9
12 North, 18 East (Wayne)	8,789	69.4	2,130	16.8	901	7.1	439	3.5	411	3.2	12,670	100.0	2.8
12 North, 19 East (Barton-Kewaskum)	6,720	65.0	1,728	16.7	704	6.8	390	3.8	793	7.7	10,335	100.0	3.7
12 North, 20 East (Farmington)	8,480	71.6	1,589	13.4	975	8.2	268	2.3	537	4.5	11,849	100.0	2.9
Total	96,222	70.8	22,338	16.5	8,763	6.5	3,694	2.7	4,806	3.5	135,823	100.0	2.8

Source: Washington County Land Conservation Department and SEWRPC.

Map 9

CROPLAND SOIL EROSION RATES IN WASHINGTON COUNTY: 1987



LEGEND

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

- LESS THAN 2.0
- 2.0-2.9
- 3.0-3.9
- 4.0-4.9
- 5.0 OR MORE

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

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

Source: Washington County Land Conservation Department and SEWRPC.

Table 5

CROPLAND SOIL EROSION RATES IN WASHINGTON COUNTY BY WATERSHED: 1987

Watershed	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 7.0-8.9 Tons/Acre/Year		Cropland Eroding at 9.0 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	Acres	Percent of Total	
Menomonee River	4,696	55.5	1,590	18.8	1,017	12.0	513	6.0	650	7.7	8,466	100.0	3.8
Milwaukee River Cedar Creek	21,563	70.1	5,640	18.3	2,096	6.8	748	2.4	740	2.4	30,787	100.0	2.7
Milwaukee River East-West Branches	18,098	70.9	3,791	14.8	1,494	5.8	788	3.1	1,370	5.4	25,541	100.0	3.1
Milwaukee River North Branch	8,486	70.7	1,643	13.7	999	8.3	284	2.4	592	4.9	12,004	100.0	3.0
Subtotal	48,147	70.5	11,074	16.2	4,589	6.7	1,820	2.7	2,702	3.9	68,332	100.0	2.9
Rock River													
Ashippun River	3,964	77.2	831	16.2	201	3.9	70	1.4	69	1.3	5,135	100.0	2.3
Bark River	2,154	65.8	671	20.5	201	6.1	82	2.5	166	5.1	3,274	100.0	2.9
Rock River East Branch	18,151	71.1	3,999	15.6	1,679	6.6	834	3.3	875	3.4	25,538	100.0	2.8
Oconomowoc River	10,163	79.2	1,762	13.8	553	4.3	156	1.2	192	1.5	12,826	100.0	2.3
Rubicon River	8,947	73.0	2,411	19.7	523	4.3	219	1.8	152	1.2	12,252	100.0	2.3
Subtotal	43,379	73.5	9,674	16.4	3,157	5.3	1,361	2.3	1,454	2.5	59,025	100.0	2.5
Total	96,222	70.8	22,338	16.5	8,763	6.5	3,694	2.7	4,806	3.5	135,823	100.0	2.8

Source: Washington County Land Conservation Department and SEWRPC.

Table 6

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN WASHINGTON COUNTY: 1987

Soil Loss Rate in Multiples of T-Value	Cropland		
	Number of Fields	Acres	
		Number	Percent of Total
1.0 or Less	12,273	106,261	78.2
1.1 or More:			
1.1 - 1.5	1,500	12,073	8.9
1.6 - 2.0	954	7,345	5.4
2.1 - 3.0	778	5,986	4.4
3.1 - 4.0	277	1,823	1.3
4.1 - 5.0	136	893	0.7
5.1 or More	225	1,442	1.1
Subtotal	3,870	29,562	21.8
Total	16,143	135,823	100.0

Source: Washington County Land Conservation Department and SEWRPC.

adequate for planning for the control of cropland soil erosion in general, for surface water quality management planning, estimates of the amount of eroding soil entering surface waters are needed. Under the Milwaukee River Priority Watersheds Program, the amount of soil entering the surface water network from farm fields in the Milwaukee River watershed will be estimated through the application of a sediment delivery model developed by the Wisconsin Department of Natural Resources. Because of the widespread concern for the impacts of soil erosion on surface water quality, under the county soil erosion control planning program, the Washington County Land Conservation Department developed estimates of sediment delivery to surface waters from farm fields in areas of the County outside the Milwaukee River watershed. The sediment delivery data from the Milwaukee River Priority Watersheds Program available at the time of the preparation of this report, along with the sediment delivery data developed by the Washington County Land

Table 7

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN WASHINGTON COUNTY BY TOWNSHIP: 1987

U. S. Public Land Survey Township	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	
9 North, 18 East (Erin)	7,560	83.2	735	8.1	422	4.7	365	4.0	1,522	16.8	9,082	100.0	0.6
9 North, 19 East (Richfield)	8,235	81.3	913	9.0	403	4.0	583	5.7	1,899	18.7	10,134	100.0	0.7
9 North, 20 East (Germantown)	7,236	69.4	956	9.2	726	7.0	1,503	14.4	3,185	30.6	10,421	100.0	0.9
10 North, 18 East (Hartford)	11,213	86.2	859	6.6	504	3.9	430	3.3	1,793	13.8	13,006	100.0	0.5
10 North, 19 East (Polk)	8,871	74.5	1,404	11.8	824	6.9	806	6.8	3,034	25.5	11,905	100.0	0.8
10 North, 20 East (Jackson)	10,084	78.1	1,445	11.2	884	6.9	493	3.8	2,822	21.9	12,906	100.0	0.6
11 North, 18 East (Addison)	12,881	80.0	1,167	7.3	860	5.3	1,186	7.4	3,213	20.0	16,094	100.0	0.7
11 North, 19 East (Barton-West Bend)	4,535	68.0	775	11.6	460	6.9	898	13.5	2,133	32.0	6,668	100.0	1.0
11 North, 20 East (Trenton)	9,503	88.4	584	5.4	308	2.9	358	3.3	1,250	11.6	10,753	100.0	0.5
12 North, 18 East (Wayne)	9,514	75.1	1,276	10.1	777	6.1	1,103	8.7	3,156	24.9	12,670	100.0	0.8
12 North, 19 East (Barton-Kewaskum)	7,529	72.8	947	9.2	516	5.0	1,343	13.0	2,806	27.2	10,335	100.0	0.9
12 North, 20 East (Farmington)	9,100	76.8	1,012	8.5	661	5.6	1,076	9.1	2,749	23.2	11,849	100.0	0.8
Total	106,261	78.2	12,073	8.9	7,345	5.4	10,144	7.5	29,562	21.8	135,823	100.0	0.7

Source: Washington County Land Conservation Department and SEWRPC.

Table 8

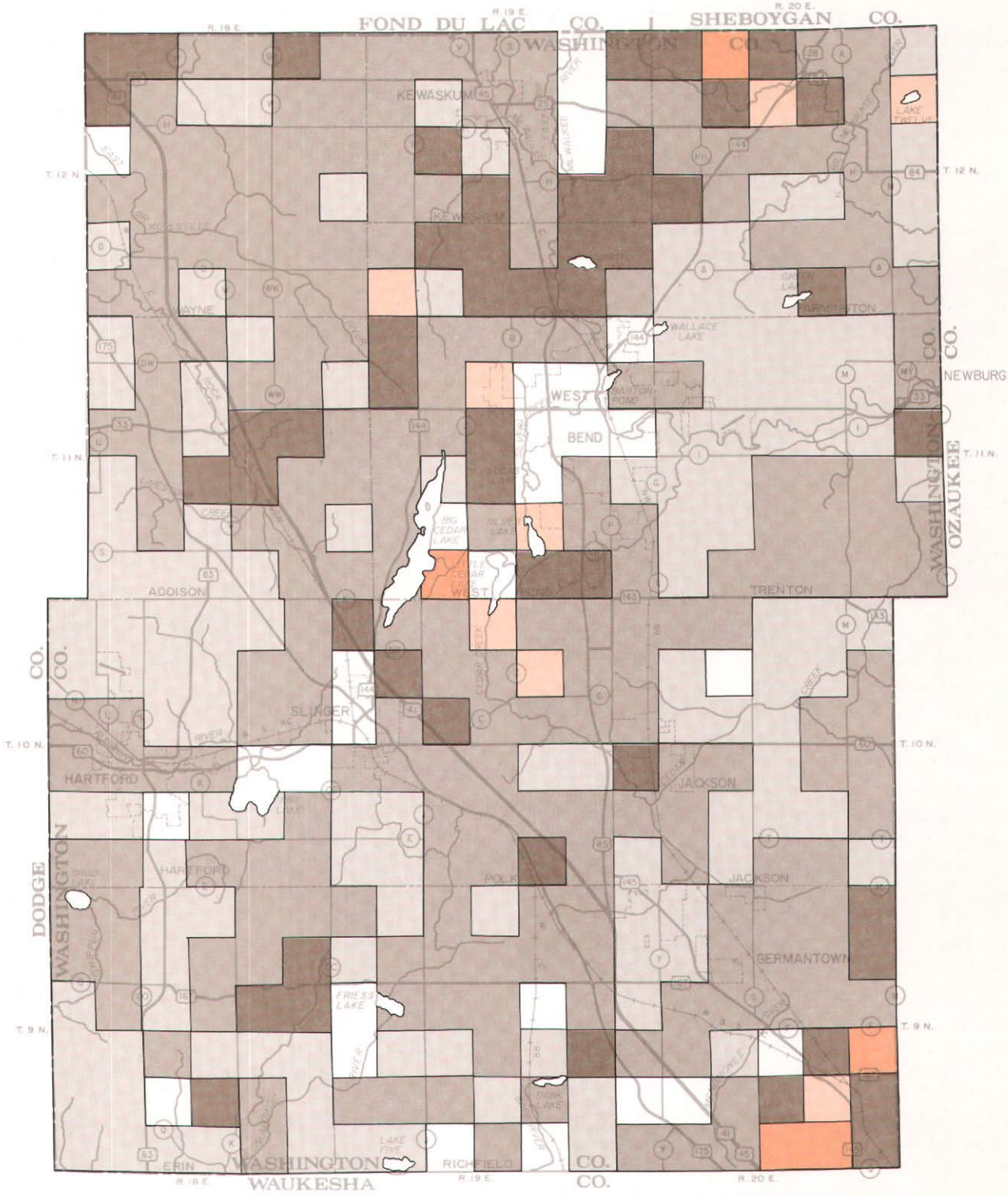
CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN WASHINGTON COUNTY BY WATERSHED: 1987

Watershed	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	
Menomonee River	5,567	65.7	863	10.2	642	7.6	1,394	16.5	2,899	34.3	8,466	100.0	1.0
Milwaukee River													
Cedar Creek	23,348	75.8	3,443	11.2	2,101	6.8	1,895	6.2	7,439	24.2	30,787	100.0	0.7
Milwaukee River East-West Branches	19,855	77.7	2,135	8.4	1,180	4.6	2,371	9.3	5,686	22.3	25,541	100.0	0.8
Milwaukee River North Branch	9,165	76.4	1,059	8.8	636	5.3	1,144	9.5	2,839	23.6	12,004	100.0	0.8
Subtotal	52,368	76.7	6,637	9.7	3,917	5.7	5,410	7.9	15,964	23.3	68,332	100.0	0.8
Rock River													
Ashippun River	4,356	84.8	415	8.1	221	4.3	143	2.8	779	15.2	5,135	100.0	0.6
Bark River	2,659	81.2	266	8.1	134	4.1	215	6.6	615	18.8	3,274	100.0	0.7
Rock River East Branch	19,909	77.9	2,060	8.1	1,500	5.9	2,069	8.1	5,629	22.1	25,538	100.0	0.7
Oconomowoc River	10,892	84.9	929	7.2	508	4.0	497	3.9	1,934	15.1	12,826	100.0	0.6
Rubicon River	10,510	85.8	903	7.4	423	3.4	416	3.4	1,742	14.2	12,252	100.0	0.5
Subtotal	48,326	81.9	4,573	7.7	2,786	4.7	3,340	5.7	10,699	18.1	59,025	100.0	0.6
Total	106,261	78.2	12,073	8.9	7,345	5.4	10,144	7.5	29,562	21.8	135,823	100.0	0.7

Source: Washington County Land Conservation Department and SEWRPC.

Map 10

CROPLAND SOIL EROSION RELATIVE TO T-VALUE IN WASHINGTON COUNTY: 1987



LEGEND

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

- 0.5 TIMES T-VALUE OR LESS
- 0.6 - 1.0 TIMES T-VALUE
- 1.1 - 1.5 TIMES T-VALUE
- 1.6 - 2.0 TIMES T-VALUE
- 2.1 TIMES T-VALUE OR MORE

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

GRAPHIC SCALE

Source: Washington County Land Conservation Department and SEWRPC.

Conservation Department for areas of the County outside the Milwaukee River watershed, are presented in Appendix A.

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 required for an analysis of soil erosion rates on pastureland and grazed woodlands were collected as part of the inventory efforts conducted under the Milwaukee River Priority Watersheds Program, Oconomowoc River Priority Watershed Program, and county soil erosion control planning program. A total of 4,224 acres of pastureland and grazed woodlands were identified under those inventories in Washington County. Application of the universal soil loss equation indicated that the average rate of sheet and rill erosion on those lands was 1.8 tons per acre per year. In relative terms, the average soil loss rate on such lands was 0.4 times T-value. A total of 468 acres, representing 11 percent of all pastureland and grazed woodlands in the County, was eroding at rates exceeding T-value—including 213 acres, or 5 percent, eroding at between 1.1 and 2.0 times T-value and 255 acres, or 6 percent, eroding at more than 2.0 times T-value. It is envisioned that the detailed farm planning activities required to address the cropland soil erosion problems identified in this report will also address any apparent erosion problems on pastureland and grazed woodlands.

Stream Bank Erosion

Erosion of stream banks in rural areas may be promoted by livestock disturbance, cropping activity immediately adjacent to a stream, and certain recreational activities. Increased stormwater runoff from urbanizing areas may also contribute to increased stream bank erosion in downstream rural areas. Although a countywide 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 in rural areas.

It should be noted that analyses of stream bank erosion within the Milwaukee River East-West Branches watershed in Washington County, conducted under the Milwaukee River Priority Watersheds Program, indicated that stream bank erosion may be a more serious problem in urban portions than in rural portions of the watershed. Stream bank erosion problems in those urban areas is exacerbated by increased stormwater runoff and disturbance of natural drainage patterns.

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, increased runoff from impervious pavements, building roofs, and compacted soil at the developed site may cause erosion on adjacent lands and may increase the potential for flooding.

Soil erosion rates attendant to construction activities are extremely variable. The amount of erosion depends upon the time period and areal extent of the construction operation; the topography of the site; the soil characteristics; the construction methods utilized; and the preventive 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, Washington County has experienced a substantial increase in lands devoted to intensive urban uses. Such lands increased by about 13,300 acres, or 65 percent, between 1963 and 1985, with residential lands accounting for about 8,700 acres, or about 65 percent, of the total increase. A total of 7,799 residential lots were platted during this time period, an average of 355 lots per year. From 1985 through 1987, a total of 694 residential lots were platted, an average of 231 lots per year. Within Washington County, urban land development—and the attendant potential for construc-

tion site erosion—has occurred both within expanding urban centers and within isolated enclaves in outlying areas of the County (see Map 8 in Chapter II).

Soil erosion from construction sites can be minimized through the application of appropriate erosion control measures. Local units of government may enact regulations requiring that such measures be applied to lands under development. Existing regulatory authority for the control of construction site erosion is described in Chapter VI of this report.

CONCLUDING REMARKS

This chapter has described the methodology and findings of an inventory and analysis of cropland soil erosion in Washington County. That work indicated that the average rate of sheet and rill erosion on cropland in Washington County was 2.8 tons per acre per year in 1987. The soil loss rate was less than 3.0 tons per acre per year on about 92,600 acres of cropland, or about 71 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 3,900 acres, representing about 3 percent of all cropland. About 29,600 acres, or 22 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 19,400 acres, or 14 percent of all cropland, was eroding at rates between 1.1 and 2.0 times T-value; about 6,000 acres, or almost 5 percent, was eroding at rates between 2.1 and 3.0 times T-value; and the balance—about 4,200 acres, or about 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 central, northern, and southeastern areas generally having the highest erosion rates. Subsequent chapters of this report establish a cropland soil erosion control objective and related standards and set forth a plan for the abatement of the identified cropland soil erosion problems.

Pastureland and grazed woodlands are susceptible to excessive erosion under certain circumstances, particularly when overgrazing occurs on steep slopes. The average rate of soil erosion on pastureland and grazed woodlands in Washington County was 1.8 tons per acre per year. In relative terms, the average soil loss rate on such lands was 0.4 times T-value. A total of 468 acres, representing 11 percent of all pastureland and grazed woodlands in the County, was eroding at rates exceeding T-value. It is envisioned that the detailed farm planning activities required to address the cropland soil erosion problems identified in this report will also address erosion problems on pastureland and grazed woodlands. It is further envisioned that stream bank erosion problems in rural areas will also be identified and addressed as part of the detailed farm planning activities.

This chapter has also pointed out the potential for serious construction site erosion problems as Washington 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. Local units of government may enact regulations requiring that such measures be applied to lands under development. Existing regulatory authority for the control of construction site erosion is described in Chapter VI.

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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 control objective for Washington County, together with a supporting principle and related standards, all as recommended for adoption by the Technical Advisory Committee as part of the county soil erosion control plan.[1]

BACKGROUND

Central to the formulation of cropland soil erosion objectives and standards is a consideration of what constitutes excessive erosion. Traditionally in conservation planning, excessive erosion has been defined as erosion in excess of the specific soil loss tolerance for a given soil. A soil loss tolerance, or "T-value," has been established by the U. S. Soil Conservation Service for each soil type. Soil loss tolerance is defined by the Soil Conservation Service as the maximum level of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely. Considered in the establishment of soil loss tolerances, or T-values, are soil depth, including depth to a restrictive layer, permeability, and other factors. For soils in Washington 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 Washington 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 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 Washington County would contribute significantly to the abatement of such offsite problems.

Some conservationists argue for more aggressive control of cropland erosion, calling for the

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[1] *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.*

prevention of all "accelerated" erosion. Accelerated erosion refers to erosion induced by man, as opposed to "normal" erosion caused by geological processes under natural environmental conditions. This position was espoused by the Ad Hoc Committee on Land Resources, created by the Wisconsin Chapter of the Soil and Water Conservation Society, in a report entitled "Soil Conservation Policies for the 1980's."[2] That report notes that soil productivity in terms of crop yield is declining 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 9. It should be noted that the standards set forth in Table 9 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.

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

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

- That despite their limitations, soil loss tolerances, or T-values, established by the U. S. Soil Conservation Service, currently provide the best available basis for establishing cropland soil erosion control 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 Washington 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 given the amount of cropland—about 29,600 acres, or about 22 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 in certain areas of the County, the reduction of soil loss to tolerable levels throughout the County by the year 2000 represents a major challenge to the County's farmers. Such a reduction in soil loss also represents a major challenge to the public agency staff responsible for helping farmers in that effort—expansion of public agency staff being difficult when units of government at all levels are more than ever required to exercise fiscal restraint.

- That in the long term, the County may support modifying erosion control objectives and standards to address sediment delivery to water resources, as warranted by continuing erosion research.

Table 9

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

SOIL EROSION CONTROL PRACTICE NEEDS

A variety of conservation practices are available to farmers for the control of cropland soil erosion. These practices range from structural approaches, such as the installation of terraces and the construction of grassed waterways, to management approaches, such as conservation tillage and contour plowing. An important objective of the county soil erosion control planning program was the identification of those practices which would be most effective in addressing the soil erosion problems identified within the County. This chapter describes the major types of erosion control practices that are available, and identifies the types and amounts of such practices believed to have the greatest potential for reducing cropland soil erosion to tolerable levels in Washington County. This chapter also sets forth a rank ordering of areas of the County based upon the severity of the erosion problem and the need for erosion control practices.

DESCRIPTION OF SOIL EROSION CONTROL PRACTICES

The major conservation practices that may be utilized in efforts to control cropland soil erosion include conservation tillage, changes in crop rotations, contouring, contour strip-cropping, terraces, grassed waterways, cover crops, grade stabilization structures, field diversions, and establishment of permanent vegetative cover. A description of those practices is presented in this section.

Conservation Tillage

The term conservation tillage refers to any tillage and planting system that maintains a crop residue on at least 30 percent of the soil surface after planting to reduce soil erosion by water.[1] There are many 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.

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 4. 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.

Under no-till systems, the soil is left essentially undisturbed from harvesting through planting (see Figure 5). 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 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 10.

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 11). The

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[1] *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.*

Figure 4

CHISEL TILLAGE

Source: Racine County Land Conservation Office.

Figure 5

NO-TILL PLANTING

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

Table 10

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.

Table 11

ESTIMATED EFFECTIVENESS OF EROSION CONTROL PRACTICES

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

[a] *In comparison to soil loss assuming continuous corn and moldboard plowing up and down the slope.*

[b] *Depends upon type and sequence of crops grown.*

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

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.

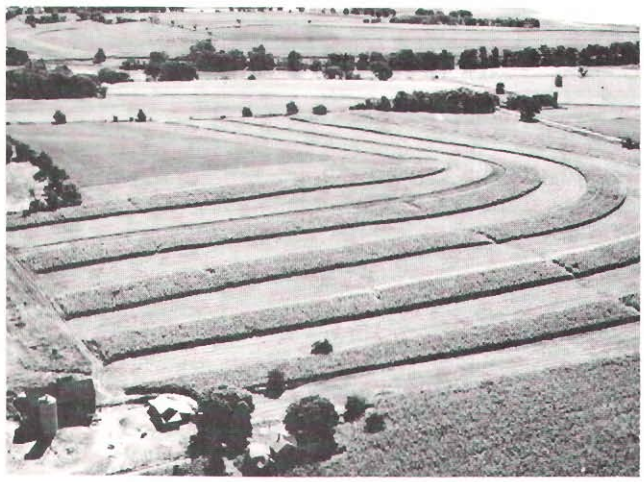
Contouring provides erosion control for storms with up to moderate levels of rainfall, with the greatest effectiveness provided on slopes of 3 to 8 percent. It should be noted, however, that where fields have short slopes that break in several directions, following the contour may be impractical or altogether impossible. Moreover, when slopes are very long, contouring may not provide effective erosion control unless combined with other practices, such as conservation tillage or terraces.

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 6). High-quality hay strips 80 to 100 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 established—reduce soil loss to about half of the average for the same rotation contour

Figure 6

CONTOUR STRIP-CROPPING



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

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 of 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. Terraces are also used to reduce runoff in areas where gully erosion is a problem.

The most common types of terraces used in southeastern Wisconsin are the farmable terrace, also referred to as a broad-base 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 7).

The vegetated ridge terrace is used on steeper land. The ridges of this type of terrace system have steep front and/or back slopes. The ridges are not farmable and are maintained in erosion-resistant vegetation (see Figure 8). The channels may also remain in permanent vegetation depending on the type of outlet provided.

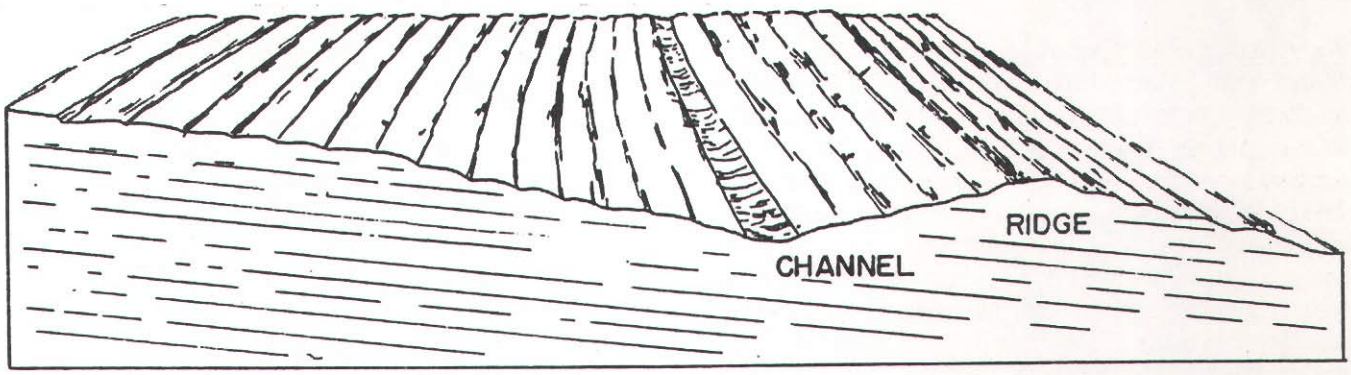
Terraces may use underground outlets or channels to collect and transport runoff water from the field.

Grassed Waterways

Grassed waterways and outlets are natural drainageways or constructed channels shaped to required dimensions and maintained in erosion-resistant perennial vegetation (see Figure 9). Grassed waterways collect and transport runoff water from fields, diversions, terraces, or other structures. A grassed-lined waterway prevents gully erosion in concentrated flow areas 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.

Figure 7

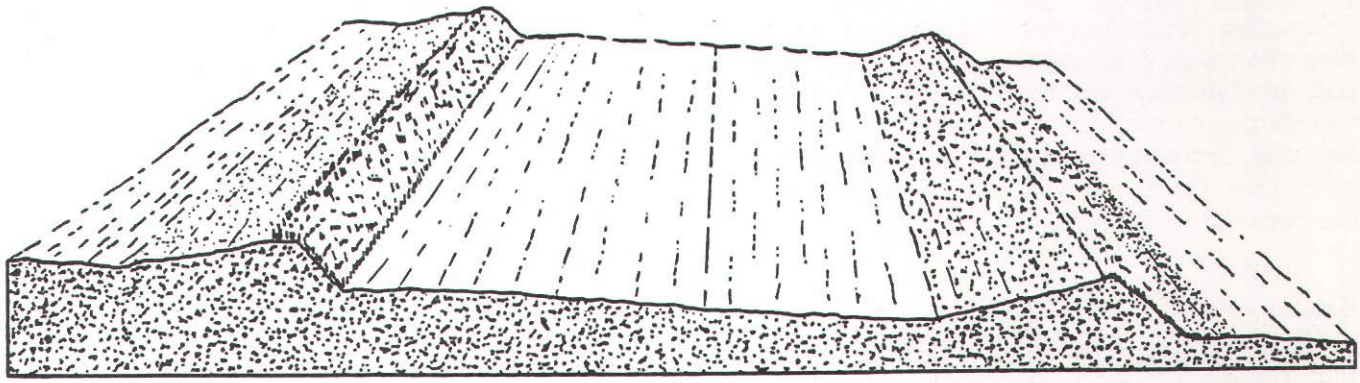
FARMABLE TERRACE



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

Figure 8

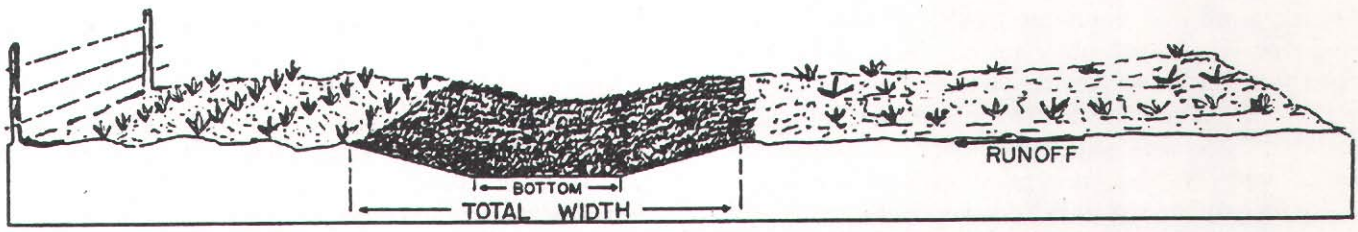
VEGETATED RIDGE TERRACE



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

Figure 9

GRASSED WATERWAY



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

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

Water and Grade Control Structures

Water and grade control structures include drop spillways, box inlets, chute spillways, pipe drop inlets, debris basins, ponds, and other grade control structures. These structures are primarily designed to reduce gully erosion and supplement vegetative practices by reducing the grade in watercourses, reducing the velocity of flowing water, storing water, trapping sediment, reducing peak water flows, and providing surface water inlets to ditches.

Diversions

A diversion is an individually designed graded channel with the supporting ridge on the lower side constructed across the slope. For erosion control purposes, diversions can be used to divert runoff from upslope areas to a stable outlet.

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.

EROSION CONTROL PRACTICE NEEDS

Analysis Procedures

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 Washington County. This systems level planning required the establishment of a general ordering of conservation practices for assignment to excessively eroding farm fields. Based upon consultation with the Washington County Land Conservation Department and the U. S. Soil Conservation Service staffs, a sequence of management practices was identified for fields which can be farmed on the contour and for fields which cannot (see Table 12). For "contourable" fields, slightly different practice sequences were developed for fields with hay in the rotation and for fields without hay in the rotation. In this regard, for contourable fields with hay in the rotation, a rotation change was given precedence over contour plowing in the practice sequence. For contourable fields without hay in the rotation, contour plowing was given precedence over a change in rotation.

Under the systems level analysis of erosion control practice needs, a specific erosion control practice or set of practices was assigned to each farm field which had been identified as experiencing excessive soil erosion—that is, erosion in excess of T-value. From the appropriate sequence in Table 12, fields were assigned the first practice or combination of practices which would have the effect of reducing soil loss to T-value. The effectiveness of the various practices or combination of practices was determined through repeated application of the universal soil loss equation.

With the exception of information regarding the potential for farming on the contour, the data required for this systems level analysis were available on a field-by-field basis, having been collected under the cropland inventories described in Chapter III. In lieu of field-specific information regarding the potential for farming on the contour, a sample of excessively eroding farm fields in each U. S. Public Land Survey township was evaluated in terms of their "contourability" through a review of topographic maps and aerial photographs, as well as field inspection, where necessary. Based upon that sample analysis, the percentage of excessively eroding fields which could be farmed on the contour was estimated for each township (see Table 13). In the process of assigning erosion control practices, a corresponding percentage of excessively eroding farm fields in each township was assumed to be contourable.

It should be noted that 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 Washington County. As discussed in more detail later in this report, detailed conservation plans should be prepared for all farms with excessively eroding cropland. It is not intended that the ordering set forth in Table 12 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.

Table 12

PRACTICE APPLICATION SEQUENCE USED IN SYSTEMS LEVEL DETERMINATION OF SOIL EROSION CONTROL PRACTICE NEEDS IN WASHINGTON COUNTY

Contourable Fields		Noncontourable Fields	
Practice or Combination of Practices	Application Order	Practice or Combination of Practices	Application Order
Conventional Tillage		Conventional Tillage	
Basic Rotation Change/Contour Plowing	1-2[a]	Basic Rotation Change	1
Basic Rotation Change and Contour Plowing	3		
Contour Strip-cropping	4	Conservation Tillage—30 Percent Residue	
Basic Rotation Change and Contour Strip-cropping	5	Conservation Tillage Alone	2
		Conservation Tillage and Basic Rotation Change	3
Conservation Tillage—30 Percent Residue			
Conservation Tillage Alone	6	Conservation Tillage—50 Percent Residue	
Conservation Tillage Combined with Other Practices:		Conservation Tillage Alone	4
Basic Rotation Change/Contour Plowing	7-8[a]	Conservation Tillage and Basic Rotation Change	5
Basic Rotation Change and Contour Plowing	9	Conservation Tillage and Major Rotation Change	6
Contour Strip-cropping	10		
Basic Rotation Change and Contour Strip-cropping	11	Permanent Vegetative Cover	7
Conservation Tillage—50 Percent Residue			
Conservation Tillage Alone	12		
Conservation Tillage Combined with Other Practices:			
Basic Rotation Change/Contour Plowing	13-14[a]		
Basic Rotation Change and Contour Plowing	15		
Contour Strip-cropping	16		
Basic Rotation Change and Contour Strip-cropping	17		
Permanent Vegetative Cover	18		

NOTES: For purposes of this report, a "basic" rotation change involves 1) adding one year of hay or dropping one year of row crop for fields with hay in the rotation; or 2) adding one year of small grain every fourth year for fields without hay in the rotation. A "major" rotation change involves 1) adding two years of hay or dropping two years of row crop for fields with hay in the rotation; or 2) adding a year of small grain every third year for fields without hay in the rotation.

For fields with no hay in the rotation, contour strip-cropping could involve contour strip-cropping with alternate strips of row crops and small grain, or contour buffer strip-cropping with narrow protective strips alternated with wide cultivated strips. For purposes of this systems level analysis, P-factor values for contour buffer strip-cropping were assumed.

[a]*For contourable fields with hay in the rotation, a basic rotation change would be tried first, followed by contour plowing. For contourable fields without hay in the rotation, contour plowing would be tried first, followed by a basic rotation change.*

Source: Washington County Land Conservation Department and SEWRPC.

Identified Erosion Control Practice Needs

The types and amounts of erosion control practices needed to reduce cropland soil erosion to tolerable levels, identified through the systems level analysis described above, are set forth in Table 14. In general, the analysis indicated the following:

- That 15,527 acres, representing about 53 percent of the excessively eroding cropland in the County, would be able to be treated through management practices involving conventional moldboard plowing—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.[2]

- That 7,531 acres, representing just over 25 percent of the excessively eroding cropland in the County, would require conservation tillage systems—typically involving fall chisel and spring disking—leaving at least 30 percent of the soil surface covered by crop residue after planting. Of that total, 1,091 acres would be treated through conservation tillage alone, while 6,440 acres would be treated through conservation tillage in conjunction with other practices—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.

- That 3,917 acres, representing about 13 percent of the excessively eroding cropland in

[2]*For purposes of this report, a "basic" rotation change involves 1) adding one year of hay or dropping one year of row crop for fields with hay in the rotation; or 2) adding one year of small grain every fourth year for fields without hay in the rotation. A "major" rotation change involves 1) adding two years of hay or dropping two years of row crop for fields with hay in the rotation; or 2) adding a year of small grain every third year for fields without hay in the rotation.*

Table 13

ESTIMATED PERCENTAGE OF EXCESSIVELY ERODING CROPLAND THAT CAN BE FARMED ON THE CONTOUR BY TOWNSHIP IN WASHINGTON COUNTY

U. S. Public Land Survey Township	Estimated Percentage of Excessively Eroding Cropland That Can be Farmed on the Contour
9 North, 18 East (Erin)	44
9 North, 19 East (Richfield)	58
9 North, 20 East (Germantown)	47
10 North, 18 East (Hartford)	25
10 North, 19 East (Polk)	38
10 North, 20 East (Jackson)	83
11 North, 18 East (Addison)	25
11 North, 19 East (Barton-West Bend)	14
11 North, 20 East (Trenton)	18
12 North, 18 East (Wayne)	48
12 North, 19 East (Barton-Kewaskum)	45
12 North, 20 East (Farmington)	50

Source: Washington County Land Conservation Department and SEWRPC.

the County, would require conservation tillage systems leaving at least 50 percent of the soil surface covered by crop residue after planting. These lands would also require other practices—particularly changes in rotation—to reduce soil loss to tolerable levels. In this regard, 1,601 acres would require a basic rotation change, while 2,316 acres would require a major rotation change.

- That 2,587 acres, representing about 9 percent of the excessively eroding cropland in the County, would be retired from production and placed in permanent vegetative cover owing to the steepness of slope or highly erodible nature of the soil. This acreage represents about 2 percent of all cropland in the County.

In order to provide further insight into the nature of erosion control practices needed in Washington County, the erosion control practice needs identified under the erosion control planning program are summarized in Table 15 according to whether or not they involve farming on the contour. As indicated in Table 15, a total of 9,048 acres, representing about 31 percent of the excessively eroding cropland in the County, would be treated through practices involving farming on the contour—either contour plowing or contour strip-cropping. This includes 5,860 acres which would be treated through contour cropping or contour strip-cropping alone, and 3,188 acres which would be treated through contour cropping or contour strip-cropping in conjunction with other practices, including basic rotation changes or conservation tillage.

In addition to the practices required to reduce sheet and rill erosion to tolerable levels as described above, other practices—including terraces, grade stabilization structures, grassed waterways, and field diversions—will be needed to address erosion problems in certain situations. The amounts of such practices required in Washington County have been estimated by the County Land Conservation Department based upon its experience in conservation planning in the County. Those estimates indicate a need for a total of 165,000 feet of grassed waterways, 55,000 feet of field diversions, 16,000 feet of terraces, and 30 grade stabilization structures. These measures are needed primarily for the control of gully erosion.

Environmental Considerations with Conservation Tillage Systems: The reliance on conservation tillage as one of the major methods to reduce cropland soil erosion in Washington County requires a related effort to judiciously manage agri-chemical inputs. 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).

Table 14

ESTIMATED SOIL EROSION CONTROL PRACTICE NEEDS—IN GENERAL ORDER OF APPLICATION SEQUENCE—FOR CROPLAND HAVING A SOIL LOSS RATE GREATER THAN T-VALUE IN WASHINGTON COUNTY

Conservation Practice	Contourable Fields		Noncontourable Fields		Total	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Conventional Tillage						
Basic Rotation Change	2,958	23.6	4,340	25.5	7,298	24.7
Contour Plowing	4,547	36.2	0	--	4,547	15.4
Basic Rotation Change and Contour Plowing	1,886	15.0	0	--	1,886	6.4
Contour Strip-cropping	1,313	10.5	0	--	1,313	4.4
Basic Rotation Change and Contour Strip-cropping	483	3.9	0	--	483	1.6
Subtotal	11,187	89.2	4,340	25.5	15,527	52.5
Conservation Tillage—30 Percent Residue						
Conservation Tillage Alone	0	--	1,091	6.4	1,091	3.7
Conservation Tillage Combined with Other Practices:						
Basic Rotation Change	95	0.8	5,622	33.0	5,717	19.3
Contour Plowing	162	1.3	0	--	162	0.6
Basic Rotation Change and Contour Plowing	37	0.3	0	--	37	0.1
Contour Strip-cropping	85	0.7	0	--	85	0.3
Basic Rotation Change and Contour Strip-cropping	439	3.5	0	--	439	1.5
Subtotal	818	6.6	6,713	39.4	7,531	25.5
Conservation Tillage—50 Percent Residue						
Conservation Tillage Alone	0	--	0	--	0	--
Conservation Tillage Combined with Other Practices:						
Basic Rotation Change	29	0.2	1,476	8.7	1,505	5.1
Contour Plowing	0	--	0	--	0	--
Basic Rotation Change and Contour Plowing	5	--[a]	0	--	5	--[a]
Contour Strip-cropping	0	--	0	--	0	--
Basic Rotation Change and Contour Strip-cropping	91	0.7	0	--	91	0.3
Major Rotation Change	0	--	2,316	13.6	2,316	7.8
Subtotal	125	0.9	3,792	22.3	3,917	13.2
Permanent Vegetative Cover[b]	418	3.3	2,169	12.8	2,587	8.8
Total	12,548	100.0	17,014	100.0	29,562	100.0

[a] *Less than 0.1 percent.*

[b] *As an alternative to retiring cropland from production entirely, farmers could resort to "extreme" rotation changes which would not include any row crops whatsoever.*

Source: Washington County Land Conservation Department and SEWRPC.

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

Table 15

ESTIMATED SOIL EROSION CONTROL PRACTICE NEEDS—CHARACTERIZED BY WHETHER OR NOT THEY INVOLVE FARMING ON THE CONTOUR—FOR CROPLAND HAVING A SOIL LOSS RATE GREATER THAN T-VALUE IN WASHINGTON COUNTY

Conservation Practice	Fields with Hay in the Rotation		Fields Without Hay in the Rotation		Total	
	Acres	Percent of Total	Acres	Percent of Total	Acres	Percent of Total
Practices Involving Farming on the Contour						
Contour Plowing Alone	2,754	11.7	1,793	30.2	4,547	15.4
Contour Plowing Combined with Other Practices:						
Basic Rotation Change	1,509	6.4	377	6.4	1,886	6.4
Conservation Tillage (30 percent residue)	0	--	162	2.7	162	0.6
Basic Rotation Change and Conservation Tillage (30 percent residue)	9	--[a]	28	0.5	37	0.1
Conservation Tillage (50 percent residue)	0	--	0	--	0	--
Basic Rotation Change and Conservation Tillage (50 percent residue)	0	--	5	0.1	5	--[a]
Contour Strip-cropping Alone	1,191	5.0	122	2.1	1,313	4.4
Contour Strip-cropping Combined with Other Practices:						
Basic Rotation Change	351	1.5	132	2.2	483	1.6
Conservation Tillage (30 percent residue)	0	--	85	1.4	85	0.3
Basic Rotation Change and Conservation Tillage (30 percent residue)	410	1.7	29	0.5	439	1.5
Conservation Tillage (50 percent residue)	0	--	0	--	0	--
Basic Rotation Change and Conservation Tillage (50 percent residue)	60	0.3	31	0.5	91	0.3
Subtotal	6,284	26.6	2,764	46.6	9,048	30.6
Practices Not Involving Farming on the Contour						
Basic Rotation Change	6,961	29.4	337	5.7	7,298	24.7
Conservation Tillage (30 percent residue)	0	--	1,091	18.4	1,091	3.7
Basic Rotation Change and Conservation Tillage (30 percent residue)	5,026	21.3	691	11.7	5,717	19.3
Conservation Tillage (50 percent residue)	0	--	0	--	0	--
Basic Rotation Change and Conservation Tillage (50 percent residue)	1,180	5.0	325	5.5	1,505	5.1
Major Rotation Change and Conservation Tillage (50 percent residue)	2,029	8.6	287	4.8	2,316	7.8
Subtotal	15,196	64.3	2,731	46.1	17,927	60.6
Permanent Vegetative Cover	2,156	9.1	431	7.3	2,587	8.8
Total	23,636	100.0	5,926	100.0	29,562	100.0

[a]*Less than 0.1 percent.*

Source: Washington County Land Conservation Department and SEWRPC.

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.

Table 16

COSTS OF SELECTED CROPLAND EROSION CONTROL PRACTICES REQUIRED IN WASHINGTON COUNTY

Erosion Control Practice	Unit Cost	Units Needed	Total Cost
Grassed Waterways	$2.50/foot	165,000 feet	$412,500
Grade Stabilization Structures	1,500/structure	30 structures	45,000
Field Diversions	2.50/foot	55,000 feet	137,500
Terraces	3.50/foot	16,000 feet	56,000
Permanent Vegetative Cover	65/acre	2,587 acres	168,200
Obstruction Removed Attendant to Farming on the Contour	3.00/foot	26,000 feet	78,000

NOTE: Unit costs are average costs for Washington County, expressed in 1988 dollars.

Source: Washington County Land Conservation Department and SEWRPC.

Reduced use of chemical fertilizers and pesticides is one aspect of a comprehensive approach to farming referred to as "sustainable agriculture." While the definition of this term is still evolving, it generally includes a reduction in the use of nonrenewable resources, including oil-based products; and a shift to the use of resources already available on the farm, away from purchased inputs. Sustainable agriculture seeks to minimize adverse environmental impacts both on the farm and on surrounding areas, and at the same time to provide a sustained level of production and profit from the farm operation. It should be noted that grants in support of sustainable agriculture demonstration projects are available in Wisconsin under a program administered by the Wisconsin Department of Agriculture, Trade and Consumer Protection.

Costs of Recommended Practices

Of the various soil erosion control practices described above, implementation costs may be readily estimated for grassed waterways, grade stabilization structures, field diversions, terraces, and establishment of permanent vegetative cover. In addition, costs attendant to obstruction removal as part of efforts to shift to farming on the contour may also be estimated. The costs of implementing these practices—excluding amounts required for design—are set forth in Table 16.[3] As indicated in that table, the estimated costs include $412,500 for grassed waterways; $45,000 for grade stabilization structures; $137,500 for field diversions; $56,000 for terraces; $168,200 for the establishment of permanent vegetative cover; and $78,000 for obstruction removal associated with efforts to farm on the contour.

The costs of other conservation practices—including the cost of shifting to conservation tillage, the cost of implementing rotation changes, and the cost of contour plowing or contour strip-cropping in addition to obstruction removal—are far more difficult to specify. With regard to conservation tillage, for example, net return to the farmer may 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 may be positively affected by lower fuel consumption and lower operation and maintenance costs because conservation tillage systems involve fewer tillage operations. Moreover, in the long term, net return may be positively affected owing to the maintenance of natural soil productivity. The impacts on net return of shifting from conventional to conservation tillage may be expected to vary from farm to farm, depending

[3]*Design is normally done by public agency staff—in particular, the U. S. Soil Conservation Service and County Land Conservation Department. The staff effort required for design for the recommended soil erosion control practices is taken into account in the public agency staff requirements set forth in Chapter VII.*

Table 17

CRITERIA FOR THE GROUPING AND RANKING OF U. S. PUBLIC LAND SURVEY SECTIONS ACCORDING TO THEIR RELATIVE NEED FOR EROSION CONTROL PRACTICES

Area	Criteria
A	U. S. Public Land Survey sections having an average soil loss rate of greater than or equal to T-value and at least 75 acres of cropland with a soil loss rate exceeding T-value
B	Other U. S. Public Land Survey sections having at least 75 acres of cropland with a soil loss rate exceeding T-value
C	U. S. Public Land Survey sections having 40-74 acres of cropland with a soil loss rate exceeding T-value
D	U. S. Public Land Survey sections having 1 to 39 acres of cropland with a soil loss rate exceeding T-value

Source: Washington County Land Conservation Department and SEWRPC.

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.

RANK ORDERING OF AREAS IN TERMS OF EROSION CONTROL PRACTICE NEEDS

As indicated in Chapter III, there is considerable variation in the severity of erosion problems, and accordingly in the need for erosion control practices, within Washington County. In order to provide insight into the relative need for soil erosion control practices within the County, U. S. Public Land Survey sections, each approximating 640 acres in area, have been grouped into four categories based on the average soil loss rate and the amount of excessively eroding cropland. The specific criteria for grouping and ranking U. S. Public Land Survey sections are set forth in Table 17. The relative ranking of each section, based on those criteria, is shown on Map 11. Summary information for each of the four areas is presented in Table 18.

As indicated in Table 18, Area A—the area having the greatest need for cropland soil erosion control practices—includes 69 U. S. Public Land Survey sections, which together encompass about 22,043 acres of cropland. On the average, cropland in Area A was found to be eroding at 1.3 times T-value, and about 10,219 acres, or about 46 percent of all cropland in the 69 sections concerned, was found to be eroding at rates exceeding T-value. Conversely, Area D—the area having the least need for cropland soil erosion control practices—includes 133 U. S. Public Land Survey sections, which together encompass about 34,783 acres of cropland. On the average, cropland in Area D was found to be eroding at 0.5 times T-value, and about 2,775 acres, or about 8 percent of the cropland in the 133 sections concerned, was found to be eroding at rates exceeding T-value.

CONCLUDING REMARKS

This chapter has described the major types of conservation practices available for the control of cropland soil erosion problems, and has identified those practices believed to have the greatest potential for reducing cropland soil erosion to tolerable levels in Washington County. This chapter has also set forth a rank ordering of areas of the County based upon the severity of the erosion problem and the need for erosion control practices.

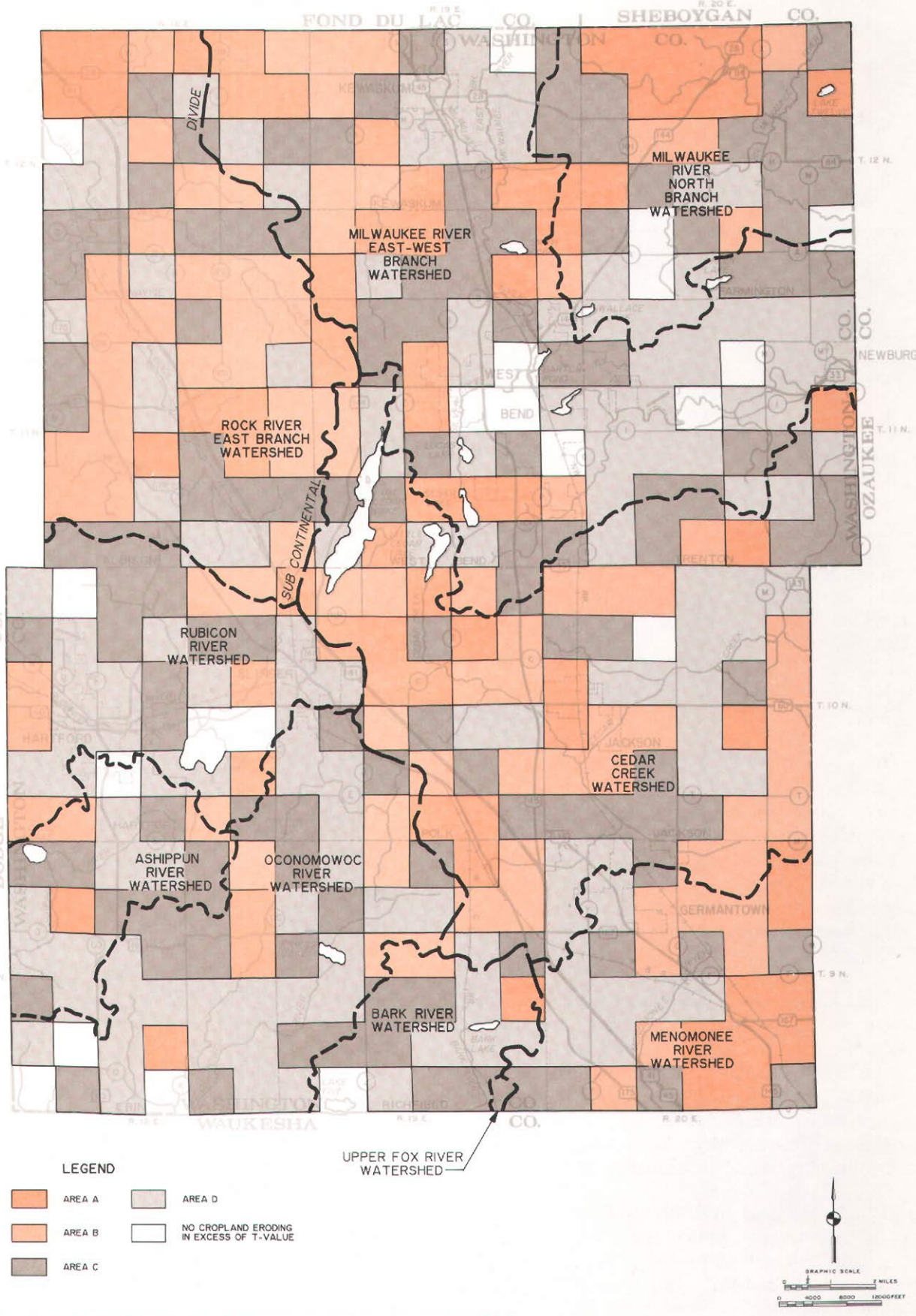
Under the soil erosion control planning program, a systems level determination was made of the types and amounts of erosion control practices that would effectively address soil erosion problems in Washington County. The analysis indicated the following:

- That 15,527 acres, representing about 53 percent of the excessively eroding cropland in the County, would be able to be treated through management practices involving conventional moldboard plowing—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.

- That 7,531 acres, representing just over 25 percent of the excessively eroding cropland in the County, would require conservation tillage systems leaving at least 30 percent of the soil surface covered by crop residue after planting. Of that total, 1,091 acres would be treated through conservation tillage alone, while 6,440 acres would be treated through conservation tillage in

Map 11

AREAS GROUPED ACCORDING TO THEIR RELATIVE NEED FOR SOIL EROSION CONTROL PRACTICES IN WASHINGTON COUNTY



Source: Washington County Land Conservation Department and SEWRPC.

Table 18

CROPLAND SOIL EROSION RELATIVE TO T-VALUE FOR AREAS GROUPED ACCORDING TO THEIR RELATIVE NEED FOR EROSION CONTROL PRACTICES IN WASHINGTON COUNTY

Area (See Map 11)	Number of U.S. Public Land Survey Sections	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	69	11,824	53.6	3,207	14.5	2,304	10.5	4,708	21.4	10,219	46.4	22,043	100.0	1.3
B	86	26,684	74.0	4,231	11.7	2,688	7.4	2,478	6.9	9,397	26.0	36,081	100.0	0.7
C	124	32,852	82.1	3,224	8.1	1,734	4.3	2,213	5.5	7,171	17.9	40,023	100.0	0.7
D	133	32,008	92.0	1,411	4.1	619	1.8	745	2.1	2,775	8.0	34,783	100.0	0.5
Other	18	2,893	100.0	0	0.0	0	0.0	0	0.0	0	0.0	2,893	100.0	0.3
Total	430[a]	106,261	78.2	12,073	8.9	7,345	5.4	10,144	7.5	29,562	21.8	135,823	100.0	0.7

[a] *Excludes sections with no cropland.*

Source: Washington County Land Conservation Department and SEWRPC.

conjunction with other practices—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.

- That 3,917 acres, representing about 13 percent of the excessively eroding cropland in the County, would require conservation tillage systems leaving at least 50 percent of the soil surface covered by crop residue after planting. These lands would also require other practices—particularly changes in rotation—to reduce soil loss to tolerable levels. In this regard, 1,601 acres would require a basic rotation change, while 2,316 acres would require a major rotation change.

- That 2,587 acres, representing about 9 percent of the excessively eroding cropland in the County, would be retired from production and placed in permanent vegetative cover owing to the steepness of slope or highly erodible nature of the soil. This acreage represents about 2 percent of all cropland in Washington County.

In addition to the practices described above, other erosion control measures—including terraces, grade stabilization structures, grassed waterways, and field diversions—will be needed to address erosion problems in certain situations. In this regard, it is estimated that a need exists for a total of 165,000 feet of grassed waterways, 55,000 feet of field diversions, 16,000 feet of terraces, and 30 grade stabilization structures.

In order to provide insight into the relative need for soil erosion control practices within the County, U. S. Public Land Survey sections were grouped into four categories based on the average soil loss rate and the amount of excessively eroding cropland. The relative ranking of each section is shown on Map 11. Area A—the area having the greatest need for cropland soil erosion control practices—includes 69 U. S. Public Land Survey sections, which encompass 22,043 acres of cropland. On the average, cropland in that area was found to be eroding at 1.3 times T-value, and about 10,219 acres, or 46 percent of all cropland in the 69 sections concerned, was found to be eroding at rates exceeding T-value. Conversely, Area D—the area having the least need for cropland soil erosion control practices—includes 133 U. S. Public Land Survey sections, which encompass 34,783 acres of cropland. On the average, cropland in Area D was found to be eroding at 0.5 times T-value, and about 2,775 acres, or about 8 percent of the cropland in the 133 sections concerned, was found to be eroding in excess of T-value.

Chapter VI

AGENCIES AND PROGRAMS CONCERNED WITH THE CONTROL OF CROPLAND SOIL EROSION

Previous chapters of this report have described cropland soil erosion problems in Washington County, and have identified the types and amounts of erosion control practices that would be needed to reduce cropland soil erosion to tolerable levels. While ultimately the responsibility for the control of cropland soil erosion rests with the farm operator, a number of agencies and units of government have, in accordance with law, important responsibilities for conservation of the soil resource. This chapter identifies those units and agencies of government concerned with the control of soil erosion, and describes the various government-sponsored programs that have been established to address soil erosion problems. This chapter also describes existing regulatory authority which may be brought to bear to minimize soil erosion problems.

CONCERNED AGENCIES

Those units and agencies of government which are concerned, directly or indirectly, with the control of cropland soil erosion include—at the county level—the Washington County Board and the Washington County Land Conservation Committee; at the state level—the Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the University of Wisconsin-Extension; 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 responsibilities of these agencies and units of government pertaining to the control of soil erosion problems are summarized below.

County Level

Washington County Land Conservation Committee: The Washington County Land Conservation Committee has broad authority and responsibility for the conservation and protection of the soil and water resources of Washington County. Through its staff in the Washington County Land Conservation Department, and in cooperation with the U. S. Soil Conservation Service and UW-Extension, the Land Conservation Committee is involved in the administration and coordination of a variety of programs dealing with soil erosion and nonpoint sources of pollution in the County. The County Land Conservation Department provides technical assistance to landowners and local units of government, including assistance in planning and in the design and installation of soil and water conservation measures. The Land Conservation Department engages in a variety of educational programs regarding proper management of soil and water resources in cooperation with the UW-Extension. The Land Conservation Department is directly involved in administration of state soil and water conservation programs, including the soil conservation provisions of the Wisconsin Farmland Preservation Program and the state priority watershed program, the Land Conservation Department being responsible for the distribution of priority watershed program cost-share assistance to landowners in the County. An important function of the Land Conservation Department is the coordination of state and federal soil and water conservation programs within the County, to avoid duplication of efforts and achieve maximum program benefits.

Washington County Board: The Washington 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 Washington County. The Washington County Board also has the authority under Section 92.11 of the Wisconsin Statutes to adopt ordinances for the regulation of land use and land management practices—including, potentially, ordinances controlling excessive soil erosion.

State Level

Wisconsin Department of Agriculture, Trade and Consumer Protection: The Wisconsin Department of Agriculture, Trade and Consumer Protection has a wide range of responsibilities for the conservation and protection of soil and water resources in the State. The Department is responsible for administering the Wisconsin

Farmland Preservation Program, the recently created state Soil and Water Resources Management Program, and the soil erosion control planning program established under Section 92.10 of the Wisconsin Statutes.

Wisconsin Department of Natural Resources: The Wisconsin Department of Natural Resources has broad authority and responsibility in the area of natural resource protection and environmental quality management. The Department of Natural Resources is responsible for administration of the state nonpoint source abatement program, referred to as the priority watershed program. The Department has authority under Section 144.025 of the Wisconsin Statutes to order the abatement of significant nonpoint sources of pollution, such as severe erosion and sedimentation problems.

University of Wisconsin-Extension: The University of Wisconsin-Extension office in Washington County is a local component of a statewide educational network supported by the the U. S. Department of Agriculture, the UW-Extension, and Washington County. The UW-Extension office 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 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 the federal Agricultural Conservation Program, a financial assistance program intended to help rural landowners in carrying out approved conservation practices; and the Conservation Reserve Program, a financial assistance program intended to help farmers convert highly erodible land from cropland to less intensive uses. The Agricultural Stabilization and Conservation Service also assists in administering the conservation compliance provisions of the Food Security Act of 1985.

U. S. Department of Agriculture, Soil Conservation Service: The U. S. Department of Agriculture, Soil Conservation Service, has a number of responsibilities in the area of cropland soil erosion control. The Soil Conservation Service, in conjunction with the Agricultural Stabilization and Conservation Service, is responsible for administering the conservation compliance provisions of the Food Security Act of 1985. The 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 and water conservation resource information to units of government. The Soil Conservation Service also conducts detailed soil surveys and provides interpretations as a guide to the use of soil survey data. Within the Southeastern Wisconsin Region, including Washington 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.

PROGRAMS THAT ADDRESS CROPLAND SOIL EROSION

A number of government-sponsored programs have been established to promote the adoption of farming practices consistent with maintenance of the soil resource. Traditionally these programs have involved the provision of financial assistance to landowners in support of the application of erosion control practices. More recently, the state and federal governments have established conservation compliance provisions requiring that participants in certain farm programs adhere to sound soil and water conservation practices. A description of the pertinent programs and their current status in Washington County follows.

State Level Programs

Soil and Water Resource Management Program: Created as part of the 1987-1989 State Budget Bill, the State Soil and Water Resources Management Program 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 financial support of county technical assistance activities. The program is administered by the Wisconsin Department of Agriculture, Trade and Consumer Protection. During 1989, the first priority for the use of available Soil and Water Resources Management Program funds is the "basic allocation" to counties for the maintenance of a county conservationist and other positions. A second priority is the continuation of financial support for previously funded state soil and water conservation programs—including the retention of county staff to assist farmers in their efforts to comply with the soil conservation requirements of the Wisconsin Farmland Preservation Program, Farmers Fund projects, and Soil Erosion Control Program projects. Very limited financial assistance is currently available for new projects through the Soil and Water Resources Management Program.

Wisconsin Farmland Preservation Program: 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. Farmers in "urban" counties, including all counties in southeastern Wisconsin, are eligible to participate in the program if their land has been placed in a state-certified exclusive agricultural zoning district and if certain other program eligibility requirements are met. Program changes enacted in 1988 also 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 of exclusive agricultural zoning for tax credit eligibility in urban counties will be restored. It should be noted that a landowner may obtain a farmland preservation agreement only if the county in which his land is located has adopted a county farmland preservation plan and if the preservation of the land is in conformance with that plan. A landowner may also apply for a farmland preservation agreement if his land is zoned for exclusive agricultural use.

Washington County adopted a county farmland preservation plan in 1981. That plan is intended to serve as a guide to the preservation of important agricultural lands in the County, particularly through the application of exclusive agricultural zoning. Six local units of government in Washington County—the Towns of Barton, Hartford, Kewaskum, Richfield, and Trenton and the Village of Germantown—have adopted exclusive agricultural zoning, enabling owners of farmland in the areas so zoned to apply for Farmland Preservation tax credits. A total of 115 landowners enrolled 15,105 acres of land in farms—including 10,500 acres of cropland—in the Wisconsin Farmland Preservation Program in Washington County for tax year 1987. The average property tax credit was $1,286, representing 34 percent of the average property tax of $3,818 for program participants.

As a result of legislation contained in the 1985-1987 state budget bill, all participants in the Farmland Preservation Program are required to adhere to sound soil conservation practices so that cropland sheet and rill erosion is kept at or below tolerable levels. In Washington County, Land Conservation Committee policy also requires gully erosion to be controlled. All current program participants must meet the soil conservation requirements by the end of 1988 to remain eligible for the tax credit. New participants have one year from the date of their first tax credit to meet the requirements. The Washington County Land Conservation Department is responsible for determining compliance with the soil conservation requirements in Washington County.

In order to assist farmers in reducing soil loss to the established tolerances, a detailed conservation plan has been, or will be, prepared for each farm for which Farmland Preservation Program tax credits are claimed. The detailed plans are prepared in cooperation with the farm operator by the Washington County Land Conservation Department. Installation of the planned conser-

vation practices may be scheduled over several years, but annual progress is required.

By the end of 1988, farm conservation plans had been prepared for each current participant in the Wisconsin Farmland Preservation Program, plans thus having been prepared for about 102 farms encompassing about 10,500 acres of cropland. Substantial additional participation in the Farmland Preservation Program is expected in Washington County as a result of the aforementioned program changes enabling landowners to participate on the basis of a long-term agreement with the State rather than through exclusive agricultural zoning. It is estimated that 150-200 additional landowners, all located in the seven towns that have not adopted exclusive agricultural zoning, will participate in the Farmland Preservation Program through the newly available long-term agreement option. As a result, about 21,000 additional acres of cropland would need to meet the soil conservation requirements.

Priority Watershed Program: The state nonpoint source pollution abatement program, referred to as the priority watershed program and administered by the Wisconsin Department of Natural Resources, 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. Landowner participation in the program is currently voluntary.

A priority watershed program includes an inventory and analysis of nonpoint source pollution problems, the formulation of a detailed plan addressing the identified problems, and implementation activities, including the provision of financial assistance in support of needed conservation practices. Soil erosion and animal waste runoff are the primary sources of nonpoint pollution targeted for control in the rural areas. With regard to cropland soil erosion, the priority watershed program provides financial assistance in an amount of up to 70 percent of the cost of installing such improvements as 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. At the local level, much of the responsibility for implementation of a priority watershed plan—including the preparation of detailed farm conservation plans and the administration of cost-share agreements—rests with the land conservation committee of the concerned county. Below is a discussion of the status of several priority watershed projects selected for funding in Washington County (see Map 6 in Chapter II for the location of each watershed).

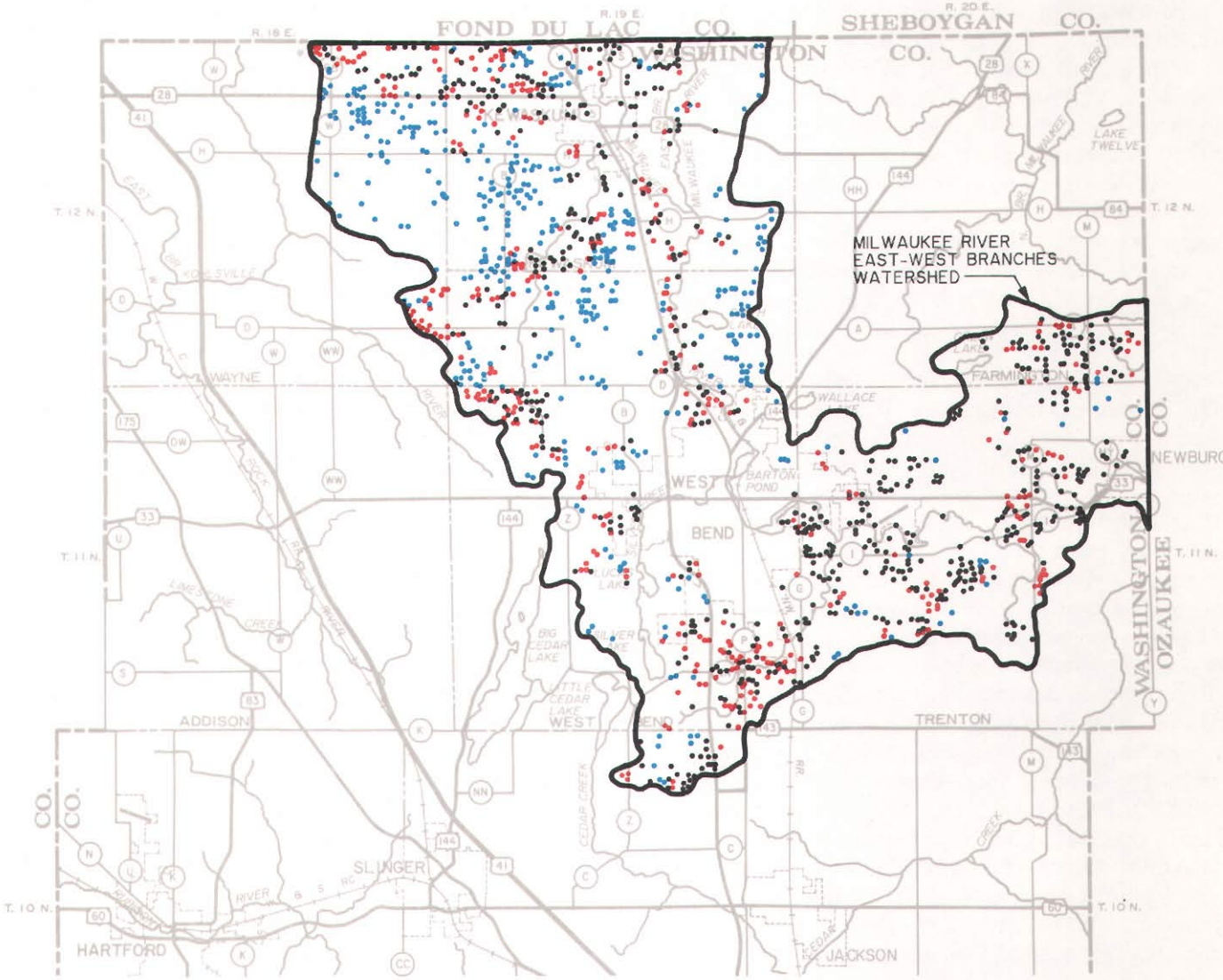
Under the state priority watershed program, a nonpoint source pollution abatement plan was completed in 1986 for the Oconomowoc River watershed. The portion of the Oconomowoc River watershed located in Washington County encompasses 47.6 square miles, or 11 percent of the County. As part of the effort to implement the Oconomowoc River priority watershed plan, 81 landowners and about 8,000 acres of cropland have been targeted for detailed farm conservation plans. By the end of 1988, conservation plans had been prepared for 2,225 acres of cropland.

Under the Milwaukee River Priority Watersheds Program, nonpoint source pollution abatement plans will be prepared for five watersheds, of which four—the Menomonee River, Cedar Creek, Milwaukee River North Branch, and Milwaukee River East-West Branches—are partially located in Washington County. In combination, these four watersheds encompass 256.7 square miles, or 59 percent of the total area of Washington County. Nonpoint source pollution abatement plans for the Milwaukee River East-West Branches and the Milwaukee River North Branch are expected to be completed early in 1989, followed by the preparation of plans for the Menomonee River and Cedar Creek watersheds. It is anticipated that implementation of these plans will target the preparation of detailed farm conservation plans for over 750 landowners covering up to 47,000 acres of cropland.

It should noted that the priority watershed program is primarily concerned with the water quality impacts of soil erosion. Farm fields eroding in excess of T-value but which are not a significant source of sediment would generally not be treated under a priority watershed program. Conversely, farm fields which are eroding at less than T-value but which are a significant source of sediment would generally be treated. This situation is illustrated for the Washington County portion of the Milwaukee River East-West Branches watershed on Map 12. As shown

Map 12

FARM FIELDS IDENTIFIED AS SOIL EROSION AND SEDIMENT PROBLEMS IN THE MILWAUKEE RIVER EAST-WEST BRANCHES WATERSHED



LEGEND

FARM FIELDS IDENTIFIED AS A SIGNIFICANT SOURCE OF SEDIMENT:

- FIELDS ERODING IN EXCESS OF T-VALUE
- FIELDS NOT ERODING IN EXCESS OF T-VALUE

FARM FIELDS NOT IDENTIFIED AS A SIGNIFICANT SOURCE OF SEDIMENT; BUT ERODING IN EXCESS OF T-VALUE

GRAPHIC SCALE
0 1 2 MILES
0 4000 8000 12000 FEET

Source: Washington County Land Conservation Department and SEWRPC.

on that map, 1,005 farm fields within that watershed have been identified under the priority watershed program as a significant source of sediment and are, accordingly, eligible for treatment under the priority watershed program. Of this total, 297 fields, or 30 percent, were eroding at rates in excess of T-value, while 708 fields, or 70 percent, were eroding at rates less than or equal to T-value. Conversely, 446 farm fields in the watershed were eroding in excess of T-value but are not eligible for treatment under the priority watershed program because they were not identified as a significant source of sediment. These 446 fields represent 60 percent of the total of 743 fields in the watershed that were eroding in excess of T-value.[1]

State Soil Erosion Control Planning Program: 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 Washington County, is required to prepare a countywide soil erosion control plan. The primary focus of the plan is the reduction of cropland soil erosion to established tolerances, thereby maintaining the long-term productivity of the soil resource. The plan documented in this report is intended to fulfill that planning requirement for Washington 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.

Federal Level Programs

Agricultural Conservation Program: Financial assistance is available to farmers throughout Washington 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 a variety of erosion control practices, including contour plowing, contour strip-cropping, conservation tillage, terrace systems, diversions, grassed waterways, establishment of long-term vegetative cover, and others. Cost sharing to farm owners and operators ranges from 50 to 75 percent of eligible costs up to a maximum of $3,500. Assistance to individual farmers may exceed $3,500 under certain circumstances as provided in long-term agreements between the Agricultural Stabilization and Conservation Service and the farmer. Technical assistance in support of needed practices is provided by the U. S. Soil Conservation Service.

During the past five years, an average of $57,000 per year was committed in support of soil and water conservation practices in Washington County under the Agricultural Conservation Program. Typically, 50 percent of Agricultural Conservation Program funds available in Washington County are used for soil erosion control purposes. The remainder goes toward tree planting and animal waste management practices.

Conservation Reserve Program: The Conservation Reserve Program, administered by the U. S. Agricultural Stabilization and Conservation Service, provides financial assistance to landowners as incentive to retire highly erodible farm fields from crop production. Under this program, annual payments are made to the landowner over a period of 10 years on a per-acre basis for highly erodible cropland taken out of production. In 1988, the program was expanded to include nonhighly erodible cropland near shoreland areas which is taken out of production to address water quality and other environmental concerns. The program also provides financial assistance for up to 50 percent of the normal costs of establishing permanent vegetative cover.

As of the end of 1988, a total of 123 landowners had enrolled 2,479 acres of cropland in the Conservation Reserve Program in Washington County. Funding under the Conservation Reserve Program is not expected to be available beyond 1990.

Conservation Compliance Provisions of the Food Security Act of 1985: The federal Food Security Act of 1985 established "conservation compliance" requirements for farmers participating in a number of U. S. Department of Agriculture

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[1] *At the time of the preparation of this report, sediment delivery goals had been established under the Milwaukee River Priority Watersheds Program only for the Milwaukee River East-West Branches watershed.*

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 January 1, 1990, and such plans must be fully implemented by January 1, 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 T-value. The U. S. Department of Agriculture, Soil Conservation Service, is responsible for identifying highly erodible lands in Washington County. The required plans are to be prepared, for the most part, by the U. S. Soil Conservation Service, with some assistance provided by the County Land Conservation Department.

By the end of 1988, the U. S. Soil Conservation Service had completed the process of identifying highly erodible lands for current participants in federal farm programs in Washington County. Farm fields encompassing about 23,500 acres were thereby identified as highly erodible. Additional highly erodible land may be identified in the County as other farmers decide to participate in federal farm programs.

It should be recognized that the conservation compliance provisions of the Food Security Act pertain only to lands identified as highly erodible. Other lands farmed by participants in federal farm programs are not subject to the Food Security Act conservation compliance requirements, even though they may be eroding above established tolerances. However, as part of its conservation planning work in conjunction with the Food Security Act, the Washington County office of the U. S. Soil Conservation Service has, to the extent practicable, prepared plans for the entire farm operations concerned. By the end of 1988, conservation plans covering a total of 27,500 acres of cropland had been prepared in conjunction with the Food Security Act provisions, including 12,500 acres of highly erodible land.

It should also be noted that under the "alternative conservation systems" provisions of the Food Security Act, a farmer may remain eligible to participate in federal farm programs while using management practices which result in soil erosion above established tolerances on highly erodible land. The intent of the alternative conservation systems provisions is to avoid situations where reduction to T-value would result in economic hardship. Under these provisions, a farmer is generally required to achieve a substantial reduction in soil erosion, but is not required to reduce soil loss to T-value. As a practical matter, in certain situations—for example, for fields which already have hay in the rotation—the alternative conservation systems provisions may allow the farmer to continue to farm without any change in management practices.

Sodbuster Provisions of the Food Security Act of 1985: 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 which was not planted to annually tilled crops during the period 1981 through 1985, including long-term hayland. 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.

Soil and Water Loan Program: 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.

Farmers Home Administration Conservation Easements: The U. S. Farmers Home Administration in 1988 began a program through which farmers experiencing serious difficulty in repaying Farmers Home Administration loans may be able to obtain a reduction in their debt by placing conservation easements on portions of their farm consisting of highly erodible land, wetlands, or wildlife habitat. The debt would generally be reduced by the value of the land included in the easement. The amount of land left after the "set aside" must be sufficient to continue the farm operation.

REGULATORY AUTHORITY FOR THE CONTROL OF SOIL EROSION

Government activities intended to achieve a reduction in cropland soil erosion have traditionally relied upon voluntary cooperation by the farmer, supported by financial and technical assistance programs and educational programs, and—more recently—by conservation compliance provisions as an eligibility requirement for state tax credits or participation in federal farm programs. Wisconsin law does, however, provide certain regulatory authority for the control of cropland soil erosion and other forms of soil erosion, as indicated below.

Section 92.11, Wisconsin Statutes

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 1988, regulations governing cropland soil erosion adopted under Section 92.11 were known to be in effect in only one municipality in Wisconsin, the Town of Sterling in Vernon County—the Town of Sterling having approved regulations set forth in the Vernon County Erosion and Sediment Control Ordinance.

Section 144.025, Wisconsin Statutes

In April of 1988, the Wisconsin Legislature enacted 1987 Wisconsin Act 297, expanding Section 144.025 of the Wisconsin Statutes, thereby authorizing the Wisconsin Department of Natural Resources to order the abatement of significant nonpoint sources of pollution, such as severe erosion and sedimentation problems, in urban and rural areas. In exercising this authority, the Department of Natural Resources must send written notice of its intent to issue the pollution abatement order to the individual concerned as well as to the Wisconsin Department of Agriculture, Trade and Consumer Protection and to the appropriate county land conservation committee.

If the nonpoint source pollution problem is agricultural in nature, the Department of Agriculture, Trade and Consumer Protection must advise the individual concerned of appropriate management options to address the problem and of the financial assistance and technical assistance resources available. Within one year, the Department of Agriculture, Trade and Consumer Protection must provide the Department of Natural Resources with a description of any pollution abatement measures taken and a recommendation as to whether an order to abate the pollution should be issued. Should an abatement order be issued and not complied with, the Department of Natural Resources may implement the order and collect the costs from the noncomplying landowner. State grants for up to 70 percent of the cost of the required conservation practices are available to assist the landowner in resolving the identified problems through the State Soil and Water Resource Management Program. As of the end of 1988, no notices of intent had been issued in Washington County.

Sections 59.974, 61.354, and 62.234, Wisconsin Statutes

Under Section 59.974 of the Wisconsin Statutes, counties in Wisconsin are granted authority to adopt ordinances for the control of construction site erosion within their unincorporated areas. Such an ordinance does not require approval and is not subject to disapproval by town governments. Villages and cities in Wisconsin are granted similar authority to adopt construction site erosion control ordinances within their incorporated areas under Sections 61.354 and 62.234, respectively, of the Wisconsin Statutes. Construction site erosion control regulations are typically adopted as part of comprehensive zoning ordinances, although they may be adopted as a freestanding, or separate, ordinance. In addition, local units of government may incorporate requirements for the control of construction site erosion into land division ordinances.[2] Specific ordinance provisions and administrative arrangements will vary depend-

[2]*Sections 59.974(7), 61.354(6), and 62.234(6) of the Wisconsin Statutes stipulate that powers pertaining to the regulation of land subdivision granted under Section 236.45 may be exercised by counties, villages, and cities with respect to construction site erosion control.*

ing upon, among other factors, which one of these options is selected.

The Wisconsin Department of Natural Resources, in conjunction with the League of Wisconsin Municipalities, in 1987 published a model construction site erosion control ordinance which may be refined and adapted as necessary by local units of government. That model is applicable to a wide range of land development and land disturbing activities—including, among others, those requiring a subdivision plat or certified survey approval or the construction of houses or commercial, industrial, or institutional buildings on lots of approved subdivision plats and certified surveys; and those involving street, highway, road, or bridge construction or modification. The Department subsequently prepared a handbook which describes available management practices to control construction site erosion and provides minimum standards and criteria for designing and using those practices.[3]

The City of West Bend has adopted a construction site erosion control ordinance providing an effective means for controlling soil erosion at development sites. In addition, Washington County and certain local units of government in the County have included general requirements pertaining to the control of erosion in land division ordinances. These regulations were adopted prior to the publication of the model ordinance cited above.

Shoreland and Floodplain Regulations: Under Wisconsin law, cities, villages, and counties with respect to unincorporated areas have the responsibility to adopt regulations to protect and preserve floodplain areas. For regulatory purposes, the term "floodplain" pertains to areas subject to inundation by a 100-year recurrence interval flood. Under Wisconsin law, counties are also required to adopt regulations for the protection of shorelands in unincorporated areas. For this purpose, shorelands are defined as lands within the following distances from the ordinary high-water mark of navigable waters: 1,000 feet from a lake, pond, or flowage; and 300 feet from a river or stream or to the landward side of the floodplain, whichever distance is greater. County shoreland regulations must include "shoreland-wetland" zoning provisions protecting wetlands of five acres or more in size located within the shoreland jurisdiction area. Cities and villages are also required to place all wetlands of five acres or more that are located within the shoreland jurisdiction area, as described above, in a shoreland-wetland zoning district.

If properly administered, shoreland and floodplain regulations can contribute materially to the avoidance of cropland and noncropland soil erosion and sedimentation problems—directly, through control of grading, filling, and other land disturbing activities in riverine areas, and indirectly, by ensuring the preservation of wetlands and of the natural drainage system in general.

CONCLUDING REMARKS

This chapter has identified those agencies and units of government concerned with the control of cropland soil erosion, and has described existing government-sponsored programs intended to improve farm management practices. The various state and federal financial and technical assistance programs and the conservation compliance provisions of state and federal farm programs should result in increased use of erosion control practices within the County. It should be noted, however, that while all of these programs are intended directly or indirectly to reduce erosion, there are significant differences in the cropland treated and in erosion control standards (see Table 19). Thus, the soil conservation requirements of the Wisconsin Farmland Preservation Program pertain to lands enrolled in that program throughout the County, the objective being the maintenance of soil erosion at or below T-value on the entire farm unit concerned. The conservation compliance provisions of the federal Food Security Act pertain to "highly erodible" farm fields farmed by participants in federal farm programs, the general objective being the maintenance of soil erosion at or below T-value, but with soil erosion in excess of T-value allowed under the "alternative conservation systems" provisions of that program. The state priority watershed program pertains to cropland identified as a sediment problem—some of which may be eroding at rates in excess of T-value and some of which may not—the objective being a reduction of sediment rates to standards estab-

[3] *Wisconsin Department of Natural Resources, Wisconsin Construction Site Best Management Practice Handbook, October 1988.*

Table 19

SELECTED FEATURES OF MAJOR PROGRAMS THAT ADDRESS CROPLAND SOIL EROSION IN WASHINGTON COUNTY

Program	Agency Primarily Responsible for Program Administration Within the County	Cropland Considered	General Program Standards
Wisconsin Farmland Preservation Program—Soil Conservation Requirements	LCD	All cropland enrolled in Wisconsin Farmland Preservation Program	Maintenance of soil erosion at or below T-value
Wisconsin Priority Watershed Program	LCD, DNR	Cropland identified as a sediment problem (such lands may be eroding at rates greater than, equal to, or less than T-value)	Reduction of sediment delivery to target levels established as part of priority watershed plan
Federal Food Security Act Conservation Compliance Provisions	SCS assisted by ASCS and LCD	Highly erodible farm "fields"—that is, fields for which potential erosion is more than eight times T-value	Maintenance of soil erosion at or below T-value; however, "alternative conservation systems" provisions allow soil erosion above T-value
Federal Agricultural Conservation Program	ASCS assisted by SCS	All cropland	- -
County Erosion Control Planning Program	LCD	All cropland	Maintenance of soil erosion at or below T-value

NOTE: Agency abbreviations are as follows:

LCD - Washington County Land Conservation Department
SCS - U. S. Soil Conservation Service
ASCS - U. S. Agricultural Stabilization and Conservation Service
DNR - Wisconsin Department of Natural Resources

Source: SEWRPC.

lished in the priority watershed plan. The county soil erosion control planning program, conducted under Section 92.10 of the Wisconsin Statutes and documented in this report, is concerned with all cropland eroding in excess of T-value throughout the County. Owing to these differences, administration of the various erosion control programs must be carefully coordinated to avoid duplication of effort and ensure the maximum program benefits.

Chapter VII

IMPLEMENTATION STRATEGY

As previously indicated, the long-range objective of the county soil erosion control planning program is the reduction of soil erosion on all cropland to tolerable levels, or "T-value," by the year 2000. A total of about 29,600 acres of cropland, representing about 22 percent of all cropland in the County, have been identified as eroding in excess of T-value. The types and amount of erosion control practices needed to reduce erosion on these lands to tolerable levels were indicated in Chapter V. The agencies and units of government concerned with the control of cropland soil erosion were identified in Chapter VI, along with government-sponsored programs which have been established to address erosion problems. A long-range strategy is needed to guide the concerned agencies and units of government in their efforts to assist farmers in the application of needed erosion control practices. Such a strategy, developed under the guidance of the Washington County Soil Erosion Control Planning Program Technical Advisory Committee, is presented in this chapter.

OVERRIDING CONSIDERATIONS

The implementation strategy presented in this chapter is intended to provide an overall framework to guide erosion control activities of the concerned agencies and units of government from 1989 through the year 1999. The development of that strategy was based upon the following assumptions:

1. That the Washington County Land Conservation Committee, working through its staff in the County Land Conservation Department, will be the lead agency in carrying out the implementation strategy, with technical support provided by the Washington County office of the U. S. Soil Conservation Service, and with informational and educational assistance provided by the Washington County offices of the U. S. Soil Conservation Service and University of Wisconsin-Extension.

2. That over much of the 11-year implementation period, the erosion control activities of the Land Conservation Department and the U. S. Soil Conservation Service will be determined, to a large extent, by staff commitments under major existing government-sponsored programs—including the conservation compliance provisions of the federal Food Security Act, the soil conservation requirements of the Wisconsin Farmland Preservation Program, and the state priority watershed program; and that implementation of the Milwaukee River Priority Watersheds Program, in particular, will be a major determinant of how staff resources are allocated over time within the County.

3. That where use is not predetermined by existing program commitments, available public financial and technical assistance resources will be targeted to areas of the County having the most serious soil erosion problems.

4. That in working with individual farmers in the preparation of farm conservation plans, the Washington County Land Conservation Department will continue the current county policy of addressing all nonpoint sources of pollution—including, importantly, animal waste problems—in addition to addressing cropland soil erosion problems.

In the development of the implementation strategy, careful consideration was given to the provisions of existing government programs which have been established to address soil erosion problems. As noted in Chapter VI, those programs differ in terms of such factors as the cropland treated, the erosion control standards, and the implementation time frames. The implementation strategy presented in this chapter was designed to help coordinate the available programs, taking into account inherent differences, in an effort to achieve the primary objective of the county soil erosion control plan—the maintenance of soil erosion at or below T-value on all cropland in the County by the year 2000.

It must be recognized that government-sponsored conservation programs are subject to change, that new programs may be created, and

that existing programs may be phased out. Given the long-range nature of the implementation strategy set forth herein and the dynamic nature of the programs involved, it may be expected that the strategy will have to be revised from time to time to reflect program changes.

IMPLEMENTATION STRATEGY

Proposed Activities

In developing the erosion control strategy, the overall 11-year implementation period from 1989 through 1999 was divided into four time periods—the first three periods being three years in length and the fourth, two years. The strategy indicates the areas proposed to be addressed and the types of activities proposed to be undertaken during each period. The major types of erosion control activities considered in the implementation strategy include farm conservation planning—that is, the preparation of detailed farm conservation plans for individual landowners; and practice implementation—that is, the provision of technical assistance to farmers in the application of needed erosion control practices. Supporting activities—including information and education activities to increase the awareness of soil erosion problems and the available means for addressing those problems, and administrative activities, including coordination of soil and water conservation programs and administration of financial assistance agreements—were also considered.

The strategy proposes that cropland soil erosion problems be addressed, for the most part, on a watershed-by-watershed basis. However, the strategy recognizes the need for the provision of technical assistance to farmers scattered throughout the County in conjunction with the soil conservation requirements of the Wisconsin Farmland Preservation Program and the conservation compliance provisions of the federal Food Security Act.

A summary of the areas to be addressed and the activities to be undertaken during each implementation period is presented in Table 20. During the first two implementation periods, the implementation strategy generally coincides with the program commitments of the state priority watershed program, the Wisconsin Farmland Preservation Program, and the federal Food Security Act.[1] As indicated in Table 20, activities during the first implementation period, from 1989 through 1991, would include conservation planning and practice implementation within the Milwaukee River East-West Branches watershed, the Milwaukee River North Branch watershed, and the Oconomowoc River watershed; practice implementation for "current" participants in the Farmland Preservation Program—that is, those participating in the tax credit program as of the end of 1988; conservation planning and practice implementation for "new" participants in the Farmland Preservation Program—that is, those additional farmers who may be expected to enroll lands in the tax credit program after 1988, primarily under the long-term agreement option; and conservation planning and practice implementation for farmers subject to the conservation compliance provisions of the federal Food Security Act.

Activities during the second implementation period, from 1992 through 1994, would include practice implementation within the Milwaukee River East-West Branches watershed, the Milwaukee River North Branch watershed, and the Oconomowoc River watershed; conservation planning and practice implementation within the Cedar Creek and Menomonee River watersheds; and practice implementation for participants in the Farmland Preservation Program and farmers subject to the conservation compliance provisions of the Food Security Act.

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[1] *These program commitments are described in Chapter VI of this report. In regard to the Milwaukee River Priority Watersheds Program, it should be noted that nonpoint source pollution abatement plans for the Milwaukee River East-West Branches watershed and the Milwaukee River North Branch watershed were nearing completion at the time of the preparation of this report. In developing the cropland soil erosion control strategy, it was assumed that implementation of these plans would begin before implementation of nonpoint source pollution abatement plans to be prepared under the priority watersheds program for the Cedar Creek and Menomonee River watersheds.*

Table 20

CROPLAND SOIL EROSION CONTROL IMPLEMENTATION STRATEGY: 1989-1999

Implementation Period	Watersheds Targeted for Erosion Control/ Compliance Provisions to be Addressed	Proposed Activities			
		Conservation Planning	Practice Implementation	Information and Education	Administration
Period I— 1989-1991	Milwaukee River East-West Branches Watershed	X	X	X	X
	Milwaukee River North Branch Watershed	X	X	X	X
	Oconomowoc River Watershed	X	X	X	X
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements:				
	Existing Participants (as of 12/88)	--	X	--	X
	New Participants (after 12/88)	X	X	--	X
	Federal Food Security Act- Conservation Compliance Requirements	X	X	--	X
Period II— 1992-1994	Milwaukee River East-West Branches Watershed	--	X	X	X
	Milwaukee River North Branch Watershed	--	X	X	X
	Oconomowoc River Watershed	--	X	X	X
	Cedar Creek Watershed	X	X	X	X
	Menomonee River Watershed	X	X	X	X
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements	--	X	--	X
	Federal Food Security Act- Conservation Compliance Requirements	--	X	--	X
Period III— 1995-1997	Cedar Creek Watershed	--	X	X	X
	Menomonee River Watershed	--	X	X	X
	Rock River East Branch Watershed	X	X	X	X
Period IV— 1998-1999	Rock River East Branch Watershed	--	X	X	X
	Ashippun River Watershed	X	X	X	X
	Bark River Watershed	X	X	X	X
	Rubicon River Watershed	X	X	X	X

NOTE: The strategy outlined in this table is intended to indicate the emphasis of erosion control activities during each implementation period. It may be expected that, as implementation proceeds, some of the activities will begin somewhat earlier or end somewhat later than scheduled.

Source: Washington County Land Conservation Department and SEWRPC.

Activities during the third implementation period, from 1995 through 1997, would include practice implementation within the Cedar Creek and Menomonee River watersheds; and conservation planning and practice implementation within the Rock River East Branch watershed. The Rock River East Branch watershed is the first watershed outside the Milwaukee River Priority Watersheds Program area that is targeted for erosion control. It was selected because of the large amount of excessively eroding cropland, the amount of eroding soil reaching surface waters, and the relatively high need for erosion control practices (see Table 8 in Chapter III, Map 11 in Chapter V, and Appendix A). This watershed has also been assigned high priority for nonpoint source pollution control under the Upper Rock River Basin water quality management plan recently completed by the Wisconsin Department of Natural Resources.

Activities during the fourth implementation period, consisting of the years 1998 and 1999, would include practice implementation within the Rock River East Branch watershed; and conservation planning and practice implementation within the Ashippun, Bark River, and Rubicon River watersheds.

As further indicated in Table 20, information and education activities and administrative activities would be carried out during each implementation period. A strong information and education program—designed to increase the awareness among farmers of soil erosion problems, of the types of practices that may be utilized to address those problems, and of the public financial and technical assistance resources that are available to help in implementing those practices—would be an integral part of the erosion control implementation strategy. The information and education activities, like most activities undertaken as part of the erosion control implementation strategy, would be closely coordinated with related activities to be carried out under the Milwaukee River Priority Watersheds Program.

Staff Requirements

The government agency staffing levels needed to carry out this erosion control implementation strategy from 1989 through 1999 are presented in Table 21. As indicated in that table, the erosion control implementation strategy would involve the commitment of about 9,900 man-hours for conservation planning; about 17,100 man-hours for practice implementation work; about 2,400 man-hours for information and education activities; and about 5,400 man-hours for administrative work. The erosion control implementation strategy would thus involve a commitment of about 34,800 man-hours, or just over 17 man-years, over the 11-year implementation period.

Also presented in Table 21 is the amount of staff time which may be expected to be available for the work envisioned under the erosion control implementation strategy. Included are staff positions currently funded or anticipated to be funded under committed county, state, and federal programs. Specifically included are the amounts of time which the Washington County Conservationist, the U. S. Soil Conservation Service District Conservationist, the University of Wisconsin-Extension agents assigned to Washington County, and the conservation technicians retained by Washington County in conjunction with the state priority watershed program would be able to devote to cropland soil erosion control activities. As indicated in Table 21, committed staff may be expected to devote about 16,500 man-hours, or just over eight man-years, to cropland soil erosion control activities over the 11-year implementation period—or about 47 percent of the staff time required. The additional staff required for carrying out the erosion control implementation strategy, beyond presently committed staff, totals about 18,300 man-hours, or about nine man-years. The cost of the additional staff required, at 1988 salary and fringe benefit levels, would approximate $275,000.

It should be noted that the staff requirements set forth in Table 21 represent only the time needed for soil erosion control activities on farms having cropland eroding in excess of T-value. For watersheds which have been selected for funding under the state priority watershed program, substantial additional staff time would be required for animal waste management and sediment control activities. That additional time is not reflected in this table. For these watersheds, the staff shortfall indicated in Table 21 represents the workload associated with soil erosion control activities for cropland that is eroding above tolerable limits, but that is not identified as a significant source of sediment (see Map 12 in Chapter VI for an illustration of the relationship between cropland soil erosion and sediment problems).

Financial Assistance Requirements

It is anticipated that an effective cropland soil control program would have to be supported by financial assistance to farm operators—either "cost-share" assistance to help offset the cost of such erosion control practices as terraces, grade stabilization structures, grassed waterways, and diversions; or incentive payments to promote the adoption of contouring, contour strip-cropping, and conservation tillage. This section presents an estimate of the amount of financial assistance required in support of those practices needed to reduce cropland soil erosion to tolerable levels, assuming that all farmers with excessively eroding cropland are eligible for, and amenable to, such assistance.

As indicated in Table 22, the amount of financial assistance required in support of needed cropland soil erosion practices would total about $1,216,200. Conversely, the amount of financial assistance which may be expected to be available in support of those practices under current financial assistance programs would total

Table 21

CROPLAND SOIL EROSION CONTROL IMPLEMENTATION STRATEGY: STAFF REQUIREMENTS

Implementation Period	Watersheds Targeted for Erosion Control/ Compliance Provisions to be Addressed	Staff Required (hours)[a]					Committed Staff (hours)[f]	Staff Shortfall (hours)
		Conservation Planning[b]	Practice Implementation[c]	Information and Education Activities[d]	Administration[e]	Total		
Period I— 1989-1991	Milwaukee River East-West Branches Watershed	1,540	1,840	340	680	4,400	2,860	1,540
	Milwaukee River North Branch Watershed	860	880	170	350	2,260	1,040	1,220
	Oconomowoc River Watershed	690	650	130	270	1,740	1,220	520
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements:[g]							
	Existing Participants (as of 12/88)	--	110	--	20	130	20	110
	New Participants (after 12/88)	1,080	110	--	240	1,430	480	950
	Federal Food Security Act-Conservation Compliance Requirements[g]	350	400	--	150	900	860	40
	Subtotal	4,520	3,990	640	1,710	10,860	6,480	4,380
Period II— 1992-1994	Milwaukee River East-West Branches Watershed	--	1,230	120	250	1,600	1,040	560
	Milwaukee River North Branch Watershed	--	590	60	120	770	350	420
	Oconomowoc River Watershed	--	430	40	90	560	390	170
	Cedar Creek Watershed	2,090	2,160	430	850	5,530	2,760	2,770
	Menomonee River Watershed	700	780	150	300	1,930	970	960
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements	--	400	--	80	480	80	400
	Federal Food Security Act-Conservation Compliance Requirements	--	800	--	160	960	960	0
	Subtotal	2,790	6,390	800	1,850	11,830	6,550	5,280
Period III— 1995-1997	Cedar Creek Watershed	--	1,440	140	290	1,870	940	930
	Menomonee River Watershed	--	490	50	100	640	320	320
	Rock River East Branch Watershed	1,530	1,740	330	650	4,250	1,200	3,050
	Subtotal	1,530	3,670	520	1,040	6,760	2,460	4,300
Period IV— 1998-1999	Rock River East Branch Watershed	--	1,160	120	230	1,510	250	1,260
	Ashippun River Watershed	260	480	70	150	960	300	660
	Bark River Watershed	230	330	60	110	730	150	580
	Rubicon River Watershed	550	1,100	170	330	2,150	300	1,850
	Subtotal	1,040	3,070	420	820	5,350	1,000	4,350
	Total Hours	9,880	17,120	2,380	5,420	34,800	16,490	18,310

[a]It should be noted that the required staff hours shown in this table represent only those hours needed for soil erosion control activities on farms having cropland eroding in excess of T-value. For watersheds which have been selected for funding under the state priority watershed programs, substantial additional staff time would be required for animal waste management and sediment control activities. That additional time is not reflected in this table. For those watersheds, the staff shortfall shown on this table represents the workload associated with soil erosion control activities for cropland that is eroding above the tolerable limits, but that is not identified as a significant source of sediment. It should also be noted that the staff requirements shown on this table assume participation by all landowners with cropland eroding above T-value.

[b]Based upon estimated acreage requiring farm conservation plans and a planning rate of 0.1 hour per acre.

[c]Based upon estimated erosion control practice needs and the following practice implementation technical assistance rates: contour plowing, including obstruction removal—0.2 hour per acre; contour strip-cropping, including obstruction removal—0.4 hour per acre; conservation tillage—0.3 hour per acre; permanent cover—0.5 hour per acre; terraces—0.04 hour per foot; grassed waterways—0.02 hour per foot; diversions—0.04 hour per foot; and grade stabilization structures—70 hours per structure.

[d]Where specified, time required for information and education activities was estimated as 10 percent of the time required for conservation planning and practice implementation.

[e]Time required for administration was estimated as 20 percent of the time required for conservation planning and practice implementation.

[f]Committed staff includes staff positions currently funded or anticipated to be funded under committed county, state, and federal programs. Included are the amounts of time which the Washington County Conservationist, the U. S. Soil Conservation Service District Conservationist, the University of Wisconsin-Extension agents assigned to Washington County, and the conservation technicians already retained, or to be retained, by Washington County, in conjunction with the state priority watershed program, would be able to devote to activities intended to reduce cropland soil erosion to tolerable levels.

[g]Data pertain to program participants outside the Milwaukee River East-West Branches, Milwaukee River North Branch, and Oconomowoc River watersheds.

Source: Washington County Land Conservation Department and SEWRPC.

Table 22

CROPLAND SOIL EROSION CONTROL IMPLEMENTATION STRATEGY: FINANCIAL ASSISTANCE REQUIREMENTS

Implementation Period	Watersheds Targeted for Erosion Control/ Compliance Provisions to be Addressed	Financial Assistance Required[a]	Committed Financial Assistance[b]			Financial Assistance Shortfall
			Priority Watershed Program	Agricultural Conservation Program	Total	
Period I— 1989-1991	Milwaukee River East-West Branches Watershed	$ 132,900	$ 86,400	$ 8,100	$ 94,500	$ 38,400
	Milwaukee River North Branch Watershed	59,100	27,200	8,100	35,300	23,800
	Oconomowoc River Watershed	40,600	28,400	8,100	36,500	4,100
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements					
	Existing Participants (as of 12/88)	10,000	0	10,000	10,000	0
	New Participants (after 12/88)	10,000	0	10,000	10,000	0
	Federal Food Security Act- Conservation Compliance Requirements	40,800	0	40,800	40,800	0
	Subtotal	$ 293,400	$142,000	$ 85,100	$227,100	$ 66,300
Period II— 1992-1994	Milwaukee River East-West Branches Watershed	$ 88,600	$ 57,600	$ 0	$ 57,600	$ 31,000
	Milwaukee River North Branch Watershed	39,400	18,100	0	18,100	21,300
	Oconomowoc River Watershed	27,100	18,900	0	18,900	8,200
	Cedar Creek Watershed	155,800	77,900	0	77,900	77,900
	Menomonee River Watershed	54,800	27,400	0	27,400	27,400
	Wisconsin Farmland Preservation Program-Soil Conservation Requirements	34,700	0	34,700	34,700	0
	Federal Food Security Act- Conservation Compliance Requirements	66,500	0	66,500	66,500	0
	Subtotal	$ 466,900	$199,900	$101,200	$301,100	$165,800
Period III— 1995-1997	Cedar Creek Watershed	$ 92,300	$ 46,100	$ 31,600	$ 77,700	$ 14,600
	Menomonee River Watershed	36,500	18,300	12,800	31,100	5,400
	Rock River East Branch Watershed	122,300	0	41,000	41,000	81,300
	Subtotal	$ 251,100	$ 64,400	$ 85,400	$149,800	$101,300
Period IV— 1998-1999	Rock River East Branch Watershed	$ 81,500	$ 0	$ 34,200	$ 34,200	$ 47,300
	Ashippun River Watershed	29,300	0	12,000	12,000	17,300
	Bark River Watershed	20,800	0	8,600	8,600	12,200
	Rubicon River Watershed	73,200	0	30,800	30,800	42,400
	Subtotal	$ 204,800	$ 0	$ 85,600	$ 85,600	$119,200
	County Total	$1,216,200	$406,300	$357,300	$763,600	$452,600

[a]Financial assistance requirements were based upon estimated erosion control practice needs and 1988 assistance rates available under the state priority watershed program. It was assumed that financial assistance would be provided in support of all erosion control practices required in the County. The following financial assistance rates were utilized:

Contour Plowing—$6.00 per acre
Contour Strip-cropping—$12 per acre
Conservation Tillage—$30 per acre
Grassed Waterways and Diversions—$1.75 per foot (70 percent of the average cost of $2.50 per foot)
Terraces—$2.45 per foot (70 percent of the average cost of $3.50 per foot)
Grade Stabilization Structures—$1,050 per structure (70 percent of the average cost of $1,500 per structure)
Permanent Cover—$65 per acre

With regard to the assistance rate for conservation tillage, it was assumed that half of the fields requiring conservation tillage have hay in the rotation, qualifying for assistance at a rate of $15 per acre for one year, and that the other fields are continuous row croplands, qualifying for assistance at a rate of $15 per year for three years.

[b]"Committed" financial assistance reflects the average amount of federal Agricultural Conservation Program cost-share assistance funds that has historically been available in Washington County, as described in Chapter VI; and funds anticipated to be made available in support of measures to reduce cropland soil erosion to tolerable levels under the state priority watershed program—in those watersheds that have already been designated for funding.

Source: Washington County Land Conservation Department and SEWRPC.

Table 23

ACRES OF CROPLAND INCLUDED IN APPLIED CONSERVATION PLANS BY IMPLEMENTATION PERIOD

Status	Acres of Cropland Included in Applied Conservation Plans[a]		
	Assuming Committed Staff/Financial Assistance Only	Assuming Staff/ Financial Assistance Shortfalls are Met	Total Cropland Acres
Included in Applied Conservation Plans as of December 1988	36,225	--	36,225
Additional to be Included in Applied Conservation Plans:			
Period I—1989-1991	26,117	14,063	40,180
Period II—1992-1994	16,528	13,522	30,050
Period III—1995-1997	6,115	10,870	16,985
Period IV—1998-1999	2,353	10,030	12,383
Subtotal	51,113	48,485	99,598
Total	87,338	48,485	135,823

[a]*Based on conservation planning and implementation estimates presented in Table 21.*

Source: Washington County Land Conservation Department and SEWRPC.

$763,600, including about $406,300 under the state priority watershed program and $357,300 under the federal Agricultural Conservation Program. The additional amount of financial assistance funds required—beyond the amounts which may be expected to be provided through current assistance programs—would thus approximate $452,600, or about 37 percent of the total amount needed. It is emphasized that this analysis assumes participation by all farmers with excessively eroding cropland. The shortfall in financial assistance would be less to the extent that farmers decide not to participate in financial assistance programs.

Staff and Financial Assistance Requirements: Concluding Remarks

The previous sections of this chapter have indicated a need for substantial additional staff time and financial assistance to landowners—beyond what may be expected to be available under committed county, state, and federal programs—in order to carry out the soil erosion control implementation strategy. If the identified shortfalls were met and the implementation strategy fully carried out, a total of about 99,600 acres of cropland would be included in applied conservation plans between 1989 and 1999. Conversely, if no additional staff and financial assistance resources were provided beyond those committed, only about 51,100 acres would be included in applied conservation plans during that time. The effects of not meeting the identified shortfalls in staff time and financial assistance are indicated by implementation period in Table 23.

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 methodology by which land conservation committees can evaluate the effectiveness of cropland soil erosion control activities. In this regard, it is recommended that the Washington County Land Conservation Committee conduct an annual assessment of the effectiveness of erosion control activities in the County, including those undertaken by the County Land Conservation Department as well as by cooperating agencies, including the U. S.

Soil Conservation Service and the University of Wisconsin-Extension. To facilitate this assessment, the detailed computerized soil erosion data base, described in Chapter III of this report, should be kept up-to-date, thereby providing a basis for determining the impacts of erosion control activities on cropland soil erosion rates.

If kept current, the data base may be expected to serve as an important planning tool, helping in the coordination of cropland soil erosion control efforts in the County. In routine applications of that data base, however, the Washington County Land Conservation Department has identified certain shortcomings which need to be overcome to facilitate the updating of the data base and to increase its usefulness as a planning tool. A description of these shortcomings, and of potential solutions, follows.

An effective cropland soil erosion data base should provide a means to monitor progress toward established erosion control objectives on a parcel-by-parcel basis and to monitor the use of government-sponsored soil erosion control programs. Relative to these objectives, shortcomings in the existing county soil erosion data base have been identified both in the area of "land tracking" and in data management. Land tracking problems include 1) an unwieldy land identification system, which relies on watersheds as the primary geographic identifier, rather than unique parcel identifiers related to the U. S. Public Land Survey System; and 2) the inability to deal with the overlap which exists among government programs, some of which pertain to landowners and some of which pertain to farm operators. The latter consideration is particularly important in Washington County because much of the cropland is farmed by renters. Existing data management problems are related primarily to 1) limited access to the data base, with access currently available through a single computer; and 2) inefficiencies in the current process under which farm conservation plans are prepared manually and subsequently encoded into the data base.

Potential solutions to the shortcomings indicated above include the following:

- Conversion of the present land identification system to one based upon the real property ownership and tax assessment system and attendant tax key numbering system. Related advantages include a simplified land identification system; relatively stable parcel boundaries over time; and ease of updating ownership information. Implementation of such a system would require close cooperation among the concerned county departments. A significant amount of staff time would be required to implement the system.

- Computer hardware and software improvements. Required hardware includes additional terminals for increased access to the data base. Required software includes software to properly network office computers and software to facilitate monitoring of program participation on a parcel-by-parcel basis, regardless of whether those programs pertain to landowners or farm operators.

While the foregoing improvements would result in a data base fully meeting the needs of the County Land Conservation Department, in the long term, Washington County may wish to consider the possibility of developing an automated multipurpose land information system designed to meet the land-related information needs of all county departments. Any consideration of such a multipurpose land information system should also include consideration of a related automated mapping system. An automated mapping system would have many useful applications within the Land Conservation Department, including the graphic presentation of soil survey data and farm conservation plans. It should be recognized that the development of such systems is a major undertaking, requiring as a first step the completion of a countywide control survey network consisting of relocating and monumenting all U. S. Public Land Survey corners in the County, the location of the corners being established on the Wisconsin State Plane Coordinate System and the elevation of the corners being established relative to national geodetic datum. Subsequent steps would include the preparation by photogrammetric methods of a set of large-scale topographic maps compiled to National Map Accuracy Standards and the preparation of a set of real property boundary line maps, both sets of which would be properly referenced to the control survey network.

REGULATORY MEASURES FOR EROSION CONTROL

Cropland Soil Erosion

As indicated in Chapter VI, while government activities intended to bring about a reduction in cropland soil erosion have traditionally relied upon the voluntary cooperation of farmers, Wisconsin law does provide regulatory authority for the control of cropland soil erosion. As indicated in Chapter VI, the Wisconsin Legislature in 1988 expanded Section 144.025 of the Wisconsin Statutes authorizing the Wisconsin Department of Natural Resources to order the abatement of significant nonpoint sources of water pollution, including severe erosion and sedimentation problems. The direct state action authorized under Section 144.025 may be expected to be taken on a complaint basis primarily for very severe erosion problems, including cropland erosion problems, which seriously impair water quality. As also indicated in Chapter VI, counties as well as cities and villages in Wisconsin have been granted authority under Section 92.11 of the Wisconsin Statutes to adopt ordinances prohibiting land management practices which cause excessive soil erosion. Use of this authority in Wisconsin to date has been very limited.

After deliberating on the possible exercise of the regulatory authority granted under Section 92.11, the Washington County Soil Erosion Control Planning Program Technical Advisory Committee determined that efforts to address cropland soil erosion in Washington 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.

Construction Site Erosion

While the focus of the soil erosion control planning program has been on the control of cropland soil erosion, this report has also pointed out the potential for serious construction site erosion problems in Washington County as the County continues to urbanize. As indicated in Chapter VI, under Section 59.974 of the Wisconsin Statutes, counties in Wisconsin are granted authority to adopt ordinances for the control of construction site erosion within their unincorporated areas. Villages and cities are granted similar authority within their incorporated areas under Sections 61.354 and 62.234, respectively, of the Wisconsin Statutes. As indicated in Chapter VI, the City of West Bend has adopted a construction site erosion control ordinance providing an effective means for controlling soil erosion at development sites. Washington County and certain local units of government in the County have included general requirements pertaining to the control of erosion in land subdivision ordinances.

After deliberating on this matter, the Washington County Soil Erosion Control Planning Program Technical Advisory Committee recommended that Washington County review the erosion control provisions of the county land subdivision ordinance and modify those provisions as necessary to provide for the effective control of construction site erosion in the unincorporated areas of the County. As an alternative, the County could adopt a separate construction site erosion control ordinance. The model construction site erosion control regulations, prepared by the Wisconsin Department of Natural Resources in conjunction with the League of Wisconsin Municipalities, should be used as a guide in evaluating existing, and developing new, construction site erosion regulations.

The Advisory Committee further recommended that each of the cities and villages in Washington County, with the exception of the City of West Bend—which, as previously noted, has already adopted a construction site erosion control ordinance—review the existing framework of local land use regulations and determine how that framework should be modified to incorporate the desired construction site erosion control regulations.

SUMMARY OF AGENCY RESPONSIBILITIES

As indicated in Chapter VI, a number of agencies and units of government are concerned with the control of cropland soil erosion, including—at the county level—the Washington County Board, and the Washington County Land Conservation Committee and its staff in the County Land Conservation Department; at the state level—the

Table 24

AGENCY RESPONSIBILITIES UNDER THE CROPLAND SOIL EROSION CONTROL IMPLEMENTATION STRATEGY

Implementation Activity	Washington County Board of Supervisors	Washington County Land Conservation Committee/Land Conservation Department	Wisconsin Department of Agriculture, Trade and Consumer Protection	Wisconsin Department of Natural Resources	University of Wisconsin-Extension	U. S. Soil Conservation Service	U. S. Agricultural Stabilization and Conservation Service	U. S. Farmers Home Administration
Plan Adoption/Endorsement	X	X	X	X	X	X	X	X
Provision of Technical Assistance to Farmers: Farm Conservation Planning and Practice Implementation		X				X		
Information and Education Activities		X		X	X	X		
Administration of Conservation Requirements of Wisconsin Farmland Preservation Program and Federal Food Security Act		X				X	X	
Allocation of State and Federal Financial Assistance Resources to Washington County			X	X			X	X
Administration of Financial Assistance Programs to Landowners		X					X	X
Coordination of the County Soil Erosion Control Implementation Strategy		X						

Source: Washington County Land Conservation Department and SEWRPC.

Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the University of Wisconsin-Extension; and at the federal level—the U. S. Department of Agriculture, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Farmers Home Administration. While the Washington County Land Conservation Committee and its staff in the County Land Conservation Department, along with the Washington County offices of the U. S. Soil Conservation Service and University of Wisconsin-Extension, will be the most directly involved in carrying out the implementation strategy proposed in this chapter, the cooperation and involvement of all of the aforementioned agencies is important. The implementation responsibilities of all of the concerned agencies and units of government as identified in this study are summarized in Table 24.

Chapter VIII

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. Although Washington County overall has not experienced a substantial increase in erosion-prone row crops, such a trend has been occurring within certain areas of the County, particularly the southeastern portion.

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 Washington 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 Washington County Board in 1985 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 Washington County Land Conservation Committee and its staff in the County Land Conservation Department. The Land Conservation Department and the Commission staff were assisted in the preparation of the plan by a technical advisory committee consisting of county farmers, 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 Washington County. The plan identifies cropland soil erosion control problems in the County; recommends a cropland soil erosion control objective and related erosion control standards; identifies the types and amounts of soil erosion control practices that may be used to reduce soil erosion to tolerable levels; and recommends a long-range implementation strategy to guide the concerned agencies and units of government in their efforts to assist farmers in the application of the erosion control practices. 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 9 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 Washington County, T-values generally range between two and five tons per acre per year. It should be noted that while the concept of the T-value enjoys widespread use as a basis for soil conservation planning, T-values are not universally accepted as goals for cropland soil erosion control. There is some concern that T-values have been set too high to adequately protect the long-term productivity of the soil. It should also be recognized, in this respect, that the established T-values do not take into account offsite impacts attendant to cropland soil erosion. Nevertheless, in developing the soil erosion control plan, the Technical Advisory Committee determined that, despite limitations, soil loss tolerances, or T-values, established by the U. S. Soil Conservation Service currently provide the best available basis for establishing cropland soil erosion objectives and standards—although continuing research of those tolerances is required.

SOIL EROSION INVENTORY AND ANALYSIS

The rate of soil erosion on cropland for any given set of climatic conditions varies considerably, depending upon the cropping system, management practices, soil characteristics, and topographic features of the individual farm fields. Under the Washington 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 Washington 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 Washington 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 Washington County in 1987 was 2.8 tons per acre per year. The soil loss rate was less than 3.0 tons per acre per year on about 96,200 acres of cropland, representing about 71 percent of all cropland in the County in 1987. At the other extreme, the soil loss rate was 10 tons per acre per year or more on about 3,900 acres, representing about 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 29,600 acres of cropland, representing about 22 percent of all cropland in Washington County, was found to be eroding at rates exceeding T-value in 1987—including about 19,400 acres, or about 14 percent of all cropland, eroding at rates between 1.1 and 2.0 times T-value; about 6,000 acres, or almost 5 percent, eroding at rates between 2.1 and 3.0 times T-value; and about 4,200 acres, or about 3 percent, eroding at rates of more than 3.0 times T-value. The remaining cropland—totaling about 106,300 acres, or about 78 percent of all cropland in the County—was eroding at rates at or below T-value.

EROSION CONTROL PRACTICE NEEDS

A variety of conservation practices are available to farmers for the control of cropland soil erosion. Under the county soil erosion control planning program, a systems level determination was made of the types of practices that would effectively address soil erosion problems within the County. The analysis indicated the following:

- That 15,527 acres, representing about 53 percent of the excessively eroding cropland in the County, would be able to be treated through management practices involving conventional moldboard plowing—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.

- That 7,531 acres, representing just over 25 percent of the excessively eroding cropland in the County, would require conservation tillage systems—typically involving fall chisel and spring disking—leaving at least 30 percent of the soil surface covered by crop residue after planting. Of that total, 1,091 acres would be treated through conservation tillage alone, while 6,440 acres would be treated through conservation tillage in conjunction with other practices—including a basic rotation change, contour plowing, contour strip-cropping, or a combination of these.

- That 3,917 acres, representing about 13 percent of the excessively eroding cropland in the County, would require conservation tillage systems leaving at least 50 percent of the soil surface covered by crop residue after planting. These lands would also require other practices—particularly, changes in rotation—to reduce soil loss to tolerable levels. In this regard, 1,601 acres would require a basic rotation change, while 2,316 acres would require a major rotation change.

- That 2,587 acres, representing about 9 percent of the excessively eroding cropland in the County, would be retired from production and placed in permanent vegetative cover owing to the steepness of slope or highly erodible nature of the soil. This acreage represents about 2 percent of all cropland in Washington County.

In addition to the practices required to reduce soil loss to tolerable levels as described above, other practices—including terraces, grade stabilization structures, grassed waterways, and field diversions—will be needed to address erosion problems in certain situations. The amounts of such practices required in Washington County, as estimated by the County Land Conservation Department, based upon its experience in conservation planning in the County, include a total of 165,000 feet of grassed waterways, 55,000 feet of field diversions, 16,000 feet of terraces, and 30 grade stabilization structures.

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.

Cost of Recommended Practices

Of the various soil erosion control practices described above, implementation costs may be readily estimated for grassed waterways, grade stabilization structures, field diversions, terraces, and establishment of permanent vegetative cover. The estimated costs of such practices needed in Washington County are as follows: grassed waterways—$412,500; grade stabilization structures—$45,000; field diversions—$137,500; terraces—$56,000; and establishment of permanent vegetative cover—$168,200.

The costs of other conservation practices—including the cost of shifting to conservation tillage, the cost of implementing rotation changes, and the cost of contour plowing or contour strip-cropping—are far more difficult to specify. With regard to conservation tillage, for example, net return to the farmer may 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 may be positively affected by lower fuel consumption and lower operation

and maintenance costs because conservation tillage systems involve fewer tillage operations. Moreover, in the long term, net return may be positively affected owing to the maintenance of natural soil productivity. The impacts on net return of shifting from conventional to conservation tillage may be expected to vary from farm to farm, depending upon the size of operation; the physical characteristics of the farm including soil and topographic characteristics; the types of crops grown; and the type and condition of existing farm machinery.

IMPLEMENTATION STRATEGY

While ultimately the responsibility for the control of cropland soil erosion rests with the farm operator, a number of agencies and units of government have important responsibilities for the conservation of soil resources. Those units and agencies of government concerned directly or indirectly with the control of cropland soil erosion include—at the county level—the Washington County Board and the Washington County Land Conservation Committee; at the state level—the Wisconsin Department of Agriculture, Trade and Consumer Protection, the Wisconsin Department of Natural Resources, and the University of Wisconsin-Extension; and at the federal level—the U. S. Department of Agriculture, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Farmers Home Administration. One of the most important tasks undertaken as part of the soil erosion control planning program was the development of a long-range implementation strategy to guide the concerned agencies and units of government in their efforts to assist farmers in the application of needed erosion control practices. The strategy was designed to bring about a reduction of soil erosion to established tolerances on all cropland in the County by the year 2000.

Proposed Activities

In developing the erosion control strategy, the overall 11-year implementation period from 1989 through 1999 was divided into four time periods—the first three periods being three years in length and the fourth, two years. The strategy indicates the areas proposed to be addressed and the types of activities proposed to be undertaken during each period. The strategy proposes that cropland soil erosion problems be addressed, for the most part, on a watershed-by-watershed basis, and that efforts to address cropland soil erosion problems be closely coordinated with the Milwaukee River Priority Watersheds Program implementation activities. However, the strategy also recognizes the need for the provision of technical assistance to farmers scattered throughout the County in conjunction with the soil conservation requirements of the Wisconsin Farmland Preservation Program and the conservation compliance provisions of the federal Food Security Act.

During the first two implementation periods, the implementation strategy generally coincides with the program commitments of the state priority watershed program, the Wisconsin Farmland Preservation Program, and the federal Food Security Act. Activities during the first implementation period, from 1989 through 1991, would include conservation planning and practice implementation within the Milwaukee River East-West Branches watershed, Milwaukee River North Branch watershed, and Oconomowoc River watershed; practice implementation for "current" participants in the Farmland Preservation Program—that is, those participating in the tax credit program as of the end of 1988; conservation planning and practice implementation for "new" participants in the Farmland Preservation Program—that is, those additional farmers who may be expected to enroll lands in the tax credit program after 1988, primarily under the long-term agreement option; and conservation planning and practice implementation for farmers subject to the conservation compliance provisions of the federal Food Security Act.

Activities during the second implementation period, from 1992 through 1994, would include practice implementation within the Milwaukee River East-West Branches watershed, the Milwaukee River North Branch watershed, and the Oconomowoc River watershed; conservation planning and practice implementation within the Cedar Creek and Menomonee River watersheds; and practice implementation for participants in the Farmland Preservation Program and farmers subject to the conservation compliance provisions of the Food Security Act.

Activities during the third implementation period, from 1995 through 1997, would include practice implementation within the Cedar Creek and Menomonee River watersheds; and conservation planning and practice implementation within the Rock River East Branch watershed.

The Rock River East Branch watershed is the first watershed outside the Milwaukee River Priority Watersheds Program area that is targeted for erosion control. It was selected because of the large amount of excessively eroding cropland in the watershed, the amount of eroding soil reaching surface waters, and the relatively high need for erosion control practices.

Activities during the fourth implementation period, consisting of the years 1998 and 1999, would include practice implementation within the Rock River East Branch watershed; and conservation planning and practice implementation within the Ashippun River, Bark River, and Rubicon River watersheds.

Information and education activities and administrative activities would be carried out during each implementation period. A strong information and education program—designed to increase the awareness among farmers of soil erosion problems, of the types of practices that may be utilized to address those problems, and of the public financial and technical assistance resources that are available to help in implementing those practices—would be an integral part of the erosion control implementation strategy.

Staff Requirements

The government agency staffing level requirements needed to carry out the erosion control implementation strategy from 1989 through 1999 include about 9,900 man-hours for conservation planning; about 17,100 man-hours for practice implementation work; about 2,400 man-hours for information and education activities; and about 5,400 man-hours for administrative work. The erosion control implementation strategy would thus involve a commitment of about 34,800 man-hours, or just over 17 man-years, over the 11-year implementation period.

The amount of staff time which may be expected to be available for the work envisioned under the erosion control implementation strategy—including staff positions currently funded or anticipated to be funded under committed county, state, and federal programs—totals about 16,500 man-hours, or just over eight man-years, over the 11-year implementation period—or about 47 percent of the staff time required. The additional staff required for carrying out the erosion control implementation strategy, beyond presently committed staff, totals about 18,300 man-hours, or about nine man-years. The cost of the additional staff required, at 1988 salary and fringe benefit levels, would approximate $275,000.

Financial Assistance Requirements

It is anticipated that an effective cropland soil control program would have to be supported by financial assistance to farm operators—either "cost-share" assistance to help offset the cost of such erosion control practices as terraces, grade stabilization structures, grassed waterways, and diversions; or incentive payments to promote the adoption of contouring, contour strip-cropping, and conservation tillage. The amount of financial assistance required in support of needed cropland soil erosion practices would total about $1,216,200. Conversely, the amount of financial assistance which may be expected to be available in support of those practices under current financial assistance programs would total $763,600, including about $406,300 under the state priority watershed program and $357,300 under the federal Agricultural Conservation Program. The additional amount of financial assistance funds required—beyond the amounts which may be expected to be provided through current assistance programs—would thus approximate $452,600, or about 37 percent of the total amount needed. This analysis assumes participation by all farmers with excessively eroding cropland. The shortfall in financial assistance would be less to the extent that farmers decide not to participate in financial assistance programs.

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 methodology by which land conservation committees can evaluate the effectiveness of cropland soil erosion control activities. In this regard, it is recommended that the Washington County Land Conservation Committee conduct a periodic assessment of the effectiveness of erosion control activities in the County, including those undertaken by the County Land Conservation Department as well as by cooperating agencies, including the U. S. Soil Conservation Service and University of Wisconsin-Extension. To facilitate this assessment, the detailed computerized soil erosion data base, described in Chapter III of this report,

should be kept up-to-date, thereby providing a basis for determining the impacts of erosion control activities on cropland soil erosion rates.

In order to facilitate the updating of the soil erosion data base and to increase its usefulness as a planning tool, the following measures are recommended: 1) conversion of the present land identification system to one based upon the real property ownership and tax assessment system and attendant tax key numbering system; 2) provision of additional terminals to increase access to the data base; and 3) development of software to properly network office computers and software to facilitate the monitoring of program participation on a parcel-by-parcel basis.

While the foregoing improvements would result in a data base fully meeting the needs of the County Land Conservation Department, in the long term, Washington County may wish to consider the possibility of developing an automated multipurpose land information system designed to meet the land-related information needs of all county departments. Any consideration of such a multipurpose land information system should also include consideration of a related automated mapping system. It should be recognized that the development of such systems is a major undertaking, requiring as a first step the completion of a countywide control survey network consisting of relocating and monumenting all U. S. Public Land Survey corners in the County, the location of those corners being established on the Wisconsin State Plane Coordinate System and the elevation of the corners being established relative to National Geodetic Vertical Datum. Subsequent steps would include the preparation by photogrammetric methods of a set of large-scale topographic maps compiled to National Map Accuracy Standards and the preparation of a set of real property boundary line maps, both sets of which would be properly referenced to the control survey network. The maps would be digitized, and parcel identifiers assigned to all land ownership to provide the necessary linkage to alter data files, in order to provide the basis for the creation over time of a multipurpose cadastre, including an automated mapping capability.

CONSTRUCTION SITE EROSION CONTROL

While the focus of the soil erosion control planning program has been on the control of cropland soil erosion, this report has also pointed out the potential for serious construction site erosion problems in Washington County as the County continues to urbanize. Construction site erosion can contribute to problems on the construction site itself—including rilled and gullied slopes and washed-out roads—and to offsite problems—including water quality degradation and clogging of culverts and roadside ditches and other watercourses. Construction site erosion can be controlled through adoption and enforcement by local units of government of appropriate construction site erosion control regulations. The City of West Bend has adopted a construction site erosion control ordinance providing an effective means for controlling soil erosion at development sites. Washington County and certain local units of government in the County have included general requirements pertaining to the control of erosion in land subdivision ordinances.

After deliberating on this matter, the Washington County Soil Erosion Control Planning Program Technical Advisory Committee recommended that Washington County review the erosion control provisions of the county land subdivision ordinance and modify those provisions as necessary to provide for the effective control of construction site erosion in the unincorporated areas of the County. As an alternative, the County could adopt a separate construction site erosion control ordinance. The model construction site erosion control regulations, prepared by the Wisconsin Department of Natural Resources in conjunction with the League of Wisconsin Municipalities, should be used as a guide in evaluating existing, and developing new, construction site erosion regulations.

The Advisory Committee further recommended that each of the cities and villages in Washington County, with the exception of the City of West Bend—which, as previously noted, has already adopted a construction site erosion control ordinance—review the existing framework of local land use regulations and determine how that framework should be modified to incorporate the desired construction site erosion control regulations.

PUBLIC REACTION TO THE PLAN

A public hearing was held on February 9, 1989, at the Washington County Courthouse for the

purpose of receiving comments on the soil erosion control plan as summarized above. A copy of the public notice regarding the hearing is set forth in Appendix D.

No objections to the recommendations set forth in the soil erosion control plan were raised at the hearing. While the plan emphasizes a basically voluntary approach to soil conservation, some individuals did express concern about the possibility of mandatory approaches in the future. Concern was expressed that references in the plan report to existing regulatory authority for controlling cropland soil erosion as established under Wisconsin Statutes might be interpreted by some as an endorsement of regulatory approaches for erosion control. Concern was also expressed at the hearing regarding the lack of funding for the technical staff and for the cost-share assistance required to carry out the plan.

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APPENDICES

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Appendix A

ESTIMATED SEDIMENT LOAD FROM CROPLAND FOR SELECTED AREAS IN WASHINGTON COUNTY

Soil loss as measured by the universal soil loss equation refers to the amount of soil dislodged and moved from place to place as a result of sheet and rill erosion. It does not indicate whether the movement is to a different location on the farm field, to a neighboring field, or to surface waters. While such estimates of soil loss are important in planning for the control of cropland soil erosion in general, for surface water quality management planning, estimates of the amount of eroding soil entering surface waters are essential. Under the Milwaukee River Priority Watersheds Program, the amount of soil entering the surface water network from farm fields in the Milwaukee River watershed study area is being estimated through application of a sediment delivery model developed by the Wisconsin Department of Natural Resources. As part of the priority watershed program, the resulting data will be used in the preparation of detailed plans for the reduction of erosion-related water quality problems. It should be noted that at the time of the preparation of this report, priority watershed program information regarding sediment delivery from eroding cropland was available for only the Milwaukee River East-West Branch watershed and the Milwaukee River North Branch watershed.

Because of the widespread concern over the impacts of soil erosion on surface water quality, an effort was made under the county soil erosion control planning program to estimate sediment delivery to surface waters from cropland in areas of the County outside the Milwaukee River priority watersheds study area. The methodology used in that analysis is described in Table A-1. The resulting data are intended to supplement data being developed under the Milwaukee River Priority Watersheds Program, providing a basis for assessing the surface water impacts of cropland soil erosion throughout the County.[1]

Sediment delivery from cropland for areas of the County for which data were available at the time of the preparation of this report—including data developed under the Milwaukee River Priority Watersheds Program and data developed under the county soil erosion control planning program—is summarized by U. S. Public Land Survey section on Map A-1.

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[1] *Under the county soil erosion control planning program, estimates of sediment delivery from cropland were developed for all areas of the County outside the Milwaukee River priority watersheds study area except the Oconomowoc River watershed.*

Table A-1

PROCEDURES FOLLOWED IN ESTIMATING SEDIMENT DELIVERY TO SURFACE WATERS FROM CROPLAND FIELDS IN WASHINGTON COUNTY OUTSIDE THE MILWAUKEE RIVER WATERSHED STUDY AREA

1. As part of the cropland inventory, each cropland field in the area of the County outside the Milwaukee River watershed study area was evaluated in terms of the ultimate destination of runoff under a heavy rain, the fields being categorized into the following groups:

Group	Criteria
A	Runoff from the field enters a lake, stream, or pond with an outlet—or a wetland bordering same—directly or by channelized flow
B	Runoff from the 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 effectively buffer the water resource[a]
C	Runoff from the field ultimately drains to a lake, stream, or pond with an outlet, but first travels by overland flow through other lands which effectively buffer the water resource[a]
D	The field is internally drained or the area to which it is tributary is internally drained

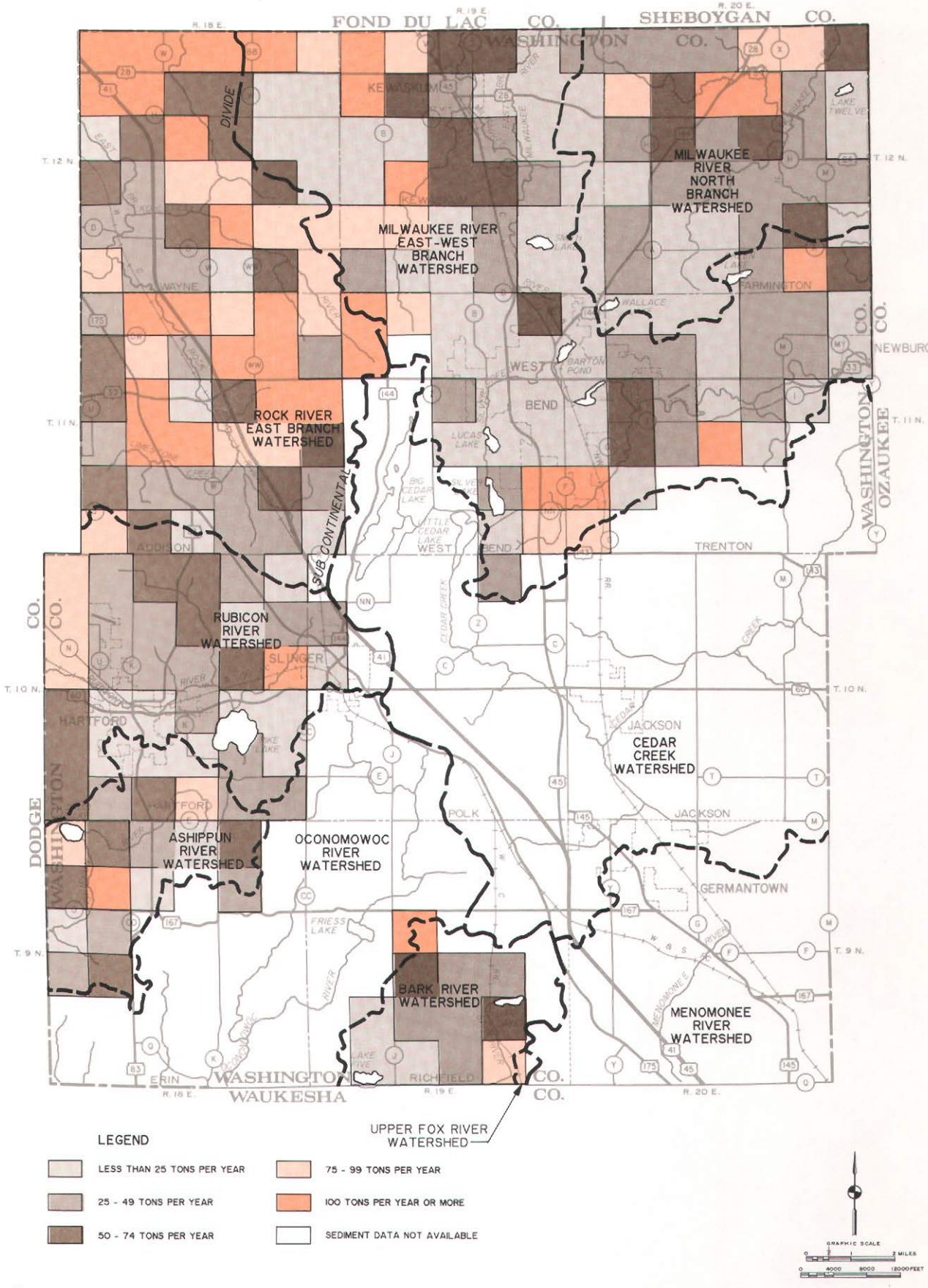
2. For fields in Group A, sediment delivery was estimated by multiplying the soil loss rate, as determined through application of the universal soil loss equation, by 15 percent—the estimated average proportion of eroding soil which reaches the surface water network for Group A fields. For fields in Group B, sediment delivery was estimated by multiplying the soil loss rate by 9 percent—the estimated average proportion of eroding soil which reaches the surface water network for Group B fields. Sediment from Group C and Group D fields was considered to be negligible. The estimated proportions of eroding soil reaching the surface water network for Group A and Group B fields were developed through an analysis of a sample of similar fields in the Milwaukee River East-West Branch watershed, for which both the overall soil loss rate and the sediment delivery rate had previously been determined under the Milwaukee River Priority Watersheds Program.

[a]*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 is increased by 50 percent.*

Source: Washington County Land Conservation Department and SEWRPC.

Map A-1

ESTIMATED SEDIMENT LOAD FROM CROPLAND FOR SELECTED AREAS IN WASHINGTON COUNTY



Source: Wisconsin Department of Natural Resources, Washington County Land Conservation Department, and SEWRPC.

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Appendix B

PUBLIC INFORMATIONAL ACTIVITIES UNDER THE WASHINGTON COUNTY SOIL EROSION CONTROL PLANNING PROGRAM

Two countywide meetings were conducted to provide information to the public concerning the county soil erosion control planning program and related programs, including the Milwaukee River Priority Watersheds Program and the soil conservation requirements of the Wisconsin Farmland Preservation Program. The meetings were held on January 28, 1986, at the Washington County Courthouse Auditorium and on January 29, 1986, at the Richfield Town Hall. Copies of newspaper and newsletter announcements of the meetings are included in this appendix. A combined total of about 40 farmers and interested parties attended the informational meetings.

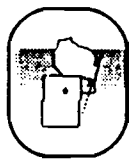
As indicated in Chapter VII of this report, under the soil erosion control implementation strategy, soil erosion problems in Washington County would be addressed largely on a watershed-by-watershed basis. The Milwaukee River North Branch watershed and Milwaukee River East-West Branches watershed are among the first areas scheduled to be addressed. In conjunction with the Milwaukee River Priority Watersheds Program, informational meetings were held in July 1988 in each of the towns within those watersheds—namely, the Towns of Barton, Farmington, Kewaskum, Trenton, Wayne, and West Bend—to explain the nature and extent of soil erosion problems and other nonpoint source pollution problems, and to describe the types of technical and financial assistance expected to be available. As the erosion control implementation strategy is carried out in conjunction with the priority watersheds program, written notices will be sent to concerned farmers informing them of soil erosion and other nonpoint source pollution problems in the area and of the types of practices generally recommended to address those problems.

Appendix B-1

NEWSPAPER AND NEWSLETTER ANNOUNCEMENTS OF THE WASHINGTON COUNTY SOIL EROSION CONTROL PLANNING PROGRAM PUBLIC INFORMATIONAL MEETINGS

WASHINGTON COUNTY

CONSERVATION NEWS



Vol. 9 "LOCAL COOPERATION TOWARDS CONSERVATION" January, 1986

PUBLIC MEETINGS TO BE HELD TO DISCUSS NEW PROGRAMS

Dates have been set for two informational meetings to be held in Washington County to discuss the many new programs dealing with soil and water conservation and how they will affect local landowners.

The accompanying fact sheet describes the two major programs that will be discussed at the meetings: the Priority Watershed and the Soil Erosion Control programs. The fact sheet gives some background information on these two programs, tells who is affected, and answers some other important questions that a landowner may ask about them. The back page then gives a very brief summary of some of the main points of each of the two programs "in a nutshell".

The Land Conservation Committee of Washington County encourages all rural landowners to review this fact sheet and attend one of the informational meetings. All the new programs and the recent changes in others, reflect a growing seriousness about controlling soil erosion and cleaning up our water resources. It's important for everyone to be aware of these programs and their goals.

Other items that may be discussed include the new soil conservation requirements for all Farmland Preservation program participants, the "Conservation Reserve" provisions in the new farm bill, and the current ACP program in the county.

At the informational meetings, local staff from the Land Conservation Department and the UW - Extension office will give a slide presentation on the objectives of the programs, review the enclosed fact sheet, and answer any questions you may have. The land inventory required for the priority watershed and the soil erosion control programs has already begun. Begining this winter many landowners will be contacted by local staff to help collect some of the cropping and barnyard data needed. So at the meeting staff will also demonstrate how this is being conducted and explain what the landowner involvement will be.

The meetings will take place:

TUESDAY, JANUARY 28, 1986
WASHINGTON COUNTY COURTHOUSE AUDITORIUM
432 E. WASHINGTON ST., WEST BEND
8:00 PM

and

WEDNESDAY, JANUARY 29, 1986
RICHFIELD TOWN HALL
4128 HUBERTUS RD., HUBERTUS
8:00 PM

Please mark your calendars and plan to attend!

[illegible]

Meetings set on soil, water

Soil erosion and nonpoint pollution have been identified as two major concerns facing the environment. Farmers, landowners, public officials and the general public have been concerned about ways to reduce the effect of these problems. A major effort is being made throughout Washington County to address these concerns through a variety of methods.

Everyone benefits when we reduce nonpoint pollution and the effects that it has on our waterways. Therefore, legislators have chosen to develop programs providing cost-share dollars and incentives to address the problems. Washington County is participating in many of these programs and they are being coordinated through the Washington County Land Conservation Committee.

Farmers, landowners, public officials and others in Washington County are invited to attend two informational meetings to become informed about the new programs involving soil and water conservation in the county and how they will affect rural landowners.

The meetings will be held at 8 p.m. on Tuesday, Jan. 28, at the Washington County Courthouse Auditorium in West Bend, and on Wednesday, Jan. 29, at the Richfield Town Hall, located at 4128 Hubertus Road, Hubertus.

Up for discussion are the priority watershed and the soil erosion control programs. Other topics include the new soil conservation requirements for the farmland preservation program participants, the conservation reserve provisions of the new farm bill and the 1986 ACP program.

All of these programs are presently in the early stages but promise to have a large impact on rural landowners in the near future. They represent a growing seriousness at all levels of government about controlling soil erosion and reducing nonpoint-source water pollution.

Large amounts of tax dollars are being invested in each program to accelerate local soil and water conservation efforts.

For more information on the programs, contact the Washington County Cooperative Extension Service Office.

West Bend News
January 21, 1986

Appendix C

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 D

MINUTES OF THE PUBLIC HEARING ON THE
WASHINGTON COUNTY SOIL EROSION CONTROL PLAN

Washington County
Land Conservation Department

2361 W. WASHINGTON STREET, WEST BEND, WI 53095 — PHONE: 334-3636

Minutes

Land Conservation Committee
February 9, 1989

The meeting was called to order by Chairman Reuben Schmahl at 1:00 p.m. Mr. Schmahl noted that the primary purpose of this meeting was to sponsor a public hearing on the Washington County Agricultural Soil Erosion Control Plan. Those in attendance included the following:

LCC	Staff
Reuben Schmahl, Chairman	Perry Lindquist, LCD
John Kohl, Vice Chairman	Doris Thiele, LCD
Dan Stoffel, Secretary	Dan Wilson, UWEX
Frank Falter	Pat Murphy, SCS
Allen Peil	Grant Loy, ASCS
Paul Tuchscherer	

Other persons present:
Bill Stauber, SEWRPC
Hilbert Scheunemann, Advisory Committee Chairman
Merlin Prost, Landowner - Town of Barton
Mrs. James McKee, Landowner - Town of Farmington
Robert Bellin, Landowner - Town of Trenton
Janet Melkmen, West Bend News

Mr. Schmahl gave a brief background on the preparation of the Erosion Control Plan noting that it was a state statutory requirement. He then introduced Bill Stauber from the Southeastern Wisconsin Regional Planning Commission (SEWRPC), with whom the county had contracted with for plan writing assistance.

Mr. Stauber proceeded by handing out copies of the abstract from the Washington County Agricultural Soil Erosion Control Plan. The handout also included several charts and maps taken from the plan. Mr. Stauber explained that the plan was prepared by SEWRPC under the guidance of an advisory committee of local representatives and with technical assistance from the Land Conservation Department (LCD) staff. The LCD staff gathered field-by-field erosion inventory data in conjunction with the Milwaukee River Watershed project. Those areas outside the watershed were inventoried separately. SEWRPC's responsibilities included processing the data to determine erosion rates and writing the plan.

Mr. Stauber summarized the results of the data gathered for the group. The average soil erosion rate for Washington County was estimated to be 2.8 tons per acre per year. He referenced charts III-1 and III-4 to show that of the county's 135,000 acres of cropland, 29,600 acres (or about 22%) were eroding over tolerable levels. He then explained map III-1 which showed soil erosion rates for each public land survey section within the county. Mr. Stauber stressed that the map only reflected soil erosion rates, not potential effects on water quality as presented in priority watershed projects.

Mr. Lindquist further explained Map III-1, saying that the concentration of high erosion rates reflected the rolling Kettle Moraine topography running north-south through the center of the county. The other concentration in the southeastern corner was explained to be caused by rotations which center on row crops.

Mr. Stauber then explained the system level analysis as presented by table V-3. This analysis determined what practices needed to be applied to fields eroding over the tolerable levels to bring them down to these levels. The sequence was unique to contourable versus non-contourable fields in the county. Each of the practices reflected a change in one of the factors on the Universal Soil Loss Equation (USLE). Mr. Lindquist explained that the LCD staff outlined this system of practices based on conservation planning experience with landowners in the county. Mr. Stauber presented acreages associated with each practice as shown in table V-4 and V-5.

Mr. Lindquist defined permanent cover as those fields which would need extreme rotation changes including no row crops in order to meet the tolerable erosion rates. Approximately 2% of the counties total cropland was put into this category through the analysis. He also explained a random sampling method used to establish percent contourability for fields within each township for those lands eroding over tolerable levels.

The implementation strategy was discussed by Mr. Stauber. The strategy is driven by programs the county is involved with. These include the Federal Food & Security Act, Wisconsin Farmland Preservation and various Priority Watershed projects. Mr. Stauber explained there are four activities involved with implementation. An outline showing time periods, activities and program involvements is shown in table VII-1. As the erosion control plan's major goal is to reach tolerable soil loss by the year 2000, the strategy was designed for all implementation work to be completed by 2000. Mr. Lindquist went further to explain table VII-2 which shows each activity, by time period and the number of hours needed to complete that activity. Staff shortfall anticipated to be funded through current county, state and federal programs. Mr. Lindquist referred to map VI-1 to show an example of the large number of farm fields which are eroding over tolerable levels but not targeted for control through the East/West Branch Priority Watershed project.

Mr. Falter questioned how these non-targeted fields would be funded as they are not eligible through the watershed program. Mr. Lindquist admitted there was a shortfall of staff hours to plan these fields as well as monies to implement any conservation practice needed, however, the plan does not propose a funding source to address the shortfall.

Mr. Wilson asked whether the planning process in the watershed would include all fields or just those targeted for sediment delivery. Mr.

Lindquist assured that all fields a landowner owned, could be planned if that landowner had at least one field targeted through the watershed. However, any cost share dollars needed to implement a practice planned would need to come from another source such as the Agriculture Conservation Program (ACP).

Mr. Stauber discussed table VII-3 which presents the financial assistance requirements (cost sharing for landowners). The table shows the total cost sharing required to install the recommended practices and the amounts anticipated to be available through existing programs. It showed a shortfall of $452,600 to install all the practices county-wide, not including staff time. He also noted that while the focus of the plan was to address cropland soil erosion, the plan also discusses construction site erosion and local control techniques.

Mr. Lindquist explained table VII-4 to represent the acres of cropland planned to be implemented at each stage of implementation. As of January 1, 1989, 36,225 acres have been planned in the county. An additional 87,338 acres will be planned under current programs by committed staff. If staffing and financial assistance needs were met, the remaining 48,485 acres could be planned by the end of 1999. All estimates for staffing and cost sharing needs as well as acres planned, are based on 100% participation levels by landowners.

Mr. Bellin questioned if the erosion control plan, with it's goal of "T by 2000", will become mandatory. Mr. Lindquist said the program will have a voluntary approach. Mr. Falter also said the voluntary approach was a discussion item in the plan's approval process.

Mrs. McKee then led a discussion with the group concerning regulatory approach available to adjoining landowners which are not meeting program and practice requirements. Her concern centered on a tile outletting on the property line. Mr. Murphy said that at the present time, the Food and Security Act only address sheet and rill erosion. He suggested he could approach the neighbor, but could not regulate the outlet. He also said that legal action might be the only recourse.

Mr. Falter indicted his concern with mandatory regulations that could come about with the passing of the plan as indicated on page 10 of Chapter 7, and page 14, Chapter 6. Mr. Lindquist explained that the paragraph in question only acknowledges that Act 297 exists. The technical advisory committee was to be strictly voluntary.

Mr. Wilson questioned if state funding for the plan will be available in the future. Mr. Lindquist said the rules of the erosion control program have been rewritten since this plan became a requirement. The DATCP will use the fifty-five county erosion control plans prepared to develop a summary of the financial needs. Using this summary, DATCP could request funding from the legislature in the future.

Mr. Stoffel wanted an explanation of the rational behind no-till creating a greater groundwater pollution potential as described on page 10 of Chapter 5. Mr. Lindquist explained the pollution potential as being greatest where no-till is practiced on sandy or organic soils with a high water table. Since no-till is not being recommended in these areas, it should not be a big threat in Washington County. Mr. Murphy acknowledged there is research which shows

greater infiltration of rainfall on no-till fields, thus soluble nutrients/chemicals are carried more easily to groundwater.

Mr. Falter stated concerns with the change in a paragraph on page 4 of Chapter 5 describing contouring. Mr. Lindquist said he recommended the change after the discussion at the last advisory committee meeting. He said the original paragraph detailed advantages and disadvantages of the practice, which was not discussed for the other practices. To be consistent, the new language attempts to discuss the purpose and technical limitations of the practice.

Mr. Stoffel asked if the land inventory reflected the acres that have already lost much of their productive value and if they would be the primary group to be recommended for permanent cover. Mr. Lindquist answered that productivity was not specifically inventoried, but the soil survey attempts to address productivity of each soil type by using numerical values which represent depth of topsoil previously lost to erosion. He also stated that while no direct correlation was made between these soil types and the acreage recommended to be put in permanent cover, a great degree of overlap likely exists.

Mr. Kohl expressed concern with variance and penalty procedures that could be used in cross compliance enforcement within the county. Local staff discussed the various options that have been made available, including Alternative Conservation Systems though the federal programs.

Mr. Falter pointed out several areas in the plan which identifies the LCC in the lead role of pursuing the program goal of "T by 2000" and the responsibilities involved.

In response to other questions concerning "implied" regulatory authority, Mr. Lindquist said the goal of "T by 2000" is in the state statues. Even though a county may favor the voluntary approach, if this goal is not met, regulations initiated at the state level cannot be prevented. He said that is why he favored additional language in Chapter 7 on what the counties response would be if the goal is not met or if regulations were proposed. Mr. Scheunemann stressed that the approach to farmers was most important and needed to be voluntary.

Some discussion followed on the program monitoring and evaluation section of Chapter 7. The county has created a field-by-field detailed database and will keep the database current as conservation plans are prepared. The database could be used to evaluate progress in the future.

Mr. Murphy explained that implementation of FSA conservation compliance planning has shown that only minor adjustments in either tillage or cropping sequences was usually necessary to meet soil loss goals.

Mr. Falter stated he still had some concerns over certain wording used in the plan, but overall approved of the final draft of the plan.

Mr. Schmahl asked three times if there were any other comments on the plan. There being none, Mr. Kohl motioned to close the public hearing at 2:35 p.m. seconded by Mr. Stoffel. Motion carried.

Mr. Tuchscherer motioned to recommend approval of the Washington County Agricultural Soil Erosion Control Plan to the County Board of Supervisors as a resolution; seconded by Mr. Peil. Motion carried.

Other Business

Mr. Lindquist clarified the discrepancy of the North Branch Educational Grant saying that there was an error in the last financial report which showed the account balance of $7,500.00 rather than the December payment of $5,000. He also presented an amendment to the education grant for Mr. Schmahl to sign. (The grant extension was previously approved by the LCC.)

There being no other business, Mr. Kohl motioned to adjourn the meeting at 2:40 p.m.; seconded by Mr. Tuchscherer. Motion carried.

Respectfully Submitted,

Daniel Stoffel
Secretary

Recording Assistance:
Perry Lindquist
Doris Thiele

Appendix D-1

PUBLIC NOTICE OF THE WASHINGTON COUNTY SOIL EROSION CONTROL PLAN PUBLIC HEARING

STATE OF WISCONSIN } ss.
Washington County }

Brian J. Batterson, being duly sworn, doth depose and say that he (she) is an authorized representative of THE WEST BEND NEWS, a newspaper printed and published in the City of West Bend, Washington County, and that an advertisement of which the annexed is a true copy, taken from said paper, was published therein on

Feb. 6, 1989
Feb. 9, 1989

(Signed) Brian J. Batterson
Advertising Manager (Title)

Subscribed and sworn to before me this 10th day of Feb., 19 89

Kathleen Ritzer
Notary Public, Wisconsin

My Commission expires Sept. 1, 19 91

NOTICE OF PUBLIC HEARING
COUNTY SOIL EROSION CONTROL PLAN

Notice is hereby given that on Thursday, February 9, 1989, commencing at 1:00 P.M. at the Washington County Courthouse, 432 E. Washington St., West Bend in Room 121, the Land Conservation Committee of the Washington County Board of Supervisors shall conduct an informational meeting, followed by a public hearing on the draft Soil Erosion Control Plan for Washington County. The plan was prepared pursuant to Wisconsin stats. Chapter 92.10, and DATCP Administrative Rules AG 160.

Dated this 2nd day of February, 1989 at West Bend, WI.
Perry M. Lindquist
County Conservationist

Publish: Feb. 6 and 8

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Appendix E

RESOLUTION OF THE WASHINGTON COUNTY BOARD OF SUPERVISORS APPROVING THE WASHINGTON COUNTY SOIL EROSION CONTROL PLAN

RESOLUTION NO. 85-88-89

Approval of Agricultural Soil Erosion Control Plan

WHEREAS, Wisconsin Statutes Section 92.10 requires each County Land Conservation Committee to prepare a County-wide Soil Erosion Control Plan according to the requirements outlined in the Wisconsin Department of Agriculture, Trade and Consumer Protection Administrative Rules AG 160; and

WHEREAS, the Land Conservation Committee (LCC) established a Technical Advisory Committee made up of local officials and landowners and authorized them to take the lead on developing the plan, accepted a 50% matching state grant and contracted with the Southeast Wisconsin Regional Planning Commission for plan writing assistance; and

WHEREAS, the final draft of the County Soil Erosion Control Plan has been reviewed and approved by the County Technical Advisory Committee, the Land Conservation Committee and the State Land Conservation Board, and public comments were accepted at a public hearing on February 9, 1989; and

WHEREAS, the Land Conservation Committee, after receiving comments on the plan from the above mentioned groups, has recommended plan approval to the board;

NOW, THEREFORE, BE IT RESOLVED by the Washington County Board of Supervisors that they hereby approve the Washington County Agricultural Soil Erosion Control Plan.

DATED this 14th day of March, 1989.

APPROVED:

Corporation Counsel

Dated 3-15-89

Considered 3-14-89

Adopted 3-14-89

Ayes____ Noes____ Absent____

Voice Vote X

(No Fiscal Effect)

Introduced by members of the LAND CONSERVATION COMMITTEE as filed with the County Clerk.

Reuben J. Schmahl, Chairperson

Frank Falter

John Kohl

Daniel Stoffel

Paul Tuchscherer